

## MEDICAL SAFETY ASSESSMENT AT SKI RESORTS OF THE RUSSIAN FEDERATION

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**Abstract.** Within recent years, the number of ski tourists in the world has been growing. Taking into account the barriers to abroad tourism in 2020–2021, in the coming years, a significant increase in the flow of ski tourists to ski resorts of Russia should be expected. At the same time, it should be emphasized that the level of injuries at Russian ski resorts remains quite high, one of the reasons for which is an insufficiently developed regulatory and legal framework for medical safety of ski resorts.

*The aim of the study is to classify ski resorts in Russia by level of their medical safety based on the developed criteria.*

*Materials and research methods.* A survey of 271 employees and visitors of ski resorts was carried out. According to its results and taking into account their own experience, the authors identified 20 criteria that affect medical safety of ski resorts. The specified criteria were divided into 5 groups: "Facility design", "Administration of ski resort", "Maintenance of routes", "Rescue service", "Medical assistance and medical evacuation".

*Research results and their analysis.* A point scale for assessing medical safety of ski resorts is proposed with the cumulative final results defined as: "insufficient level", "minimum sufficient level", "moderate level", "maximum level".

According to these criteria, an assessment was made of 21 ski resorts in Russia and in the neighboring countries, as a result of which only 4 ski resorts (19%) corresponded to the maximum level of medical safety; to the moderate -- 16 ski resorts (76.2%). These results generally coincided with the opinion of the expert community, which supports the effectiveness of the developed classification.

Conclusions are made about the need to introduce this classification into the system of assessment and of certification of ski resorts and about the necessity to widely communicate the results of the assessment to visitors of ski resorts.

**Key words:** classification, criteria, medical safety, point score, Russian Federation, ski resorts

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## ОЦЕНКА МЕДИЦИНСКОЙ БЕЗОПАСНОСТИ НА ГОРНОЛЫЖНЫХ КОМПЛЕКСАХ РОССИЙСКОЙ ФЕДЕРАЦИИ

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**Резюме.** В последние годы в мире растет число горнолыжных туристов. С учетом сложностей зарубежного туризма в 2020–2021 гг., в ближайшие годы следует ожидать существенного увеличения потока горнолыжных туристов на горнолыжные комплексы (ГК) России. При этом следует подчеркнуть, что уровень травматизма на ГК России остается довольно высоким. Одна из причин этого – недостаточно развитая нормативно-правовая база медицинской безопасности горнолыжных комплексов.

*Цель исследования* – классификация горнолыжных комплексов России по уровню их медицинской безопасности на основе разработанных критериев.

*Материалы и методы исследования.* Проведено анкетирование 271 сотрудника и посетителя ГК, по результатам анкетирования и с учётом собственного опыта автора определены 20 критериев, в наибольшей степени влияющих на медицинскую безопасность ГК. Указанные критерии были разделены на 5 групп: «Проектирование объекта», «Администрирование ГК», «Обслуживание трасс», «Спасательная служба», «Медицинская помощь и медицинская эвакуация».

*Результаты исследования и их анализ.* Предложена балльная шкала оценки медицинской безопасности ГК с вариантами итогового результата по соблюдению условий их медицинской безопасности: «недостаточный уровень», «минимально достаточный уровень», «умеренный уровень», «максимальный уровень».

По этим критериям дана оценка 21 ГК в России и ближнем зарубежье, в результате которой максимальному уровню медицинской безопасности соответствовали только 4 ГК (19%); умеренному – 16 ГК (76,2%). Эти результаты в целом совпали с мнением экспертного сообщества, что свидетельствует об эффективности разработанной классификации.

Сделаны выводы о необходимости внедрения данной классификации в систему оценки и сертификации горнолыжных комплексов с широким информированием посетителей ГК о полученных результатах.

**Ключевые слова:** горнолыжные комплексы, классификация, критерии, медицинская безопасность, оценка в баллах, Российская Федерация

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Globally, the level of injuries among fans of ski tourism ranges from 0.6 to 4.1 cases per 1,000 visits [1-3]. There is no centralized collection of ski injury data in the Russian Federation. According to the internal reporting documentation, at the largest ski resorts of the country – Rosa Khutor, Sorochany, Mountain Air and others, this figure ranges from 1.5 to 2.5 incidents per 1,000 visits.

According to the Federal Tourism Agency, for the ski seasons 2015–2017, tourist flow at Russian resorts and recreation centers amounted to more than 6 million people per year [4]. Even if we estimate very roughly the frequency of visits to ski resorts by each tourist of 1-2 times per season, we can predict up to 30 thousand traumatic incidents.

Such an "additional" flow of patients increases the load on the territorial medical infrastructure in the regions where the ski resorts operate, and requires creation of a system for providing medical assistance to victims from the moment of injury to discharge from the hospital.

