System for Supporting the Decision about the Possibility of Concluding the Civil Law Agreements for Medical, Therapeutic and Dental Services

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Summary
The review of known decisions showed that currently there are no systems and technologies for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services. The paper models the decision-making support process on the possibility of concluding the civil law agreements for medical, therapeutic and dental services, which is the theoretical basis for the development of rules, methods and system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services. The paper also developed the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services, which automatically and free determines the possibility or impossibility of concluding the corresponding civil law agreement for the provision of a corresponding medical service. In the case of formation of a conclusion about the possibility of concluding the agreement, further conclusion and signing of the corresponding agreement takes place. In the case of forming a conclusion about the impossibility of concluding the agreement, a request is made for finalizing the relevant agreement for the provision of the relevant medical service, indicating the reasons for the impossibility of concluding the agreement – missing essential conditions in the agreement. After finalization, the agreement can be analyzed again by the developed system for supporting the decision.

Keywords:
Civil law agreements for medical, therapeutic and dental services, semantic analysis (parsing) of natural-language civil law agreements for medical, therapeutic and dental services, support for decision-making on the possibility of concluding the civil law agreements for medical, therapeutic and dental services.

1. Introduction

One of the most important civil law institutions are agreements for the provision of services. A civil law agreement on the provision of various medical services is the most important and widespread basis for the emergence of legal relations on the provision of certain types of medical services.

An agreement for the provision of medical services can be considered as an agreement under which one party (a doctor, a medical institution) undertakes to provide a relevant medical service at the request of another party (the patient) aimed at restoring and maintaining his health, and the patient is obliged to undertakes to pay for it the amount specified in the agreement. As a civil law agreement, the agreement on the provision of medical services is the basis for the emergence of the rights and obligations of the doctor and the patient [1].

An agreement for the provision of therapeutic services can be considered as an agreement under which one party (the executor) undertakes, on behalf of the other party (the customer), in compliance with the legislation on health care, to provide a service of a therapeutic nature, which consists in establishing and treating the etiology, pathogenesis and clinical manifestations of diseases of internal organs, their diagnosis, prevention and rehabilitation, and the customer undertakes to pay the executor for the specified service, unless otherwise established by agreement or law. The parties to the agreement on the provision of therapeutic services may be health care institutions (business entities based on a license, subject to the fulfillment of qualification, organizational, and other special requirements); natural persons engaged in private medical practice; patients are natural persons [1].

An agreement for the provision of dental services can be considered as an agreement under which one party (the contractor) undertakes, at the request of the other party (the customer), in compliance with the legislation on health care, to provide a dental service aimed at the prevention of diseases of the teeth and mucous membrane , organs of the oral cavity, jaws and face, partially neck (maxillofacial area), their diagnosis and treatment, which has an independent finite value, and the customer undertakes to pay the executor for the specified service, unless otherwise established by the agreement or law [2].

Today, the issue of concluding the agreement for the provision of medical services, in particular, checking the presence of all essential conditions in the agreement, requires considerable attention. The absence of essential conditions in the agreement for the provision of medical services may lead to the absence or incorrect definition of the subject of the agreement for the provision of medical services; errors in determining the legal status of the

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parties (often, agreements omit conditions that should be specified – as a rule, the rights of the parties); impossibility to offer own conditions of the agreement [1]. Uncertainty is a critical factor that affects decision making and reasoning in the medical field.

Currently, many agreements for the provision of medical services contain burdensome conditions for the patient, offer a non-legal way of resolving disputes, and lack characteristics that individualize medical services. These shortcomings can lead to adverse legal consequences both for the patient and for medical organizations if they continue to use such sample agreements that have obvious limitations of their content and insufficient legal preparation.

The problem of providing computer support for decision making in medicine is relevant due to the increasing information load on the doctor, the development of computer technologies. When making medical decisions, there is a lack of time, high dynamics of the course of diseases, a high cost of medical error, etc. Decision support systems provide decision-makers with functionalities to exploit various information on which to build a basis for making decisions.

Exactly the use of a decision support system by providing a conclusion on the possibility or impossibility of signing a prepared agreement from a legal point of view, based on a free and automated check of the existence of all essential conditions in the agreement, can significantly increase the correctness of the concluded agreement from a legal point of view (especially given the lack of an established form many medical agreements in Ukraine), to protect the doctor and the patient from legal conflicts, to provide the possibility of a quick and free check of the presence of all essential conditions in the agreement, as well as recommendations on the further conclusion or non-conclusion of the agreement [3, 4]. Such system is expected to play an increasingly important role in the future of healthcare.

