



Wiadomości Lekarskie

Official journal of the Polish Medical Association



Memory of
dr Władysław
Biegański

VOLUME LXXV, ISSUE 12, DECEMBER 2022

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OCCUPATIONAL SAFETY AND HYGIENE OF HEALTHCARE PROFESSIONALS IN THE CONTEXT OF HOSPITAL ENVIRONMENT SAFETY

DOI: 10.36740/WLek202212107

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ABSTRACT

The aim: This study was conducted to carry out a comprehensive assessment of the occupational safety and health of medical workers.

Materials and methods: The study involved a questionnaire survey and full-scale physiological and hygienic research using bibliosemantic, questionnaire, hygienic, and statistical methods.

Results: In the course of research it was recorded that the work of surgeons (according to the criteria of the current "Hygienic classification of work") is characterized by high intensity (class 3.2), high probability of exposure to infectious agents (class 3.3, and 4), harmful effects of physical factors (class 3.1), which according to the criteria of the general hygienic assessment of working conditions according to the degree of harmfulness and danger allows being assigned to class 3.3 ("harmful") and 4 ("dangerous"), respectively. Such working conditions provoke an increase in chronic morbidity (industrial and temporary disability), lead to the development of occupational diseases, and can pose a threat to the lives of workers. The need to focus attention on assessing the safety of hospitals in emergencies not only on issues of occupational safety and health but also on the stability and reliability of hospitals in such extreme conditions.

Conclusions: The work process of doctors is characterized by the impact on their body of a complex of unfavorable production factors of psycho-physiological, biological, physical, and chemical nature, among which the leaders are high labor intensity due to intellectual and emotional load, irrational mode of work and rest, and biological factors.

KEY WORDS: medical staff, occupational hygiene, occupational safety, safe hospital environment

Wiad Lek. 2022;75(12):2933-2938

INTRODUCTION

The scientific community around the world is actively demonstrating its interest in the problem of ensuring the safety of the hospital environment. However, at present, most scientific publications are devoted to the study of patient safety, and the problem of occupational safety and health in the medical sector is paid much less attention [1-4].

And this is although, according to the WHO, there are more than 59 million health workers in the world. In particular, in Ukraine (according to the Center for Medical Statistics, Ministry of Health of Ukraine), as of 2021, there were 147,400 doctors of all specialties and 273,526 paramedics. At the same time, health care systems in many countries are leading among other areas of economic activity in terms of losses due to temporary disability, and occupational injuries, and the average lifespan of doctors in the world, according to the WHO, is only 54 years, dentists - 51 years much less than the lifespan of the population as a whole [5-6].

All this indicates the relevance and timeliness of research aimed at studying working conditions in the medical field and developing measures to prevent their negative impact on the health of medical staff [5-8].

THE AIM

The aim was to comprehensively assess the occupational safety and health of health workers.

MATERIALS AND METHODS

The work was performed in two stages, including a questionnaire and full-scale physiological and hygienic research.

At the first stage of the study, a survey of 135 health workers of 10 hospitals in Kyiv, Zhytomyr, and the Zhytomyr region was conducted using a questionnaire created by the authors, which contained 54 questions and covered safety and hygiene aspects of the work of medical staff [9-10].

The second stage of the study performed a hygienic assessment of the conditions and nature of work on the health of health professionals, taking into account the possible impact of hazardous and harmful factors in the working environment, as well as the severity and intensity of the work process according to criteria of "Hygienic classification of labor by indices of harmfulness and danger of factors of the working environment, the weight and intensity of the

labor process”, approved by the order of the Ministry of Health of Ukraine № 248 dated 08.04.2014.

The research was conducted in surgical departments based in two multidisciplinary city clinical hospitals in Kyiv. Measurements were performed at permanent workplaces of medical staff (in operating rooms, dressings, manipulation, residencies, nurse posts, and wards).

The analysis was performed based on staffing schedules, schedules of scheduled and emergency shifts, protocols of surgical interventions, protocols of anesthesia, and job descriptions of doctors and according to the timing of surgeons' working hours.

The intensity of work was assessed based on time trials on intellectual workloads, nature of work performed, sensory workloads, size of the object of observation, emotional loads and degree of responsibility, degree of risk to one's own life, and degree of responsibility for other people's safety.

