Recommendations regarding medical contraindications for embarkation concerning non-mariner professional personnel

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The mere action of embarking on a vessel incurs risks, regardless of the navigation performed. These risks can be linked to:

- Falling overboard into the sea (directly or due to sinking).
- An occupational accident on-board.
- Endangerment through acute complication of an underlying pathology in consequence of it being impossible to speedily evacuate the sick person to a healthcare facility. This may put the individual's life in danger or at the very least cause a major setback in chances of successful treatment.

As a general rule "a temporary or permanent medical contraindication against embarkation is any physical or psychic state of health, disorder or disability that is likely to:

- Generate through its morbid entity, transformative potential and therapeutic implications an unacceptable risk for the individual who may, through performance of work, find himself or herself out of reach of any appropriate medical assistance.
- Be aggravated by the work in question.
- Result in an unacceptable risk for others on-board (the crew, scientists or technicians).
- Place the individual in a situation where it is impossible to normally perform his or her duties on-board, in particular due to addiction (to drugs and/or alcohol)".*

It is clearly obvious that embarkation for missions that are relatively short lessens the risk in comparison to professional mariners who find themselves on-board a vessel permanently.

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* Extract of the order dated 16th April 1986 modified on 6th July 2000 concerning physical capacity for the profession of mariner.

Nonetheless, this specific professional situation requires special attention, which may lead to detailing of medical contraindications that can be classed into two categories:

1. Health conditions that in principle contraindicate embarkation for missions offshore (>150 nautical miles from a medical facility) generally lasting for more than 15 days.

• Physical disabilities:

A/ Any musculoskeletal system or neurological system disabilities that cause trouble standing, walking, grasping or balancing are contraindications to embarkation (due to risks of falling when climbing or descending ladders or stairs or on a flat deck when the boat rolls or pitches).

B/ Visual and auditory perception of less than:
- 4/10 (taking correction into account) in binocular vision for visual perception.
- Perception of speaking aloud from 3 metres away for auditory perception.

C/ Major obesity if it markedly reduces mobility (from $P/T^2>40$).

D/ Pregnancy is a contraindication in principle: absolute after 3 months, relative before (contraindication in principle for offshore missions and to be discussed for short-term coastal missions, after consultation with a specialist and depending on embarkation conditions: type of vessel, navigation zone and weather conditions).

• **Acute medical conditions:**

Since any acute disorder can either lead to complications or contaminate other people, or raise problems regarding treatment, they are temporary contra-indications to embarkation, in particular:

- Infections and contagious diseases.
- Cancers and blood diseases under treatment.
- Medical conditions that have not definitively stabilised: gastro-duodenal ulcers that have not been confirmed to have healed by verification via a fibroscopy, for example)

• **Heart disease:**

The following are contraindications to embarkation:

- Angina pectoris and symptomatic ischemic heart failure.
- Haemo-dynamically significant valvular heart disease and valvular prostheses undergoing anticoagulation therapy.
- Potential dangerous after effects of a heart attack. The incapacity is obvious if there is residual angina, heart failure, irregular heartbeat or conduction of any nature. It is possible to let an individual who has suffered an infarction without complications re-embark after a wait of 1 year, a

coronary angiography that has returned to normal and satisfactory results on a cardiac stress test. The situation is the same for individuals who have undergone revascularisation surgery or a coronary angioplasty during at least the first 12 months of recovery. Their capacity can then be reassessed if the post-infarction report is good: normal cardiac stress test results, a favourable coronary angiography and no clinical signs.

- Poorly tolerated (ventricular, spasmodic) tachycardia, atrial fibrillations and permanent flutters, people with heart pacemakers (due to the risk of interference with radar equipment).
- Permanent or uncontrolled spasmodic high blood pressure.
- People undergoing anticoagulation therapy.
- A combination of several risks (high blood pressure + major hypercholesterolemia + considerable addiction to cigarettes) or a major metabolic syndrome (hypertriglyceridemia + low HDL + diabetes + high blood pressure + waistline > 102 cm in men and 88 cm in women or at least 3 of these elements) must lead to the prescription of additional examinations, for example a cardiac stress test before the age of 45 years.