Unfortunately, in the Russian standards for the design of industrial facilities, the concept of a ski track as a sports building structure is absent. Therefore, not a single SNiP and SANPiN contains safety requirements that are mandatory for the design of such facilities.

In the ski industry, despite the adoption of a number of normative legal acts, there is still a deficit in the legislative framework for the safety requirements for ski tourism. To date, there are no normatively fixed criteria for a comprehensive assessment of medical safety at ski resorts. In the existing regulations, the issues of ensuring the medical safety of skiers are covered fragmentarily, in a number of cases – in a contradictory way<sup>1,2,3</sup>. None of these regulations contain a comprehensive assessment methodology that would allow potential visitors to make an independent conclusion about the safety of the services provided at the ski resort. Also, they do not provide the specialists of the ski resort with a comprehensive approach to the organization of a system for preventing medical incidents and effective assistance to potential victims.

**The aim of the study** is to classify the ski resorts in Russia according to the levels of their medical safety based on the developed criteria.

**Materials and research methods.** At the first stage, a survey was conducted, which included 271 employees and visitors of the ski resort, as well as employees of emergency rescue teams and other operational services involved in providing assistance to victims on the ski slopes. Based on the results of this survey, it was decided to divide the ski resort into 3 safety levels: minimum sufficient, moderate and maximum. The division is based on the 20 most significant, in our opinion, criteria that allow us to assess the peculiarities of the functioning of the ski resort from the point of view of the medical safety of skiers and visitors. These 20 indi-

<sup>1</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts"

<sup>2</sup> GOST 57279-2016 "Assessment of the services of ski resorts"

<sup>3</sup> On the approval of the procedure for the classification of objects of the tourism industry, including hotels and other accommodation facilities, ski slopes and beaches, carried out by accredited organizations: order of the Ministry of Culture of Russia dated July 11, 2014 No. 1215, Appendix 19

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cators characterizing the effectiveness and conditions of providing assistance to victims on the territory of the ski resort were combined into 5 groups.

**Research results and their analysis.****The first group – object design**

1.1. *The presence of tracks of "red"<sup>4</sup> and "black"<sup>5</sup> levels of difficulty in accordance with the classification of GOST R 55881-2016<sup>6</sup>.*

This indicator was adopted by us in view of an objective increase in risk when descending on the tracks of the "red" and "black" level. According to marketers, among the visitors of the ski resort, the slopes of the "blue" level of difficulty are most in demand, despite the fact that they are considered to be tracks for beginners. Even experienced skiers, who are aware of the complexity of the "red" and "black" slopes and adequately assess their strength, rarely spend the whole day on such slopes, preferring to alternate them with more gentle "blue" slopes. An increased risk of skiing on "red" and "black" slopes is associated with: their steeper slope and, therefore, with a higher kinetic energy of a likely fall or collision of skiers; a smaller width and less space for maneuvering when avoiding a collision; higher altitude and more severe climatic conditions (wind). In addition, due to the steepness of their slopes, the snow cover on "black" slopes is often not processed or is not properly processed by snow plowing machines, creating additional difficulties when maneuvering during downhill skiing.

1.2. *Availability of engineering protection of routes and supports of chairlifts from avalanches in potentially dangerous places.*

The most common threats to the normal operation of the gondola, chairlift and funicular-type suspended roads are avalanches and strong winds. The emergency automation of modern ropeways is configured to stop functioning independently when the wind load on the supports is higher than the maximum permissible value. This is done to prevent breakage of cabins and seats, as well as to prevent their dangerous rocking and grazing on the supports. However, such a stop of a cableway cabins leads to a temporary blocking of passengers in the seats and cabins of the road, which, in conditions of low temperatures and low mobility until the moment of unblocking, can lead to dangerous consequences for health.

The threat of damage of cableroad supports from avalanches is leveled by a whole range of measures, including forecasting avalanche formation, engineering structures, observation and active impact on avalanche-prone slope areas. Some of the most commonly used engineering structures include avalanche-diverting dams, avalanche breakers in front of cable car pylons, and snow-retaining nets in avalanche-prone areas.

Measures to eliminate the consequences of such situations should be spelled out in detail in a document called "Emergency Response Plan", drawn up individually for each specific facility.

<sup>4</sup> "Red" track – a track of an average difficulty level

<sup>5</sup> "Black" track – a track of a high level of difficulty

<sup>6</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts", Appendix D

1.3. *The nature of the road surface and the width of the road bed along the entire route to the nearest medical organization corresponding to the level III trauma center.*

The speed of medical evacuation of the victim from the territory of the ski resort to the hospital depends on the quality of the road. Many ski resorts being situated outside the boundaries of municipalities, in hard-to-reach areas, are forced to independently build a section of access roads and clean to it from snow. Sometimes it is a one- or two-lane dirt road, the sides of which on weekends, during a massive visit to the object, are filled with spontaneously parked cars, turning into an insurmountable obstacle for an ambulance car. Even 300-500 m of such a road can nullify the speed effect from a wide and cleaned track bed, passing not far from the main complex.

