

1. Introduction

Diagnosis of cause and conditions, verification of cause-and-effect link (CEL) in the development of the pathological process of trauma are the professional task of a forensic expert. Determining the role of forensic objects (events, processes) in the formation of trauma and complications should be based on a thorough knowledge of forensic experts of the laws of the profile pathological process, mechanisms of etiology and pathogenesis, and, at the same time, take into account modern scientific achievements in the field of logic, philosophy, systems theory. In FME remains unanswered questions about the general methodology for forensic research methods, as well as well as the ambiguous qualitative characterization of the subject matter of the examination as a relevant factor of appropriate communication. FME as basic "forensic science" is a systematic type of scientific and practical knowledge of medical and biological, forensic objects, which requires a special organization of scientific research and practical activity of forensic experts.

Verification of cause-and-effect link (CEL) and conditional linkages (CL), as well as appropriate diagnosis of causes and conditions in pathological dependencies, are urgent tasks of forensic experts in relation to legal requests of society.

Investigations of forensic objects in the direction of causal diagnosis of causes and conditions should be based on a thorough knowledge of forensic experts of the patterns of development of the profile pathological process, mechanisms of etiology and pathogenesis. Forensic experts have considered FME objects, depending on the trauma process, so far traditionally in empirical terms, without a justified consideration of their causal characteristics.

The modern scientific approach is carried out in separate works of forensic experts from the standpoint of the general methodology. In their view, the definition of tools and methods of methodology refers in FME to the specifics of the forensic facility. Scientists em-

CAUSAL EVALUATIONS OF THE FORENSIC OBJECTS IN THE TRAUMATIC PROCESS

Alla Gavryluk

MD, Professor, Head of the Department¹

Viacheslav Voronov

MD, Associate Professor¹

Raisa Zharlinska

PhD, Associate Professor¹

¹*Department of Pathological Anatomy,
Forensic Medicine and Law
National Pirogov Memorial Medical University
56 Pirogova str., Vinnytsia, Ukraine, 21018*

Abstract: Expert diagnostics of forensic causal determinations should be based on a dialectical-materialistic approach, provided with a modern level of specially applied theoretical knowledge of pathology, etiology and pathogenesis of traumatic processes, as well as stimulated by urgent requests of the theory and practice of forensic medical expertise (FME). **The aim** of this work is to determine causal estimates of the components of forensic objects: natural and causal – through retrospective causal modelling.

Materials and methods. The research material was archival documents of the Vinnytsia Regional Bureau of Forensics (Ukraine) for 2009–2012 with cases of violent death from injuries. 27 deterministic models were constructed by modelling the regular relationships in traumatic processes.

Result. The qualitative unity of the forensic object is simulated: empirical (natural) and causal (determinant). The existence of an object determinant in concordance of the determinant object with the deterministic object is stated. The method of investigation of the determinants of expertise was proposed – logical retrospective modelling of object determinants dependencies. An assumed model of the dependency model is a multi-link time-chain of forensic medical determination. The adequacy of the proposed method of logical modelling of determinants in forensic examination is confirmed with the help of known scientific knowledge about dual, causal determination, causal diagnostics of determinants and forensic cause and effect relationships. It is proved that forensic expertise is a multidisciplinary branch of science and reflects the realized integration of different scientific knowledge. However, diagnosis of "causes of violent and non-violent death" requires the development of an applied methodology for FME from the standpoint of modern philosophical concepts of causality and general theory of systems, the achievements of which must be used in the construction of the methodology of FME.

Conclusions. From the results of this study, it follows that causation is only a moment of determination, and purely causal modelling as an exploration of a particular type of determination cannot give a complete explanation for the deterministic relationship. The property of necessity of a specific reason determines the tendency, the orientation of development in the form of possibility, which is actualized only by the complete set of determinants – causal and noncausal, conditional.

Keywords: methodology, forensic object, determinant, system modeling, causal diagnostics, system approach.

phasize the specific and applied nature of methodological tools and methods – their design, creation, development and justification [1, 2].