The difficulty of the surgeons' work was assessed by the working posture and inclinations of the body.

Studies of microclimatic conditions (air temperature, ° C; adhered humidity, %; air velocity, m / s; indoor temperature, ° C; THC index) were performed in the warm season with the help of devices: infrared thermometer “Nimbus- 2000 “, ball thermometer” Tensor-41 “, thermoanemometer. Hygienic assessment of microclimate parameters was carried out by the “Sanitary norms of the microclimate of industrial premises” sanitary standard 3.3.6.042-99 and GOST 12.1.005-88 “General sanitary and hygienic requirements for the air of the working area”.

The intensity of ultraviolet radiation was measured using a radiometer of energy exposure of illumination of the ultraviolet range (UV meter) in the spectral range from 200 to 400 nm (regions A, B, and C). The results were evaluated by sanitary norms № 4557-88 “Sanitary norms of ultraviolet radiation in industrial premises”.

Noise measurements were performed using the Larson-Davis 812 device following GOST 12.1.050-86 “Methods of measuring noise in Hygienic assessment of industrial noise was carried out following sanitary norms 3.3.6.037-99 “Sanitary standards of noise, ultrasound, and infrasound”, “Sanitary standards of permissible noise generated by medical devices in the premises of medical institutions” № 3057 -84, “Sanitary standards noise in residential and public buildings and residential areas” № 3077-84.

Industrial lighting was measured and evaluated using a luxmeter Yu-117 by DSTU B B.2.2-6-97 (GOST 24940-96) “Buildings and structures. Methods of measuring illuminance “and DBN B.2.5-28-2006” Natural and artificial lighting “.

RESULTS

In the first stage of the research, we conducted a subjective assessment of working conditions in hospitals in Kyiv, Zhytomyr, and the Zhytomyr region through a questionnaire. The obtained data show that the vast majority of medical workers are affected by increased nervous and emotional stress (89.7% of Kyiv and 74.0% of Zhytomyr doctors). Zhytomyr doctors in 22.9% of cases experience fatigue in

the middle of the work shift, 66.7% at the end of the work shift. Among Kyiv doctors, these figures are slightly higher at 28.2% and 79.5%, respectively.

Among harmful chemical occupational factors, Kyiv (71.8%) and Zhytomyr (57.3%) doctors most often mentioned the presence of biocides and medicines - 46.2% and 39.6%, respectively. Interviewed Kyiv doctors noted as a manifestation of the influence of chemical factors: odor - 41.0%, irritation of mucous membranes or skin - 35.9%, and allergic reactions - 18.0%, and their Zhytomyr colleagues had the value of these manifestations at 51, 0%, 45.0%, and 33.3% respectively.

Sufficient lighting in the workplace and sufficient ventilation efficiency were considered by 90.6% and 50.0% of doctors in the Zhytomyr region and only 51.3% and 30.8% of doctors in Kyiv, respectively.

Zhytomyr doctors among the physical factors noted the negative impact of ultraviolet radiation (22.9%), second place - noise (20.8%), and third place (16.7%) - ionizing radiation. Ultraviolet radiation (48.7%) and noise (20.51%) were also in first and second place among their Kyiv colleagues, and electromagnetic radiation was in third place (18.0%).

In addition, health care workers are at risk of injury due to falls, burns, and electric shocks.

Data from our study show that during 2019-2020, almost every 5th Zhytomyr doctor was injured due to a slippery floor (1 to 10 times). Approximately at the same level, the problem of injuries was noted by Kyiv doctors.

Previous research by us [10-11] has shown that the risk of contracting SARS CoV 2 and the risk of dying from COVID-19 in health care workers is many times higher than in the general population (for example, at the end of 2020 the corresponding excess was recorded at 2.7 and 1.4 times). And this dependence, despite the reduced risk of infection and death of medical personnel throughout the pandemic, persists to this day.

It should also be noted that according to the literature, the incidence of SARS, influenza, tonsillitis, pharyngitis, laryngotracheitis, bronchitis, intestinal infections, pustular skin lesions, and herpes infection is higher by an average of 1.5 - 3 times higher than the population in general [12].

