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Occupational Aspects of Alpine Helicopter Rescue Operations

Intended for Physicians, Occupational Health and Safety Advisors, Rescue Personnel and Interested Non-medical Persons

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1 Preamble

This recommendation was first part of recommendation No.15 “Work in Hypoxic Conditions”. In the course of time this one has been updated several times and includes also several aspects of isobaric hypoxia. Finally the appendix and the recommendation addressed two different topics and target groups. Therefore UIAA MedCom has decided to erase the appendix at No.15 and to include its content in an independent recommendation to address those who are active in helicopter rescue at altitude or who are responsible for the health of the crews. The content of the procedure and the criteria to decide in a certain situation has not been changed.

2 Introduction

Crews of helicopter rescue services who operate at high altitude have to cope with a multitude of stressors and risk factors like extreme noise levels, cold, high workload, environmental factors (rock or icefall, slippery or ice capped terrain...), and others. Additionally they must be able to communicate closely and to notice several types of warning signs to perform the operation safely. This multitude of factors is not taken into account by standard procedures of aviation medicine for medical check-up of the crew members as it does not differentiate between pilots and those team members who do the winch operation and / or work in the field. Therefore UIAA MedCom has decided to offer a procedure which takes the factors mentioned above into account and which also gives advices how to decide if there should be individual health risks of crew members. The procedure and the criteria for decision making may also be used when crew members should be reintegrated after disease. It should be mentioned, that this procedure is not obligatory by law, although it includes the checks

and criteria for helicopter pilots. Helicopter pilots must be checked according to the respective international regulations. The procedure presented here is mainly based on [1], [2], [3], [4], [5], [6], [7].

3 First check (before start of work)

3.1 Patient's history

- General history
- Specific history (aviation medicine and altitude medicine)
 - Problems during or after flight (which ones?, when?, reproducible?, at which altitude?, how long after arrival at altitude?, other symptoms?)
 - Problems linked to an altitude sojourn, especially shortness of breath at altitude, dyspnoea or reduced fitness (when?, reproducible?, at which altitude?, when after arrival at altitude?, other symptoms?); AMS, HAPE or HACE in history?
- Vaccinations
 - Previous or actual infections or infectious diseases
- Work history
- Actual symptoms
- Attention should be paid to:
 - Immunological diseases or diseases (or therapies) which significantly impair the immunological system
 - Circulatory disturbance (hypertension, hypotension with dizziness)
 - Coronary heart disease / angina pectoris, history of myocardial infarction, arrhythmia, cardiac insufficiency
 - Cerebral trauma
 - Diabetes mellitus (especially Type I A)
 - Nephropathy
 - Dermatological diseases which facilitate the invasion of pathogenic germs or which cause an increased sensitivity to UV radiation
 - Neurological diseases
 - Psychiatric diseases
 - Use of drugs or luxury food which may have sedative side effects, alcohol or hypnotic drugs
 - Ophthalmological diseases or trauma which impair the visibility
 - Diseases or trauma of the middle or inner ear

- Sensitivity to kinetosis
- Psychic resilience (acrophobia, free of dizziness , fear of flying)

3.2 Medical check with special regard to the kind of work

- Clinical check-up
- Screening test „Noise“
 - Otoskopy
 - Audiometry (air conduction) at 1-6 kHz
- Laboratory investigations
 - Urine screening (dipstick)
 - ESR
 - Blood count (haemoglobine, erythrocythrocytes, leucocytes, haematocrite)
 - GGT, GOT, GPT
 - Creatinine
 - Serum glucose concentration (where appropriate: oral glucose stress test, Hb_{A1c})
 - Anti-HBc or (vaccinated persons) Anti-HBs quantitatively
 - If Anti-HBc positive: check HBs-Ag and Anti-HBs quantitatively
 - If HBs-Ag positive: check HBe-Ag and Anti-HBe
- Eyes
 - Measurement of visus (proximity and distance)
 - Stereoscopic vision
 - Colour vision
 - Field of vision
 - Mesopic vision sensibility to glare
- Thorax X-ray
- Performance
 - Spirometry
 - Ergometry
- Balance
 - Romberg test (1 min.)
 - Fukuda test (1 min.)

Remarks:

- Audiometry is not necessary if the respective data are available from a check which was performed <6 months before. If any pathologies are verified an immediate extended check of the ears is indicated.
- Thorax X-ray is not necessary if an X-ray which was performed <2 years ago is available and when no significant diagnosis is expected.

