

SECTION 5. THEORETICAL MEDICINE

DOI: 10.46299/ISG.2024.MONO.MED.3.5.1

5.1 Taxonomy of clinical thinking

5.1.1. The concept of critical thinking and thinking skills

For the past five years, the global educational process has been proceeding under the auspices of the UNESCO specialized program, which created and introduced the educational cluster “ESD” - Education for Sustainable Development (education for sustainable development) [118].

The roadmap, based on an approach focused on continuous training, sets out a number of related measures in the ESV For 2030 section, including coordination of programs of formal and informal education suppliers [118].

Within the framework of such a global educational process, many countries responded to the call for coordination of efforts to develop progressive models of modern education in schools and higher educational institutions. One of these models is the concept of teaching critical thinking among modern students and students [119].

The theory of critical thinking is at the moment very popular, since it involves the creation of a special analytical design in a person’s thinking - “filter”, which from an array of incoming information helps a person to choose only the necessary information, on the basis of which it is possible to build an unmistakable output and making a decision.

On the other hand, with weak critical thinking skills, people are more often lending to marketing manipulations, and take false principles and ideas on faith. In making professional decisions, the lack of critical thinking can become a serious tactical or strategic risk.

Thus, the concept of “critical thinking” is an element of a more general properties of human intellectual activity - thinking.

As noted by Hidayati & Sinaga (2019), critical thinking skills are not innate, so they can be used, explained and developed in the learning process [120].

The need for teaching this type of intellectual activity is declared both by school teachers and university teachers, including medical ones. This interest is dictated by the practical situation - the need to maximize the elimination of such negative phenomena in the healthcare system as medical errors [121,122]. The methodology of analyzing the options for cognitive errors in assessing the health status of patients allowed by medical workers is of deep interest. The working hypothesis of such studies is that the identification of the laws of logical errors can help introduce the study of elements of medical logic in pre- and postgraduate medical education.

Interuniversity competition in the field of higher education and new initiatives in the field of creating academic standards caused the need to form students of the so - called “Higher Order Thinking Skills). A similar type of thinking forms “such a style of mental activity in which the student knows how to find the necessary information, analyze and synthesize it, draw logical conclusions, build evidence, critically process facts, competently present the results of studies” [123].

Low level thinking skills are associated with elementary forms of information processing, such as memory, associations and simple perception. These include mainly verbal thinking and comprehension, when students may not be able to abstract or draw conclusions, which affects their ability to critical thinking and solving more complex tasks. These skills belong to basic cognitive operations, such as perception, attention and simple memorization. They provide the initial stages of information processing that underlie the development of more complex cognitive skills, such as analysis and synthesis. These skills are important for the formation of the foundations of more advanced levels of understanding and analysis.

Thus, critical thinking is both an element of thinking and a cognitive process.

When comparing these categories, it is necessary to proceed from the fact that thinking should be attributed to the psychological category describing the mechanisms and features of the deep, internal processes of perception and processing of information, its analysis and decision –making.

Cognitive processes, as a category of psychology, reflects a person’s attitude to the analyzed phenomenon. It manifests itself in his actions, conviction, primary attitude,

forming in his subsequent action, emotional reaction. In this context, cognitive distortions can lead to inadequate emotional reactions and behavior. They are not based on the processing of facts, but false ideas about the phenomena and the habit of thinking template. To one degree or another, cognitive distortions can also be found among university students. One of the tasks of pedagogy of higher education is to harmonize behavioral and mental activity, which corresponds to the UNESCO program “Education for Sustainable Development”.

For many decades, the pedagogy of higher education has been theoretically sought to substantiate and practically translate into the educational process the most advanced technologies for the transfer of independent critical thinking skills to students. In the middle of the last century, Benjamin Bloom developed a classification of thinking skills, which is also useful today [124]. According to the presented model, the structure of thinking includes six levels: from the lower (basic) to the highest (most advanced). The ratio of the internal process of thinking and external cognitive thinking is represented in table 1.

In what relation are the levels of thinking presented in Figure 1 and critical thinking? Obviously, the 4th level of thinking is an analysis of the 4th level of thinking-analysis. Therefore, it is a high -level cognitive operation.

Table No. 1

The ratio of the levels of the thinking of the blum and their cognitive content

No. level*	The name of the levels of thinking	Cognitive content of levels of thinking
6.	Grade	The ability to evaluate and analyze work or results based on criteria
5.	Synthesis	The ability to unite, draw up and create new on the basis of gained knowledge
4.	Analysis	The ability to decompose information into the components and identify their relationship
3.	Application	The ability to use knowledge and skills in new situations or to solve problems.
2.	Understanding	The ability to explain and interpret information.
1.	Memorization	Ability to remember and reproduce information

* The numbering is given in accordance with the classification of blum levels of thinking to lower (1.2) and higher (4.5,6).

The practical significance of such a hierarchy of levels of thinking is that each subsequent level is “on the shoulders” of the previous one.

Any attempt to “accelerated” knowledge of the subject by jumping of any level is doomed to failure. This phenomenon is clearly noticeable on the example of the transition of a medical education to distance learning methods caused by a war in Ukraine. The independent development by applicants for higher education of medical universities of practical skills in the diagnosis of diseases is difficult due to the weakness of critical thinking in the selection of specific symptoms from the general clinical picture.

The variety of signs of any health disorders requires the ability to differentiate them into two classes: specific and not specific. Non -specific signs of health disorders are not symptoms of a particular disease. This is “noise” information that critical thinking should exclude from the logical process of diagnosis. The essence of learning clinical thinking is to develop skills to secrete specific signs of the disease - symptoms from the total number of signs of health disorders. The absence of such an accentuation on specificity leads to the fact that with insufficient critical thinking, the obvious signs of a particular disease are “blurred” by non -specific signs of health disorders (such as “deterioration of working capacity”, “reduction of appetite”, “lethargy”, etc.). The lack of accentuation on specificity does not allow the doctor to form a syndrome specific for this disease from the group of symptoms.

