

**B.V. MYKHAILYCHENKO
A.M. BILIAKOV
I.G. SAVKA**

Forensic MEDICINE

T E X T B O O K

Second edition

APPROVED

by the Ministry of Education and Science of Ukraine
as a textbook for students of higher educational
establishments — medical universities, institutes
and academies

RECOMMENDED

by the Academic Council of Bogomolets
National Medical University as a textbook for
students of medical universities with English
language training

Kyiv
AUS Medicine Publishing
2019

UDC 340.6,134
LBC 58;67.99(2)93ya73
M69

*Approved by the Ministry of Education and Science of Ukraine as a textbook
for students of higher educational establishments — medical universities,
institutes and academies (letter No. 1/11-11455, 6 December 2011)*

*Recommended by the Academic Council of Bogomolets National
Medical University as a textbook for students of medical universities
with English language training (minutes No. 12, 27 April 2017)*

Authors:

B.V. Mykhailychenko, A.M. Biliakov, I.G. Savka

Reviewers:

*Viktor Bachynskyi — D.M., Professor, Head of the Department of
Forensic Medicine and Medical Law of Higher State Educational Estab-
lishment of Ukraine “Bukovinian State Medical University”, Chernivtsi,
Ukraine;*

Olexandr Gerasymenko — D.M., Professor

Mykhailychenko B.V.

M69 Forensic Medicine : textbook / B.V. Mykhailychenko, A.M. Bilia-
kov, I.G. Savka ; edited by B.V. Mykhailychenko. — 2nd edition. —
Kyiv : AUS Medicine Publishing, 2019. — 224 p.
ISBN 978-617-505-755-1

The textbook briefly highlights both the history of forensic medicine and orga-
nization and arbitration principles of forensic medical examination. Forensic and
medical thanatology issues as well as diagnostics of various environmental injuries
and health conditions are scrutinized in view of current scientific advancements.

The data on lager radiation injuries and information on biological factor influ-
ence on the human body are introduced.

Peculiarities of examining the injured and accused parties and other persons are
described according to the Criminal Code of Ukraine.

Current possibilities of forensic medical examination of material evidence are
considered.

Legal aspects of health care provision and legal responsibilities of physicians as
health care providers for malpractice are provided according to the Criminal Code
of Ukraine.

All the chapters end with a list of questions for self-control.

For students of higher medical educational establishments, as well as for intern-
ship doctors and beginners at forensic medical expert examination.

UDC 340.6,134
LBC 58;67.99(2)93ya73

ISBN 978-617-505-755-1

© B.V. Mykhailychenko, A.M. Biliakov,
I.G. Savka, 2017, 2019
© AUS Medicine Publishing, design, 2019

CONTENTS

CHAPTER 1. Forensic Medicine as a Science. History of Forensic Medicine	
Development (B.V. Mykhailychenko).....	7
1.1. Definition, Contents, Tasks and Role of Forensic Medicine	7
1.2. Historic Overview of Forensic Medicine Development.....	8
CHAPTER 2. Procedural and Organizational Basics of Forensic Medical	
Examination (B.V. Mykhailychenko)	13
2.1. General Information about Forensic Medical Examination.....	13
2.2. Participation of a Forensic Medical Expert in Examination	15
2.3. Structure of Forensic Medical Service	17
2.4. Forensic Medical Documentation.....	20
CHAPTER 3. Forensic Medical Inspection of a Scene of Incident and Corpse	
(I.G. Savka).....	22
3.1. The Site of an Incident and its Inspection: General Notions	22
3.2. Detection, Fixation, Taking Blood Traces During Inspection of a Scene	
of an Incident.....	26
3.3. Taking Other Biological Objects.....	27
3.4. Documents Prepared During On-site Inspection of an Incident.....	29
CHAPTER 4. Forensic Medical Thanatology (B.V. Mykhailychenko).....	30
4.1. General Information about Dying and Death.....	30
4.2. Forensic Medical Classification of Death	32
4.3. Forensic Medical Aspects of Organ and Tissue Transplantation.....	33
4.4. Forensic Medical Diagnosis of Death	34
4.5. Determination of the Time of Death	44
CHAPTER 5. Forensic Medical Examination of a Corpse (I.G. Savka)	45
5.1. Forensic Medical Examination of a Corpse: General Information	45
5.2 The Order to Conduct Forensic Medical Examination of a Corpse	46
5.3. External Examination.....	47
5.4. Internal Examination	50
5.5. Peculiarities of Examination of an Unknown Person.....	54
5.6. Taking of the Material for Laboratory Examination	55
5.7. Official Registration of the Results of Forensic Medical Examination	
of a Corpse.....	59