Thus, the data of our survey show that the formation of working conditions of CHP staff is influenced by biological, physical, and chemical, factors, and high physical and neuro-emotional stress. In combination, they enhance the effect of each other and cause the functional accumulation of fatigue in health professionals.

At the next stage of the study, we conducted an in-depth assessment of the working conditions of medical staff by conducting full-scale physiological and hygienic studies in individual surgical departments of the two cities of Kyiv. Surgical departments were chosen because they have the widest (compared to other departments) range of harmful and dangerous factors in the production environment.

Assessment of the severity and intensity of work shows that the work of medical staff, and especially surgeons, is characterized by a significant intellectual load, requires a large amount of information and long-term memory, and

Table I. Classes of working conditions of surgeons in terms of labor intensity

Indicators of the intensity of the labor process	Characteristics of the indicator	Class of working conditions
1. Intellectual loads		
1.1. Content of work	Heuristic (creative) activity that requires solving complex problems in the absence of an algorithm; personal guidance in difficult situations	3.2
1.2. Perception of signals (information) and their evaluation	Perception of signals followed by a comprehensive assessment of interrelated parameters. Comprehensive assessment of all production activities	3.2
1.3. Distribution of functions according to the degree of complexity of the task	Control and preliminary work on the distribution of tasks to others	3.2
1.4. The nature of the work performed	Work in conditions of shortage of time and information with increased responsibility for the result	3.2
2. Sensory loads		
2.4. Load on the visual analyzer		
2.4.1. The size of the object of distinction (at a distance from the eyes of the worker to the object of distinction, not more than 0.5 m), at the duration of concentrated observation (% of shift time)	1.0-0.3 mm more than 50% of the time	3.1
3. Emotional load		
3.1. The degree of responsibility for the result of their activities. Significance of the error	Responsible for the functional quality of the final product, work, and tasks. Wrong decisions can be life-threatening	3.2
3.2. The degree of risk to one's own life	Reliable	3.2
3.3. Degree of responsibility for the safety of others	Is responsible for the security	3.1
4. Operating mode		
4.1. Working day length (hours)	More than 8 hours	3.1
4.2. Variability of work	Irregular variability with work at night	3.2

Table II. Classes of working conditions of surgeons by indicators of difficulty

Indicators of the severity of the labor process	Characteristics of the indicator	Class of working conditions
Working posture	periodic stay in an awkward and/or fixed position from 25% to 50% of the time of change; being in a standing position from 60% to 80% of the time change	3.1
Slopes of the case (forced, more than 300), the number per shift	120	3.1

contains elements of creativity. Doctors are forced to solve complex problems in the absence of an algorithm, personally manage the work in difficult situations; distribute tasks to others and monitor their implementation; work in conditions of shortage of time and information with increased responsibility for the result.

When performing work, surgeons are subjected to loads on the visual analyzer, which consists in distinguishing small objects (1.0-0.3 mm) for a long time (more than 50% of the time): during surgery, bandaging, examination of patients, and registration of medical documentation. The density of signals (light, sound) for one hour of work is up to 75.

Periodically, surgeons monitor the screens of video terminals (up to 2-3 hours per shift), sometimes using optical devices.

The significant emotional burden on doctors is associated with a great responsibility for the possible danger to the life and health of patients, probable risk to their own lives, and responsibility for the safety of others. Daily contact with people of different ages, social statuses (patients and their relatives, managers, colleagues), and different psychological characteristics requires medical professionals constant nervous and emotional stress. Estimation of working conditions of surgeons on indicators of the intensity of labor process is given in table I.

The working day of surgeons lasts 7 hours. 42 min (from 8³⁰ to 16¹²), no lunch break. In addition, each surgeon has several shifts during the month, lasting 7; 16, or 24 years. In this case, after each shift on a working day, the surgeon continues to work during the next working day, thus, the duration of continuous working time increases. There are no regulated breaks during working hours according to the work schedule.

About 30% of doctors work part-time, which increases the total time of contact with harmful factors in the work environment.

Based on the analysis of the protocols of operations, it was found that one surgeon has about 185 hours of surgery per year. One operation lasts, on average, 1 hour 12 min.

