ERGONOMIC WORKPLACE FACTORS AS INDICATORS OF OCCUPATIONAL RISK FOR COSMETOLOGISTS

Latyshevskaya NI, Krainova IYu, Shestopalova EL, Belyaeva AV, Malyakina AA, Levchenko NV✉

Volgograd State Medical University, Volgograd, Russia

Currently, cosmetology is one of the fastest growing branches of medicine. Some of the factors contributing to the occupational hazards of cosmetology include static loads, repetitive small-scale hand and wrist movements, and prolonged sitting in uncomfortable positions. This study aimed to assess the ergonomics of the working posture of cosmetologists and the related risk of musculoskeletal disorders. We examined doctors' complaints about having to remain in an uncomfortable, rigid working posture for long periods. The variations in posture were assessed photogoniometrically, and the results were used to construct the distribution diagrams for "sitting" and "standing." The participants' shoulders were examined using the Artro-Pro hardware and software complex (digital goniometry). It was found that a cosmetologist stays in an uncomfortable and/or fixed position for about 85% of the working time, which puts the occupation into hardness class 3.2. Cosmetologists most often complain about pain in the neck (60.0–85.4%), back (33.1–82.1%), and shoulders (62.6–80.2%). Digital goniometry has shown that in the sitting position, almost all goniometric indicators deviate from the recommended values. For the standing position, the greatest deviations were established for neck, trunk, and elbow, especially among older specialists ($p \leq 0.05$). Thus, an aggravating factor related to the working posture of cosmetologists is the lack of an ergonomically adequate seat, which poses a significant occupational risk for developing musculoskeletal disorders.

Keywords: cosmetologists, digital goniometry, uncomfortable working position, ergonomics, musculoskeletal system

Author contribution: Latyshevskaya NI, Krainova IYu — study design, analysis of the data obtained; Latyshevskaya NI, Malyakina AA, Belyaeva AV — manuscript authoring; Shestopalova EL, Krainova IYu — review of thematic publications; Shestopalova EL, Levchenko NV — collection of the data for the analysis.

Compliance with ethical standards: the study was approved by the Ethics Committee of Volgograd State Medical University (Minutes No. 005 of February 7, 2025). All participants submitted signed forms confirming their informed consent to participate in the study.

✉ **Correspondence should be addressed:** Natalia V. Levchenko
R. Sorge, 38-56, Volgograd, 400064, Russia; chernova_n_v@mail.ru

Received: 13.02.2025 **Accepted:** 22.04.2025 **Published online:** 26.09.2025

DOI: 10.24075/rbh.2025.138

ЭРГОНОМИЧЕСКИЕ ФАКТОРЫ УСЛОВИЙ ТРУДА ВРАЧЕЙ-КОСМЕТОЛОГОВ КАК ПОКАЗАТЕЛИ ПРОФЕССИОНАЛЬНОГО РИСКА

Н. И. Латышевская, И. Ю. Крайнова, Е. Л. Шестопалова, А. В. Беляева, А. А. Малякина, Н. В. Левченко✉

Волгоградский государственный медицинский университет, Волгоград, Россия

В настоящее время косметология является одной самых быстроразвивающихся отраслей медицины. При этом потенциально вредными факторами, формирующими тяжесть труда косметологов, являются статическая нагрузка, мелкие стереотипные рабочие движения, периодическое нахождение в неудобной рабочей позе. Целью исследования было выполнить эргономическую оценку рабочей позы и риска нарушений опорно-двигательного аппарата у врачей-косметологов. Изучены жалобы медиков в связи с длительным удержанием неудобной фиксированной рабочей позы. Рабочую позу оценивали фотогониометрическим методом с последующим построением эпюров рабочих поз «сидя» и «стоя». Выполнена цифровая гониометрия плечевых суставов с использованием аппаратно-программного комплекса «Артро-Про». Установлено, что врач-косметолог около 85% времени смены находится в неудобной и/или фиксированной позе, что соответствует классу 3.2 по степени тяжести. Среди врачей-косметологов наибольшую распространенность имеют жалобы на боли в области шеи (60,0–85,4%), в спине (33,1–82,1%), в плечевом суставе (62,6–80,2%). Цифровая гониометрия показала, что во время работы косметолога в позе «сидя» практически все гониометрические показатели не соответствуют рекомендуемым значениям. При работе в позе «стоя» выявлены наибольшие отклонения в области шеи и туловища, а также локтевого сустава, особенно в старшей возрастной группе ($p \leq 0,05$). Таким образом, усугубляющим фактором, связанным с особенностями рабочей позы врачей-косметологов, является отсутствие эргономически адекватного сидения, что создает реальный профессиональный риск формирования нарушений опорно-двигательного аппарата.