So, if the doctor did not see or learned the visual image of the exanthema (skin rash) with infectious rubella, then when meeting with such a symptom, his argument will not be infectious, but a more common and routine - an allergic rash genes. At the same time, an understanding of the essence of the disease of a particular patient suffers. In the doctor’s mind, the identified signs of health disorders look chaotic, not related by a common genesis. Their use, to justify the primary preliminary diagnosis, is difficult. As a result, such “diagnostics” leads to false conclusion and erroneous choice of the treatment method, sometimes very dramatic.

5.1.2. Genesis of medical errors and critical thinking

One of the most topical problems of practical healthcare is the dramatic support of medical activity with medical errors. Despite the rapid development of diagnostic and pharmacotherapeutic capabilities, the risk of adverse outcome of medical intervention in the patient's health becomes a "curse" of the theory and practice of medical activity.

So, according to Anne Carrie, "medical errors are now the third most important cause of death in the United States, having overtaken strokes, Alzheimer's disease and diabetes [121]. In addition, one of the seven Medicare patients receiving help in the hospital is a victim of a medical error. "

In the Rodziewicz [122] review, attention is drawn to the financial burden of medical errors: according to some experts, healthcare costs per year only for nosocomial infections in the United States are up to 35.7–45 billion dollars. The risk of nosocomial infection in hospitalized patients is 1: 20 or 5%.

The widespread spread of pools associated with violation of hygienic norms and the effective elimination of these shortcomings in the form of companies for compliance with sanitary rules reports [125]. On errors related to the incorrect use of antibiotics [126], various kinds of catheter [127], the falls of elderly patients in medical institutions and nursing houses, accompanied by fractures of the bones of the skull and femoral bones [128], communication errors [129] related to various cultural level of the doctor and patient [130]. Moreover, the dramatic outcomes of treatment cause the so -called "domino effect", when a wave of disappointment and negative attitude to the medical staff from the patient's relatives switches to medical personnel. At the same time, the employees of medical institutions themselves experience depression, anger, guilt up to suicidal thoughts [131]. or subsequent clinical uncertainty of the rightness of their actions.

What is the essence of medical errors? The Health Health Committee of the Institute of Medicine (MOM) in the USA, which conducted the first major study of medical errors, defined a medical error as "non -fulfillment of the planned action properly or the use of improper planning to achieve the goal." [132]. Another definition defines medical errors as failures in providing assistance that may or cannot lead to

harm to the patient [133]. As you can see, these modern definitions of a medical error did not change the definition given a quarter of a century ago: “A medical error is an action or inaction with potentially negative consequences for a patient, which would be regarded as incorrectly experienced and knowledgeable colleagues at the time of its commission, regardless of it, regardless whether there were any negative consequences”[134].

Numerous options for the negative activities of medical personnel can be divided into two classes: active and hidden errors [135,136]. Active errors include situations whose wrongness is obvious. For example, the development of a hemolytic transfusion reaction associated with the introduction of blood or blood products with significant incompatibility, or the performing of a drug injection not to the patient. In such situations, medical error is detected immediately.

Hidden errors include cases in which the fallacy of actions, due to their secrecy, continues for a long time and is revealed suddenly. For example, the use of an implant of dubious quality or the use of a faulty sphimanometer.

Thus, medical errors, as a cognitive act and, as a logical actions that arise from it, exist objectively. The search for a solution to this problem is relevant for any type of medical activity.

Based on the study of the 115 stories of diseases written by the highways of the Odessa National Medical University, a number of erroneous reasoning and conclusions about the state of health of the nominated patients were revealed. Their analysis made it possible to distinguish four groups typical of erroneous cognitive logical formulations. Figure 1 reflects typical erroneous conclusions of young doctors. At the same time, the gender features of thinking among masters - men and masters - women were noted.

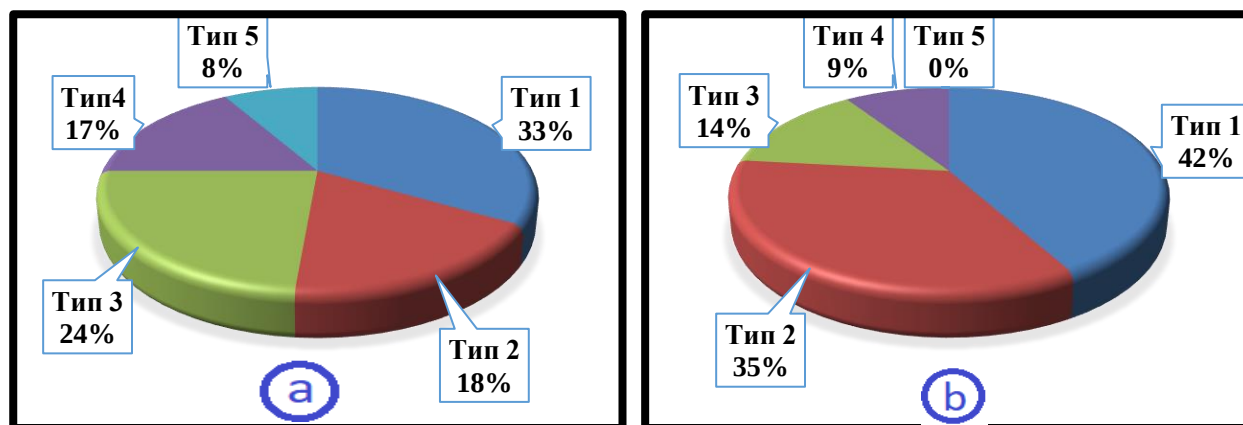


Figure 1. Distribution of erroneous medical conclusions among masters of men (a) and women (b). Type 1 - non sequitur; Type 2 - *post hoc ergo propter hoc*; Type 3 - *idem per idem*; Type 4 - *irrefutable proof*; Type 5 - *combined errors*. Explanation in the text.