The nature of the surgeon's work is associated with elements of difficulty, as it is characterized by periodic, from 25% to 50% of the time of the work shift in an awkward and/or fixed position, as well as being in a forced "standing" position from 60% to 80%.

When performing the main types of their activities, surgeons perform forced tilts of the body at an angle of more than 30 to 120 times per shift.

Often irrational working posture is due to non-compliance of medical equipment with ergonomic requirements.

Estimation of working conditions of surgeons on indicators of difficulty of labor process is given in table II.

The general assessment of the severity of the surgeon's work was performed based on auxiliary indicators (working posture, body tilts), during the main activity - surgical interventions. Taking into account the coefficients of the significance of auxiliary indicators, the sum of points in severity is less than 1, which corresponds to class 2 - acceptable working conditions.

Assessment of the microclimate of industrial premises showed that the air temperature does not meet the optimal parameters. Thus, at some workplaces (in manipulation, operating, and patient wards) the air temperature exceeded the permissible parameters by 1.0-1.3°C and corresponded to the class of working conditions "harmful" - 3.1. At other workplaces, the air temperature was within the permissible values and corresponds to the class of working conditions - 2 "permissible".

Relative humidity in most workplaces is optimal (Class 1 working conditions), except for operating and dressing, where it is acceptable (Class 2 working conditions).

The speed of air movement corresponded to the optimum at all studied workplaces and corresponded to the 1st class of working conditions "optimal".

The temperature of the internal surfaces in some rooms exceeded more than 2 °C optimal values.

Thus, the work of doctors of surgical departments in terms of microclimate by the criteria of the "Hygienic Classification of Labor..." mainly belongs to the 2nd class of working conditions (permissible). However, in some workplaces (in manipulation, operating, and patient wards) - up to class 3.1 (harmful).

During the sanitary and hygienic study of air exchange, it was found that in all rooms the openings of mechanical

ventilation were blocked by artificial screens. This created conditions for impaired ventilation and led to an increase in room temperature.

During the assessment of the intensity of UV radiation, it was found that the medical staff in operating rooms and dressings are affected by UV radiation of the spectral region C (from 0.02 to 11 mW / m²), which should not be at all (class of working conditions 3.1 (harmful 1 degree UV radiation in sections A and B did not exceed the maximum allowable levels.

At all workplaces, except for the wards for patients, noise levels exceed the maximum allowable values from 2 to 8 dBA (class of working conditions 3.1 (harmful 1 degree). than 5 dBA.

Most nurses' offices did not have natural light, as they were located in remote corners of corridors without windows. However, DBN B.2.5-28-2018 regulates the level of natural light for these types of premises. The lighting of workplaces at such posts was provided only by general artificial lighting, the level of which was 93-146 lux, which was significantly lower than the standardized lighting indicators (300 lux).

Levels of artificial lighting in the workplaces of surgeons comply with hygienic regulations for the relevant types of premises.

The work of surgeons by the "Hygienic Classification of Labor..." on the level of illumination in the workplace belongs to the 2nd class (permissible), and nurses on duty - to the class of working conditions "harmful" 3.2.

Among the biological factors that affect surgeons, there are two groups - pathogens of infectious diseases and antibiotics and antibiotic-containing drugs.

According to the data of microbiological passports of surgical and traumatological departments of hospitals in the treatment of patients surgeons are exposed to pathogenic and opportunistic microorganisms: *Strep. viridans*, *b-Strep. hemolytic*, *Staph. aureus*, *Staph. epidermidis*, *Staph. fecal*, *Klebsiella pneumonia*, *E. Colli*, etc. Surgeons use a large number of antibiotics to treat wounds infected with these microorganisms: erythromycin, tetracycline, gentamicin, lincomycin, rifampicin, ofloxacin, cefoperazone, gentamicin, etc., and which can directly affect the doctor's body.

During the deteriorating epidemic situation of Covid-19 (a particularly dangerous disease) in Kyiv, the study wards of hospitals were reorganized to provide medical care to this category of infectious patients.

According to the "Hygienic classification of work..." working conditions of surgeons under the influence of the above pathogenic microorganisms belong to class 3.3 ("harmful" 3 degrees), and under the influence of pathogens of particularly dangerous infections (SARS-CoV-2 virus) - up to class 4 ("Dangerous").