Ключевые слова: косметологи, цифровая гониометрия, неудобная рабочая поза, эргономика, опорно-двигательный аппарат

Вклад авторов: Н. И. Латышевская, И. Ю. Крайнова — разработка дизайна исследования, анализ полученных данных; Н. И. Латышевская, А. А. Малякина, А. В. Беляева — написание текста рукописи; Е. Л. Шестопалова, И. Ю. Крайнова — обзор публикаций по теме статьи; Е. Л. Шестопалова, Н. В. Левченко — получение данных для анализа.

Соблюдение этических стандартов: исследование одобрено локальным этическим комитетом ФГБОУ ВО ВолгГМУ Минздрава России (протокол № 005 от 7 февраля 2025 г.). От всех участников получено информированное согласие.

✉ **Для корреспонденции:** Наталья Викторовна Левченко
ул. Р. Зорге, д. 38-56, г. Волгоград, 400064, Россия; chernova_n_v@mail.ru

Статья получена: 13.02.2025 **Статья принята к печати:** 22.04.2025 **Опубликована онлайн:** 26.09.2025

DOI: 10.24075/rbh.2025.138

Cosmetology is one of the most rapidly developing branches of medicine. Its progress is driven by innovative technologies and improved methods for correcting aesthetic defects and age-related skin changes. Among other reasons are the changing needs of people to refine their appearance as a factor affecting their quality of life and social status. In many cases, aesthetic medicine improves not only the looks but also the feelings of the patients, their psychological state. Today, more than 35% of Russian citizens seek medical assistance from cosmetologists, and women do so four times as often as men. According to the BusinesStat agency, in 2023 Russians spent a record 269 billion rubles on cosmetology, and the number of cosmetology clinics and offices exceeded 28000 [1].

Cosmetology developed on the basis of dermatovenerology. As a discipline in higher medical education institutions, cosmetology appeared only in 2009, and the occupational standard "Cosmetologist" was approved in 2021 [2, 3].

The currently available research papers cover legal issues associated with cosmetology and the problems of assessment of quality of medical assistance rendered by cosmetologists

[4–6]. There are practically no publications exploring the subject of occupational health of cosmetologists, which justified the search for potentially harmful and (or) dangerous work-related factors, a methodological approach used by the occupational safety and health specialists in the context of assessment of working conditions [7].

The working posture was established as a potentially harmful factor shaping the overall degree of hardness of the cosmetologists' labor. Overall, studies investigating work-related ergonomic risks of musculoskeletal disorders (MD) among medical doctors of all specialties are considered relevant [8–10]. Thus far, the problem of MD has received the greatest attention in relation to the health of dentists. For them, the main reasons for becoming incapable of work are pain and the musculoskeletal disorders resulting from "incorrect, traumatic working posture" [11–14]. The unnatural body position, repetitive movements, and constant tension can lead to osteochondrosis, local neuroticisms, arthritis, tendovaginitis, and other related conditions. The most common of those unnatural body positions among dentists involve an excessive forward tilt of the head with strained neck, a tilted torso semi-rotated to one side, a raised shoulder or both shoulders, a less than 90° hip angle [15].

The assessment of the hardness of work of cosmetologists performed by the authors earlier substantiated adoption of the following indicators contributing to the said hardness, including: static loads in the context of the procedures (photo rejuvenation, ultrasound peeling, etc.) performed with one hand; a significant number of small-amplitude, local, repetitive movements that involve the hand and finger muscles; and periodical assumption of uncomfortable or unnatural working postures [16].