The most common error for the entire group of masters (type 1) - 42 cases (36.52%) was the so -called “imaginary logical connection” (*lat. non sequitur*), in which content was arbitrarily extracted from the presented systematized data on the patient, containing fragmentary data [137].

These data were adjusted to the subjective idea of a non -existent disease and a virtual patient proposed an appropriate “treatment”, often correct, but for another disease.

An example is a typical “clinical case” of the mother’s contact for help to the doctor about coughing and poor appetite in a three -year -old child for two days. The brightness of these most common symptoms of the disease of the respiratory system has pushed into the background the collection of information about the history of the disease (*anamnesis morbi*) and one third of the masters made a hasty conclusion about the presence of an acute disease of the upper respiratory tract in a child with the subsequent prescription of antitussive drugs. At the same time, the sudden onset of the disease against the background of complete health, the absence of a temperature reaction, the absence of signs of inflammation of the nasopharynx and the presence of weakened breathing in the zone of the lower lobe of the right lung - the bright signs of aspiration of the foreign body of the respiratory tract - were not taken into account.

In second place in frequency - 28 cases (24.35%), there was a logical error of the 2nd type: *lat. post hoc ergo propter hoc* “After that means because of this” [138]. As the exams showed, it is enough in the history of the child’s development born with congenital heart defect or bronchous system to introduce information about the early cessation of the baby breastfeeding and transferring it to artificial mixtures, a significant part of the masters connects the lag in the physical development of the child with protein-energy-energy Nutrition insufficiency. At the same time, obvious signs of the presence of severe innate pathology are ignored: systolic rude noise in the heart, the presence of a “heart hump”, acropyanosis and other systems.

The next place was taken by errors of the 3rd type - 23 cases (20.00%). This class of logical errors is designated as “*idem per idem*” (circular reasoning) [139.]: “The child had angina two weeks ago, and now swelling on his legs, erythrocyturia and proteinuria are noted, which indicates the severity of the angina. It is necessary to sow microflora from the tonsils and conduct adequate specific antibiotic therapy. ” In this example, in diagnosis, the possibility of complications from other organs (in this case, the lesion of the kidneys) is missed, and the increasing severity of the disease is identified as the further development of the primary pathological process.

Quite often, 16 (13.91%) there are verbal tricks (type 4), which are “ethically controversial rhetorical techniques” [140]. In this type of reasoning, doctors try to justify their eyes, using fundamentally irrefutable statements as an argument - “*irrefutable proof*” [141]. For example: “I find it difficult to say what disease this patient has. It should be additionally comprehensively examined. But it is clear that it is necessary to increase its body's defenses, to compose the correct diet and teach it a healthy lifestyle. ”

In 6 cases (5.22%), combined logical errors were made by young doctors (Type 5).

For all clinical conclusions in practical medicine, the most crucial stage in the treatment of the patient is differential diagnosis, the correct conclusion of which guarantees adequate treatment. Figure 2 identified three information areas that the doctor analyzes in his routine work during the clinical examination of the patient (further laboratory and instrumental data are not taken into account in this scheme).

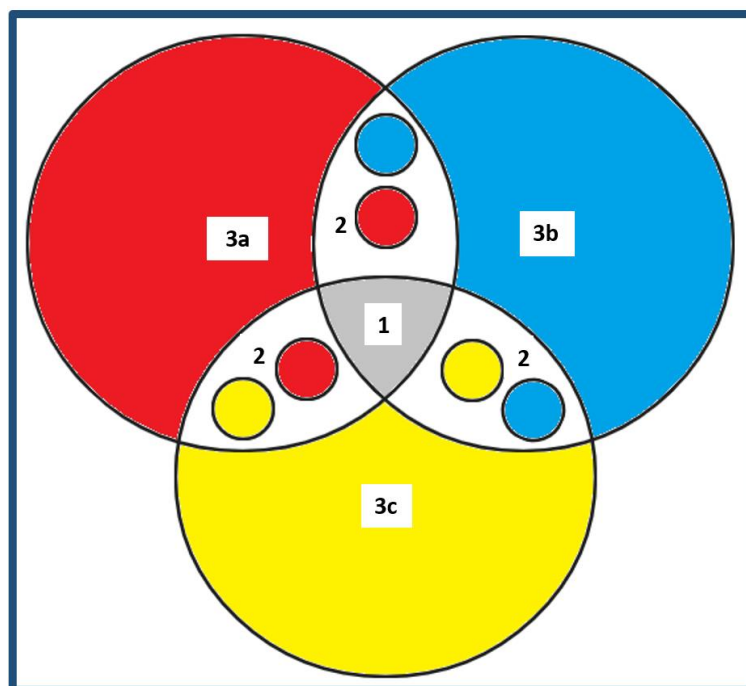


Figure 2. The visualization of three information zones reflecting the clinical symptoms of the disease: 1 - “gray zone” (the total amount of subjective information received - the patient’s complaint, anamnesis of the disease and life); 2 - “motley zone” (a set of similar, heterogeneous clinical data requiring differential diagnostics; 3a, 3b, 3c - “nosological zone” (establishing, on the basis of a correctly performed differential diagnosis, the true cause of the disease, formulated in the generally accepted nosological terminology).

The transition from the first zone directly to the third zone, bypassing the "variegated zone", a common cause of a diagnostic error. As an example of such a “leap”, when conducting a role -playing game, the following fragment of a practical lesson is a role.