1.4. *Availability of a helipad or of a platform suitable for receiving helicopters at the facility.*

In global practice, ambulance helicopters remain the most prompt and effective means of medical evacuation of an injured person from the territory of the ski resort. Despite the low availability of this service in Russia and the ban on helicopter flights in the mountains at night, the possibility of a helicopter landing on the territory of the ski resort is a significant criterion for ensuring the medical safety of its visitors. A small number of ski resorts in Russia have a helicopter on their territory or on the sites next to it. In European countries, where the experience of organizing ski resorts is much bigger, the use of an ambulance helicopter to evacuate an injured skier is a routine event.

**The second group is the administration of the ski complex**

2.1. *Availability at the facility of a comprehensive plan for the elimination of consequences of possible emergencies.*

The creation of such a plan is the responsibility of the administration of a particularly dangerous facility. According to the law, almost all types of chairlifts represent such a facility. This document should serve as a basis for conducting regular trainings with employees and representatives of operational services to eliminate the consequences of possible emergencies. Therefore, this document must be adapted to the specific conditions of the facility. For example, when planning the actions of employees in the event of an emergency stop of the cable car and of blocking people in the cabins or on the seats, it is necessary to work out the most probable ways of unblocking and of lowering them, depending on the distance to the ground, ways of providing heating and protection from the wind, of providing the supply of drinking water while carrying out emergency work, taking into account the specifics of this facility.

2.2. *Possibility of calling the rescue service by the visitors of the ski resort; coverage of the track area with a stable radio signal for the rescue service.*

It is difficult to overestimate the importance of operational communication during rescue operations. Visitors should be able to call for help from anywhere in the ski resort and rescuers should be able to contact each other as well as the control and rescue point or the control room of the ski resort. In the case when this rule is not observed — such situations are not uncommon in conditions of a rough terrain — there is a threat of leaving the victim without any help at all, or there can be difficulties in obtaining assistance in the required amount. The issues of covering "dead zones" with a cellular or radio signal are solved by installing additional equipment for signal retransmission.

2.3. *Availability of staff responsible for the operation, maintenance and emergency response on the chair lifts.*

According to the current regulations, the administration of the ski resort must conclude an agreement for its maintenance with a professional emergency rescue team or create and certify such a formation in the structure of the ski resort. However, in the case of an agreement with a third-party professional rescue team and of an extraterritorial deployment of its employees, a prompt response to an emergency situation is not always possible. In addition, cable road, like any complex mechanism, requires timely maintenance and repair. The presence of ski resort employees responsible for this work makes it possible to make this segment of security more manageable, including by improving the qualifications of these employees in the company that manufactures ropeway equipment.

2.4. *Deadline for bringing the access road into working condition after snowfall in winter.*

The importance of the quality and accessibility of access roads has already been discussed. Prompt response to the condition of the roadway in case of a snowfall is one of the key tasks for ensuring the accessibility of the territory of the ski resort and, in particular, for a timely medical evacuation of the victim. The variability of the weather and the likelihood of heavy snowfalls, especially in mountainous areas, may require the involvement of considerable forces to solve this problem. A vivid illustration of this is the situation in the mountainous region of Valais and in the vicinity of the resort of Zermatt (Switzerland), where in January 2019, due to heavy snowfalls and avalanches, traffic on roads and railways was repeatedly stopped, blocking 9-13 thousand people for several days in villages and resorts [5-7].

**The third group — maintenance of tracks**

3.1. *The quality of the snow cover on the ski slopes according to GOST R 55881-2016<sup>7</sup>.*

The quality of the snow cover on the slope directly depends on the efforts applied to control the projectile — skis or snowboard, as well as the predictability of the trajectory of the skier during the descent. The presence of ice build-up, bare soil, bumps or holes on a slope greatly increases the likelihood of losing control of your ski or snowboard and a subsequent fall or collision. It should be noted that the importance of this factor for the safety and quality of skiing is indicated by all specialists and visitors who took part in the survey. However, due to the high cost of snow compacting machines, there is a shortage of this equipment on many of the Russian ski resorts.

3.2. *Marking of ski slopes and directions of movement in accordance with GOST R 55881-2016 8. Provision of slopes with safety equipment, marking and placement of information on ski slopes and slopes in accordance with GOST R 55881-2016<sup>9</sup>.*

High-quality, intuitive and clearly distinguishable track markings are one of the cornerstones of ensuring the safety of skiers. When descending, in conditions of frequently changing slope and direction of the track, it is critical for the skier and snowboarder to choose an appropriate direction and speed of movement and to unambiguously interpret the warning signs. Carefully fencing off dangerous areas, installing restraining nets at the edge of the track, and securing mats around obstacles can prevent a significant amount of injury while riding. At the same time, according to the

<sup>7</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts", Appendix B

<sup>8</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts", Appendix D

<sup>9</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts", Appendix E

opinion of employees and visitors, only a few of the ski resorts surveyed by us had a sufficient number of such security equipment.