CHAPTER 6. Forensic Medical Examination in Case of Sudden Death (<i>A.M. Biliakov</i>).....	62
6.1. General Information about Sudden Death.....	62
6.2. Forensic Medical Examination in Case of Different Types of Sudden Death ...	63
6.3. Sudden Death in Childhood	67
6.4. Sudden Death under Peculiar Circumstances	68
CHAPTER 7. Forensic Medical Examination of Newborn Corpses (<i>B.V. Mykhailychenko</i>)	69
7.1. Peculiar Features of Forensic Medical Examination of Newborn Corpses	69
7.2. Determination of Neonatality	71
7.3. Determination of Full-Term and Mature Newborn	72
7.4. Determination of Newborn Viability	72
7.5. Determination of Live-Born Fetus.....	73
7.6. Causes of Death of Newborns.....	74
CHAPTER 8. Forensic Medical Traumatology (<i>A.M. Biliakov</i>)	76
8.1. Injury Classification and Peculiarities	76
8.2. Blunt Object Injuries	77
8.3. Traumatism and its Types	84
8.4. Transportation Traumatism.....	84
8.5. Sharp Object Traumas.....	90
8.6. Clothes Damage in case of Obtuse and Sharp Object Traumas	95
CHAPTER 9. Forensic Medical Expertise of Gunshot Injuries (<i>I.G. Savka</i>)	97
9.1. Firearms and the Mechanism of Shot: General Notion.....	97
9.2. Bullet Entrance Wound due to the Shot from a Distant Range.....	103
9.3. Bullet Entrance Wound due to the Shot from a Close Range	104
9.4. Bullet Entrance Wound due to Contact Range of Shot	107
9.5. Bullet Exit Wound.....	108
9.6. Firearm Wound Canal.....	109
9.7. Firearm Wounds from Hunting Arms	112
9.8. Shot Injuries.....	113
9.9. Firearm Damages of the Clothes.....	116
9.10. Suicide Signs with the Use of Firearms.....	117
9.11. Injuries after Blank Cartridges.....	118
9.12. Injuries after Pneumatic Arms.....	118
9.13. Peculiarities of Injuries Caused by Devices for Shooting Cartridges Supplied with Rubber or Analogical by Their Properties Missiles of a Survivable Exposure	119
9.14. Explosive Injury.....	120
9.15. Laboratory Methods of Examination in Case of Gunshot Wounds.....	122
9.16. Causes of Death due to Mechanical Injury	123
9.17. Detection of the Vital Origin and Time of Injuries	127
CHAPTER 10. Injuries From Low and High Temperature Effect (<i>B.V. Mykhailychenko</i>)	131
10.1. The Local Effect of the High Temperature	131
10.2. The General Effect of the High Temperature (Overheating).....	134

10.3. The Local Effect of the Low Temperature	135
10.4. The General Effect of the Low Temperature	135
CHAPTER 11. Injuries and Death from Atmospheric Pressure Changes	
(<i>B.V. Mykhailychenko</i>)	138
11.1. The General Effect of the Increased Atmospheric Pressure on the Body	138
11.2. The General Effect of the Decreased Atmospheric Pressure on the Body	140
CHAPTER 12. Forensic Medical Examination of Electrical Injuries	
(<i>B.V. Mykhailychenko</i>)	142
12.1. General Information on Electrical Injuries	142
12.2. The Characteristics of the Electric current Effect	143
12.3. Diagnostics of Death from the Technical Electricity Effect	144
12.4. Damage from the Atmospheric Electricity Effect	146
CHAPTER 13. Forensic Medical Examination of the Radiation Trauma	
(<i>B.V. Mykhailychenko</i>)	147
13.1. The General Effect of Ionizing Radiation	147
13.2. The Specifics of the Forensic Medical Examination	149
13.3. Forensic Medical Examination of the Laser Injuries	152
CHAPTER 14. Forensic Medical Examination in Case of Mechanical	
Asphyxia Death (<i>A.M. Biliakov</i>)	154
14.1. General Information about Oxygen Starvation and Its Course	154
14.2. Forensic Medical Diagnosis of Mechanical Asphyxia	155
14.3. Hanging	156
14.4. Ligature Strangulation	160
14.5. Throttling	160
14.6. Closing of Mouth and Nostrils	161
14.7. Choking	161
14.8. Drowning	163
14.9. Squeezing of Chest and Abdomen	165
14.10. Asphyxia in a Limited (Closed) Space	166
CHAPTER 15. Forensic Medical Toxicology (<i>A.M. Biliakov</i>)	167
15.1. Overview on Poisons and Poisoning	167
15.2. Forensic Medical Diagnostics of Death Caused by Poisons of Local Action	168
15.3. Forensic Medical Diagnostics of Death Caused by Blood Poisons	169
15.4. Forensic Medical Diagnostics of Death Caused by Destructive Poisons	170
15.5. Forensic Medical Diagnostics of Death Caused by Functional Poisons	170
15.6. Forensic Medical Diagnostics of Death Caused by Narcotic Substances	173
15.7. Food Toxins (Food Poisons)	178
CHAPTER 16. Forensic Medical Diagnosis of Health Disorders Caused	
by a Biological Environmental Factor (<i>B.V. Mykhailychenko</i>)	179
16.1. General Information on Biological Environmental Factors	179
16.2. Infectious Effect of Biological Factors	180
16.3. Prion Infection and Its Peculiar Features	180
16.4. Biological Effect of Antigens	181
16.5. Peculiarities of Forensic Medical Examination	182