Therefore, the development of the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services is currently an *urgent task*, the solution of which is devoted to this study.

2. Literature Review

Let's consider the known decision support systems and technologies on the possibility of concluding the civil law agreements for medical, therapeutic and dental services.

The paper [5] presents a prototype of a mobile decision-making support system designed for quick access to correct information on the authority of doctors, to determine and follow the correct procedure based on current legislation in order to reduce the probability of wrong actions and related risks, as well as in order to preserve the life and health of patients and their rights.

In [6] a portal of medical data models for sharing more standardized data models with semantic annotations and information between information systems is presented.

The authors of [7] developed an information technology to fill in the dynamic consent of patients and to transform it into an interactive process between patients and medical professionals.

The author [8] proved that the decision-making support system will contribute to the strengthening of trust between the doctor and the patient, as well as increasing the independence in decision-making and granting the right to self-determination of the patient.

The author [9] proposed a model of decision-making autonomy in medical matters, which prioritizes the expression of patients' wishes on the basis of patients' consent to medical procedures.

The purpose of the work [10] is to determine the most important factors that influence the decision-making process by patients in the market of selected medical services, as well as to determine the priority of these factors.

The aim of the study [11] is to investigate the possibilities and limitations of accessing and interacting with important health information through the Swedish national health information exchange platform.

In the paper [12] two approaches (the Collaborative Recommender and hybrid Demographic-based Recommender) for facilitating therapy decision support are compared. The approaches support the doctor in making therapy decisions for a specific patient and time of providing the services.

The paper [13] demonstrates an exemplary data-based clinical decision support systems which provides individualized pharmaceutical drug recommendations to physicians and patients. The proposed solution may be a template for future data-based clinical decision support systems, which support physicians to identify the most appropriate therapy and to enable a shared decision-making process between physicians and patients.

The research work [14] introduces an interactive multi-criteria decision-making to focused ultrasound therapy planning in order to improve treatment quality.

The aim of tools for patient decision aids [15] are to promote cooperation patients and doctors or clinics on the available options as a tool to assist the decision making process. These tools eliminate to lack of information, the stress for making the wrong choice or to lack of effective communication with their doctor.

Authors of [16] present a decision support system in emergency stroke care as a part of integrated health-care environment. Presented system consists of four interconnected modules, each responsible for supporting

medical staff in making correct decision at each step of emergency stroke care.

The artificial-intelligence-based method for assessing service quality in the dental prosthesis sector was developed in [17]. The constructivist decision support system was also designed in [17] to facilitate the assessment of service quality in the dental prosthesis sector.

Paper [18] describes the decision-making process of the general dental practitioner underlying the choice of coronal restoration of a root filled tooth with respect not only on clinical factors, but also on decisive contextual factors and consideration of the patients' views.

Paper [19] describes an open decision-support system based on Bayes' theorem connected to a relational database and developed using the C++ programming language. This system allows to construct and to manage a pathology database, and to simulate diagnoses in oral pathology using the variables from the database.

The review [20] describes the application, limitations and possible future of AI-based dental diagnostics, treatment planning, and conduct image analysis, prediction making, record keeping, as well as dental research and discovery. AI-based applications will streamline care, relieving the dental workforce from laborious routine tasks, increasing health at lower costs for a broader population, and eventually facilitate personalized, predictive, preventive, and participatory dentistry.

The paper [21] proposes a classification approach that would facilitate the selection of an appropriate artificial intelligence technique with purpose of using in medical decision support systems to aid physicians in their diagnosis procedures; making decisions more accurate and effective, minimizing medical errors, improving patient safety and reducing costs.

The presented in [22] architecture of medical decision support system make use of Electronic Health Record combined with available technologies and standards, clinical databases and specialized knowledge bases with the purpose of answering the needs of the health system and helping to improve the medical services.

The paper [23] presents different methods of representing the knowledge for expert medical diagnosis systems and utilizing it for rational decision making to predict the problem. The aim of this paper is the real time implementation of Cognitive medical decision making systems using Machine Learning and Fuzzy-Cognitive-Map Model.

The paper [24] describes basic design principles of the new-generation decision support system for providing personalized patients care based on patients' clinical and treatment data with the use of authors synergetic collective decision-making model and the methods of hybrid computational intelligence which allows to increase significantly the quality of the results of solutions to complex medical problems in information variety and heterogeneity as well as to enhance decision-making by reducing losses from erroneous and irrelevant to the problem complexity individual solutions.