3.3. *Regular monitoring and research of the snow cover for the presence of the danger of avalanches and taking measures for artificial avalanches in especially dangerous areas; use of the international scale for marking the avalanche danger of slopes with the provision of relevant information to visitors.*

Avalanches are one of the few natural disasters in mountainous areas that are permanent. Despite the fairly good knowledge of this phenomenon, no specialist will fully guarantee protection from avalanches in the mountains. Nevertheless, the constant monitoring of the state of the snow cover by specialists, forecasting the processes of crystallization of snow, construction of special engineering structures and possibility of actively influence on the slope, as well as artificial avalanches are important measures to protect skiers from this threat. The administration of the minor part of ski resorts surveyed by us pays sufficient attention to this aspect of security. For the sake of objectivity, it should be noted that not all ski resorts have a problem of avalanche danger on slopes — on hilly or flat terrain with man-made slopes, avalanche formation processes are excluded. Nevertheless, even the ski resorts in mountainous areas often does not have their own avalanche safety service. The observations of their respective specialists are carried out "by eye", without using the necessary measurements and methods. One of the options for solving this problem is the use of information from the avalanche service of the entire mountainous region in which the ski resorts are located, which does not take into account the individual conditions of the relief and microclimate of a particular ski resort and greatly reduces the effectiveness of anti-avalanche measures.

3.4. *Closing of routes in accordance with the working hours of employees serving the routes and cable cars, depending on weather conditions and on the danger of avalanches.*

Timely removal of skiers from a potentially dangerous track reflects the level of organization of the rescue service at a particular ski resort. Ideally, after several announcements on the loudspeaker about the closure of the route and the stopping of the cable car, the rescue service personnel, together with the employees of the route service, descend from the top point of the route and visually monitor the slope, helping those who cannot go down on their own, and setting signs prohibiting entry to the track. However, on some of the ski resorts, the process is limited only to announcements over the loudspeaker or even only to the stop of the cable car. It is easy to guess that there is a high probability of leaving an injured or lost skier on the track.

#### **The fourth group — rescue service**

4.1. *The presence of a specialized control and rescue service (ski patrol) with the necessary equipment at the facility.*

This is one of the key elements of ensuring the safety of the skiers on the slope. The functionality of the service employees is very diverse: control over the behavior of visitors; suppression of dangerous, aggressive skiing; help for those who are lost or tired; providing first aid to victims with their subsequent transportation to the place of meeting with the ambulance brigade; monitoring the state of the route, of its marking and of the safety of protective structures in hazardous areas, etc. But the main condition for the effective functioning of this service is the deployment of its employees on the territory of the ski resort and thus the possibility of a prompt response to emerging situations. When the admin-

istration of the ski resort uses the emergency services of the nearest municipality (NSR station, city rescue service, territorial search and rescue squad, etc.), the response time to an incident becomes poorly predictable.

4.2. *The established mode of operation of the object's rescue service.*

The rational use of human and material resources and the promptness of response to situations largely depend on the competent location of the employees of the control and rescue service of the ski resort and on the mode of their work. In the general case, it is optimal to locate control and rescue points with service personnel at the top points of the cable cars, so that all places of probable incidents are located down the slope. This makes it possible for service personnel to arrive at the scene of the incident with a minimum waste of time. An important addition to this scheme is the mode of constant patrolling of the slope by the service personnel: while one rescuer is going down the slope, the second is waiting for his return at the upper station of the cable car. Such a patrol scheme assumes a quick descent of the rescuer to any point on the slope in response to a call. The rest of the personnel with evacuation equipment stay in the control and rescue point, ready to move on command to the scene. With a large length of the main routes, such a scheme of the functioning of the rescue service makes it possible to minimize the time to detect the victim and to arrive to him.

However, such a scheme is not the only effective one. For example, with a short slope length and its good visualization, the control and rescue point can be located at the lowest point, near the base of the snowmobile equipment. This will allow rescuers to arrive quickly to any point on the slope.

4.3. *The rescue service employees have documents on training in the subject / topic / discipline "First aid" in the amount of at least 16 academic hours; regularity of their repeated training.*

Regular training in providing first aid to injured people on the slope allows to maintain the necessary skills, to develop muscle memory, which is important in stressful situations, and to develop soft skills — communication skills, self-organization, etc. A global trend in the development of first aid skills is to conduct repeated trainings every six months using simulation training equipment.