- The doctor: *“Good afternoon, my name is Wahab, I am your family doctor. What happened to your child? What is his name and how old is he? ”*
- Mother: *“My son's name is Mikhail and he is 5 years old.”*
- The doctor: *“What are the problems of Mikhail?”*
- Mother: *“His stomach hurts and he has a rapid urination, every hour. ”*
- The doctor: *“Do not worry, this is ordinary cystitis. I will write you an effective antibiotic and all the problems will quickly leave. Show me your boy in three days if the problem is saved. ”*

This “fast”, self -confident diagnosis was presented by 4 master of 13 respondents (more than $\frac{1}{4}$). At the same time, the entire database of the clinical and paraclinical examination of the child contained convincing data on the presence of a child’s manifestation of diabetes. That frequent urination or Pollakiuria is not unambiguously the term “polyuria”. The master was not asked an important question about the amount of liquid heated by the child (about three liters per day) and the amount of urine secreted. In this case, the cause of the erroneous conclusion of the “gray zone” was the dominance of a bright, but not specific feature - “rapid urination and abdominal pain”.

One of the methods for overcoming medical errors is the cyclic process of rethinking (iteration) of the generally accepted practice or model of processes of medical institutions, as well as the processes of mastering masters at the medical faculties of universities.

In a general sense, it is a repetition of a process or cycle aimed at approaching the desired result or solution. Figure 3 reflects the most common problem levels and reference points of medical activity, where there is a risk of medical errors.

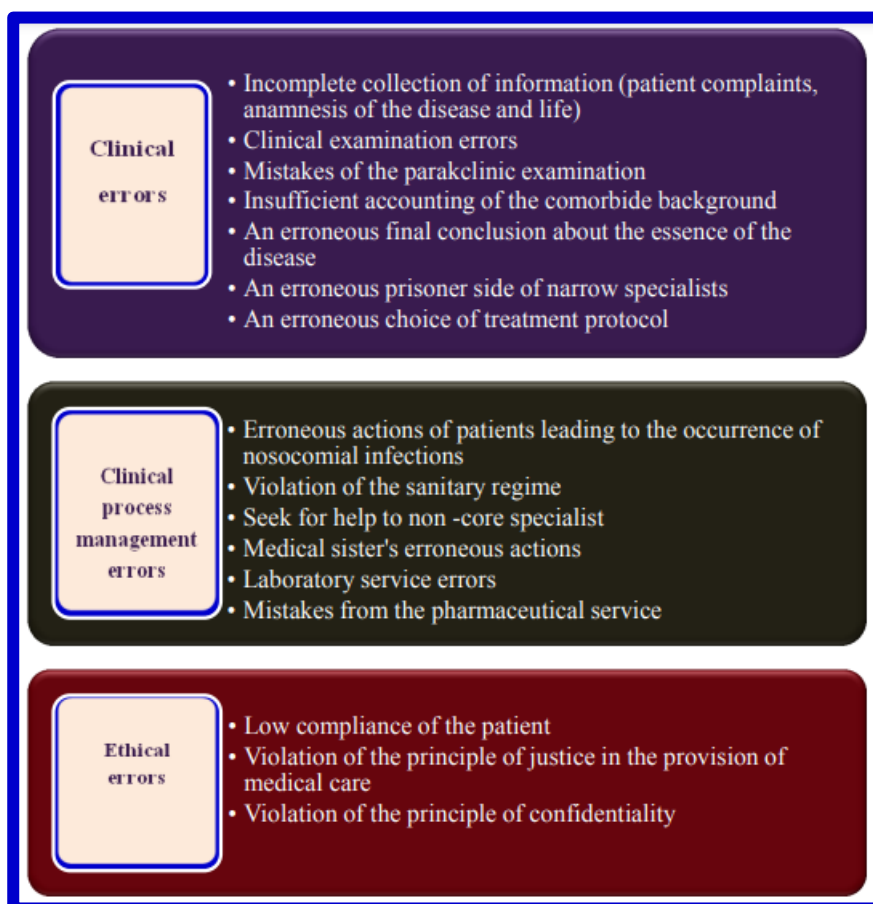


Figure 3. Recipient points of medical errors in the processes of medical activity

We are talking about giving iterative principles of the status of a methodology of critical clinical thinking, which, in particular, is facilitated by the re -discussion of controversial clinical cases with the analysis of the logical causes of medical errors.

The analysis of the causes of erroneous medical conclusions, with an emphasis on compliance with logical rules, always meets a positive response among masters and young doctors.

Paying attention to the repertoire points in order to improve the quality of the activities of medical institutions, including medical universities, is justified by practice. Modern clinical management has proven the effectiveness of the introduction of a new management style-“risk management”, which allows not only to identify, but also to prevent adverse situations of medical and preventive activities of medical institutions [142].

One of the indicators of the quality of medical services is the number of discrepancies in diagnoses between primary and secondary medical levels, as well as between clinical and pathological diagnoses. The departure from the treatment protocols or the low quality of diagnostics significantly extend the terms of hospitalization, rehabilitation, increase the percentage of the transition of acute conditions to chronic, or disabilities of patients, which also affects the image of medical institutions [143,144].

Summarizing the material of this chapter and information from the open press regarding the spread of medical errors, it is necessary to recognize the conclusion that “errors are found at all levels of the medical care system” [122].

5.1.3. Clinical thinking and formal logic

There are repeated attempts to improve the quality of clinical thinking not only by increasing laboratory and instrumental diagnosis of diseases, but also by increasing the culture of the logical thinking of the doctor [145,146].

At the same time, an attempt is made to introduce the laws of formal logic into the structure of clinical thinking [147], or an attempt to adapt the traditional algorithm for the diagnosis of diseases to the laws of logic is made. At the same time, as a postulate,

the thesis is accepted about the accuracy of the decision (diagnosis and the choice of therapy) by a doctor if he strictly adheres to the laws of logic.