In connection with the above, the purpose of this study was to assess the ergonomic aspects of the working posture of cosmetologists and evaluate the risk of MD among them.

PATIENTS AND METHODS

The study involved three cosmetology clinics in Volgograd and spanned 2024 and 2025. We monitored the work of the cosmetologists for 12 man-shifts and assessed the collected data against the provisions of the "Guidelines for the Hygienic Assessment of Working Environment Factors and the Labor Process. Criteria and Classification of Working Conditions (R 2.2.2006-05)." There were two study groups: the first consisted of 35 people aged 28–39 years with an average work experience of 7.2 ± 3.75 years, and the second consisted of 33 people aged 40–59 years with an average work experience of 19.4 ± 7.12 years.

A questionnaire was developed to study medical complaints related to prolonged retention of an uncomfortable fixed working position. The participants were surveyed at the end of the working day.

The working posture of the cosmetologists was registered photogoniometrically. The total number of the examined participants was 12, five in the 1st group and seven in the 2nd; we have built distribution diagrams for all of them. Photographs were taken from the side, when the doctors assumed their working postures, sitting and standing. The parts and areas of interest on the pictures were as follows: the external auditory foramen, the great humerus, the outer condyle of the humerus, the styloid process of the ulna, the metacarpophalangeal joint of the third finger, the great trochanter of the femur, the outer epicondyle of the femur, the ankle of the fibula, the joint area of the second or third toe, the calcaneal tubercle. The values recorded for them were compared to the recommended ranges of goniometric angles [17].

We performed digital goniometry of the shoulder joints using the Artro-Pro hardware and software complex (certificate of state registration of the computer program No. 2023667718 of 17.082023) developed by the specialists from the Volgograd State Medical University (Russia). The assessment of the functional state of the shoulder joint involved computer registration of a number of bone landmarks, processing of the obtained data, and compilation of the conclusion on functional and/or structural deformities. We studied the flexion, extension, abduction, and adduction in the shoulder joint. The software drew a graph, goniometrogram, based on the values, which allowed evaluating the function of the joints.

For statistical processing of the results, we used the IBM SPSS Statistics Version 22 software package (IBM; USA). The Kolmogorov-Smirnov test was used to verify the normality of the distribution of the indicators, and the results confirmed that the distribution was normal. The mean (M), the standard error of the mean (*m*), and the 95% confidence interval (95% CI) were used to describe the quantitative data. The significance of the differences was calculated using the Student *t*-test. To compare the two independent study groups, we applied Fischer's *F*-test. The differences were considered statistically significant at $p \leq 0.05$.

RESULTS

The timed observation showed that for about 85% of the working time, the cosmetologists assume an uncomfortable and/or fixed position, which allows putting this occupation under the hardness class 3.2 [16]. We visually assessed the cosmetologist's working posture associated with the most common procedures, and evaluated the doctor's position relative to the patient on the treatment table. Injections, electrocoagulation, etc., require maintaining an uncomfortable pose because of the need to distinguish small (from 0.5 mm) features on the patient's face, neck, and decollete area that are no more than 0.4–0.5 m from the doctor's eyes. Thus, a cosmetologist stays seated for 55–60% of the shift time, and while standing, the specialist has the body tilted forward, straining, specifically, the cervical spine, and rotating spine and shoulder joint. The laboratory chair with height adjustment cannot be considered an adequate piece of workplace equipment.

The results of the survey taken by the study groups revealed that older doctors complained more often than their younger peers (Table 1). Neck was found to be the most common area of pain among cosmetologists: it as mentioned by 60.0% of the participants from the first group and 85.4% from the second group. There were also a high percentage of respondents complaining of back pain (33.1–53.3% in the first group and 53.5–82.1% in the second) and shoulder joint (62.6% and 80.2%, respectively).