4.4. *Estimated time of arrival of the rescue service personnel to the victim.*

As the best indicator for this criterion, we took an interval of up to 10 minutes. Considering the fact that injuries prevail in the statistics of incidents on the slope, rescuers must be prepared to respond quickly to an incident and to provide assistance in case of profuse external bleeding, of shock trauma and of manifestations of shock in the victim. The time of arrival of rescuers depends on the area of the patrolled territory of the ski resort and on the adequate number of employees of the control and rescue service available. The standards set out in GOST R 55881-2016 — 3 rescuers per 10 hectares of surface<sup>10</sup> — often need adjustments.

4.5. *Scheme and planned time of delivery of the victim to the medical center or evacuation site.*

In the chain of relief and life-saving of the victim, the time of transporting the victim from the slope is summed up with other time intervals. Based on the severity of the victim's con-

<sup>10</sup> GOST R 55881-2016 "Tourist services. General requirements for the activities of ski resorts", Appendix E, clause 9.3

<sup>11</sup> On approval of the Procedure for the provision of ambulance, including specialized ambulance, medical care: order of the Ministry of Health of Russia dated June 20, 2013 No. 388n, Appendix 2, clause 6

dition, the time of his/her delivery to a medical institution should be shortened as much as possible. The value of the time interval largely characterizes the efficiency of the security system and the provision of assistance at a particular ski resort.

### **The fifth group — medical assistance and medical evacuation**

#### *5.1. Estimated time of arrival of the ambulance team.*

According to the Procedure for the provision of ambulance, including specialized ambulance, medical care, the time of arrival of the ambulance brigade to the victim should not exceed 20 minutes<sup>11</sup>. However, given the remoteness of ski resorts from the borders of the municipality, difficulties in approaching the territory of the ski resort, workload of the NSR stations with current calls and a number of other reasons, the time of arrival of the NSR brigade to the territory of the ski resort when called from the city can significantly increase. The optimal, but expensive solution to this problem may be the organization of a medical center on the territory of the facility or the involvement of ambulance teams under the contract.

The presence of medical workers on the territory of the ski resort to provide assistance to the injured is one of the main wishes of the employees of the ASF and other operational services involved in providing assistance to the injured on the ski slopes.

#### *5.2. Estimated time of evacuation to a medical organization corresponding to a level III trauma center.*

Focusing on the severity of the victim's condition, we conventionally adopted the concept of the "golden hour" as a starting point for calculating the optimal time intervals in the rescue chain, realizing that the time from the moment of injury or of development of an emergency to the start of surgery should be as short as possible. The interval of 10 minutes established by us as the optimal for this criterion can be implemented in practice in the case of the proximity of a medical hospital to the territory of the ski resort or when using an ambulance helicopter for medical evacuation of the victim.

#### *5.3. Provision of medical care on the territory of the ski resort.*

The availability of emergency medical care for an injured person on a ski slope is an ambiguous criterion. On one hand, the data of the survey of employees and visitors of the ski resort indicate the need for the presence of medical workers at the foot of the slope as one of the most important indicators of the safety of skiers. On the other hand, the organization of such medical support, as a rule, requires considerable financial expenses from the administration of the ski resort to obtain a license to provide medical care or to conclude an agreement with a third-party medical organization for the duty of a medical team on the territory of the ski resort during the operation of the facility. Other options are also possible. So, on the territory of the Russian Federation there are many ski resorts, the administration of which includes personnel with medical education in the rescue service of the facility. However, with this option, the provision of medical care without an appropriate license becomes unauthorized.

#### *Evaluation of criteria in points*

After the formulation and selection of criteria, each of them can be evaluated in points — 0, 1, 2. In case of non-compliance or minimum fulfillment of the requirements of the criterion, the examined ski resort is given 0 points; in case of incomplete fulfillment of the requirements, it is assigned 1 point; with full fulfillment of the requirements of the criterion — 2 points. The maximum possible amount for all sections is 40 points (see Table).

The sum of the indicators of the evaluated criteria gives us a new complex indicator — the index of medical safety of the ski resort. In our opinion, this index most fully reflects the expected effectiveness of rendering assistance to a visitor of the ski resort when he/she gets an injury or develops an emergency.

At the second stage of the study, we conducted a survey according to the selected criteria with an assessment of the results in points and with the assignment of the ski resort to one of the conditional levels of medical safety:

Insufficient level — less than 7 points — in our opinion, in such cases, visitors cannot be admitted to the ski resort.

The minimum sufficient level is 7-15 points.

Moderate level — 16-32 points.

The maximum level is 33-40 points.

The calculation of points was carried out on the basis of:

- publicly available data contained in publications about the ski resort;
- results of the questionnaire survey of employees and management of the ski resort;
- own observations.