The study [25] examines and compares different Fuzzy Cognitive Map structures that researchers have proposed for developing the medical decision support systems in different medical fields for decision making, diagnosis and classification.

The review of known decisions showed that currently there are no systems and technologies for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services. Although the analyzed systems and technologies have considerable potential for the field of medicine, as they are designed to support medical decision-making, these systems and technologies do not take into account the requirements of the civil law of any country and do not provide the possibility of checking the correctness of civil law agreements for medical, therapeutic and dental services before their concluding.

3. Modeling the Process of Supporting the Decision about the Possibility of Concluding the Civil Law Agreements for Medical, Therapeutic and Dental Services

Let *AECMS* is the set of missing essential conditions in a civil law agreement for medical services.

For the conclusion and legal correctness of a civil law agreement for medical services, the presence in the agreement of all essential conditions defined in [1] is mandatory, therefore *the criterion for the possibility of concluding the civil law agreement for medical services* will be as follows:

• if $AECMS = \varnothing$, then the civil law agreement for medical services can be concluded;

• if $AECMS \neq \varnothing$, then the civil law agreement for medical services cannot be concluded.

Taking into account the mandatory essential conditions of the civil law agreement for medical services defined in [1], *the reference set of essential conditions for determining the possibility of concluding the civil law agreement for medical services*, which is correct from the point of view of civil-law regulation, has the following form:

$$CMS = \{csj, psp, acc, crs, pra, ccs, rpi, sqt, mip, pcd, ttm, tmi, ccb, tmc, tvo\}, \quad (1)$$

where *csj* – "the subject of the agreement", *psp* – "the process of providing the service (actions of the performer)", *acc* – "the purpose of concluding the

agreement", *crs* – "the result of the agreement", *pra* – "the process of achieving the result", *ccs* – "the price of the agreement", *rpi* – "the right to available, timely, reliable and complete information about patient's state of health", *sqt* – "quality of service", *mip* – "profile of the medical institution", *pcd* – "professional competence of the doctor(s)", *ttm* – "treatment methods", *tmi* – "equipment of the medical institution with the necessary modern medical equipment", *ccb* – "terms of termination of the agreement", *tmc* – "term duration of the agreement", *tvo* – "the period of validity of the obligations".

Taking into account the developed criterion for the possibility of concluding the civil law agreement for medical services and the reference set of essential conditions for determining the possibility of concluding the civil law agreement for medical services, which is correct from the point of view of civil law regulation (equation (1)), let's perform *modeling the process of supporting the decision about the possibility of concluding the civil law agreements for medical services*.

If *AECMS* is the set of missing essential conditions in a civil law agreement for medical services, then:

$$AECMS = CMS \setminus (CMS \cap RCMS), \quad (2)$$

where *RCMS* is the set of essential conditions contained in a real civil law agreement for medical services.

The general rule for making a decision about the possibility of concluding the civil law agreement for medical services is as follows:

$$\begin{array}{l} If \quad AECMS = \varnothing \\ then \quad "medical \quad agreement \quad can \quad be \quad concluded" \\ else \quad "medical \quad agreement \quad cannot \quad be \quad concluded" \end{array}. \quad (3)$$

Let *AECT* is the set of missing essential conditions in a civil law agreement for therapeutic services.

For the conclusion and legal correctness of a civil law agreement for therapeutic services, the presence in the agreement of all essential conditions is mandatory, therefore *the criterion for the possibility of concluding the civil law agreement for therapeutic services* will be as follows:

• if $AECT = \varnothing$, then the civil law agreement for therapeutic services can be concluded;

• if $AECT \neq \varnothing$, then the civil law agreement for therapeutic services cannot be concluded.

Taking into account the mandatory essential conditions of the civil law agreement for therapeutic services, *the reference set of essential conditions for determining the possibility of concluding the civil law agreement for therapeutic services*, which is correct from the point of view of civil-law regulation, has the following form:

$$\begin{array}{c} CTSP = \{cs, ta, pt, ldc, dd, rd, rbd, dc, rc, rbc, \\ ps, pp, tm, ss, mce, mie, oc, pc, ids, mh, lh, sd, gm, lm, \\ pd, dn, pps, dcf, fs, dcm, dcb, fd, \\ opr, odr, ohr, mt, pht, sm, spa\} \end{array}, \quad (4)$$