Every third cosmetologist in the first group and almost 70% of doctors in the second group complained of a headache at the end of the working day; 36.67% and 39.28%, respectively, had the eyesight deteriorating. The high prevalence of complaints about MD justified the need to assess the morphofunctional state of joints and spine. We measured the main goniometric parameters of the sitting and standing working poses (Table 2). It was found that when a cosmetologist is working seated, almost all of these parameters are outside the recommended range. The greatest vertical deviations were seen in the neck and shoulder (head-forward position) area; another common discrepancy concerned excessive flexion of the hip and knee

Table 1. Comparison of the frequency of complaints, %

Indicators	Group 1, %; 95% CI	Group 2, %; 95% CI	*F* (Fischer's *F*-test)	Significance
Headache	33.34 (30.0–36.38)	67.85 (64.81–70.89)	7.568	0.008
Visual impairment	36.67 (33.56–39.78)	39.28 (36.10–42.46)	0.041	0.841
Neck pain	60 (56.82–63.18)	85.71 (83.88–87.54)	5.046	0.029
Pain in the upper spine	53.33 (50.07–56.59)	82.14 (79.67–84.61)	7.219	0.009
Pain in the lower spine	33.33 (30.25–36.41)	53.57 (50.31–56.83)	1.664	0.202
Shoulder pain	62.66 (59.45–65.34)	80.2 (77.27–83.26)	5.663	0.021
Leg pain	20 (17.39–22.61)	35.71 (32.60–38.82)	1.784	0.187

joints. For the standing position, we registered the greatest deviations from the recommended values in the neck and the trunk (deviations from the recommended verticality values) as well as the elbow joint.

Since, according to the doctors, pain in the shoulder joint area causes the greatest discomfort when performing manipulations, we did digital goniometry thereof to determine the amplitude of movements and diagnose the degree of overstrain of the muscular component of the shoulder joint complex.

Table 3 shows the results of digital goniometry of one of the examined doctors.

The analysis of the digital goniograms showed that in 87.2% of the doctors aged 28–39 years, the static and dynamic loads experienced during the working day did not significantly affect the functional state of the shoulder joint. At the same time, in the older age group (40–59 years old), this was true only for 31.6% of the respondents.

DISCUSSION

It was found that complaints of pain in the neck area are the most common among cosmetologists. This type of pain is known to occur in 20–70% of people during their lifetime, and its prevalence in the general population is 4.9%. The most common variety is non-specific neck pain, the risk factors for which include prolonged static loads in the neck area, failure to follow ergonomic rules at work, and being female [18–20]. The results of this study differ from the data describing the respective indicators in the general population, and this difference suggests occupational conditioning thereof: specifics of organization of the workplace and the need to maintain a working posture. Sitting, a cosmetologist has the body tilted forward and the gaze fixed on the features of face, decollete area below; consequently, the weight of the head increases relative to the cervical vertebrae, and that of the upper body — relative to the lumbar region. According to [21], when the angle of inclination of the head relative to the vertical axis is 30–45°, the load on the spine can reach 18–22 kg. At the same time, the load on the extensor muscles of the neck and spine increases, which leads to their early fatigue, overwork, and pain [22, 23]. In addition, the cosmetologist's working posture is characterized by a spiral curvature of the spine in the thoracic and lumbar regions, which leads to the development of pain in there, and headaches. For the standing position, we identified the angles of inclination from the neck, shoulder, and spine vertical are more than twice as great as the recommended values, which also creates a risk of straining the muscles of the shoulder girdle, occiput, and back [23]. The lack of an ergonomically adequate seat further exacerbates the established occupational risks associated with the specifics of the working posture of cosmetologists. It has been proven that ergonomic interventions, i.e., provisions of a chair that meets the requirements of the profession, can prevent excessive tension of the neuromuscular system, musculoskeletal pain and discomfort [24]. The "ergonomic" chair proposed by manufacturers, which has inclined surfaces, forces the person counter constant sliding down, which leads to a straighter position of the spine, but entails undesirable hyperactivity of the muscles of the upper and lower extremities [25, 26].