It is known that the etiology, pathogenesis, pathoautokinosis of trauma are based on the attributive properties of regular relationships in the traumatic process, such as generality, stability, repetitiveness, controllability, communicativeness, imperativeness, necessity [3–5]. These properties concentrate in the object determinants: the conditions, the reasons they reflect, identify in the traumatic process the corresponding types of regular relationships (dependencies): CL and CEL. Thus, as established scientifically, verification of the type of dependence is associated with the diagnosis of the relevant determinant, the essence of which determines the specific object of the examination.

It is scientifically known that the natural qualitative constituents of the object are sensory organs, and the causal qualities are the abstract phenomena of consciousness – these are the conditional and causal determinants. Detection and species identification in the objects of examination of the deterministic component determines the prospects of the causal evaluations of the object not yet scientifically solved in FME theory. Because the determinant of an object is dependent solely on relationships with other object determinants, logical modelling of the complexes of objects and the relationships between them is an adequate method of object diagnosis. Such complexes, which have not yet been thoroughly studied, appear to be linked in series by the links of the chain of dependence in the pathological (traumatic) process.

The aim of this work is to determine the causal estimates of the components of forensic objects: natural and causal – using retrospective logical cause-system modelling.

2. Methods

Information on the nature of forensic facilities and regular relations in traumatic processes with cases of violent death

from injuries was collected from the “registration cards” of the Vinnitsa Regional Bureau of Forensic Examination (Ukraine) for 2009–2012 by obtaining data from 4392 technical units of observations: archival “Acts of forensic research of corpses” and “Expert Opinions” (section data) – 3725; acts of laboratory investigations in cases of death from mechanical trauma – 168; “Resolutions” and “Directions” of investigators – 499. Methods of the general methodology concerning FME were worked out: logic-retrospective causal-system modelling of forensic causal relationships, reproduction of patterns of regular relations in traumatic process, scientific induction to understand the necessary dependence of forensic objects in the process of formation and complication of trauma, information-entropy and dispersion model for the determination of trauma. Statistical methods of analysis: correlation, information, variance.

3. Results

It is known in science that ontological categories of conditions and causes are abstract and do not exist independently in real reality, but belong to or relate to material substrates - deterministic objects, carriers of determinants. At the same time, the forensic expert’s study of the result – body injury, pathological condition, and pathological (traumatic) process – is a real material result of naturally related changes in the body. Consequence concentrates both the factors of the cause and various factors, the constituent conditions, which form the full cause, but are external to its foundation. Therefore, the natural process of trauma reflects a dual determination – “self-determination” (internal laws of causation) and causal determination, both conditioning and external non-necessary conditions. It is now scientifically proven that there is inherently a synthetic link between conditions and causes, which is carried out in the CEL of the pathological process by the method of double determination.

We modelled regular relationships in traumatic processes and constructed 27 models of determinations (deterministic, regular relationships). The substantiated grounds for adequacy between the starting and the distant, as well as between the related forensic facilities in each link of traumatic dependencies, are grounded in the constructed models of causal relationships using a systematic approach. In particular, the structural system of **model 1** demonstrates single-stranded CEL in the traumatic process as a genetic, necessary, and sufficient interdependence of events between full cause and effect.

Model 1 causing bone fracture of the nose:

complete reason = $P+u$ CEL H_y – *complete consequence*,

$$\frac{(pu_1)nose \rightarrow P \rightarrow first(pu_2)}{\downarrow \uparrow glove(u)} \perp [H_{p_1}(thenose\ bones\ fragments) + H_{p_2}(hand\ injury)].$$

The plot example. Alternate during the event: punch to the nose – fracture of the bones of the nose.

The full reason is in verbal form «punch to the nose» – is formed by material causal factors «nose» and «fist» – determinant carrier objects **pu1** and **pu2**, as well as the condition **u**, which is represented by an external circumstance – a glove. Interaction of the named causal factors (marked with « \leftrightarrow »), manifests the specific cause **P**. External condition **u** and the specific cause form in the interaction (« $\downarrow \uparrow$ ») the full cause that gives rise to the emergent effect. « \perp » fixes the causal dependence.

Model 1 CEL defines uniquely the following properties of relevant forensic objects: «localization of the object in time and space», «directionality and consistency of the intensity of

actions», «necessity and sufficiency in relation to the consequences».