Working conditions of surgeons in terms of harmfulness and danger of factors of the working environment, severity, and intensity of the labor process by the criteria of "Hygienic classification of labor..." belong to class 3.3 ("harmful" 3 degrees), and working with patients with Covid-19 - up to 4th grade ("dangerous").

DISCUSSION

As mentioned in the introduction, the scientific community's interest in ensuring hospital environment safety is actively growing. Despite this, scientific publications devoted to the patient safety study predominate, and less attention is paid to other safety aspects (safety of healthcare workers) [1-4].

And here it is worth noting that the specific form of a safe environment in hospitals includes close interaction between individual components of the safe environment. Above all, it concerns patient safety with the safety and occupational hygiene of healthcare workers [13-14]. That significantly actualizes the need for a more active introduction into the practice of research aimed at studying medical personnel's safety and occupational hygiene.

At the same time, it is worth noting that conducting field studies to assess the hygienic working conditions of medical workers require additional funding and specialized equipment, which complicates their conduct, especially in emergencies of various natures. The authors emphasize the proposed methodology's prospects for assessing medical personnel's working conditions.

In particular, I would like to draw attention to the consonance of the results of the questionnaire, conducted using the questionnaire developed by the authors of the article, and the data of classical natural physiological and hygienic research, performed by the requirements and criteria of the current "Hygienic Classification of Labor".

The course of field research confirmed the presence and qualitatively and quantitatively assessed the impact of psycho-emotional factors, irrational lighting, high noise, exposure to ultraviolet radiation, and chemical factors on the production environment. Similar results are also presented in the scientific literature [5, 15].

This demonstrates the effectiveness of the method proposed by the authors, as an additional, for assessing the working conditions and safety of medical staff in emergencies of various kinds. An objective quantitative assessment of physical, chemical, biological, and psychophysiological factors can be provided only as a result of appropriate laboratory and instrumental studies.

However, in the absence of opportunities for full-fledged physiological and hygienic research, the proposed method can be effectively applied and allow for rapid assessment of the situation and influence the most important risk factors. In addition, this technique makes it possible to conduct a preliminary assessment of working conditions during the planning of physiological and hygienic research, to optimize them.

CONCLUSIONS

Conducted sociological (through a questionnaire) and physiological and hygienic studies to study the working conditions of medical staff allowed to draw the following conclusions:

1. The labor process of doctors is characterized by the impact on their body of a complex of adverse production factors of psycho-physiological, biological, physical,

and chemical nature, among which the leaders are high labor intensity due to intellectual and emotional stress, irrational work and rest, and biological factors.

2. The work of surgeons is characterized by high intensity (class 3.2), high probability of exposure to infectious agents (class 3.3 and 4), and harmful effects of physical factors (class 3.1), which according to the criteria of general hygienic assessment of working conditions according to the degree of harm and danger refer to class 3.3 ("harmful") and 4 ("dangerous"), respectively.
3. The working conditions of surgeons are characterized by such levels of harmful factors of the production environment and labor process of class 3.3 ("harmful"), which, in addition to increasing chronic morbidity (industrial and temporary disability), lead to occupational diseases. And dangerous working conditions of the 4th class - pose a threat to life, and a high risk of acute occupational injuries, including severe forms.
4. The effectiveness of the proposed method of assessing the working conditions of medical staff through questionnaires, which can be used in emergencies of various kinds (in the absence of classical research) and in the planning of physiological and hygienic research (to optimize their conduct).
5. As hospitals are currently operating in a dual emergency of medical, biological, and military origin, further research, in addition to occupational safety and health, should focus on the sustainability and reliability of hospitals in such extreme conditions.