where *cs* – "the subject of the agreement"; *ta* – "theoretical principles of the work"; *pt* – "practical toolkit"; *ldc* – "limits of competence of a practicing physician"; *dd* – "duties of a doctor (medical institution)"; *rd* – "rights of a doctor (medical institution)"; *rbd* – "responsibility of the doctor (medical institution)"; *dc* – "client's responsibilities"; *rc* – "client's rights"; *rbc* – "client's responsibility"; *ps* – payment for services; *pp* – payment procedure; *tm* – "terms of service provision"; *ss* – "service provision schedule"; *mce* – "possible manifestations of the accompanying adverse consequences of the influence of therapeutic services"; *mie* – "possible manifestations of accidental adverse consequences of the influence of therapeutic services"; *oc* – "other conditions"; *pc* – "patient's complaints"; *ids* – "detection of individual signs (symptoms) of the disease based on complaints"; *mh* – "medical history"; *lh* – "patient's life history"; *sd* – "objective examination data"; *gm* – "general clinical research methods"; *lm* – "laboratory-instrumental research methods"; *pd* – "previous (syndromic) diagnosis"; *fd* – "final diagnosis"; *dn* – "name of the disease"; *pps* – "stage of the pathological proces"; *dcf* – "clinical form of the disease"; *fs* – "functional state of organs and systems"; *dcm* – "diagnosis of complications"; *dcb* – "diagnosis of concomitant diseases"; *opr* – "optimal physical regime"; *odr* – "optimal dietary regime"; *ohr* – "optimal hygienic regime"; *mt* – "medicinal products"; *pht* – "physiotherapeutic means"; *sm* – "surgical methods"; *spa* – "sanatorium-resort offers".

Taking into account the developed criterion for the possibility of concluding the civil law agreement for therapeutic services and the reference set of essential conditions for determining the possibility of concluding the civil law agreement for therapeutic services, which is correct from the point of view of civil law regulation (equation (4)), let's perform *modeling the process of supporting the decision about the possibility of concluding the civil law agreements for therapeutic services*.

If *AECT* is the set of missing essential conditions in a civil law agreement for therapeutic services, then:

$$AECT = CTSP \setminus (CTSP \cap RCTSP), \quad (5)$$

where *RCTSP* is the set of essential conditions contained in a real civil law agreement for therapeutic services.

The general rule for making a decision about the possibility of concluding the civil law agreement for therapeutic services is as follows:

$$\begin{array}{l} If\ \ AECT = \varnothing \\ then\ \ "therapeutic\ \ agreement\ \ can\ \ be\ \ concluded" \\ else\ \ "therapeutic\ \ agreement\ \ cannot\ \ be\ \ concluded" \end{array}. \quad (6)$$

Let *AEDSC* is the set of missing essential conditions in a civil law agreement for dental services.

For the conclusion and legal correctness of a civil law agreement for dental services, the presence in the agreement of all essential conditions defined in [2] is mandatory, therefore *the criterion for the possibility of concluding the civil law agreement for dental services* will be as follows:

• if $AEDSC = \varnothing$, then the civil law agreement for dental services can be concluded;

• if $AEDSC \neq \varnothing$, then the civil law agreement for dental services cannot be concluded.

Taking into account the defined in [2] mandatory essential conditions of the civil law agreement for dental services, *the reference set of essential conditions for determining the possibility of concluding the civil law agreement for dental services*, which is correct from the point of view of civil-law regulation, has the following form:

$$\begin{array}{l} DSC = \{ lcn, rpt, dpt, rbp, cdc, bds, tds, grt, pds, pmt, \\ \qquad trs, rrp, ipc, phs, pdh, pcs, pad, nvd \} \end{array}, \quad (7)$$

where *lcn* – "the license number of the medical and preventive institution", *rpt* – "the rights of the parties", *dpt* – "the obligations of the parties", *rbp* – "the responsibility of the parties", *cdc* – "the price of the agreement", *bds* – "the payment procedure for dental services", *tds* – "the term of providing the dental services", *grt* – "guarantee term", *pds* – "patient's diagnosis", *pmt* – "plan and method of examination and treatment", *trs* – "typical risks", *rrp* – "rules and recommendations to be followed by the patient", *ipc* – "patient's informed consent", *phs* – "patient's general state of health", *pdh* – "condition of the patient's dental health", *pcs* – "patient's complaints", *pad* – "patient's anamnestic data", *nvd* – "date of the next visit".

Taking into account the developed criterion for the possibility of concluding the civil law agreement for dental services and the reference set of essential conditions for determining the possibility of concluding the civil law agreement for dental services, which is correct from the point of view of civil law regulation (equation (7)), let's perform *modeling the process of supporting the decision about the possibility of concluding the civil law agreements for dental services*.