There are various definitions of logical thinking. So, the philosophical dictionary gives the following definition “to think logically is to think accurately and consistently, to prevent contradictions in your reasoning, to be able to open logical mistakes. These qualities of thinking are of great importance in any field of scientific and practical activity [148]. It is not difficult to notice that such a definition suffers from the substitution of some fuzzy values by other similar ones.

What is "think for sure"? How to “prevent contradictions” to the subject of thinking, if his mental entity, the algorithm of reasoning is logical for him, but not true for another person. Logical miscalculations can accompany a variety of training schools (classical medicine, folk or not traditional medicine: naturopathy, homeopathy, acupuncture, ayurveda, reflexology, aromatherapy, lithotherapy (stones treatment), etc.

False conclusions as a result of logical thinking can be the result of false original postulates, based on which, even the most advanced logic will lead to an erroneous conclusion. Medicine knows such stages in its development, when all the endless variety of causes and nature of human diseases was reduced to one -sided formulation of the type “all diseases from nerves” or “any disease - weakness of immunity”.

The appeal to the possibilities of formal logic in order to increase the competence of doctors sounds quite often. However, do not overestimate the meaning of this methodological technique in medical thinking. Formally, the laws of logic are based on only 4 law.

The first of them is the so -called “The law of identity”, which in the medical sphere means the need to adhere to a clear unambiguous terminology throughout the interaction of medical workers with a particular patient.

An algorithm of conclusions, according to the law of identity, consists in the approval: “A is A” or “ $A \rightarrow A$ ” (read as “if A, then A”). This option can be used: “A ++ A” (and then and only when A).

The algorithm of traditional empirical medical activity includes the following multi way sequence [149]:

Step one (questioning):

- 1.1. Patient complaints.
- 1.2. The history of the disease (Anamnesis Morbi).
- 1.3. Life History (Anamnesis Vitae).

Step two (clinical examination of the patient):

- 2.1. Inspection.
- 2.2. Palpation.
- 2.3. Percussion.
- 2.4. Auscultation.

Step third (preliminary diagnosis).

Step Four (additional examination methods):

- 4.1. Laboratory methods.
- 4.2. Instrumental methods.

Step fifth (clinical diagnosis).

Violations of the logical law of identity can be identified at each stage of a traditional medical examination. The essence of diagnostic errors lies in the assumption of the correctness of the formula of the mathematical identity: “if $a = B$, and $B = C$, then $A = C$ ”. Thus, the identity of the abstract quantities A and C is accepted for the truth of the problematic element of this identity in medical practice in the fact that the assessed value or phenomenon “ B ” always has a subjective interpretation either from the patient or from the doctor and then this formula looks like Otherwise: "If $a = B_1$, and $B_2 = C$, then $A \neq B$ ".

Erroneous conclusions can be detected at each stage of the medical algorithm, which is reflected in table No.1.

Table 1.

The algorithm of the diagnostic process and possible logical errors of the first type.

Stages of the algorithm	The content of the stage	Logical errors that violate the first law of logic. Symbols A and B mean the true essence of the observed phenomenon and the adequacy of its interpretation
Step one (questioning)		
1.1.	Patient complaints	The possibility of aggravation of the symptom or hiding it with the patient [A Patient subjectivity $\neq$ B The subjectivity of the doctor]
1.2.	Medical history (Anamnesis morbi	Independent interpretation of the causal factor of the disease, imposing a doctor of his point of view [A patient logic $\neq$ B intuition of the doctor]
1.3.	Life history (Anamnesis vitae).	Possible distortion of events that are disadvantageous to the patient [A social observance $\neq$ B communicative skills of the doctor]
Step two (clinical examination of the patient)		
2.1.	Inspection	The visualization of the external signs of the disease, the patient's behavioral reactions reflects both the severity and the possible causes of the disease. This is the initial stage of detection of clinical symptoms of the disease [A visualization $\neq$ B subjective interpretation]
2.2.	Palpation	The reliability of the data obtained during the physicine examination largely depends on the doctor's skills and the patient's readiness for examination (complays). This is a concluding stage in the detection of clinical symptoms [A pathogenesis of the symptom $\neq$ B interpretation of a doctor]
2.3	Percussion	
2.4.	Auscultation	
Step Third (preliminary dagnosis)		
3.1	Organic pathology	The stage of the symptoms in the syndrome. Medical conclusion at this stage is more likely. This is the so-called "Working diagnosis", which is based on statistics on the frequency of appeals of patients with such a syndrome complex. [A syndromomplex $\neq$ B nosological interpretation]

Continuation of table 1

3.2	Leading syndrome	The allocation of the identified specific and non - specific symptoms is the necessary informative syndrome. [A variety of symptoms $\neq$ B analytical skills of a doctor]
Step fourth (additional examination methods)		
4.1.	Laboratory methods	More often reflect metabolic disorders [A sensitivity of tests $\neq$ B specificity of tests]
4.2.	Instrumental methods	Help to clarify the organ pathology [A changes in organs structure $\neq$ B level of specificity]
Step fifth (clinical diagnosis)		
5.1	The main diagnosis	This stage should accurately reflect the name of the disease, unified in the international classification of diseases. [A unified terminology $\neq$ B empiric diagnostics]
5.2	Complications	A differentiated approach to the primary affected organ of the "target" and the secondary defeat of other organs and systems. [A dominant signs $\neq$ B non -specific symptoms]
5.3	Concomitant diseases	Identification of concomitant diseases. [A concomitant background $\neq$ B ignoring the background]

According to the first law of formal logic, the process of the clinical thinking algorithm is constantly accompanied by the identification of the truth or the falsity of the perceived information. Medical practice is not a speculative process. The doctor's reasoning proceeds in the complex psychological environment of contact with the patient and his relatives. Formal logic implies the presence of true primary information and does not provide for its deliberate or subjective distortion. In the presence of "true" initial knowledge, the logical diagnostic algorithm guarantees the accuracy of medical conclusion. In the real practice, with which young doctors are found, it is necessary to have the skills of "filtering" of information coming from the patient in order to distinguish significant facts for the future identification of the disease. This requirement implies the presence of high communicative qualities, sufficient practical

experience, logical and critical thinking and developed intuition.

