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### Medical terminology of patients' medical cases: structural and semantic analysis

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Abstract: The research focuses on the pivotal issue of human-related nominations of medical terminology. The scrutiny is given to the terminology of patients' medical cases and complete management. The work attempts to fill in the research niche of structural, semantic analysis and specifics of interlinguistic equivalents of English and Russian medical terminology of patient cases. The nominations of human body, conditions, triggers and medical manipulations are studied. The research material, followed methods and approaches contribute to the research relevance implemented within human-oriented paradigm. The study aims at clarifying and specifying the semantic and structural features of medical terms elicited from the subcorpora of patient cases presented in the 'House M.D.' TV series, compiled by the authors. The aim is achieved through the study of semantic components, contextual features, lexical valency and derivational features of 168 terms. The corpora-based approach combined with text proces sing tools and techniques used by the authors make the research novel. Moreover, the developed algorithm provides a solid base for further investigations alike. The research was implemented in four stages. The word frequency analysis of the words in the compiled corpora showed the prevalence of medical terms. The number of terminological word combinations equals to one-word terms. Among the former word combinations with prepositions are not frequent. The latter exhibit clear derivational patterns with a marked set of word formation suffixes. The distribution of the terms into semantic groups revealed the prevalence of the semes 'diagnosis', 'symptoms' and 'pathology'. The need for transliteration of English-Russian equivalents of medical terms arises due to the Latin origin of the most part of the terms which may be regarded as international medical vocabulary.

Key words: medical terminology; word frequency; topic groups; suffixes; word combinations; translation.

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#### <u>НАУЧНАЯ СТАТЬЯ</u>

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# Медицинская терминология случаев заболевания пациентов: структурный и семантический анализ

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Аннотация: Статья исследует одну из ключевых проблем номинаций, связанных с человеком, — медицинскую терминологию. Особое внимание уделяется терминологии, описывающей медицинские случаи заболеваний и ведение пациентов. В данном исследовании предпринимается попытка заполнить исследовательскую нишу структурного, семантического анализа и специфики межъязыковых соответствий английской и русской медицинской терминологии случаев заболеваний пациентов, номинирующей тело человека, состояния, каузирующие факторы и медицинские манипуляции. Материал и подходы к его исследованию вносят вклад в актуальность работы, выполненной в русле господствующей в науке антропоцентричной парадигмы. Целью исследования являются выяснение и конкретизация особенностей семантики и структуры медицинских терминов,

извлеченных из собранных авторами корпусов историй болезни пациентов, представленных в телесериале «Доктор Хаус». Цель достигается при помощи изучения семантической структуры, контекстуальных особенностей, лексической валентности и словообразовательных особенностей 168 терминов. Новизна исследования обусловлена использованием корпусного подхода в сочетании с инструментами и техниками обработки текста. Более того, разработанный алгоритм обеспечивает прочную основу для дальнейших исследований. Работа проводилась в четыре этапа. Частотный анализ слов в собранных авторами корпусах показал превалирование медицинской терминологии. Терминологические словосочетания и однословные термины представлены в равном количестве. Словосочетания с предлогами не являются частотными. Однословные термины демонстрируют четкие словообразовательные схемы с выраженным набором словообразовательных суффиксов. Распределение терминов по семантическим группам выявило преобладание сем «диагноз», «симптомы» и «патология». Необходимость в транслитерации англо-русских соответствий медицинских терминов возникает в связи с латинским происхождением большинства терминов, что обуславливает их универсальную номинацию во многих языках мира.

**Ключевые слова:** медицинская терминология; частотность слов; тематические группы; суффикс; словосочетания; перевод.

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Информация о конфликте интересов: авторы заявляют об отсутствии конфликта интересов.

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#### Introduction

There has been a marked interest towards the study of medical terminology recently [Andreeva, Amatych 2024; Shaekhova, Andreeva 2024; Suyunov 2024; Gorbunova, Makarova, Kazakova 2023; Akhmedov 2020; Bilyalova, Bazarova 2017; Fiordo 2012]. This research work studies medical terms (hereinafter MTs) elicited from the patient medical cases presented in the 'House M.D.' TV series.

Traditionally, terminological units are classified according to the nature of their availability in dictionaries [Andreeva, Amatych 2024; Solnyshkina, Kalinkina, Ziganshina 2015]. Terminological units found in paper and electronic dictionaries are defined as codified and thus are viewed as a core of professional terminology. The terms are coined and generated by speakers of any professional or social group and may lack dictionary definitions. These terms are classified as uncodified peripheral ones [Solnyshkina, Kalinkina, Ziganshina 2015]. The MTs researched in given study are codified units used by both medical and nonmedical professionals globally.