3.3 Additional investigations which may be performed

- Cranio-Corpography with photooptical recording
- Spiroergometry

3.4 Criteria of aviation medicine and occupational medicine

3.4.1 Permanent unable for work at altitude or in hypoxia

- Persons with one or several of the following neurological, otological, or psychiatric situation::
 - o Impaired consciousness or seizure disorder independent from the cause
 - o Neurological diseases (central or peripheral) with significant functional impairment, especially after cerebral trauma, impairment of the cerebral perfusion, organic diseases of the brain or the spinal cord, and peripheral neuropathies independent from the cause
 - o Disturbance of equilibrium with
 - Lateral oscillations in the Fukuda stepping test >20 cm or lateral deviance in the Romberg test >80° to the right or >70° to the left side, or
 - Longitudinal oscillations in the Romberg test of >12 cm or lateral oscillations >10 cm, if these did not disappear after the observation periods given in 1.4.2
 - o Chronic attacks of dizziness with significant vestibulo-okular or retino-okular disturbance of movement (to be proved in electromyostagmy)
 - o Permanent medication with drugs which may have sedative side effects.
 - o Any kind of drug or stimulant abuse, also if in the person's history
 - o Any psychic disease, also if in the case of a significant amelioration a relapse or decompensation may have a significant influence on occupational safety (especially diseases which may impair stress management or assessment of risk)
 - o An individually increased risk for hearing loss by noise, e.g.:
 - Significant hearing loss in bone conduction of at least one ear and at least 1 test frequency between 1 and 6 kHz
 - Any vestibular dizziness or Morbus Menière

- Any significant diseases of the inner ear in the person's history (e.g. acute hearing loss)
- Hardness of hearing of the inner ear or by Nervus cochlearis, or after cerebral trauma
- Otosklerosis operation in the person's history
- Persons who do not tolerate ear protection, headsets, or helmets with integrated communication systems because of any disease of the ear canal or the auricle (e.g. ekzema which is resistant to therapy)
- Persons who are unable to perform pressurization of the ear or the sinuses because of a chronic disease
- Persons with chronic disease of the external parts of the eyes
- Persons, who apply to one or several of the following aspects of internal medicine or performance:
 - Any disease of the cardio-circulatory system which causes a permanent impairment of performance or the ability for regulation and which in the long run limit the individual performance to a PWC170 of <3,0 W/kg body weight [1] (especially coronary heart disease, cardiac insufficiency, pulmonary hypertension, or severe arterial hypertension)
 - Any disease of the respiratory system which causes a permanent impairment of performance or the ability for regulation and which in the long run limit the individual performance to a PWC170 of <3,0 W/kg body weight [1] (especially chronic-obstructive pulmonary disease (COPD), diseases of the pulmonary tissue which cause restrictive breathing disturbance, any kind of disturbances of gas exchange)
 - Any change of the red blood cells which causes a permanent impairment of performance to a PWC170 of <3,0 W/kg body weight [1] (e.g. chronic anaemia independent from its cause). Any disease of the red blood cells or anomalies of haemoglobine which may decompensate acute in hypoxia (e.g. sickle cell anaemia)
 - Any disease of the skin or the blood vessels which impairs the peripheral perfusion (risk for frostbite!) or persons with frostbite >I° in their history.
 - Significant diseases of the kidney or urinary system (e.g. insufficiency III° or IV° with a glomerular filtration rate of 30 – 59 ml/min [6])
 - Rheumatic diseases with the risk of worsening if exposed to cold climate and all severe stages of rheumatic diseases
 - Any metabolic disease which causes a permanent impairment of performance, alertness, coordination or balance (e.g. diseases of the thyroid gland, parathyroid, adrena glands)
 - Medically treated diabetes, especially if the patient tends to hypoglycaemia
 - Persons with intolerance reactions to cold exposure (e.g. cold agglutinins, cold urticaria, or cold haemoglobinuria)

- Permanent reduction of the muscular strength, the flexibility, or with the loss of any limb if the impairment causes a permanent degree that the realization of the task cannot be expected.
- Untreated sleep disturbances (sleep apnoea) if they cause a significant impairment of alertness or pulmonary hypertension
- Persons with reduced immunological competence like:
 - Chronic diseases or long-ranging infections (e.g. HIV), which cause a significant impairment of the immune defence
 - Therapy with immune suppressive drugs, cytostatic drugs, or ionising radiation
 - Chronic (therapy resistant) eczema of the hands, which impair the protecting effect of the skin against infectious agents
- Persons with chronic skin diseases, which cause an increased sensibility against UV radiation