If *AECMS* is the set of missing essential conditions in a civil law agreement for dental services, then:

$$AEDSC = DSC \setminus (DSC \cap RDSC), \quad (8)$$

where *RDSC* is the set of essential conditions contained in a real civil law agreement for dental services.

The general rule for making a decision about the possibility of concluding the civil law agreement for dental services is as follows:

$$\begin{array}{l} If\ \ AEDSC = \varnothing \\ then\ \ "dental\ \ agreement\ \ can\ \ be\ \ concluded" \\ else\ \ "dental\ \ agreement\ \ cannot\ \ be\ \ concluded" \end{array}. \quad (9)$$

The conducted modeling the decision-making support process on the possibility of concluding the civil law agreements for medical, therapeutic and dental services is the theoretical basis for the development of rules, methods and system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services.

4. System for Supporting the Decision about the Possibility of Concluding the Civil Law Agreements for Medical, Therapeutic and Dental Services

Taking into account the results of the analysis of the civil law regulation of agreements for medical, therapeutic and dental services carried out in [1, 2], as well as the carried out in Chapter 3 of this article modeling the process of supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services, let's develop the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services – Fig. 1.

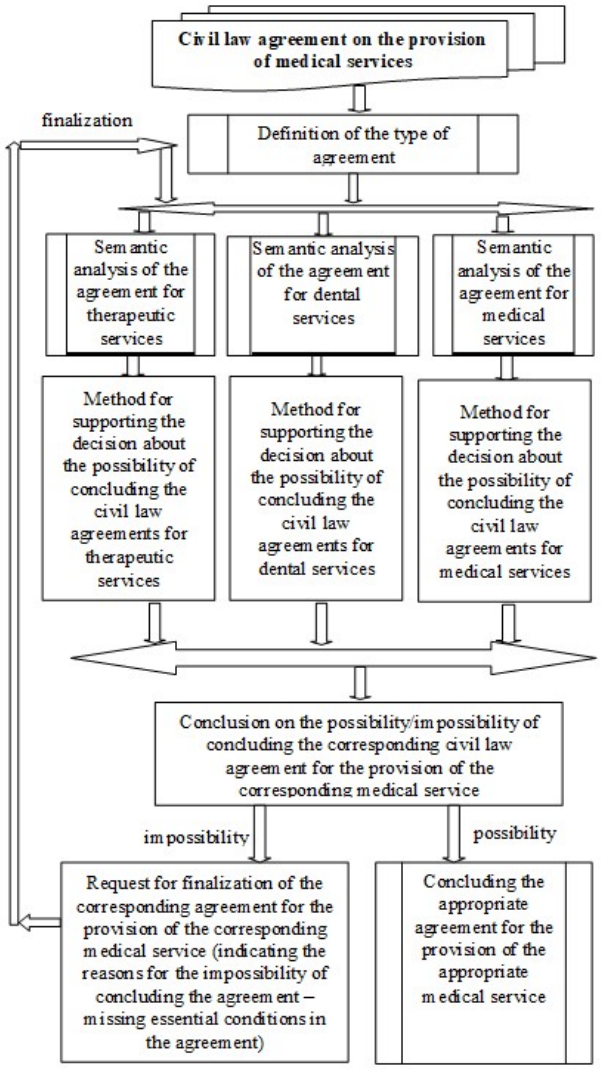

Fig. 1 System for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services.

The main source of information for the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services is a civil law agreement for the provision of medical services (general medical, therapeutic or dental). The information flows of the developed system are the essential conditions of the corresponding civil law agreement for the provision of medical services. After determining the type of agreement, the semantic analysis of the agreement takes place (Fig. 2), during which a search is made for the essential conditions of the corresponding agreement, which are mandatory, – a search for the values of the elements of the reference set *CMS* (in the case of the analysis of the agreement for general medical services), *CTSP* (in the case of the analysis of the agreement for therapeutic services) or *DSC* (in the case of the analysis of the agreement for dental services). Such semantic analysis is based on the concept of semantic parsing of natural language specifications of software requirements developed by one of the authors in [26, 27].

