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**Teaching of Integrated Management of Patients with Hypothyroidism During the Cycle of Specialization “General Practice - Family Medicine”**

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**Abstract.** Pathology of the thyroid gland is an actual medical and social problem of our time. It is due to the increasing prevalence of thyroid diseases and the negative impact of thyroid dysfunction on somatic, reproductive and mental health of the population. In addition, hypothyroidism is associated with an increased risk of developing coronary heart disease, myocardial infarction, chronic heart failure and cardiovascular mortality regardless of gender, age, and past cardiovascular diseases.

**The objective** of the research was to improve the quality of training medical interns in the specialty “General Practice - Family Medicine” through the improvement of teaching the topic “The Integrated Management of Patients with Hypothyroidism”.

**Discussion.** Postgraduate education involves training of medical interns specializing in general practice and family medicine to independent work at the primary health care facility. An essential internship component is the assimilation of practical skills.

**Conclusions.** Further improvement of practical training of medical interns in the specialty “General Practice - Family Medicine” when teaching “The Integrated Management of Patients with Hypothyroidism” is a complex process that requires organizational measures, specific algorithms for managing patients, as well as a continuous improvement of academic, medical and diagnostic, educational work and technical support of the classes.

**Keywords:** *hypothyroidism; thyroid disease; treatment; practical skills.*

**Problem statement and analysis of the recent research**

Thyroid diseases in Ukraine, both in adults and children and adolescents, rank second after diabetes mellitus. The problem is of great relevance due to the increasing prevalence of thyroid pathology and the negative impact of thyroid dysfunction on somatic, reproductive, and mental health of the population. Thyroid disease results in serious lesions of the internal organs, performance decrement and incapacitation among young people. Hypothyroidism is associated with an increased risk of developing coronary heart disease, myocardial infarction, chronic heart failure, and cardiovascular mortality regardless of gender, age, and past cardiovascular diseases [3]. Early diagnosis of hypothyroidism is very difficult. It is a family doctor who diagnoses the disease timely. It allows selecting adequate therapy and preventing severe complications. Ukraine is an endemic iodine deficient zone [1]. There is no region in Ukraine where the population would not experience iodine deficiency [5]. Iodine deficiency in pregnant women is especially dangerous increasing the risk of having children with low birth weight, cretinism, miscarriages and stillbirths [5]. Iodine deficiency significantly affects the mental development of older children. Nowadays hypothyroidism is one of the most common endocrine diseases. The prevalence of manifested hypothyroidism, according to various data, is 0.2-2%; the prevalence of subclinical one is up to 3% for men and up to 10% for women, and 13-14% for people over 70 years of age. In Ukraine, at the beginning of 2016, more than 98 thousand people with this disease were officially registered. Hypofunction of the thyroid gland is considered as an additional risk factor for cardiovascular disease being associated with the development of atherogenic dyslipidemias, diastolic arterial hypertension and myocardial remodeling, which are the predictors of arrhythmic complications, sudden cardiac death and heart failure [4]. Autoimmune thyroiditis (AIT) is the most common cause of primary hypothyroidism. The prevalence

of hypothyroidism among these patients is about 20% including individuals with goiter, and those without it. Postoperative hypothyroidism develops in 35-48% of patients after thyroid surgery. Thyroidectomy is accompanied by stable hypothyroidism in 100% of cases.

Pathogenetically, hypothyroidism is heterogeneous. Depending on the degree of disruption of thyroid hormone biosynthesis, the following types of hypothyroidism are distinguished:

1. Primary (thyrogenic) hypothyroidism, which is caused by primary thyroid disease:

a) as a result of the reduction in the amount of functionally active tissue;

b) as a result of various defects in the biosynthesis of thyroid hormones.

2. Secondary (hypophysial) hypothyroidism, which is caused by the decrease in thyroid-stimulating hormone (TSH) production;

3. Tertiary (hypothalamic) hypothyroidism, which is caused by the decrease in thyrotropin-releasing hormone (TRH) production. Today this form is often regarded as the second one - secondary hypothyroidism;

4. Peripheral (tissue) resistance to the effects of thyroid hormones.

Postoperative hypothyroidism develops usually within the year; the types developing in more distant periods are rare.