CONCLUSIONS

The data obtained indicate that the identified ergonomic deficiencies are the main factors conditioning the hardness of work of cosmetologists; they create a real occupational risk of disorders of the musculoskeletal system. It is necessary

Table 2. Goniometric parameters of cosmetologists' working posture, degrees

	Sitting position			Standing position	
Parameter (angles)	Recommended ranges	Hands propped M ± *m*, deg.	Hands unpropped M ± *m*, deg.	Recommended ranges	M ± *m*, deg.
Wrist joint	170–190	---	---	170–190	---
Elbow joint	80–110	91.5 ± 16.9	42 ± 3.1	80–100	87.5 ± 16.7
Hip joint	85–100	83.5 ± 13.1	75 ± 12.8	165–180	122.0 ± 7.2
Knee joint	95–120	89.5 ± 12.2	93 ± 15.4	----	----
Ankle joint	85–95	85 ± 4.2	95 ± 16.1	90–100	105.0 ± 3.8
Neck, vertical deviation	10–25	44.5 ± 2.9	40 ± 3.1	10–25	44.5 ± 2.6
Shoulder, vertical deviation	15–35	37.5 ± 4.8	36 ± 4.7	15–35	38.5 ± 4.5
Trunk, vertical deviation	15–25	15 ± 6.5	20 ± 5.5	0–15	30.5 ± 5.1

Table 3. Digital goniometry results (subject A)

Movement	Beginning of the working day		End of the working day	
	Right shoulder	Left shoulder	Right shoulder	Left shoulder
Abduction amplitude	167	164	140	144
Flexion	178	175	174	173
Extension	40	49	40	40
The difference in angles between the midline of the body and the axis of the upper limbs	Max up to 3 with shoulder joint retraction up to 60		Max up to 1.5 with shoulder joint retraction up to 60	
Symmetry of the graphs of changes in the angle of abduction of the right and left shoulder joints	Symmetrical		Symmetrical	

Conclusion: in the subject A (cosmetologist), the static and dynamic loads alter the functional state of the shoulder joint, overworking and overstraining its muscular component

to continue researching the subject of workplace optimization, since ergonomic interventions can be quite effective in reducing occupational risk and preventing diseases associated with the considered medical activity.