It is believed, in particular [147] that “the use of the ending of *-pathy* ”(for example, gastropathy, myopathy, cardiopathy, arthropathy, etc.) is an erroneous diagnosis, since in this case there is no indication of a particular disease of a particular organ, but there is only a statement of the presence of a pathological process. To eliminate this problem, it is necessary, according to the author, the creation of a unified clinical nomenclature of diseases”.

It is impossible to agree with this thesis, since the direction of diagnosis goes, first of all, to clarifying the class of the disease, to systemic organ topology, and only then the differential diagnosis of possible causes of the damage to the organ or system follows. Thus, the patient's complaints of painful urination will lead to a medical assumption about the presence of an inflammatory process in the urinary system, but no one-respiratory or some cardiovascular systems disorders. However, a further step is the clarification of the anatomical level of damage (urethra, bladder, prostate) and the etiology of the disease (renal stone, bacterial or parasitic infection, tumor, etc.). And only on this, the final diagnosis is it possible to fulfill the requirement of a single terminology. Practice shows that in three patients who have addressed a doctor with the same complaints about coughing, a runny nose and a hoarse voice, depending on the competence of the doctor, diagnoses “acute rhinitis”, “acute pharyngitis” or “acute laryngitis” will be made.

These different diagnoses, reflecting the anatomical characteristics of the disease, can be combined according to the etiological generalizing principle - an “acute viral disease of the upper respiratory tract” or “acute respiratory viral disease”. The question arises: “And who, in fact, needs the implementation of the law of identity? And who is the creator of the peremptory term, who are obliged to adhere to doctors around the world? Is the diagnosis of acute rhinitis (Latin) really corresponds to the Russian term “насморк”, the Ukrainian “нежить”, the English “Cat and Dog” or the Polish “Zasmarkany Nos”?

Modern personalized medicine requires an individual doctor’s approach to each patient. This medical model involves the adaptation of medical solutions, practices and

drugs to the needs of each particular patient [150].

In the presence of the same three symptoms of the lesion of the upper respiratory tract, the sick teacher will be disturbed by the hoarseness of the voice and the difficulty of voice communication with students. The teacher of the kindergarten, suffering from a supership, dry cough, will be disturbed by the risk of introducing infection into a group of babies. And, finally, a person present at a concert or other public event, where the attention of others is focused on the stage, will disturb the anxiety of the surrounding viewers with his sneezing and frequent use of a handkerchief.

With the formal equality of the number of symptoms in these patients, the dominant discomfort and the emphasis of complaints about the health of sick people will be different, which will inevitably lead to a variety of diagnoses and treatment tactics. An artificial fitting of medical conclusion under the terminology limited by the requirements of medical classifiers of diseases prevents the implementation of a personalized approach in medicine, since it slows down to the need for routine protocol treatment. This is the work of special statistical services that are not interested in the peculiarity of the course of the disease in a particular patient. In their competence, the collection of information on the classes and types of identified diseases in accordance with the requirements of the ICD (international classification of diseases and causes of death) [152].

The clinical terms encoded using the ICD are the basis for medical registration and statistics of diseases in primary, secondary and tertiary medical care, as well as for evidence of the cause of death. These data and statistics support payment systems, services planning, quality and safety management, as well as research in the field of medical services. The diagnostic manual related to the categories of the ICD also standardizes the data collection and allows large -scale research.

The second law of logic is the law of contradiction, the essence of which lies in the consistency of thought in the process of its development. This requirement is good when substantiating the final diagnosis, but not like during the period of differential diagnosis, in which the doctor involves a possible many different diseases. Moreover, the formula of reasoning is as follows: "A or B, or C, or D". It is quite justified from a

practical point of view, which allows the most widely covered possible causes of the disease. So, the fact of the presence of anemia in the patient may cause an assumption of the possible deficiency of iron, or insufficiency of folic acid, or vitamin B12, or hemolytic, or hemorrhagic processes.

From the point of view of common sense and formal logic, only one of these points can be true. But medical practice involves a possible combination of these forms. So, anemia caused by chronic blood loss can be combined with a scarce state of both iron and vitamin B12.

Linear, clear, well-described patterns noted in physics and chemistry are rarely present in isolation in biological systems, especially in medical and social systems. Deficit states in these cases are not experimental phenomena that are easily reproduced in the laboratory, but multifactorial determinants that give a negative synergistic effect. These include: stressful phenomena of social life, poor -quality nutrition, digestive system diseases, bad habits, lack of preventive programs in the regional healthcare system, insufficient competence of personnel of the primary level of the medical care system - this is far from a complete list of external and internal factors that can cause scarce states.

Thus, medical thinking begins with the “recognition” of the leading, but non - specific symptom inherent in many pathological conditions. At the next stage, a sample of the most suitable diagnosis, called "differential diagnostics" takes place. The essence of this intellectual procedure consists in the conscious exclusion of the general non - specific signs of the disease and the inclusion of signs in the alleged model that do not contradict its pathogenesis. These classical specific features are postulates in the methodology of justification of the diagnosis. They are not questioned. And at this stage, clinical thinking is similar to formal logic. A set of such “clinical postulates” can be considered the subject “Semiotics of Diseases”.

As already indicated, according to E. Minasova [147] “The use of the ending “-*pathy*” violates the laws of identity’.