CHAPTER 17. Forensic Medical Examination of Crime Victims, Accused and Other Persons (<i>A.M. Biliakov</i>)	183
17.1. Reasons and Procedure of Examination	183
17.2. Forensic Medical Examination to Determine the Severity of Bodily Injuries	184
17.3. Forensic Medical Examination of Health State, Simulation, Aggravation, Self-inflicted Injuring	187
17.4. Determination of Age	189
CHAPTER 18. Forensic-Medical Expertise in Case of Disputable Sexual Conditions and Sexual Crimes (<i>I.G. Savka</i>)	191
18.1. Peculiarities of Expertise Concerning Disputable Sexual Conditions	191
18.2. Detection of Sex	193
18.3. Detection of Sexual Maturity	194
18.4. Detection of Rupture of Hymen Integrity	195
18.5. Detection of Sexual Reproductive Ability	196
18.6. Detection of the Term of Previous Labour (Past Deliveries)	197
18.7. Detection of the Term of Previous Miscarriage (Abortion)	197
18.8. Forensic Expertise of Sexual Crimes	198
CHAPTER 19. Forensic Medical Examination of Material Evidence (<i>B.V. Mykhailychenko</i>)	201
19.1. Blood Examination	201
19.2. Examination of Hair	209
19.3. Examination of Semen	211
19.4. Examination of Human Organs, Tissues and Some Secretions	213
CHAPTER 20. Forensic Medical and Criminalistic Methods of Examination (<i>B.V. Mykhailychenko</i>)	215
20.1. Measurement Methods	215
20.2. Photographic Methods	216
20.3. Optical Methods	216
20.4. Radiological Methods	216
20.5. Examination in Extreme Spectrum Rays and Luminescent Examination	217
20.6. Determination of Object Metallization	218
20.7. Examination of the Mineral Composition of Objects	219
20.8. Identification Examination of the Instruments of Injury	220
20.9. Identification Examination Using Bone Remains and Skull	221

FORENSIC MEDICINE AS A SCIENCE. HISTORY OF FORENSIC MEDICINE DEVELOPMENT

- 1.1. Definition, Contents, Tasks and Role of Forensic Medicine.
- 1.2. Historic Overview of Forensic Medicine Development.

1.1. DEFINITION, CONTENTS, TASKS AND ROLE OF FORENSIC MEDICINE

When investigating some cases connected with endangering health and especially life of a person, issues of medical and biological nature are sure to appear. These are the questions, which forensic medicine deals with. Forensic medicine is a medical science that generalizes not only medical knowledge but also knowledge of law.

The term “forensic medicine” was first used in the work of J. Bonn “*Specimen medicinae forensis*” in 1690.

Forensic medicine is a branch of medical science, which studies issues of medical, biological and medical-criminal nature for the purposes of justice, legislation and health care.

The notion of “forensic medicine” differs from “forensic medical examination” because ***forensic medical examination*** means *practical use of scientific forensic medical data at the request of law-enforcement bodies or court.*

The main task of forensic medicine and forensic medical examination is assisting justice in investigating crimes against life and health of persons by means of scientific development and practical solution of certain issues of medical and biological nature.