References

1. Analiz rynka kosmetologii v Rossii v 2019–2023 gg, prognoz na 2024–2028 gg. BusinesStat. 2024; 60 p. (in Rus.). Available from: https://businesstat.ru/catalog/id80565/.
2. Prikaz Ministerstva zdravoohranenija i social'nogo razvitija Rossijskoj Federacii ot 7 ijulja 2009 g. № 415n "Ob utverzhdenii Kvalifikacionnyh trebovanij k specialistam s vysshim i poslevuzovskim medicinskim i farmacevticheskim obrazovaniem v sfere zdravoohranenija" (in Rus.).
3. Prikaz Ministerstva truda i social'noj zashhity Rossijskoj Federacii ot 13 janvarja 2021 g. № 2n «Ob utverzhdenii professional'nogo standarta "Vrach-kosmetolog" (in Rus.).
4. Kolsanova AA, Suslin SA. Mediko-organizacionnye aspekty obrashhaemosti pacientov v kliniku kosmetologii. Sovremennye problemy zdravoohranenija i medicinskoj statistiki. 2023; (1): 506–22 (in Rus.). DOI: 10.24412/2312-2935-2023-1-506-522.
5. Manakina ES, Medvedeva OV, Manakin II. Ocenka kachestva okazanija medicinskoj pomoshhi po profilju «kosmetologija» v medicinskih organizacijah razlichnyh form sobstvennosti. Sovremennye problemy zdravoohranenija i medicinskoj statistiki. 2020; (4): 445–56 (in Rus.). DOI: 10.24411/2312-2935-2020-00124.
6. Kubanov AA, Kolsanova OA, Suslin SA, Chertuhina OB. Problemy sovershenstvovanija organizacii kosmetologicheskoj pomoshhi (obzor). Sovremennye problemy zdravoohranenija i medicinskoj statistiki. 2022; (3): 540–60 (in Rus.). DOI: 10.24412/2312-2935-2022-3-540-561.
7. Prikaz Ministerstva truda i social'noj zashhity Rossijskoj Federacii ot 21 nojabrja 2023 g. № 817n "Ob utverzhdenii metodiki provedenija special'noj ocenki uslovij truda, klassifikatora vrednyh i (ili) opasnyh proizvodstvennyh faktorov, formy otcheta o provedenii special'noj ocenki uslovij truda i instrukcii po ee zapolneniju" (in Rus.).
8. Malkov PG, Mihajlov IA. Jergonomicheskie parametry rabochego mesta vracha-patologoanatoma kak vazhnye faktory profilaktiki professional'nyh zabolevanij oporno-dvigatel'nogo apparata. Arhiv patologii. 2022; 84 (6): 32–9 (in Rus.). DOI: 10.17116/patol20228406132.
9. Kabir-Mokamelkhah E, Aghilinejad M, Dehghan N, Sanati P, Hosseininejad M. Work-related musculoskeletal disorders and ergonomic risk assessment among radiologists and gastroenterologists using the workplace ergonomic risk assessment method. Hygiene and Sanitation. 2024; 103 (1): 31–7. DOI: 10.47470/0016-9900-2024-103-1-31-37.
10. Natali MB, Barbalho-Moulim MC. Prevalence of musculoskeletal symptoms among administrative workers at a teaching hospital in the state of Espírito Santo, Brazil. Rev Bras Med Trab. 2021; 19 (4): 465–71. DOI: 10.47626/1679-4435-2021-658.
11. Vorobev MV, Dzhuraeva ShF. Analiz uslovij truda i sostojanija zdorov'ja vrachej-stomatologov v medicinskih organizacijah razlichnoj formy sobstvennosti. Nauchnoe obozrenie. Medicinskie nauki. 2020; (2): 21–5 (in Rus.).
12. Syzdykova AB, Toguzbaeva KK, Bekkazinova DB, Akylbekov MZh. Vlijanie jergonomicheskih uslovij truda na zdorov'e vrachej-stomatologov. Farmacija Kazahstana. 2023; 4 (249): 181–91 (in Rus.). DOI: 10.53511/PHARMKAZ.2023.46.32.025.
13. Lopez RV, Sierra JL, Diaz SP, Agudelo HB. Quality of working life for dentists in Antioquia 2011–2012. Rev Salud Publica. 2020; (20): 684–91. DOI: 10.15446/rsap.V20n6.52054.
14. Marklund S, Huang K, Zohouri D, Wahlström J. Dentists working conditions — factors associated with perceived workload. Acta Odontol Scand. 2021; (79): 296–301. DOI: 10.1080/00016357.2020.1849791.
15. Marklund S, Mienna CS, Wahlström J, Englund E, Wiesinger B. Work ability and productivity among dentists: associations with musculoskeletal pain, stress, and sleep. Int Arch Occup Environ Health. 2020; 93 (2): 271–8. DOI: 10.1007/s00420-019-01478-5.
16. Jacyshena TL, Latyshevskaja NI, Shestopalova EL, Krajnova IJu. K voprosu gigienicheskoj ocenki uslovij truda i faktorov riska zdorov'ju vrachej-kosmetologov. Al'manah. 2019; (2): 245–7 (in Rus.).
17. Kurenkova GV, Lemeshevskaja EP, Zhukova EV. Organizacija i provedenie fiziologicheskih i jergonomicheskih issledovanij na proizvodstve: uchebnoe posobie. FGBOU VO IGMU Minzdrava Rossii. Kafedra profil'nyh gigienicheskih disciplin. Irkutsk: IGMU, 2022; 42 p. (in Rus.).
18. Bergenudd H, Nilsson B. The prevalence of locomotor complaints in middle age and their relationship to health and socioeconomic factors. Clin Orthop Relat Res. 1994; (308): 264–70.
19. Golovacheva VA, Golovacheva AA, Zinoveva ShhE. Bol' v shee kak problema nashego vremeni. Medicinskij sovet. 2020; (19): 14–20 (in Rus.). DOI: 10.21518/2079-701X-2020-19-14-20.
20. McLean SM, May S, Klaber-Moffett J, Sharp DM, Gardiner E. Risk factors for the onset of non-specific neck pain: a systematic review. J Epidemiol Community Health. 2010; 64 (7): 565–72. DOI: 10.1136/jech.2009.090720.
21. Hansraj KK. Assessment of stresses in the cervical spine caused by posture and position of the head. Surg Technol Int. 2014; (25): 277–9.
22. Aruin AC, Zaciorskij BM. Jergonomicheskaja biomehanika. M.: Medicina, 1989; 251 p. (in Rus.).
23. Novikova TA, Danilov AN, Spirin VF. Vlijanie jergonomicheskih faktorov na formirovanie professional'nogo riska narushenij zdorov'ja mehanizatorov sel'skogo hozjajstva. Medicina truda i promyshlennaja jekologija. 2019; 1 (7): 400–5 (in Rus.). DOI: 10.31089/1026-9428-2019-59-7-400-405.
24. Esmaeilzadeh S, Ozcan E. Effects of ergonomic intervention on work-related upper extremity musculoskeletal disorders among computer workers: a randomized controlled trial. Int Arch Occup Environ Health. 2014; 87 (1): 73–83. DOI: 10.1007/s00420-012-0838-5.