For the survey, we selected ski resorts that comply with the mandatory norms of the current legislation. For example, the operation, the system of quick evacuation of passengers from any point of the cable cars, as well as all stages of the life cycle of the cable cars at the facility had to comply with the Safety Rules for passenger cable cars and funiculars<sup>12</sup>.

We also introduced special conditions according to the criteria:

1.2. Availability of engineering protection of routes and supports of chairlifts from avalanches in potentially dangerous places.

2.4. Deadline for bringing the access road into working condition after snowfall in winter.

3.3. Regular monitoring and research of the snow cover for the presence of the danger of avalanches and taking measures for their artificial descent in especially dangerous areas; use of the international scale for marking the avalanche danger of slopes with the provision of relevant information to visitors.

According to the specified criteria, the ski resort score should have been at least 1 point for each criterion. If at least one of the criteria is assessed at 0 points, the operation of the ski resort, in our opinion, should be prohibited. Such conditions were introduced due to their importance for ensuring the safety of the cable car users, to combat the avalanche threat as the most probable natural emergency factor at the ski resort and to ensure unhindered medical evacuation of the victim from the territory of the ski resort.

In accordance with the developed criteria, an assessment of 21 ski resorts in Russia and neighboring countries was given. As a result, the following 4 objects (19.0%) were classified with the maximum level of medical safety:

- Rosa Khutor ski resort (33 points), which confirms the opinion of most experts and skiers about it as the leading ski resort in Russia;

- sports complex "Kant", located within the city of Moscow (33 points);

- Alpine skiing center "Abzakovo" (34 points) — a large all-season sports complex in the Republic of Bashkortostan;

<sup>12</sup> On approval of federal norms and rules in the field of industrial safety. Safety rules for passenger cable cars and funiculars: order of the Federal Service for Environmental, Technological and Nuclear Supervision dated 06.02.2014 No. 42

**Оценка горнолыжных комплексов по критериям безопасности**  
Evaluation of ski resorts according to safety criteria

Группа / Group	Критерий / Criterion	Оценка, баллы / Assessment, points		
		0	1	2
1. Проектирование объекта Designing an object	Наличие трасс черного и красного уровня сложности в соответствии с классификацией Приложения Г ГОСТ Р 55881-2016 Presence of black and red level trails in accordance with the classification listed in Appendix G GOST R 55881-2016	Да, черные трассы – диапазон уклонов – >22° / > 40% Yes, black slopes – slope range – > 22° / > 40%	Да, красные трассы – диапазон уклонов трассы от 16 до 22° – от 25% до 40% Yes, red slopes – slope range 16 to 22° – 25% to 40%	Нет / No
	Инженерная защита трасс и опор канатных дорог от лавин в потенциально опасных местах Engineering protection of routes and ropeway supports from avalanches in potentially dangerous places	Нет / No	Да, по мнению проектировщиков Yes, according to designers	Предусмотрено при проектировании и обеспечено при строительстве Foreseen during design stage and provided during construction stage
	Характер дорожного покрытия и ширина полотна дороги на всем маршруте до ближайшей ЛМО, соответствующей травмоцентру III уровня Nature of road surface and road bed width along the entire route to the nearest medical organisation corresponding to the level III trauma center	Однополосная грунтовая Single-lane unpaved	Двухполосная грунтовая или однополосная с твердым покрытием Two-lane unpaved or single-lane paved	Двухполосная и шире с твердым покрытием Two-lane and wider paved
	Наличие на объекте вертолетной площадки или площадки, пригодной для приема вертолетов Availability of a helipad or of a platform suitable for receiving helicopters at the facility	Нет / No	Да – в дневное время Yes – in daytime	Да – пригодна к работе и в ночное время Yes – suitable for work at night
2. Администрирование ГК Administration of ski resort	Наличие на объекте комплексного плана ликвидации аварийных и чрезвычайных ситуаций Availability of a comprehensive emergency response plan at the facility	Нет / No	Да / Yes	Да – проведение тренировок с персоналом не реже одного раза в полгода Yes – training with personnel at least once every six months
	Возможность вызова спасательной службы посетителями ГК, покрытие площади трасс устойчивым радиосигналом для аварийной службы Possibility of calling the rescue service by the visitors of the ski resort, covering of the track area with a stable radio signal for the emergency service	Нет / No	Не по всей площади трасс Not over the entire trail area	Обеспечивается по всей площади трасс Provided over the entire trail area
	Наличие на объекте сотрудников, ответственных за функционирование, обслуживание и действия при аварийных ситуациях на ККД Availability of employees responsible for the operation, maintenance and actions in emergency situations at the chairlift	Да, но сотрудники не имеют специальной подготовки Yes, but employees have no special training	Да – специалисты проходят регулярную аттестацию в области промышленной безопасности Yes – specialists are regularly certified in the field of industrial safety	Да – специалисты проходят регулярную аттестацию в области промышленной безопасности, что подтверждается сертификатом официального производителя о прохождении обучения Yes – specialists undergo regular certification in the field of industrial safety, which is confirmed by a certificate of the official training centre
	Срок приведения подъездной дороги в рабочее состояние после снегопада в зимнее время, ч Time for bringing the access road into working condition after snowfall in winter	12 и более 12 hours and more	Менее 12 Less than 12 hours	Оперативное реагирование на текущее состояние подъездных путей Prompt response to the current state of access roads
3. Обслуживание трасс / Tracks maintenance	Качество снежного покрытия на горнолыжных трассах в соответствии с Приложением В ГОСТ Р 55881-2016 Quality of the snow cover on the ski slopes in accordance with Appendix B of GOST R 55881-2016	1-й вариант – ледяной склон, доля обработанных участков трассы – до 30% Option 1 – ice slope, share of processed route sections – up to 30%	Снег естественный или искусственный, подготовленный с помощью снегоуплотнительных машин (СУМ) на плотном грунте Snow, natural or artificial, prepared with snow compacting machines on dense ground	Снег плотный – естественный или искусственный – подготовленный с помощью СУМ, на плотном грунте без выбоин, бугров, ям и жестких комьев. Обнаженных участков – нет. Доля льдистых участков трассы – менее 10%