As a result of the analysis of the interaction of models of causal factors «nose» and «fist» under the «management» of the determinants – the necessary conditions **pu1** and **pu2**, as well as the impact of the external condition **u**, represented with the object «glove», – the full cause gives rise to the full consequence $H_t (H_{p_1}+H_{p_2})$. The expert proves generation of consequence inevitably and categorically if and only if the causal model of the traumatic process reflects the logical grounds of the necessary and sufficient complex of conditional and causal determinants.

As a result of the study of logical models, the scientific position on the qualitative unity of the forensic medical object was confirmed: empirical and causal. Adequate research method is proposed – logical retrospective causal modelling of the dependencies of empirical objects and object determinants, as well as the considered model of dependence – a multi-link in time chain of forensic determination. The performance of the proposed method of logic modelling of determinants in FME was confirmed with the help of proven scientific knowledge about dual, causal, deterministic, as well as scientifically established causal diagnostics of determinants. At the same time, it is proposed to improve the method of logical retrospective causal modelling of forensic addictions in the traumatic process.

4. Discussion and conclusions

It should be agreed with well-known scientists that the methodology of logical modelling should use the scientific achievements of the XX–XXI centuries in the field of logic, philosophy, systems theory, information analysis.

In the broad sense of the word, the object of knowledge, as interpreted by the «New Philosophical Encyclopedia», is a fragment of reality, which is directed by the real and cognitive activity of the subject, the researcher: V. A. Lectorsky (2010). In a narrow sense, these are objects that are specifically studied by a researcher, such as a forensic expert. Objects include phenomena, events, processes, objects that exist in nature, as well as their models, created by human consciousness. Objects can be classified into groups according to different division grounds. Thus, in 2002, prof. O. I. Gerasimenko separately identifies objects of examination as materialized, defined by criminal procedure and civil procedural legislation sources of information – materials of criminal or civil case, as well as material evidence, parts of the corpse, fragments of the scene, specimens, etc. [6]. The interconnection of objects with each other determines different types of regular object relations, among which CEL underlies all pathological processes in the body, which underlie the mechanisms of trauma formation and complications.

The forensic expert is obliged to ensure a unified approach in the process of expert research through a clear and unambiguous use of specific concepts. C. G. Hempel (1966) states that the term «determinant» (basis) is affirmed as a subjective part of the real essence of an object, which defines the regular relations between the empirical objects of the material world [7]. In other words, the forensic object can be explored from two sides or aspects of the essence: the objective as an empirical phenomenon, the subjective as the determinant. Thus, in approximations, an object represents the unity of two realities: the empirical part of the essence and the essence of the determinant. Forensic objects, which are in regular relations of the traumatic process, are material carriers, substrates of determinants. The integrated system of determinants – together: the specific cause and condi-

tions – forms the system of the full cause. In general, the system of causal and causative determinants regulates with the need for expertly designed model of a regular relationship the direction and intensity of its material carriers, empirical objects.

Material reasons for reflecting the events of the past, as well as indicators of morphological and functional changes in the organism that have occurred as a result of causing body injury and the development of a traumatic process, are the basis for retrospective design of the model of deterministic communication. Retrospective modelling of subject systems, as evidenced by the results of the analysis of archival expert material, is the most widespread in the practice of forensic examination.

Causality, CEL is, in the context of modern determinism, a central, principled side of determination, as it has a general character. Principle of causal determinism: any phenomenon is causally deterministic at any time.

A. S. Carmine, G. G. Bernatsky in 2007 noted that materialist dialectics proceeds from the proposition that the attributes of material phenomena, objects, events, processes of being are reflected in the mind by models of ontological categories. The above explains that such, in particular, the attributes of the phenomena of being, such as conditionality, causality, are not identical with their reflection in consciousness, although they are called the same words [8]. Ph. Illari, F. Russo (2014) state that identifying the attributes of being with their ontological categories may represent one of the parties to the error [9]. Another aspect of mental aberration is the identification of attributes with the phenomena of being. Such simplification is often offered in educational texts, when defining the concepts of causality.

Academician Yu. V. Sachkov in 2003 gives the following definition: «Causality acts as one of the most important forms of interconnection and interdependence of phenomena and processes of being, which expresses such a genetic connection between them, in which one phenomenon (process), called the cause, if any certain conditions inevitably «give rise to», triggering to life another phenomenon (process) called a consequence (or action)» [10]. This scientific formula for the concept of causality can be interpreted with logical fallacies. Such interpretations, with all their accessibility, cannot be scientifically correct because they do not reveal the essential bases, sources of causation.