Postradiation hypothyroidism is observed in 20-30% of patients. Their number increases in parallel with an increase in life expectancy after taking a therapeutic dose of radioactive iodine. One of the causes of hypothyroidism, mostly in adults, is malignant thyroid tumor or metastases from others organs, as well some rare diseases (amyloidosis, syphilis) of the thyroid gland. The other group of etiologic factors in primary hypothyroidism is represented by various defects in the biosynthesis of thyroid hormones. Many medical preparations can inhibit thyroid function causing the development of transient hypothyroidism. First of all, these are drugs used to treat thyrotoxicosis. Lithium carbonate, potassium perchlorate, sulfonamides, thiocyanates, ethionamide, para-aminosalicylic acid, phenylbutazone, cobalt, resorcinol are able to inhibit the production of thyroid hormones. The diagnosis of hypothyroidism is often untimely, since in its early stages, the symptoms are extreme nonspecific. In addition, hypothyroidism syndrome may mimic different non-thyroid disease that is associated with multiple organ involvement which is detected in case of thyroid hormone deficiency.

**The objective** of the research was to improve the quality of training medical interns in the specialty “General Practice - Family Medicine” through the improvement of teaching the topic “The Integrated Management of Patients with Hypothyroidism”.

**Discussion**

Postgraduate education involves training of medical interns specializing in general practice and family medicine to independent work at the primary health care facility. A good specialist should be able to assess a specific situation, especially critical one, to quickly make an accurate diagnosis and to make organizational decisions. In order to provide qualified medical

care at any stage, it is necessary to standardize and work out the only approach to diagnosing and treating thyroid diseases, as well as to the educational program of training family doctor. It is desirable that at the stage of self-training any medical intern got access to up-to-date information, methodological recommendations, electronic sources, and an indicative plan for working with literature. Therefore, an urgent need is the study of modern national and international recommendations on the diagnosis and treatment of thyroid diseases by medical interns.

Traditionally, the practical class consists of the preparatory stage, the main stage and the final stage. The preparatory stage of the practical class takes 20% of the lesson time and involves consideration of organizational issues, determination of the educational goals, and control of the initial level of knowledge, skills and abilities. Individual recitation, test control, solution of routine tasks and case studies are used.

The main stage of the practical class takes about 60% of the lesson time. This time is devoted to mastering practical skills. Independent practical work with the patient contributes to the formation of professional skills and abilities.

An examination of patients with thyroid disease includes an assessment of the patient's behavior, detection of hand tremor and ocular symptoms, and the determination of the degree of gland enlargement. The patient's constitution type, its extreme variants, may indicate the impairment of thyroid gland function. A patient with reduced thyroid function is slow, his reactions are adequate, but slowed down; the language is less emotional and a bit monotonous. Excessive nutrition is usually observed in patients with reduced function of the thyroid gland. Medical intern should identify the enlargement of the thyroid gland – a goiter. The patient should be asked to stand or sit looking forward. The neck muscles should be relaxed, and the neck should be slightly bent. It is necessary to start neck examination 2 cm above the clavicle, trying to see the lower edges of the thyroid gland between the sternocleidomastoid muscles. The isthmus of the thyroid gland is located below the cricoids cartilage. To make the thyroid gland better visualized, it is advisable to ask the patient to tilt his head slightly and to extend his neck to 10 degrees. Similarly, in many cases, minor lateral head movements help identify space-occupying lesions, nodes or asymmetry of the thyroid gland. One can definitely exclude goiter, if the thyroid gland is not visible during its lateral view and when the neck is extended. It is necessary to assess the state of the veins of the neck and note all possible pathological changes. While examination of the thyroid gland, one can determine the location of the gland, its size, shape, symmetry and the state of the surface, the degree of its mobility during swallowing.

While palpating the thyroid gland, it is necessary to assure oneself of the size, shape, localization, symmetry and mobility of the thyroid gland being determined during the examination. The palpation allows determining the structure and consistency of the thyroid gland, focal or diffuse pain, the presence of fluctuations. Thus, cartilaginous density of the gland usually indicates cancer. It is important to determine whether there is a single node in the thyroid, or it is a multinodular goiter. Diffuse, shallow, rounded tuberosity indicates diffuse toxic goiter. Pain the compacted, diffusely enlarged thyroid gland with multiple nodules indicates subacute thyroiditis.

One can palpate the thyroid gland with one or two hands from behind or while facing the patient. The doctor stands behind the patient and puts the tips of his index finger and middle finger of both hands on the middle line of the neck. They should be positioned at a finger-width (2 cm) above the sternal notch and 1.5 cm inward from the medial edge of the sternocleidomastoid muscle. From this position, one should try to detect the isthmus (below the cricoids cartilage and above the sterna notch) and then, to palpate the lobes of the thyroid gland. A slight extension

of the neck (10 degrees) can contribute to the palpation of intrathoracic goiter since it raises its apex tip in a position convenient for research.