Группа / Group	Критерий / Criterion	Оценка, баллы / Assessment, points		
		0	1	2
		2-й вариант – снег на всем склоне не обработан снегоуплотнительной машиной, с большим количеством выбоин, бугров и ям. Доля обнаженных и ледяных участков – до 30% Option 2 – snow on the entire slope has not been processed by a snow compacting machine, with a large number of potholes, bumps and holes. Share of bare and icy areas – up to 30%	Наличие небольшого количества выбоин, бугров и ям. Доля ледяных участков трассы – до 30%. Обнаженные участки или мокрый снег – менее 10% трассы Presence of a small number of potholes, bumps and holes. Share of icy sections on the route is up to 30%. Bare sections or wet snow – less than 10% of the trail	Snow – natural or artificial – is dense, prepared with snow compacting machines, on dense ground, without potholes, bumps, pits and hard lumps. There are no exposed areas. Share of icy sections of the route is less than 10%
	Разметка горнолыжных трасс и направлений движения в соответствии с Приложением Д ГОСТ Р 55881-2016. Обеспеченность трасс средствами безопасности, маркировка и размещение информации на горнолыжных трассах и склонах в соответствии с Приложением Е ГОСТ Р 55881-2016 Marking of ski slopes and directions of movement in accordance with Appendix D GOST R 55881-2016. Security of the slopes with safety equipment, marking and placement of information on ski slopes in accordance with Appendix E of GOST R 55881-2016	Нет / No	Частично соответствует Partially compliant	Соответствует Compliant
	Регулярное наблюдение и исследование снежного покрова на предмет наличия опасности схода лавин и принятие мер для искусственного схода лавин на особо опасных участках. Использование международной шкалы маркировки лавинной опасности склонов с предоставлением информации посетителям Regular monitoring and examination of the snow cover looking for the presence of danger of avalanches and taking measures for making artificial avalanches in especially dangerous areas Use of the international scale for marking the avalanche hazard of slopes with the provision of information to visitors	Нет / No	Да / Yes	Да – наличие на объекте постоянной снеголавинной службы. Или отсутствие опасности схода лавин ввиду рельефа местности Yes – there is a permanent avalanche service at the facility. Or absence of danger of avalanches due to the terrain specifics
	Закрытие трасс в соответствии со временем работы обслуживающих трассы канатных дорог, а также ввиду погодных условий и существующей опасности схода лавин Closing slopes in accordance with operating hours of cable cars serving the trails, as well as due to weather conditions and existing danger of avalanches	Нет / No	Да, формальное с объявлением по громкой связи или на стендах Yes, formal, with an announcement over speakerphone or at stands	Да, с проверкой трасс после их закрытия силами сотрудников объекта Yes, with an inspection of tracks after they have been closed by facility staff
4. Спасательная служба / Rescue service	Присутствие на объекте специализированной контрольно-спасательной службы (лыжный патруль) с необходимым оборудованием в случае, когда трасса открыта Presence of a specialized control and rescue service (ski patrol) with all the necessary equipment, when track is open	Оказание помощи – не организовано First aid provision – not organized	Обслуживающий персонал объекта обучен приемам и обладает навыками оказания первой помощи Facility maintenance personnel are trained in techniques and first aid skills	В штате объекта собственная спасательная служба с необходимым снаряжением Facility has its own rescue service with all the necessary equipment
	Установлен режим функционирования спасательной службы объекта Operating mode of the object's rescue service has been established	Нет / No	Отправка лыжного патруля при поступлении сигнала о происшествии на трассе Ski patrol dispatch upon receipt of a signal about an incident on the track	Бесперебойное патрулирование трасс сотрудниками Trouble-proof patrolling of the tracks by employees
	Наличие у сотрудников спасательного формирования документов об обучении по предмету / теме / дисциплине «Оказание первой помощи» в объеме не менее 16 академических часов; регулярность повторного обучения Rescue team personnel have documents certifying their training in "First aid" discipline within at least 16 academic hours; regularity of retraining	Нет / No	Да. Повторное обучение реже одного раза за сезон. Re-training less than once a season.	Да. Повторное обучение не реже одного раза за сезон Re-training at least once a season