The author sees the elimination of the problem in creating a unified clinical nomenclature of diseases. We can agree with this thesis, but only half, since the

direction of diagnosis goes, first of all, to the creation of a working hypothesis, to clarifying the class of the disease, to system-organized topology. So the term “gastropathy” outlines the body of the body - the stomach, and the term “cardiopathy” clearly determines the sphere of damage to the body - either only the heart or the cardiovascular system.

After the states of the body damage areas, differential diagnosis of possible causes of the disease traditionally follows. Thus, the patient's complaints of painful urination will lead to a medical assumption about the presence of an inflammatory process in the urinary system (a statement of the body damage zone), but not like-respiratory or cardiovascular systems. However, a further step is the clarification of the anatomical level of damage (urethra, bladder, prostate, etc.) and the etiology of the disease (renal stone, bacterial or parasitic infection, tumor, etc.).

For this, the second, clarifying stage, a universal terminology has been developed, represented by an international classification of diseases and causes of death. At the moment, it is presented 10 and 11 reviews (ICD-10 and ICD-11)-a special list of medical diagnoses and other conditions, each of which is assigned a unique code (Latin letters and numbers).

For example, the cause of tachycardia may be physical activity, myocarditis, low blood pressure or abuse of caffeine's containing food products. The doctor must formulate all these possible causes of the patient's complaints about an enhanced heartbeat in a preliminary diagnosis and, after that, begin to search for evidence in favor of the most probable reason.

The third law of logic is called the Law of the Excluded Third. He claims that two contradictory statements about the same subject cannot be false at the same time - one of them is necessarily true. For example, the doctor may be the following judgment on the causes of severe headaches (cephalgia) in the patient: “Cephalgia is caused by migraine.” An alternative opinion will have the following form: “In this patient, Cephalgia is not caused by migraine.” This is the dilemma, the solution of which in evidence -based medicine will be indicated as “zero hypothesis”. The search for

evidence in favor of the presence or absence of migraines should contribute to the adoption of the right conclusion about the causes of headaches in this patient.

The statement of an alternative question eliminates the “diplomatic” course of searching for the third explanation option. In formal logic, such a maneuver will be considered a false technique or logical error. Each statement should be either one or the other. That is why this is called the law of the excluded third, because it excludes the middle ground between truth and lies [153].

The fourth law of logic is the “law of sufficient reason”. This law requires sufficient justifications to make a final decision on the truth or falsity of the imprisonment. The perception of this law should occur through the prism of a spatio-temporal continuum [154] of health and illness that accompany a person throughout his life.

The presence of a lot of the determinant of health dictates the need for their maximum accounting by strength and duration of exposure. Some aggravating factors appear earlier, others later, but combining, they synergily potentiate disorders of the adaptation of a healthy organism to pathological factors and start the process of the disease. The disease, like health - attributes of biological life, are stretched in time and are woven into the substance of life. So, distinguish acute, sub-acute, chronic diseases. Human health is also different, respectively, the biological axis of time: birth, newborn, infancy, childhood, adolescence, youth, maturity, old age, death).

Therefore, in practical medicine, the so -called “transverse study” is very important, when all the necessary laboratory and instrumental tests are made simultaneously for several hours. In such cases, the doctor has a complete idea of the severity and essence of the disease of this particular patient. With poor clinical management, there is a stretch of research within a few days, which reduces their diagnostic value, since the ratio of regenerative and destructive processes changes in time.

Classic pathogenesis can be complicated by damage to other organs and systems. This complex dynamic process requires a monitoring approach, and not single examinations. The disease often does not develop by linear line, but according to the

laws of geometric progression, when some structural and functional disorders cause a new group of complications, and those, in turn, form further distribution in time and space (organ topology) of the body's disorders. Thus, a breakthrough of the viral infection of the primary protection line of the respiratory system (deficiency of mucociliary clearance, the depletion of the synthesis of surface immunoglobulin a) leads to viremia. The consequence of this breakthrough of the infection may be the direct toxic effect of the virions on the cells of the endothelium. The death of the endothelium reveals the collagen base of the basal vessel membrane and causes platelet adhesion with the formation of a primary thrombus with the subsequent launching of plasma blood coagulation factors. A new branch of pathogenesis begins - intravascular coagulation syndrome, etc. Hence the dialectical inconsistency of the law of sufficiency of the bases, since those arguments that were convincing yesterday in assessing the patient's condition are clearly insufficient or even contradicts the initial arguments.

At the same time, it is necessary to note such, not often used, but existing and proved the way of diagnosis - as a “exclusion method”. He is figuratively similar to the activity of the sculptor, who to the question: “How do you manage to create such perfect creations?”, He replied: “I just take a piece of marble and remove everything superfluous from it!”

In such an algorithm, the well -known medical environment of the IV criteria for gastroenterology is developed. Diagnostic criteria proposed by experts and the classification of functional disorders of the digestive organs, such as the syndrome of the excited intestine, abdominal migraine and functional dyspepsia require a special methodological approach: the diagnosis of functional disorders is made only in such situations where no other organic diseases were detected with the most thorough examination of patients [155].

Thus, the four laws of formal logic can be, with reservations, are implicated into the clinical thinking of medical workers. But their methodology does not exhaust all the polyvariance of the ways of medical thinking. Figure 4 reflects the main structural blocks that make up the taxonomy of clinical thinking. In addition to the laws of formal

logic, it obeys the general laws of thinking, including deductive and inductive thinking. The essence of deductive thinking consists in the presence of a certain theory developed, using which, the researcher can explain the origin of particular cases of the phenomenon under study. This type of thinking is directed from the general to the particular. For a doctor, a similar attitude exists between an object (sick person) and the subject of the study (clarifying the cause of the disease). Deductive medical approach includes a number of consistent steps:

- Based on a conversation with the patient, a hypothesis about the nature of the disease and its severity is formulated.