As one of the major anthropocentric disciplines medicine is of primary importance for every person. The language units used by medical professionals more often than not require thorough understanding. Current work sheds the light on the semantic, lexical structural? and translation features of the MTs viewed as a research niche. It explains the **relevance** of the research. The research **novelty** lies in the combination of methods used to study MTs, in particular, semantic, lexicographic, distributional, contextual and translation analysis and offline text processing tools. To the best of our knowledge such an algorithm has not been implemented yet.

The research **aims** at determining lexical, semantic and contextual features of MTs used in patient medical cases management.

The stated aim predetermines the research **tasks**:

1) to compile a subcorpus of medical terminology elicited from 'House M.D.' TV series of Episodes 1 – 5 of Season 1 (hereinafter Subcorpus 1); 2) to compile a subcorpus of short plots of five episodes of 'House, M.D.' Season 1 (hereinafter Subcorpus 2); 3) to perform a part-of-speech classification of one-word MTs and determine structural types of word combinations; 4) to group one-word MTs based on the common suffixes; 5) to perform semantic analysis, categorizing the MTs into topic groups; 6) to categorize the MTs into groups according to their English-Russian equivalents.

The analysis of medical records of the patients who deal with thoracic issues revealed the prevalence of anatomical terminology pertaining to various human body parts [Andreeva, Amatych 2024]. Authors also resort to the historical analysis to reveal the etymology of medical terminology elicited from the academic sources and determine the differences of the terms meaning through the years [Suyunov 2024]. Akhmedov (2020) highlight the significance of all parts of speech to be involved in the analysis medical terminology and develop the multidisciplinary approach to allot semantic and lexical issues in clinical practice [Akhmedov 2020]. The study of lexical and semantic features of medical terms of human diseases exhibit no violations of meaning distinctness of the terms and synonyms, antonyms, polysemy and homonymy processes among medical terms are different from those of general vocabulary [Bilyalova, Bazarova, Gilyazeva, 2017].

The research was implemented in four stages aimed at elucidating the following research questions (RQ):

RQ1: What are the most frequent MTs and their collocations revealed in the patients' cases?

RQ2: Are MTs, predominantly, one-word units or word combinations?

RQ3: What topic groups do the MTs constitute? RQ4: What is the translation specifics English MTs and their Russian equivalents?

#### Material and methods

The research implied the analysis of 168 MTs elicited from the TV series 'House M.D.' (HMD) Season 1, Episodes 1 – 5. The research is based on two subcorpora. The complete utterances containing MTs were registered in the authors' Subcorpus 1 and coded. The code contains numbers and letters, for example, code E1.A10 marks Episode 1, Anatomy, example sentence 10.

Besides, the authors compiled Subcorpus 2 of short plot descriptions, comprising 1304 tokens, extracted from open online resources (WHMD). The first stage of the research implied the use of offline text analyzer AntConc (AntConc). The tool processes any input text in txt file and generates N-Grams, KWIC search results, concordances, and word clouds (AntConc).

The research rested on the following methods: continuous sampling, description, comparison and contrasting, lexicographic analysis, contextual analysis.

The second stage of the research rested on the description and classification of word combinations as structural entities. According to V.D. Arakin (2005), the main component of the structure is termed kernel (or core (hereinafter K)), whereas the peripheral one is an adjunct (hereinafter A) [Arakin 2005]. The kernel and adjunct may be manifested by words of various parts of speech, namely, verbs (v), nouns (n), adjectives (a), adverbs (d) and prepositions (prep).

To perform research stage three we need to take a closer look at the structure of the word meaning. Obviously, it is a multi-layer phenomenon that comprises deep and superficial structures, called semes or 'minimal components of meaning' [Naciscione 2010]. Deep structures are termed as a core and superficial ones are viewed as a periphery [Sternin, Salomatina 2011]. Core seme of the word **doctor** is 'a person', peripheral ones may include 'medicine', 'male', 'female', 'treat', 'health' and 'issues'. To obtain the semes we need to resort to the dictionaries' definitions and context. The latter is of primary importance as it is an ample source of semantic and lexical valency of a word [Kupriyanov, Solnyshkina, Dascalu, Soldatkina 2022; Kazakova, Gorbunova, 2024; Karachina 2023].

