

PERIODIC HEALTH EVALUATION  
OF YOUNG ATHLETES IN ESTONIA

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**Summary**

***Periodic health evaluation of young athletes in Estonia***

*Aim of the present paper is to give an overview of periodic health evaluation (PHE) and of health conditions and diseases found in PHE of young athletes.*

*The electronic medical record of Tartu University Hospital was searched to retrieve primary diagnoses of medical conditions and diseases as an outcome of PHE performed in Sports Medicine and Rehabilitation Clinic during 01.01 – 31.12.2014. The data of young (9-19 years) athletes (n=3479) were included.*

*The primary diagnoses of health conditions and diseases were established in 24.9% (n=856) of evaluated young athletes as an outcome of PHE. The most frequent were diagnoses of the musculoskeletal system (44%) followed by the cardiovascular system (22%). Injuries were most frequently detected among diagnoses concerning the musculoskeletal system – in 53 % of all musculoskeletal system diagnoses, of which overuse injuries were the most frequent.*

*PHE is a valuable tool in the management of athletes' health, which permits the detection of health conditions that could be predisposing factors for the development of injuries or diseases in the future. The discovery of underlying silent diseases enhances the promotion of athletes' health, timely treatment and risk assessment. The high incidence of overuse injuries among young athletes raises many concerns and prompts further study.*

**Keywords:** *periodic health evaluation, young athletes, health conditions and diseases*

**Резюме**

***Профилактическое обследование состояния здоровья молодых спортсменов в Эстонии***

*Целью данного исследования было дать обзор используемой методики профилактического обследования здоровья (ПОЗ) молодых спортсменов и выявленных при проведении ПОЗ отклонений от состояния здоровья и заболеваний.*

*Первичные диагнозы состояний здоровья и заболеваний, выявленных при проведении ПОЗ в клинике спортивной медицины и восстановительной терапии в период 01.01 – 31.12.2014, были изъятые из электронной истории болезни Клиникума Тартуского Университета. В анализ*

включили данные молодых спортсменов в возрасте 9–19 лет ( $n=3479$ ).

У 24.9% ( $n=856$ ) молодых спортсменов были диагностированы различные отклонения здоровья и заболевания. Самыми частыми были диагнозы, связанные с опорно-двигательным аппаратом (44%). Затем следуют заболевания и отклонения кардиоваскулярной системы (22%). Среди заболеваний опорно-двигательного аппарата больше всего было выявлено диагнозов, связанных с повреждениями – 53% всех диагнозов опорно-двигательной системы. Причём самыми частыми являлись повреждения, вызванные перегрузкой или перенапряжением.

ПОЗ молодых спортсменов является неоценимым средством в определении состояния здоровья в разные периоды тренировочного процесса и помогает выявлять пограничные состояния, являющиеся факторами риска разных повреждений и заболеваний. Регулярное обследование спортсменов позволяет обнаруживать заболевания и повреждения, планировать их своевременное лечение. Выявленная высокая частота повреждений, связанных с перегрузкой или перенапряжением опорно-двигательного аппарата у молодых спортсменов, вызывает озабоченность и требует направления на последующие исследования с целью выяснения их причин.

**Ключевые слова:** профилактическое обследование здоровья, юные спортсмены, отклонения здоровья и заболевания

## Background

Physical activity and sports are important resources in health promotion and in the prevention of various diseases. On the other hand, imposing an inappropriate training load, which is not in accordance with athletes' physical capability or undetected health conditions, may predispose an athlete to serious health risks. Therefore, the preparticipation health screening of athletes is advised before beginning regular physical training and periodic health evaluation (PHE) in competitive athletes [1].

PHE of athletes has long traditions – the first publications on the subject could be dated back to 1950s. At the present time, the PHE is implemented in most countries in Europe as well as in the United States. According to various studies carried out in Europe and the USA [2]:

- 0.3-1.3% of children were not eligible for sports participation due to health problems detected during PHE;
- 3.2-13.9% of children were restricted from sports participation due to diagnosed pathologies;
- the incidence of sudden cardiac death was 2.1 per 100,000 athletes per year.

The terms of conducting PHE vary between countries [3]. In Estonia, in 2009 the guidelines

for PHE of young athletes were developed by the Estonian Sports Medicine Federation, which were accepted by the Estonian Health Insurance Fund (EHIF) and the Estonian Olympic Committee. In addition to PHEs in adult elite and recreational athletes, about 10,000 PHEs of young athletes are annually performed in Estonia. In young athletes (9-19 years), PHE costs are covered by the EHIF. The PHE costs are paid by the athletes themselves or will be covered by the responsible sports associations or sports clubs if the athlete is more than 19 years old. The principal overview of PHE components is given in figure 1.