Nowadays the most commonly used classification of endemic goiter is the classification proposed by O.V. Nikolaev in 1955:

- 0 degree of enlargement - the thyroid gland is not visible during inspection, it is not determined when palpated;
- I degree - the isthmus being determined when palpated is visible when swallowing, or one of the lobes of the thyroid gland and the isthmus are palpable;
- II degree - both lobes of the thyroid gland are palpable; however, the contours of the neck are not changed;
- III degree - the thyroid gland is enlarged due to both lobes and the isthmus; it is visible as a thickening on the anterior surface of the neck (thick neck);
- IV degree – a goiter is large, often asymmetric, with signs of compression of adjacent tissues and neck organs;
- V degree – a goiter is extremely large.

Percussion of the thyroid gland is the most informative method of examining patients with retrosternal and intrathoracic goiter. With its help, the localization and boundaries of the thyroid gland are determined.

Auscultation is of less importance in diagnosing thyroid diseases. Auscultatory, in patients with hyperthyroidism, a continuous murmur at the level of the upper pole of the gland which increases during systole occurs. When the trachea is compressed by enlarged gland, whistling sound is heard.

Medical interns must correctly assess clinical symptoms and conduct a physical examination, objectively assess the patient's condition and laboratory findings. They study follow-up care and how to develop the examination and treatment plan for a patient. The diagnosis of hypothyroidism is often untimely, since in its initial stages, the symptoms are extreme nonspecific. In addition, hypothyroidism syndrome may mimic different non-thyroid disease that is associated with multiple organ involvement which is detected in case of thyroid hormone deficiency. Clinical picture of hypothyroidism is presented in Table 1. Dysfunction of the thyroid gland must be diagnosed and evaluated in all patients with symptoms of hypothyroidism.

Screening of asymptomatic patients is indicated in the presence of risk factors for hypothyroidism, namely past autoimmune diseases, the irradiation of the head and neck, preliminary therapy with radioactive iodine, the presence of goiter, family history of thyroid disease, treatment with drugs affecting thyroid function.

Today the determination of TSH level is considered as the most sensitive test for the evaluation of thyroid hormone production [6]. TSH level in euthyroid state is between 0.4–4.0 mIU/L. In primary hypothyroidism, the level of TSH increases. Subclinical hypothyroidism is characterized by an increase in TSH level, while the serum level of free thyroxine (T4) is within the normal range [2]. Low TSH level in reduced T4 concentration may indicate a reduction in the function of the pituitary gland or hypothalamus (secondary hypothyroidism).

Such cases are rare. In hyperthyroidism, the synthesis and secretion of TSH in the pituitary gland by the feedback principle are blocked by elevated levels of T4 and T3. The term "subclinical" literally means the absence of any clinical manifestations of the disease. In fact, the presence or absence of symptoms depends on the doctor's attention when examining the patient and the patients' corresponding attitude even to minor changes in their body. Doctors often do not pay attention to complaints such as a slight performance decrement, mood disturbance, sleep disorders. Most patients get used to periorbital edema, attributing it to fatigue, insomnia. Elderly patients consider drowsiness, lethargy, sluggishness, forgetfulness, dry skin and other symptoms as age-related changes in the body.

Table 1. Clinical signs of hypothyroidism

Clinical and laboratory characteristics of hypothyroidism. Symptoms of hypothyroidism	Clinical signs of hypothyroidism	Laboratory indicators of hypothyroidism
-Arthralgia -Cold intolerance -Constipation -Dry skin -Myalgia -Thinning hair/ hair loss -Impairment of hearing -Hoarseness -Weight gain -Attention failure -Fatigue -Memory impairment -Menstrual disorders /infertility	-Bradycardia -Diastolic hypertension -Edema -Goiter -Hypothermia -Cognitive impairment -Delayed relaxation phase of deep tendon reflexes -Macroglossia -Periorbital edema -Pleural and pericardial effusion	-Increase in C-reactive protein -Hyperprolactinemia -Hyponatremia -Increase in creatine kinase levels -Increased low density lipoprotein production -Increased levels of triglycerides -Normocytic anemia -Proteinuria -Reduced voltage of the teeth of the electrocardiogram

The following variant of screening is proposed:

1. TSH levels should be determined in all women older than 35 years of age and men older than 50 years of age.

2. If TSH level is  $\geq 0.40$  mIU/L, it is necessary to determine the level of free T4 and T3 to detect the variant of hyperthyroidism.