25. van Niekerk SM, Louw QA, Hillier S. The effectiveness of a chair intervention in the workplace to reduce musculoskeletal symptoms. A systematic review. BMC Musculoskelet Disord. 2012; (13): 145. DOI: 10.1186/1471-2474-13-145.
26. Hamaoui A, Hassaïne M, Watier B, Zanone PG. Effect of seat and table top slope on the biomechanical stress sustained by the musculo-skeletal system. Gait Posture. 2016; (43): 48–53. DOI: 10.1016/j.gaitpost.2015.10.024.

Литература

1. Анализ рынка косметологии в России в 2019–2023 гг., прогноз на 2024–2028 гг. BusinesStat. 2024; 60 с. URL: https://businesstat.ru/catalog/id80565/.
2. Приказ Министерства здравоохранения и социального развития Российской Федерации от 7 июля 2009 г. № 415н «Об утверждении Квалификационных требований к специалистам с высшим и послевузовским медицинским и фармацевтическим образованием в сфере здравоохранения».
3. Приказ Министерства труда и социальной защиты Российской Федерации от 13 января 2021 г. № 2н «Об утверждении профессионального стандарта «Врач-косметолог».
4. Колсанова А. А., Суслин С. А. Медико-организационные аспекты обращаемости пациентов в клинику косметологии. Современные проблемы здравоохранения и медицинской статистики. 2023; (1): 506–22. DOI: 10.24412/2312-2935-2023-1-506-522.
5. Манакина Е. С., Медведева О. В., Манакин И. И. Оценка качества оказания медицинской помощи по профилю «косметология» в медицинских организациях различных форм собственности. Современные проблемы здравоохранения и медицинской статистики. 2020; (4): 445–56. DOI: 10.24411/2312-2935-2020-00124.
6. Кубанов А. А., Колсанова О. А., Суслин С. А., Чертухина О. Б. Проблемы совершенствования организации косметологической помощи (обзор). Современные проблемы здравоохранения и медицинской статистики. 2022; (3): 540–60. DOI: 10.24412/2312-2935-2022-3-540-561.
7. Приказ Министерства труда и социальной защиты Российской Федерации от 21 ноября 2023 г. № 817н «Об утверждении методики проведения специальной оценки условий труда, классификатора вредных и (или) опасных производственных факторов, формы отчета о проведении специальной оценки условий труда и инструкции по ее заполнению».
8. Мальков П. Г., Михайлов И. А. Эргономические параметры рабочего места врача-патологоанатома как важные факторы профилактики профессиональных заболеваний опорно-двигательного аппарата. Архив патологии. 2022; 84 (6): 32–9. DOI: 10.17116/patol20228406132.
9. Кабир-Мокамельха Э., Агхилинеджад М., Дехгхан Н., Санати П., Хоссейнинеджад М. Профессиональные заболевания опорно-двигательного аппарата и оценка эргономических рисков у рентгенологов и гастроэнтерологов с использованием метода оценки эргономических рисков на рабочем месте. Гигиена и санитария. 2024; 103 (1): 31–7. DOI: 10.47470/0016-9900-2024-103-1-31-37.
10. Natali MB, Barbalho-Moulim MC. Prevalence of musculoskeletal symptoms among administrative workers at a teaching hospital in the state of Espírito Santo, Brazil. Rev Bras Med Trab. 2021; 19 (4): 465–71. DOI: 10.47626/1679-4435-2021-658.
11. Воробьев М. В., Джураева Ш. Ф. Анализ условий труда и состояния здоровья врачей-стоматологов в медицинских организациях различной формы собственности. Научное обозрение. Медицинские науки. 2020; (2): 21–5.