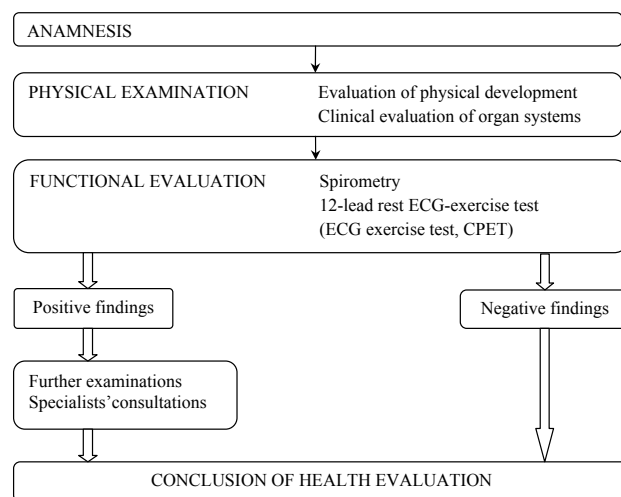


Figure 1. Periodic health evaluation components in Estonia

The PHE starts with collecting the anamnesis. Every athlete (or parent in case of very young athletes) fills in a health questionnaire, which is thereafter used for a targeted interview with the physician. The issues of sports participation (sports played, sports experience and qualification of an athlete, training load), health complaints (especially occurring during physical activity or immediately after that), personal health history (chronic diseases, medication) and family medical history (hereditary diseases in family) are analyzed.

The physical examination consists of the evaluation of physical development and clinical evaluation of organ systems. For the evaluation of physical development, anthropometric data and body composition are measured. These data are assessed according to ubiquitous normal values and age-specific weight and height curves. Based on the evaluation of the aforementioned data, the following aspects of athletes' health could be considered: the physical development of young athletes; occurrence of over- and underweight; in certain sports (aesthetic sports, sports with weight categories, technical sports etc.) an optimal body weight could

be calculated and the possibilities for healthy weight loss or gain evaluated.

The clinical evaluation of organ systems consists of the inspection of appearance (signs of Marfan syndrome), skin and mucous membranes, lymph nodes, musculoskeletal system, respiratory system (lung auscultation) and cardio-vascular system (cardiac auscultation, blood pressure measurement, peripheral pulse).

Functional evaluation: all PHEs in Estonia consist of spirometry and ECG recording at rest. The spirometry is included due to the high incidence of asthma in Estonian children. ECG recording is strongly suggested by the European Federation of Sports Medicine Associations as history and physical exam alone have low sensitivity and specificity in detecting underlying silent congenital cardiac disease [4]. To reduce the false positive ECG findings, it is advisable to apply the *Seattle criteria* for reading the athletes' ECG [5]. The ECG-exercise test is performed in athletes having cardio-pulmonary complaints during exercise, abnormal findings during physical examination or ECG at rest. In addition, an exercise test is performed in athletes with a high training load (over 8 hours per week). In competitive endurance athletes, the cardio-pulmonary exercise test is performed.

In case of positive findings, further examinations (blood tests, X-ray, echocardiography, ECG Holter etc.) or specialists' consultations are carried out.

According to PHE results, the conclusion of health evaluation is formulated, in which the clearance or restriction for sports participation is stated.

The aim of the present paper is to give an overview of health conditions and diseases found in PHE of young athletes in Tartu University Hospital.

## Methods

The electronic medical record of Tartu University Hospital was searched to retrieve primary diagnoses of medical conditions and diseases as an outcome of PHE performed in Sports Medicine and Rehabilitation Clinic during 01.01 – 31.12.2014. The data of young (9-19 years) athletes were included. All athletes were evaluated according to the PHE protocol described above. The International Statistical Classification of Diseases and Related Health Problems (ICD-10) was used for the classification of health problems.

## Results

3479 PHEs (64% boys and 36% girls) were performed during the study period. Primary diagnoses of health conditions and diseases were found in 24.9% of young athletes (n=865). The most frequent were diagnoses of the musculoskeletal system (44%,

n=380) followed by the cardiovascular system (22%, n=186) (figure 2). In the endocrine, nutritional and metabolic systems diagnoses group (9%, n=81), overweight (4.3%, n=37) and vitamin D deficiency (3.7%, n=32) were most often detected. In the respiratory system group (7%, n=56), chronic tonsillitis (2.9%, n=25) and acute upper respiratory tract diseases (2.5%, n=22) were leading pathologies. Primary diagnosis of bronchial asthma was established in 3 young athletes.