REFERENCES

1. Global action on patient safety. Report by the Director-General. Executive board 148th session. 2021. https://apps.who.int/gb/ebwha/pdf_files/EB148/B148_6-en.pdf [date access 20.06.2022].
2. Healthcare Safety Culture: A Seven-Step Success Framework. HealthCatalyst. 2019. <https://www.healthcatalyst.com/insights/safety-culture-healthcare-7-step-framework/> [date access 20.06.2022].
3. Kaiser Family Foundation analysis of data from the Centers for Medicare & Medicaid Services, Hospital Compare datasets and Medicare Hospital Quality Chartbook. 2018. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/OutcomeMeasures> [date access 20.06.2022].
4. Employer-reported workplace injuries and illnesses – 2018. Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses, in cooperation with participating state agencies. 2019. <https://www.bls.gov/news.release/pdf/osh.pdf> [date access 20.06.2022].
5. Nahorna A.M., Sokolova M.P., Kononova I.G. Profesiina zakhvoriuvanist medychnykh pratsivnykiv v Ukraini yak medyko-sotsialna problema [Occupational morbidity of medical workers in Ukraine as a medical and social problem]. *Ukrainskyi zhurnal z problem medytsyny pratsi*. 2016;47(2): 3-16. (in Ukrainian).
6. Brayne A.B., Brayne R. P., Fowler A.J. Medical specialties and life expectancy: An analysis of doctors' obituaries 1997–2019. *Lifestyle Medicine*. 2021;2:e23. doi:10.1002/lim2.23.
7. Van Poppel F., Bijwaard G., Van Lieburg M. et al. The Life Expectancy of Medical Professionals in the Netherlands, Sixteenth to Twentieth Centuries. *Population*. 2016;71(4):619-40.

8. Suresh P. Doctor heal thyself. Addressing the shorter life expectancy of doctors in India. *Indian Journal of Ophthalmology*. 2019;67(7):1248-50.
9. Yavorovskiy O.P., Shkurba A.V., Skaletskiy Yu.M. et al. Hihiena i bezpeka pratsi medychnoho personalu v umovakh podolannia pandemii COVID-19. Druhe povidomlennia: zminy i problemy [Hygiene and labour protection of medical staff under conditions of COVID-19 pandemicovercoming. The second message: changes and challenges]. *Dovkillya ta zdorov'ya*. 2020;4(97):4-13. (in Ukrainian).
10. Yavorovskiy O.P., Shkurba A.V., Skaletskiy Yu.M. et al. Problemy bezpeky, hihieny pratsi ta infektsiinoho kontroliu v borotbi z profesiinymy zakhvoriuvanniamy medychnykh pratsivnykiv na COVID-19 u zakladakh okhorony zdorovia Ukrainy [Problems of safety, occupational hygiene and control over infections in fighting with occupational diseases of healthcare workers with COVID-19 in treatment facilities of Ukraine]. *Medicni Perspektivi* 2020;25(4): 159-65. (in Ukrainian).
11. Yavorovskiy O.P., Naumenko O.M., Skaletsky Yu.M. et al. COVID-19 as a stress test of healthcare establishments effectiveness and reliability measured nationally and globally. *Wiadomosci lekarskie*. 2021;74(10):2471-76.
12. Yavorovskiy O.P., Brukhno R.P. and Brukhno O.M. Zbudnyky infektsiinykh zakhvoriuvan yak shkidlyvi ta nebezpechni faktory umov pratsi medychnykh pratsivnykiv [Pathogens of Infectious Diseases as Harmful and Dangerous Factors of Working Conditions in Medical Workers]. In: *Aktualni problemy profilaktychnoi medytsyny: zb. nauk. pr. Lviv*. 2020; 20: 3-15. (in Ukrainian).
13. Flott K., Durkin M., Darzi A. The Tokyo Declaration on patient safety. *BMJ*. 2018;362:k3424.
14. OSHA (US Occupational Safety and Health Administration) & Worker Safety. Handling with Care. Practicing safe patient handling, 2017. https://www.jcrinc.com/assets/1/7/Pages_from_ECN_20_2017_08-2.pdf [date access 20.06.2022].
15. Tymoshina D. P., Lubyanova I. P. Problemy zdorov'ia pratsivnykiv medychnoi haluzi v Ukraini [Health problems of workers of the medical branch in Ukraine]. *Upravlinnia zakladamy okhorony zdorov'ia*. 2015;8:54–58. (in Ukrainian).

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Conflict of interest:

The Authors declare no conflict of interest.

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Received: 11.07.2022

Accepted: 14.11.2022

A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article