• Other chronic medical conditions likely to cause acute and severe complications or for which treatment is problematic:

- Severe sleep apnoea syndrome.
- Acute or chronic respiratory distress, with continued breathlessness or repeated spasmodic occurrences thereof (uncontrolled asthma for example).
- Arterial occlusive disease with stage II claudication and significant varicose on the lower limbs. The detection of arterial occlusive disease must be followed by a cardiac stress test and/or a coronary angiography to check for ischemic heart failure.
- Uncontrolled psychomotor epilepsy in spite of treatment.
- Insulin-dependent diabetes mellitus that is unbalanced or with a recent case history of hypoglycaemic malaise. Capacity to embark may be granted if the diabetes is well balanced with thorough self-surveillance of the glycaemia.
- Cirrhosis of the liver and portal hypertension.
- Digestive disorders: outbreaks of ulcerative colitis, vesicular lithiasis that may cause an acute attack, overt inguinal hernias.
- Periurethral adenoma with effects on the upper system or already complicated by an episode of retention. Caution must be exercised with regard to anti-sea-sickness medicines which are contraindicated in the case of a periurethral adenoma. Lithiasic disease of the urinary system.
- Characterised liver failure.
- Untreated ocular hypertension. Caution must be exercised with regard to anti-sea-sickness medicines which are contraindicated in the case of glaucoma. Stabilised treated glaucoma is not a contraindication if the ophthalmologist’s report prior to embarkation is good.

- **Certain states of mind**

    - Proven psychopathic states of mind, psychoses, personality disorders, severe chronic depression (even when under treatment) as well as individuals with addiction to alcohol and drugs.
    - A psychiatric report is imperative before any embarkation for all individuals treated with tranquilisers and/or anti-depressants.

2. Health conditions which are a contraindication to coastal missions:

Coastal missions can be defined as a mission within a navigational zone located less than 150 nautical miles (1 nautical mile = 1852 metres) from the nearest port equipped with adequate medical facilities or at least 175 nautical miles from a port permanently equipped with aero-medical evacuation means (in accordance with the criteria of Directive 92/29/EEC dated 31st March 1992 on the minimum safety and health requirements for improved medical treatment on board vessels).

The medical contraindications are, at first glance, the same as those mentioned above, with particular regard to health conditions and sensory standards, acute medical conditions and certain chronic conditions that are self-evident. However, certain pathologies could be discussed on a case by case basis depending on the type of embarkation and its length. The length of the embarkation is and important factor in reaching a decision.

3- The occupational physician shall be the sole judge for assessing contraindications for embarkation in accordance with the medical criteria of the moment and the type of navigation in question.
He or she may proceed with any paraclinical examinations deemed necessary.
He or she shall also ensure that the individual possesses satisfactory dental hygiene (consulting a dentist prior to embarkation is recommended) and a level of auditory and visual perception compatible with safety (see standards in chapter I). A second pair of spectacles is essential in the case of visual impairments.
The minimum check-up recommended before boarding is as follows:

- **Systematic blood tests** before initial boarding then every 3 years with NF, blood group, glycaemia on an empty stomach, gamma GT, ASAT, ALAT, creatinine, HDL / LDL cholesterol.
- A **Lung X-ray** from the front before initial embarkation and then, if necessary, every 5 years (2 years if there is a case history of work on-board old boats containing asbestos).
- **A Cardiac stress test at a cardiologist's every 3 years from 45 years onwards.**

4- In a certain number of cases, the doctor must proceed with a veritable risk assessment.

He or she can use the following methodology:

A- Determine the dangerous processes and the possible complications related to the pathology in question.
B- Assess the risk, i.e. attempt to quantify it in terms of seriousness, frequency and the circumstances of its occurrence.

In order to do this, the Evidence Based Medicine recommended methodology should be used.

1- Ask the relevant questions in clear language.
2- Conduct a study that is as comprehensive as possible of recent literature on the subject.
3- Validate the study of recent literature by classing the publications according to level of relevance (from 1 to 5). It must be born in mind that an expert opinion is classed level 1 in terms of relevance, i.e. at the lowest level. However, correctly performed meta-analysis is classed as level 4.

C- Determine the acceptability of the risk and the capacity or not for embarkation.

1- The severity of a possible complication should be assessed in accordance with the risk of emergency casualty evacuation.
- Complication requiring MEDEVAC to a suitable healthcare facility.
- Complication requiring treatment by a doctor.
- Complication that may be handled by nursing personnel or the officer responsible for healthcare on board.