Verification in retrospection of regular relationships between objects and processes of the past is based on known laws of physiology and pathology of man, including the etiology and pathogenesis of traumatic process. It is known that the etiology and pathogenesis of trauma are causative and other determinants. In forensic practice, modelling of the determined traumatic process is based on the theory of general human pathology, as well as statements of dialectical materialism and causal determinism.

R. P. Thompson, E. G. Upshur Ross (2017) note that G. V. F. Hegel introduced the philosophical category of conditions in the system of categories he developed in the «Science of Logic» and for the first time determined their immanence in the real determination of the full cause, along with the basis of the specific cause [4]. Differentiating the role of conditions in the effects of injury – injuries and complications – is the most important, as we consider, the direction of the expert's work in modelling forensic determinations. The relevant conditions of the full cause act either as necessary for the action of the specific cause (causal basis), or as necessary for the effect of the consequence, or as neither necessary for the action of the specific cause nor for the genesis of the consequence. The latter are called external relevant conditions. Each necessary condition of action of a spe-

cific cause in conjunction with the cause constitutes a necessary condition for producing the consequence and the presence of all the necessary conditions for the action of the reason together with the cause constitute a sufficient condition for producing the consequence. Therefore, the object determinants form the system of the full cause of bodily injury in the real causal determination.

External conditions, as evidenced by the causal modelling of the object of examination objects, play a special role. The forensic expert in the study of trauma should have complete, accurate and thorough information about the circumstances of the event, compare them with the data of the section analysis, interpret and make correct conclusions as a whole about the cause and conditions of the traumatic process. Investigated forensic expert consequence – personal injury, pathological condition, and pathological (traumatic) process – is the result of the emergence and development of naturally related material changes in the body. In doing so, the consequence concentrates on both the factors behind the cause formation and the various factors, the constituent conditions, which form the full cause but are external to its foundation.

In the field of medicine, it is scientifically proven that cause and effect and other dependencies determine the etiology and regulate the mechanisms of pathological (traumatic) process in the body. In the study of the causal process of trauma, the forensic expert uses common methodological approaches with their application in the field of practical knowledge - forensic examination [1, 2]. The use of diagnostic methods of general methodology includes a modern systematic approach, the basics of synergetic, known methods of logic, philosophy, and medical statistics – within the limits of applied significance in FME. The results we have obtained are fundamentally different from the existing causation studies to date with the inclusion of a systems approach. A new scientific direction in the methodology of forensic assessment of objects of expertise in the cause and effect relationship between the formation of trauma and adverse effects is theoretically substantiated and elaborated, which is to provide a systematic approach to the causal modelling of dependencies in the traumatic process between the effects of objects externally environment on the body and the formation of personal injury, complications and fatal consequences. The use of applied methods of the general methodology presented in our work is a necessary basis for successful activity of a forensic expert and does not require a narrow theoretical knowledge of non-medical fields of science.

Based on the logical model of the forensic object, the well-known position in the science of the existence of a real object in two qualities was confirmed: a material object perceived by the sensory organs (an empirical object), and an abstract causal phenomenon, which perceived consciousness through thinking, as an element of natural connection (determinant) in the traumatic process. This is essential for the creation of a unified forensic terminology, logical expertise.

The retrospective causal modelling of forensic objects in the dependencies of the traumatic process is substantiated, based on the modern natural scientific systematic knowledge of the structural model of the full cause and the twofold, causal conditionality determination of forensic objects.

Thus, the basics of differential causal diagnostics of traumatic process dependencies are determined, based on the characteristics of determinative components, determinants – causes and conditions of forensic objects.

Positive prospects for the study of forensic objects in the causal dependencies of the pathological (traumatic) process are

related to the further refinement of the logical retrospective method of modelling the objects of examination. This requires the construction of a unified database of causal concepts, the development of visual reproduction of simulated data, the

classification of forensic relationships. Thus, the approach to comprehensive causal evaluation of forensic facilities requires the use and development of specific application methods of a common methodology for FME.

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Received date 06.09.2019

Accepted date 03.10.2019

Published date 30.10.2019

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