3. If TSH level is between 0.40 to 2.00 mIU/L, further determination of TSH level is carried out once every 5 years.

4. If TSH level is between 2.01 to 5.00 mIU/L, anti-thyroid autoantibodies and free T4 levels are determined.

At the same time, there is a need for periodic study of TSH level in people at risk of developing hypothyroidism. Risk factors for hypothyroidism include the presence of anti-thyroid antibodies, non-endocrine and endocrine autoimmune diseases, past irradiation, any past thyroid pathology or its treatment, diabetes mellitus, mood instability, depression, defective memory, hypercholesterolemia, and hyperlipidemia, infertility, menstrual disorders, diminished hearing, chromosomal abnormalities, taking medications affecting thyroid function (lithium, amiodarone, etc.), anemia, myalgia, myopathy. If serum level of TSH is elevated, a test should be done to measure serum level of T4. To adequately interpret the results of the study of thyroid hormones, it is necessary to consider the normative ranges of the corresponding test, which are specific for each laboratory; in addition, there are diurnal variations in TSH secretion, the lowest level is diagnosed in the early morning hours.

Ultrasound allows studying the structure and size of the thyroid gland in details. It is rather informative method; however, it cannot reliably identify the nature of the formations that may occur in various thyroid pathologies. Medical interns specializing in general practice and family medicine have to be able to interpret the results of ultrasound investigation of the thyroid gland. Thus, it is possible to exclude cancer, as well as to distinguish benign tumor from malignant one.

During the analysis of hypothyroidism treatment, the main conclusions and recommendations of the experts of the working group of the American Thyroid Association and the European Thyroid Association concerning replacement therapy for hypothyroid patients were discussed [6]. L-thyroxine is recommended as the drug of choice for treatment of hypothyroidism. The drug has been successfully used for many years; it has a good safety profile, is easy to use and easily absorbed by the intestine having a long elimination half-life. L-thyroxine replacement therapy has three main objectives:

- elimination of symptoms and signs of hypothyroidism;
  - normalization of serum level of TSH with the improvements of thyroid hormones indices
  - prevention of overdose, especially in the elderly.
- Dynamics of symptoms is needed to be monitored

interpreting it with the level of TSH, present comorbidities and other factors. Tissue biomarkers of the effects of thyroid hormones are not recommended for routine clinical use except for research purposes as they are not sufficiently sensitive, specific, available or standardized. Since simultaneous ingestion of food and L-thyroxine affects its absorption, it is recommended to take L-thyroxine 60 minutes before breakfast or bedtime (3 hours or more after dinner) for its optimal absorption. Traditionally, it is recommended to leave at least 4 hours between doses; however, it is not proven. In patients who require higher than expected doses of L-thyroxine, it is necessary to exclude gastrointestinal diseases such as Helicobacter-associated gastritis, atrophic gastritis and celiac disease. If they are detected and effectively treated, a reassessment of the function of the thyroid gland and the adequacy of the dose of L-thyroxine are recommended. It should be noted, that starting or stopping taking estrogen and androgen is accompanied by the reassessment of stable serum TSH levels, as these drugs can alter a need for L-thyroxine. The determination of TSH is advisable when starting therapy with phenobarbital, phenytoin, rifampicin, and sertraline. The initial dose of L-thyroxine is determined considering the patient's weight, pregnancy, the etiology of hypothyroidism, the degree of increase in the level of TSH.

The principles of deontology and medical ethics are of great importance too. During their classes, medical interns discuss the medical history of patients with hypothyroidism, learn to identify major syndromes, formulate clinical and syndromic diagnoses and analyze the mistakes made at the stages of medical care. It is necessary to develop clinical thinking, the ability to work with medical documentation, as well as to conduct a discussion and defend one's point of view. Thus, the main stage of the lesson combines the independent and collective work of medical interns. It is advisable to use modern techniques, such as brainstorming method. This allows every medical intern to express his point of view. The case method will teach medical interns how to make decisions, since they will have to deal with difficult patients and situations throughout their career. The Synanon's method will prepare medical interns for conflict situations and develop the ability to maintain emotional balance.

The final stage of the practical class (20% of the lesson time) consists of controlling and correcting professional and practical skills, summing up the conclusions. It is important to control the level of knowledge among medical interns, as well as to influence the formation of future specialists' mindset and to develop professional and moral qualities of future physicians. At the end of the practical class, all medical interns receive homework.

### Conclusions

Thus, further improvement of practical training of medical

interns in the specialty “General Practice - Family Medicine” when teaching “The Integrated Management of Patients with Hypothyroidism” is a complex process that requires organizational measures, specific algorithms for managing patients, as well as a continuous improvement of academic, medical and diagnostic, educational work and technical support of the classes.

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