2- The occurrence of the risk will be determined by:
- The results of the EBM study, bearing in mind that a damage occurrence risk rate will be required to be determined (for example, a risk of between 15 and 20% that the complication may occur during the year). If the occurrence frequency rate for a complication is higher than 5% per year, discussions on whether this risk is unacceptable take place.
- The clinical condition of the individual and the results of paraclinical examinations required before embarkation.
- The characteristics of the mission:
    - Offshore or coastal in accordance with the definition given above.
    - A duration of less than or more than 15 days.
    - According to the type of vessel and work conducted on-board.
    - According to the season as well as the geographical and climate zone.
    - Depending on the presence on-board of a doctor or not.

All these carefully weighed up elements will help the doctor to analyse the situation in full knowledge and to determine on embarkation whether the risk is acceptable or not, and thus the capacity to embark or not.

Note on Evidence Based Medicine

I- Definition:

EBM or Evidence Based Medicine is an approach which, inasmuch as it is possible, endeavours to base clinical decisions on the most meaningful data (proof) stemming from medical research.
Proof designates systematic clinical studies and, in particular, randomised control trials and meta-analysis. These can be well-constructed cross-sectional studies or monitoring studies when the issue is the evaluation of a diagnostic test or predicting the development of an illness.
Under no circumstances can such proof replace the judgement and experience of a doctor. Moreover, they supplement it, giving it extra weight.
In practice, the EBM approach is made up o f4 steps:

1- Transforming information needs concerning a given patient into clear and precise questions.
2- Searching as efficiently as possible for the most relevant articles.
3- Critically evaluating the validity and interest of the results and extracting the proof which is the basis for the clinical decisions.
4- Determining the action to be taken for the patient in consideration.

II- Glossary of types of study and publications

Randomised controlled trials = an experimental study in which patients selected for therapy are randomly divided into 2 groups, with the first group receiving the treatment studied and the second group receiving a placebo.

Meta-analysis = a type of publication involving consolidation of data from comparative studies and re-analysis using adequate statistical tools to provide a global answer in critical and quantitative terms.

Cross-sectional studies = a snapshot of a population.

Description of the frequency of an illness, its risk factors or other characteristics within a given population and during a pre-determined period of time.

Cohort studies, follow-up studies = an observational study, mostly forward-looking, in which a group of individuals exposed to risk factors entailed by an illness or specific treatment, are monitored for a determined period and compared to a unexposed control group. The individuals are selected in accordance with the exposure and not its outcome.

Case control studies = a mostly backward-looking observational study in which the characteristics of the patients (the cases) are compared with those of individuals free of the disease (the control set). The individuals are selected in accordance with the outcome.

III- Level of proof

+++++ Randomised control trials
Situation in which the treatment provides obvious improvement ("all or nothing").
Diagnostic tests whose results give an unquestionable diagnostic.

++++ Independent comparisons and blind comparisons with the diagnostic test and standard reference.
Cohort studies

> Studies in which the relationship between treatment and the outcome are studied for a systematic group of patients

+++ Case control studies

++ Low quality cohort studies.
Low quality case control studies.
Series of cases

+ Expert opinion
Research articles

Published medical research may lack either relevance of sufficient methodological thoroughness to be used as a basis for clinical decisions.
Furthermore, there are sources of variability and errors in clinical trials, such as random or systematic errors (bias). It is necessary to ensure that statistical analysis of the results is adapted and that the tests used are appropriate.
For bias, it must be identified and verified whether it has been taken into account during design of the study and analysis of the results.

It is possible to distinguish selection bias due to the make-up of samples and performance bias linked to differences in application of the protocol to the group studied and to the control group, measurement bias, observation errors and confusion bias due to taking variables into consideration that are linked both to the action performed and the disease.

IV- Sites dedicated to EBM:

Bandolier **www.jr2.ox.ac.uk/bandolier/**

CEM **www.cebm.net/toolbox.asp**

EBM toolkit **www.med.ualberta.ca/ebm/ebm.htm**

Medixx **www.medixx.ch/**

Cochrane **www.cochrane.org/cochrane/revabstr/mainindex.htm**
www.update-software.com/cochrane