#### **Results and Discussion**

At Stage I the cases of the patients in each of the five series were briefly described. The description was obtained from a short plot presentation provided by online sources (WHMD). Thus we compiled a study Subcorpus 2 of 1304 tokens that was further processed with the AntConc offline tool (AntConc) (see Fig. 1).

The most frequent words apart from the articles, prepositions and pronouns were **patient** (9)<sup>1</sup>, **diagnosis** (7), **blood** (7), **prescribe** (7), **symptoms** (5), **clinic** (4), **hospital** (4), **evidence** (4), **infection** (3). Clearly, the vast majority of the most frequent content words were medicine-related ones, as their semantic structure met the inclusion criteria (see Stage III further).

The AntConc tool also provides KWIC word collocations outline (see Fig. 2).

<sup>&</sup>lt;sup>1</sup> Hereinafter the numbers in brackets indicate the frequency of the MT in given contexts.

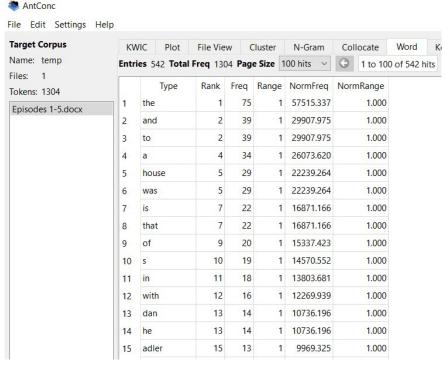


Figure 1 – The AntConc frequency list of 'the House M.D.' short plot Рисунок 1 – Частотный список слов, выявленный инструментом AntConc, для корпуса краткого описания случаев болезни пациентов сериала «Доктор Хаус»

Left Context	Hit	Right Context
ormal. It was surmised that the tea the	patient	had been taking before the epinephrine was
e from the ileum. It turned out that the	patient	had been using drugs containing colchicine.
causing the immunosuppression. The	patient	had anaphylactic shock in the sterile box. A
nd levothyroxine were prescribed. The	patient	had kidney failure, acute interstitial nephriti:
on to kill the tapeworms. When a clinic	patient	claims to have an appointment with the dia
ears that one of the symptoms is . The	patient,	Dan, is a 16-year-old player who has been
a . In the hospital's clinic, House's first	patient	is a man who is orange because of an
sh was passing. Low leucocyte count -	patient	was transferred to a sterile box. Doctors too
ing normally. The treatment made the	patient	worse - blood pressure dropped, fluid accur

Figure 2 – KWIC search and concordance lines for the word 'patient' in the AntConc tool Рисунок 2 – Поиск KWIC и линии соответствия со словом 'patient' («пациент») в инструменте AntConc

Figure 2 clearly marks the collocations with the word **patient** registered in the Subcorpus 2 of the study. Namely, the MT **patient** is followed by the verbs **take**, **use**, **have**, **claim**, **be**, **prescribe**.

The analysis showed that the most frequent words (apart from articles, pronouns and prepositions) in the compiled corpus are medicine-related ones. The use of both Active and Passive Voice grammatical forms when describing the **patients** means coordinated and mutual doctor-patient work aimed at determining and managing the conditions.

Furthermore 168 MTs were elicited from the first five episodes of 'House M.D.' Season 1.

Stage II implied the structural classification of the elicited MTs. Interestingly, MTs almost equally fall into one-word units (87)<sup>2</sup> and word combinations (81). The part-of-speech distribution of the former revealed the prevalence of nouns (68) over adjectives (19). Moreover, one-word MTs were researched based on the suffixes they share [Karachina 2023; Languages].

Medical issues and conditions are formed by the suffixes-itis (inflammation) vasculitis, encephalitis,—sis,—ion (state) neurocystocirrhosis, sclerosis, occlusion, deterioration,—ia,—pathy (disease/condition) ambiopia, leukemia, arrhythmia, encephalopathy, adenopathy, neuropathy,—oma (tumour) argentaffinoma, melanoma.

The nominations of treatment options comprise the following suffixes: -one/ole, -in/ine (chemical compound) **prednisone**, **albendazole**, **penicillin**, **creatinine**, **colchicines**, - otomy (incision) **laparotomy**.

MTs nominating medical examinations are formed by the suffix -graphy (writing) polysomnography, tomography, electroencephalography.

The determined word combinations fall into nominal (41) and verbal (40) [Arakin 2005]. For instance, the MT 'to prescribe treatment' is coded as  $K^{v} + A^{n}$  (see Table 1).