Most often forensic medical examination has to find answers to such questions as the cause of death, prescription of death coming, presence of injuries and

their severity, trauma mechanism, possibility for the person to fulfill any purposeful actions after getting injured, and category of death. However, the list of questions, which must be answered during a forensic medical examination, depends on the specific case under consideration.

Moreover, forensic medical examination as a branch of medicine helps healthcare institutions to improve the level of their treatment and prevention of diseases.

Collaboration of forensic medical examination and healthcare institutions is realized by analyzing the cases of sudden death, lethal injuries caused by vehicles, household and industrial poisoning, medical practice. Another important task of forensic medical examination is provision of transplantation material as well as prevention of alcoholism, drug addiction and toxicomania.

1.2. HISTORIC OVERVIEW OF FORENSIC MEDICINE DEVELOPMENT

Forensic medicine appeared due to the needs of the law science, court procedure and state administration.

The first forensic medical data can be found in ancient times. As early as 3000 years BC Imhotep, doctor of the Egyptian pharaoh, performed both duties of doctor and judge at the same time.

The code of law created by Babylonian king Hammurabi (2200 BC) was the first to include some regulatory norms that dealt with medicine, rights and duties of doctors as well as control of their activity. If a doctor was guilty of his patient's death, he was subject to criminal responsibility.

If a pregnant woman in Mesopotamia committed a murder, she was released from death penalty. In this case the fact of her being pregnant had to be proven by priests, doctors and midwives.

In Ancient Greece Hippocrates (460—355 BC) studied some issues of traumatology, sudden death and deontological ethics.

In Ancient Rome midwives testified in court concerning pregnancy, abortions or deliveries. In 499 BC a code was published which, among other things, dealt also with the duration of pregnancy, and those data were used in legal proceedings.

In 44 BC Emperor Julius Caesar was killed in Rome, and his dead body was examined by the court doctor Antistius, who found 27 stab wounds on the corpse but declared only one of these stabs to be lethal, it was the wound in the chest cavity.

In the manuscripts of Moses, Talmud (1st century BC) it was already written in much detail that doctors had to take part in solving questions concerning the term of conception, peculiarities of injuries, etc.

But it would be wrong to state that forensic medical examination really existed in those ancient times because back then there was neither forensic medicine nor doctors involved in this activity.

During the reign of Emperor Hadrian (1st century BC) Roman doctors had already begun to participate in legal proceedings.

The famous “Corpus Juris Civilis” by Justinian I (529—534 AD) emphasized the special role of doctors in legal proceedings, “Doctors are not witnesses, but they are rather judges than witnesses”.

In Early Middle Ages forensic medicine stopped developing because judicial proceedings at that time boiled to the contest of opposing parties (so called “Field) or ordeal with fire and sword (so called “Dei Judicium”).

Asian countries (China, Japan, Korea) were exceptions because forensic medicine began developing in the 13th century there. In 1247 the work in forensic medicine “Collected Cases of Injustice Rectified” by Song Ci was published in China and dealt with the issues of diagnosing the cases of violent and sudden death. This work was the first to describe postmortem lividities, postmortem rigidity, signs of death caused by a lightning stroke, the procedure of corpse examination, and those areas on a human body were also described, which, when injured, can cause death.

Starting with the 13th century doctors in Europe began to be consulted with during judicial proceedings more and more often. For example, Pope Gregory III pointed at the exclusive role of doctors when cases of injuries were tried. Violent death had gotten to be studied both in medical and legal aspects.

The first criminal code in Medieval Europe, in which forensic medical aspects were fixed legally, was “Constitutio Criminalis Bambergensis” (1507).

The kings of France had a surgeon, who was often invited to the court of Paris to give explanations.

Scientific forensic medicine in Europe (Germany) came into existence due to Emperor Charles V, who introduced in 1532 a criminal code known as “Lex Carolina”. According to this code courts were obliged to invite doctors to examine corpses, persons with physical injuries, and in the cases of child murder, poisoning, medical malpractice, etc. This code stimulated the development of forensic medicine and scientific research of forensic medical nature.

The first reference book in forensic medicine was written by French surgeon Ambroise Pare (1517—1590), in which he described examination of impotence, bodily injuries, child murder, investigation of wounds, some issues of diagnosing mechanical asphyxia, poisoning with carbon monoxide and so on. Works of Phidelius (1602) on medical conclusions and embalming of dead bodies played an important role too because they contained some information concerning different questions of forensic medicine.