Группа / Group	Критерий / Criterion	Оценка, баллы / Assessment, points		
		0	1	2
	Расчетное время прибытия сотрудников спасательной службы к пострадавшему Estimated time of arrival of rescue service personnel to a victim	Нет службы или >30 мин No service or more than 30 min	11–30 мин 11–30 min	В пределах 10 мин Within 10 min
	Схема и планируемое время доставки пострадавшего до медицинского пункта или эвакуационной площадки Scheme and planned time of delivery of the victim to medical center or evacuation site	В порядке само- и взаимопомощи или более 30 мин Self-help and mutual help or more than 30 minutes	Силами спасательной службы в пределах 20 – 30 мин By rescue service within 20-30 minutes	Силами спасательной службы в пределах 20 мин By rescue service within 20 minutes
5. Медицинская помощь и медицинская эвакуация / Medical assistance and medical evacuation	Расчетное время прибытия бригады СМП Estimated time of arrival of ambulance team	Прибытие бригады СМП в срок свыше 20 мин после обращения или эвакуация попутным транспортом Arrival of ambulance team within 20 minutes after a call or evacuation by passing transport	Прибытие бригады СМП в течение 20 мин после обращения Arrival of ambulance team within 20 minutes after a call	Дежурство бригады СМП с транспортом в период нахождения на территории посетителей или прибытие бригады СМП в течение 5 мин после обращения Duty of an ambulance team with transport on the ski complex territory while visitors are there or arrival of ambulance team within 5 minutes after a call
	Расчетное время медицинской эвакуации до ЛМО, соответствующей травмоцентру III уровня Estimated duration of medical evacuation to medical organisation corresponding to the level III trauma center	Более 20 мин More than 20 min	В течение 11–20 мин Within 11-20 min	10 мин и менее 10 min or less
	Обеспеченность медицинской помощью на территории ГК Provision of medical care on the territory of ski resort	Нет / No	Присутствие на территории объекта медицинского работника при отсутствии у ГК лицензии на оказание медпомощи Presence of a medical worker on the territory of the facility if the ski resort does not have a license to provide medical care	Лицензированный медпункт в структуре объекта или дежурство бригады СМП/медработника в медпункте по договору во время работы подъемников Licensed first-aid post in the facility structure or contractual duty of ambulance team / paramedic in first-aid post during operation of ski elevators

- Sorochany ski resort (35 points) — the largest ski resort in the Moscow region.

Sixteen ski resorts (76.2%) were classified with a moderate level of medical safety. This category includes such popular ski resorts as the all-season resort Okhta Park in the Leningrad Region, the Sheregesh tourist center in the Kemerovo Region, the Bolshoi Vudayvr ski resort in the Murmansk Region, the Kholdomi mountain resort in the Khabarovsk Territory, the all-season tourist recreational complex "Arkhyz" in the Karachay-Cherkess Republic, the all-season "resort town" "Krasnaya Polyana" (formerly "Gorki Gorod" of the Krasnodar Territory), the ski resort "Mountain Air" in the Sakhalin Region, etc.

The tourist complex "Azish-Tau" (11 points) in the Republic of Adygea fell into the category of the minimum acceptable level of medical safety.

The data we have obtained coincide with the results of many unofficial surveys conducted on Internet forums, and with the conclusions of the experts of the ski industry on the quality and safety of services provided at the ski resorts of Russia [8–10].

It should be emphasized that the analysis of the conditions for the functioning of the ski resorts according to the selected criteria and an attempt to distribute them into conditional levels does not mean their division into good and bad. The proposed methodology makes it possible to identify risk factors and possibilities of providing assistance to victims at ski resorts. The presented classification of ski resorts can help the administration of individual ski resorts to form and to concretise development plans, as well as to create healthy competition to attract clients.

### Conclusion

1. The proposed method for assessing the level of medical safety of ski resorts has demonstrated its viability. The results of its application coincide with expert assessments and can be used for inspection and certification of ski resorts.

2. The level of medical safety assigned to ski resorts should be included in their mandatory characteristics, and all consumers of services should be able to familiarize themselves with them.

3. Improving the level of medical safety will be a significant incentive for the further work of the administration of the ski resorts to improve the quality of service for ski tourists.



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