Table 1

## The types of terminological word combinations Таблица 1

#### Типы многословных терминологических единиц

The type	Number of MTs	
Nominal word combinations		
$A^{a/n} + K^n$	32	
K <sup>n</sup> + prep + A <sup>a/n</sup>	9	
Verbal word combinations		
$K^{v} + A$	40	

Mostly, nominal word combinations follow the pattern  $A^{a/n} + K^n(32)$ , with the adjunct followed by the kernel. E.g. virus mutation, hair loss, heart damage, asthma attack, skin infection, drug overdose.

Moreover, prepositional phrases are also revealed  $K^n + \text{prep} + A^{a/n}(9)$ . Mainly, the preposition of is used. E. g. attack of disease, loss of consciousness, symptoms of cold, puffiness of arms.

Verbal phrases correspond to the pattern  $K^{\rm v}+A$  (40), e. g. to start treatment, to decrease blood sugar, to inject a medication, to make a diagnosis, to drain the liquor, to take X-ray, to administer the drug, to damage the lungs.

The revealed balanced distribution of nominal and verbal MT word combinations shows descriptive as well as narrative text style. The combination of the former and the latter may contribute to appropriate development of the patient cases and provide sufficient details. Verbal phrases are, primarily, medical manipulations performed and thus they are vital for the case management.

At Stage III we classified the MTs into eight topic groups based on the core seme revealed in their meaning (see Fig. 3).

As Figure 3 suggests the prevailing number of MTs belong to the anatomical terms (38), units nominating the diagnosis (30), symptoms (25) and pathology (24). Given frequency is evident and is due to detailed case studies and explicatory nature of the medical TV series abundant in terminological units.

<sup>&</sup>lt;sup>2</sup> Hereinafter the numbers in brackets show the frequency of the MTs in the classification applied.

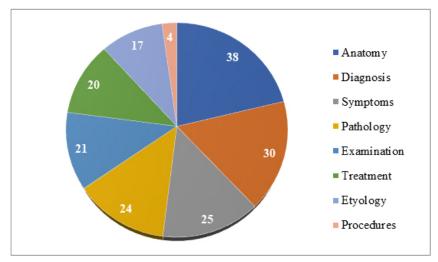


Figure 3 – Topic groups of the revealed MTs Рисунок 3 – Тематические группы медицинских терминов

The topic group 'Anatomy' (38) is represented by the names of internal organs and structures (brain stem, femur, liquor, brain, cerebral hemisphere, iliac bone, endometrium), physiological processes (erythrocyte sedimentation rate, QRS complex, cell division, heart muscle contraction, blood flow) and histology (leucocytes, immune cells, eosinophils). E.g. E1.A10 'Unless the implant directs stresses out into the surrounding femur, bone tissue will be resorbed and the implant will become loose causing severe pain to the patient and eventual failure' (HMD).

Given contexts of the patients' cases predetermine the classification of the nominations of 'Diagnosis' (30) revealed in the TV series into misdiagnosis (cerebral vasculitis, occlusion, neurosyphilis, disseminated sclerosis, encephalopathy, vasculitis, viral myocarditis, cardiomyopathy, hypothyroidism, Lyell's syndrome, purple fever, herpes encephalitis, T-cell leukemia) and final diagnosis (neurocysticercosis, subacute sclerosing panencephalitis, colchicine poisoning, Echovirus 11 infection, allergic contact dermatitis). E. g. E3.D08 'The wall of the artery has a normal architecture without signs of vasculitis, atherosclerosis or aneurysm formation' (HMD). In given circumstances the classification arises from the need to distinguish between the staging of patients' treatment and to show that, semantically, the name of every disease may be either a misdiagnosis or a final one. Obviously, the classification is flexible and largely depends on particular patient case. Thus, semantic classification of given MTs rests primarily on the core seme 'diagnosis' and semes 'correct / incorrect' are purely differential and context based.

Within the topic group 'Symptoms' (25) the MTs were further classified into those nominating subjective (abdominal pain, fervescence, pain in the fingers, fever, pain in the joints, ambiopia, acousma) and objective symptoms (loss of consciousness, loss of oral speech skills, cognitive deterioration, motor disorder, nausea, hair loss, puffiness of arms). E. g. E5.S02 'As well as cleansing the skin, comfrey oil also reduces puffiness, and softens and conditions the skin' (HMD).