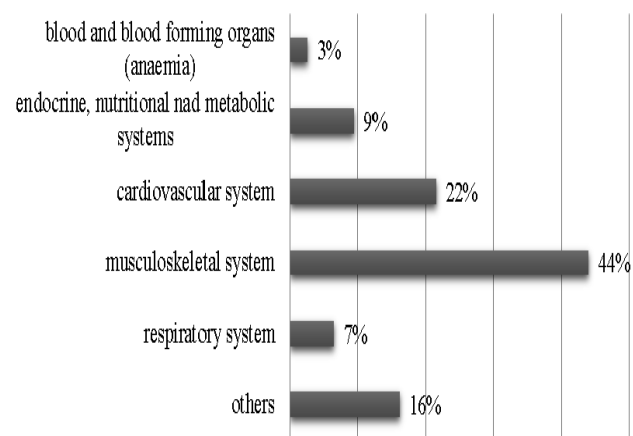


Figure 2. Distribution of diagnoses by organ systems

Among diagnoses concerning the musculoskeletal system (figure 3), most frequently injuries were diagnosed – 53% of all musculoskeletal system diagnoses (soft tissue overuse injuries, back disorders, disorders of patella, osteochondropathies, and acute traumas). Injuries were followed by deformities of foot and deforming dorsopathies – 34% of musculoskeletal system diagnoses.

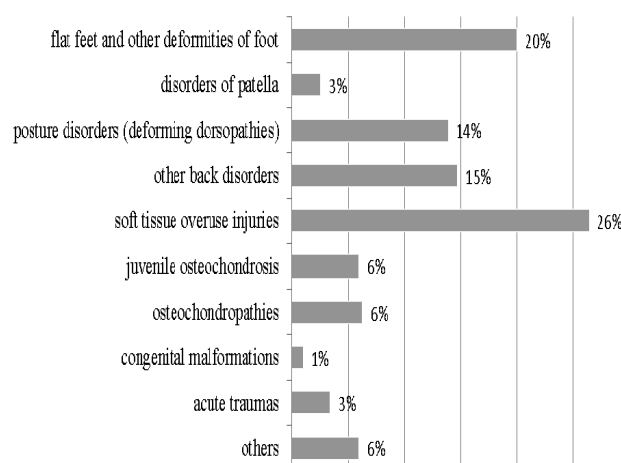


Figure 3. Distribution of musculoskeletal system diagnoses

In the cardiovascular system (figure 4), cardiac arrhythmias (31%) and higher blood pressure readings without hypertension diagnosis (27%) were found most frequently.

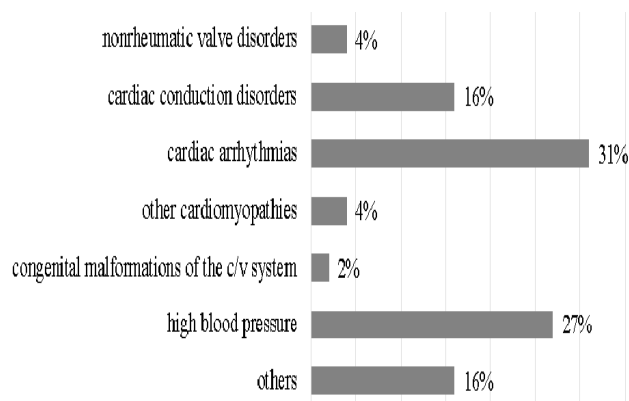


Figure 4. Distribution of cardiovascular system diagnoses

## Discussion

The aim of the present paper was to give an overview of health conditions and diseases found in PHE of young athletes in Tartu University Hospital.

The primary diagnoses were established in nearly ¼ of evaluated young athletes as an outcome of PHE. Although PHE is generally indicated for screening of cardiac, especially hereditary cardiac diseases in young athletes, our data shows quite a high occurrence of general health conditions.

Injuries of the musculoskeletal system were most frequent conditions that required modification/restriction of the training load or temporary withdrawal from training. The high incidence of overuse injuries in young athletes raises many concerns in health professionals and in our opinion requires thorough analysis not only from the medical part of view but also from the viewpoint of training methodology used by coaches working with young athletes. Deformities of foot, occurring quite often in young athletes, may play a possible role as predisposing factors in the development of leg and foot overuse injuries. On the other hand, a too high training load that is not appropriate for the athlete's age and qualification, and premature specialization in sports may lead to injuries.

Cardiomyopathies were diagnosed in the context of overtraining and the restriction from training was required during the treatment period. The congenital malformations of the cardiovascular

system were mild (for example haemodynamically not relevant foramen ovale apertum, coronary artery fistula) and did not interfere with physical activity. During the study period, there was no case on account of which the athlete was denied the clearance for competitive sports participation due to cardiovascular disease.

The anaemia was generally mild and bound to iron deficiency in young athletes. However, there were four cases of profound anaemia that required a temporary break from training for the treatment period. The occurrence of anaemia and vitamin D deficiency could be underestimated in our data since blood tests are not carried out routinely but only in case of health complaints.

## Conclusion

It is important to detect medical conditions, which are common and not severe from a health perspective but may influence sports performance of athletes. Therefore, PHE is a valuable tool in the management of athletes' health that permits detection of health conditions, which could be predisposing factors for development of injuries or diseases in the future. Discovery of underlying silent diseases enhances the promotion of athletes' health, timely treatment and risk assessment. The high incidence of overuse injuries among young athletes raises many concerns and prompts further study.

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