3.4.2 Temporary concerns

Persons with impairment of health listed in 3.4.1, if a complete or sufficient recovery can be expected, e.g.:

- Persons with a fitness of less than 3.0 W/kg body weight (PWC170) [1]: create training schedule, next medical check after 6-12 months depending on the performance and the compliance of the person
- Persons with anaemia <11,0 g/dl, if a recovery to normal values can be expected
- Temporary reduced immune defence (e.g. during temporary corticoid medication with high dosages or during severe acute infectious diseases)
- Temporary reduced ability for pressurization (e.g. during acute infections of the upper respiratory system)
- Persons with a body-mass-index >28 or a body weight >90 kg (the limit of the helicopter winch includes the weight of the rescuer, of the patient and of the equipment!)
- Acute eczema of the hands or large-scale abrasion, which impair the protective effect of the skin against infectious agents for a while
- Persons who exceed the limits of Romberg test and Fukuda test as given above. Annual re-check to test for possible recovery. After the 4th year any amelioration cannot be expected. The latter situation causes permanent concerns and the person has to quit the job.
- Persons with temporary disease, which make the use of hearing protection, headsets, or helmets with integrated communication devices impossible for a while (e.g. injuries of the external ear, acute disease of the auditory canal or of the auricle)

- Persons who temporarily have to take drugs which may increase sensitivity to UV radiation

3.4.3 No concerns if specific preconditions are realized

- Immune defence: If the disturbance is less significant, a careful consideration should be done, whether a further activity may be accepted (define specific preventive procedures, where appropriate). Reduced period until medical re-check recommended.
- Migraine (specific need for advice, prevention of attacks by drugs, if appropriate)

3.4.4 No concerns at all

Any other persons, as far as there are no restrictions or a ban by laws (e.g. pregnant women, youths)

4 Re-checks

4.1 Periods until re-check

4.1.1 First re-check

Before the end of the 6th month after beginning of the work

4.1.2 Further re-checks

Before a 12-months-period ends

4.1.3 Early re-check

If any disease with a duration of >4 weeks or any disease which may impair significantly the performance of the cardiopulmonary or the peripheral muscular system, also if the employee assumes a correlation between his symptoms or disease and the work.

5 Medical check after the employee has finished the job

On the eve of 6 months after finishing the job a serological check for Hepatitis B/C and HIV is recommended for persons who had direct contact to patients or used medical equipment.

6 References

1. Kupper, T., [*Workload and professional requirements for alpine rescue*], in *Dept. of Aerospace Medicine*. 2006, RWTH Aachen Technical University: Aachen.

2. Kupper, T., et al., *Safety in alpine helicopter rescue operations--minimal requirements of alpine skills for rescue personnel*. Ann Occup Hyg, 2013. **57**(9): p. 1180-8.
3. Kupper, T., et al., *Does modern helicopter construction reduce noise exposure in helicopter rescue operations?* Ann Occup Hyg, 2013. **57**(1): p. 34-42.
4. Kupper, T., et al., *Occupational Aspects of Work in Hypoxic Conditions – the new Recommendation of the Medical Commission of the Union Internationale des Associations d'alpinisme (UIAA MedCom)*. Med Sport, 2010. **14**(1): p. 34-39.
5. Kupper, T., J. Steffgen, and P. Jansing, *Cold exposure during helicopter rescue operations in the Western Alps*. Ann Occup Hyg, 2003. **47**(1): p. 7-16.
6. Kupper, T., J. Steffgen, and P. Jansing, *Noise exposure during alpine helicopter rescue operations*. Ann Occup Hyg, 2004. **48**(5): p. 475-481.
7. Kupper, T., et al., *Workload during cardiopulmonary resuscitation*. Int Arch Occup Environ Health, 2015. **88**(2): p. 175-84.

7 Members of UIAA MedCom

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8 History of this recommendation paper

The version presented here was first presented as appendix 1 of UIAA recommendation No.15 "Work in Hypoxic Conditions". At the annual meeting at Kalymnos in May 2015 the commission decided to present it as an independent recommendation because it focuses another target group than recommendation No.15.