12. Сыздыкова А. Б., Тогузбаева К. К., Бекказинова Д. Б., Акылбеков М. Ж. Влияние эргономических условий труда на здоровье врачей-стоматологов. Фармация Казахстана. 2023; 4 (249): 181–91. DOI: 10.53511/PHARMKAZ.2023.46.32.025.
13. Lopez RV, Sierra JL, Diaz SP, Agudelo HB. Quality of working life for dentists in Antioquia 2011–2012. Rev Salud Publica. 2020; (20): 684–91. DOI: 10.15446/rsap.V20n6.52054.
14. Marklund S, Huang K, Zohouri D, Wahlström J. Dentists working conditions — factors associated with perceived workload. Acta Odontol Scand. 2021; (79): 296–301. DOI: 10.1080/00016357.2020.1849791.
15. Marklund S, Mienna CS, Wahlström J, Englund E, Wiesinger B. Work ability and productivity among dentists: associations with musculoskeletal pain, stress, and sleep. Int Arch Occup Environ Health. 2020; 93 (2): 271–8. DOI: 10.1007/s00420-019-01478-5.
16. Яцышена Т. Л., Латышевская Н. И., Шестопалова Е. Л., Крайнова И. Ю. К вопросу гигиенической оценки условий труда и факторов риска здоровью врачей-косметологов. Альманах. 2019; (2): 245–7.
17. Куренкова Г. В., Лемешевская Е. П., Жукова Е. В. Организация и проведение физиологических и эргономических исследований на производстве: учебное пособие. ФГБОУ ВО ИГМУ Минздрава России. Кафедра профильных гигиенических дисциплин. Иркутск: ИГМУ, 2022; 42 с.
18. Bergenudd H, Nilsson B. The prevalence of locomotor complaints in middle age and their relationship to health and socioeconomic factors. Clin Orthop Relat Res. 1994; (308): 264–70.
19. Головачева В. А., Головачева А. А., Зиновьева Щ. Е. Боль в шее как проблема нашего времени. Медицинский совет. 2020; (19): 14–20. DOI: 10.21518/2079-701X-2020-19-14-20.
20. McLean SM, May S, Klaber-Moffett J, Sharp DM, Gardiner E. Risk factors for the onset of non-specific neck pain: a systematic review. J Epidemiol Community Health. 2010; 64 (7): 565–72. DOI: 10.1136/jech.2009.090720.
21. Hansraj KK. Assessment of stresses in the cervical spine caused by posture and position of the head. Surg Technol Int. 2014; (25): 277–9.
22. Аруин А. С., Зациорский В. М. Эргономическая биомеханика. М.: Медицина, 1989; 251 с.
23. Новикова Т. А., Данилов А. Н., Спирин В. Ф. Влияние эргономических факторов на формирование профессионального риска нарушений здоровья механизаторов сельского хозяйства. Медицина труда и промышленная экология. 2019; 1 (7): 400–5. DOI: 10.31089/1026-9428-2019-59-7-400-405.
24. Esmaeilzadeh S, Ozcan E. Effects of ergonomic intervention on work-related upper extremity musculoskeletal disorders among computer workers: a randomized controlled trial. Int Arch Occup Environ Health. 2014; 87 (1): 73–83. DOI: 10.1007/s00420-012-0838-5.
25. van Niekerk SM, Louw QA, Hillier S. The effectiveness of a chair intervention in the workplace to reduce musculoskeletal symptoms. A systematic review. BMC Musculoskelet Disord. 2012; (13): 145. DOI: 10.1186/1471-2474-13-145.
26. Hamaoui A, Hassaïne M, Watier B, Zanone PG. Effect of seat and table top slope on the biomechanical stress sustained by the musculo-skeletal system. Gait Posture. 2016; (43): 48–53. DOI: 10.1016/j.gaitpost.2015.10.024.