The topic group 'Pathology' (24) comprises the malfunctions, dysfunctions and failure of various body systems, namely, cardiac (cardiac arrest, heart damage, heart scarring, fibrosis), renal (intraabdominal infection, kidneys fail), and respiratory (respiratory arrest, allergic reaction, viral infection, bacterial infection, pulmonary injury, oxygen poisoning). E.g. E1.P13 'I remember one case late at night when someone had a cardiac arrest. The staff started leaping up and down on him' (HMD).

The nominations of the 'examination' procedures (21) performed to the patients fall into two types, namely, laboratory (complete blood count (CBC), urinalysis, biopsy) and instrumental (X-ray, radionucleoid cisternography, exploratory laparotomy). E. g. E3.E09 'A biopsy of brain tissue detected the presence of toxoplasmosis, which is relatively harmless in people with normally functioning immune systems' (HMD).

MTs pertaining to the 'Treatment' (20) topic group nominate medications for various conditions, i.e. antibacterial, anti-inflammatory, antiviral, analgesic, antihistamine.

The names of 'Etiological factors' (17) are further classified into biological (armed tapeworm larvae, measles virus, Epstein-Barr virus) and chemical (poisonous effect of colchicines, copper allergy). E. g. E5.Et03 'Doctors hope vaccination will repeat the success of measles and whooping cough immunisation programmes and eradicate deaths' (HMD).

The revealed topic distribution of the MTs correlates with the patient case formation and management. Four key points of patients' medical records comprise etiology, symptoms, examination and treatment. Obviously, the description of medical cases involves anatomical terms and diagnosis that exhibit high frequency in given research.

At Stage IV we focused on the English – Russian equivalents of the MTs under study. Of note is the evident prevalence of the transliteration used in the medical professional communication [Bikbulatova,

Gorbunova 2023]. According to the semantic analysis, the MTs which are transliterated (51) nominate medicines (Albendazole альбендазол<sup>3</sup>, Prednisone преднизон, Penicillin пенициллин), germs (parvovirus парвовирус, enterovirus энтеровирус, Toxoplasma токсоплазма), diseases (lymphoma лимфома, sepsis cencuc, abscess абсцесс).

However, for several MTs both transliteration and translation may be applied. E. g. **motor** моторный, двигательный, **hypertension** гипертензия, повышенное давление, **abdominal** абдоминальный, брюшной, **obstruction** обструкция, закупорка, **occlusion** окклюзия, закупорка, **vasoconstrictor** вазоконстриктор, сосудосуживающее средство, **saturation** сатурация, насыщение.

We believe the choice of the Russian equivalent of these MTs, i. e. transliteration or translation rests on the discourse and people involved in the communication. Thus it is highly likely that medicine-related communicants will use transliteration.

Russian equivalents of multiword MTs are transposed, i.e. their word order changes. E. g. adrenocorticotrophic hormone stimulation test тест на стимуляцию адренокортикотропного гормона, red bone marrow puncture пункция красного костного мозга, erythrocyte sedimentation rate скорость оседания эритроцитов, heart muscle contraction сокращение сердечной мышцы.

The prevalence of transliteration arises due to medical specifics of the researched terminology as it uses many words of the Latin origin and names of the medications recognised worldwide.

#### Conclusion

According to the words' frequency analysis medicine-related linguistic units are on top of the frequency list of the subcorpora compiled by the authors. Moreover, doctor-patient interaction partly revealed in the use of Active and Passive Voice verb forms and collocations is consistent with the mutual actions taken to struggle medical conditions.

MTs are equally represented by one-word units and word combinations. The prevalence of nouns among the former ones is further explained at Stage III of this research work, namely, dominance of Anatomical terms, treatment ways and diagnoses. The spectrum of studied suffixes contributes to the understanding of the ways terms of medical conditions, treatment options, and medical examinations are coined. The balanced use of nominal and verbal MT word combinations is a good means to create text full of description and narration. Obviously, descriptive and verbal phrases are crucial and vivid for the audience to come to terms with challenging medical texts.

The prevailing topic groups of MTs, namely, 'Anatomy', 'Symptoms', 'Diagnosis', 'Examination' correlate with usual patient case management and patient records.

Multiple examples of transliteration found in the MTs under study show the specifity of medical terminology and many words of the Latin origin and names of the medications recognised worldwide.

The research perspective lies in the application of the developed algorithm to the study of terminological units of other professional domains. Moreover, the number of MTs and corpus may be enlarged and the obtained results validated on a bigger data set. The research material and findings are sufficient enough to compile specialized dictionary entries of medical terminology.

#### Materials of the research

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<sup>&</sup>lt;sup>3</sup> The translation is performed by the authors of the article (MI and RR).

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