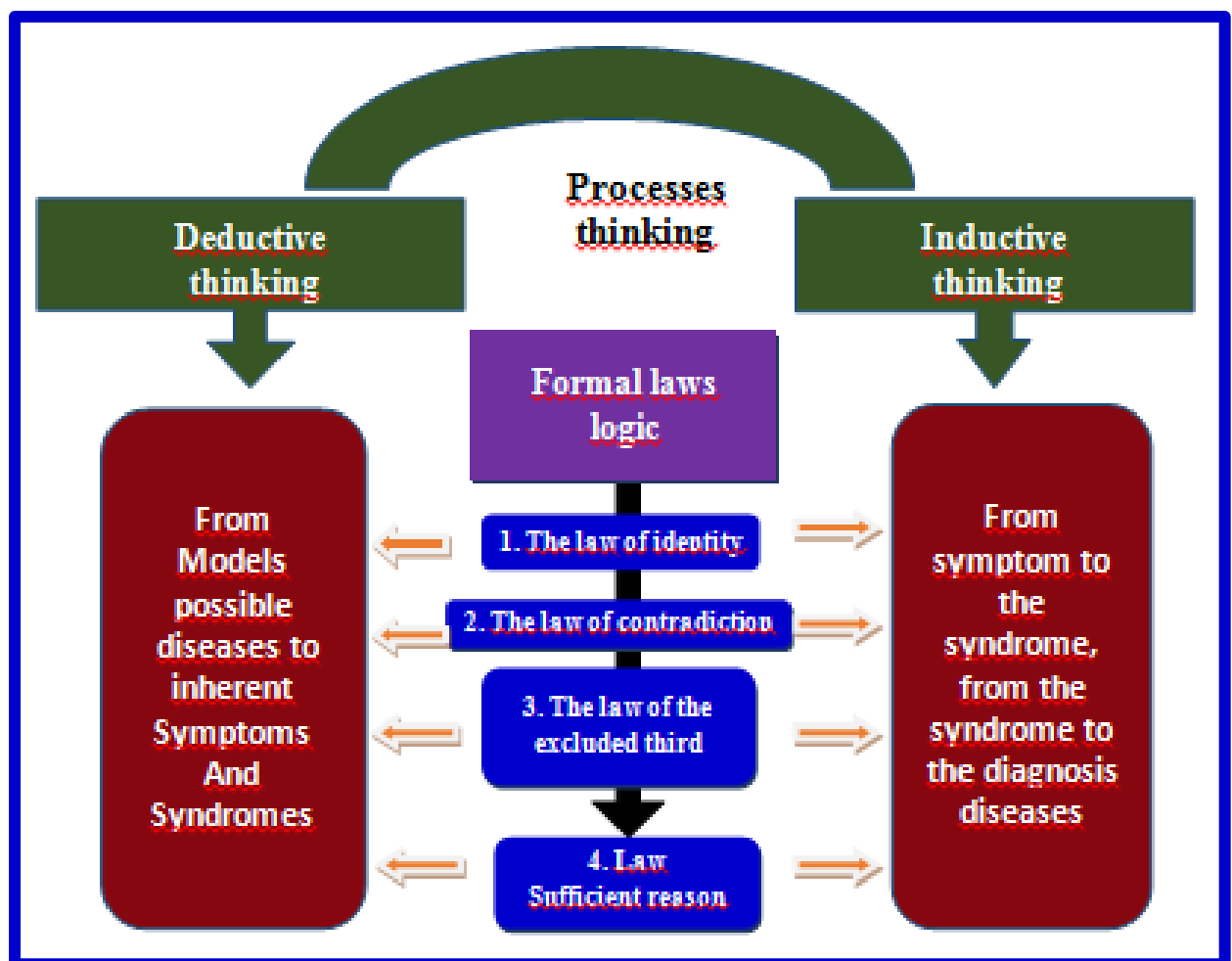


Figure 4. Taxonomy of clinical thinking

- an assumption is made about the necessary clarifying diagnostic methods.
- Clinical, laboratory and instrumental examinations are based on the need to check the hypothesis.

- Analytical comparison of the received data with a hypothesis put forward is carried out.

- a decision is made on the proven hypothesis and the truth of the assumption, or on the erroneity of the hypothesis and the need to revise the medical conclusion.

The strength of the deductive approach is the possibility of an objective verification of the truth of the hypothesis obtained by the data of a medical examination, as well as the presence of formal rules for the wording of diagnoses.

The weak side of this type of thinking is the complete dependence of the entire chain of deductive thoughts on the original postulate. If the theory is correct, then the correct course of thoughts from general to the particular will give the right conclusion. But if a concept is taken as a basis, the truth of which is not confirmed, then most likely the final conclusion will also be false.

Unlike the deductive approach, the inductive method is directed in the opposite direction: from private to general. This is a difficult research path to an unknown one, since a hypothesis or a guiding idea should arise later, based on the collected single data of the phenomenon under study.

The classic path of diagnosing diseases in medicine is a careful collection of information when talking with the patient, collecting clinical symptoms, combining them into pathogenetically tied syndromes and, finally, the transition to the final conclusion.

According to Yu. Subachev [156], the inductive approach has the following number of advantages:

- Flexibility.
- A wider and wider look at things.
- Freedom to generate new ideas.

Predictive potential.

Understanding the essence of complex phenomena.

The weak side of the inductive approach is always a present risk of revising the alleged hypothesis or theory. An avalanche -like growth of information in the field of

biology and medicine leads to the need to constant the existing concepts of pathogenesis and the treatment of diseases.

Thus, the taxonomy of clinical thinking includes the hierarchy of various thinking methods and the interpretation of the information obtained at each stage of the traditional clinical examination of the patient.