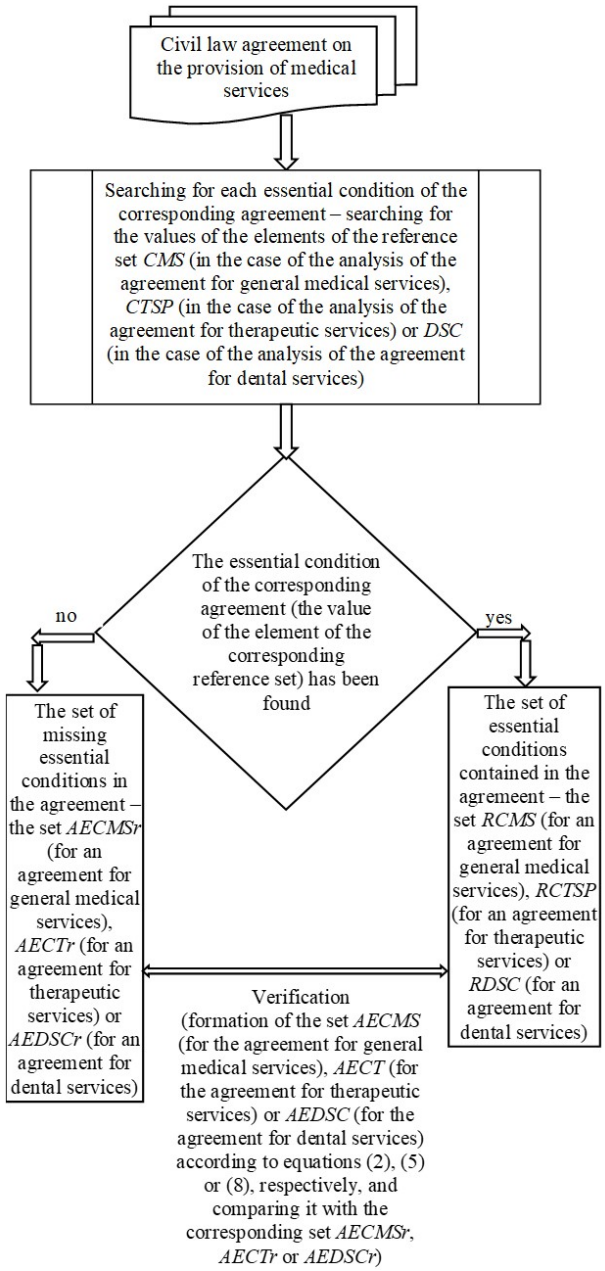

Fig. 2 Semantic analysis of the civil law agreement for the provision of medical services.

As a result of the conducted semantic analysis of the corresponding agreement, a set of essential conditions is formed, which are contained in a real civil law agreement

for the provision of medical services (*RCMS* (in the case of the analysis of the agreement for general medical services), *RCTSP* (in the case of the analysis of the agreement for therapeutic services) or *RDSC* (in the case of the analysis of the agreement for dental services)); a set of missing essential conditions in a real civil law agreement for the provision of medical services (*AECMS* (in the case of the analysis of the agreement for general medical services, according to equation (2)), *AECT* (in the case of the analysis of the agreement for therapeutic services, according to equation (5)) or *AEDSC* (in the case of the analysis of the agreement for dental services, according to equation (8))).

On the basis of the obtained sets of present and absent mandatory essential conditions, the rules developed in [1, 2] are checked – in the case of the analysis of the agreement for general medical services, the rules for making a decision about the possibility of concluding the civil law agreement for medical services are used, developed on based on the general rule represented by equation (3); in the case of the analysis of the agreement for therapeutic services, the rules for making a decision about the possibility of concluding the civil law agreement for therapeutic services are used, developed on based on the general rule represented by equation (6); in the case of the analysis of the agreement for dental services, the rules for making a decision about the possibility of concluding the civil law agreement for dental services are used, developed on based on the general rule represented by equation (9). Based on the result of checking the rules, the possibility or impossibility of concluding the corresponding civil law agreement for the provision of a corresponding medical service is determined in accordance with the developed by the authors in [1, 2] method of supporting the decision about the possibility of concluding civil law agreements for medical, therapeutic and dental services. In the case of formation of a conclusion about the possibility of concluding the agreement, further conclusion and signing of the corresponding agreement takes place. In the case of forming a conclusion about the impossibility of concluding the agreement, a request is made for finalizing the relevant agreement for the provision of the relevant medical service, indicating the reasons for the impossibility of concluding the agreement – missing essential conditions in the agreement (values of the elements of the set *AECMS* (in the case of the analysis of the agreement for general medical services), *AECT* (in the case of the analysis of the agreement for therapeutic services) or *AEDSC* (in the case of the analysis of the agreement for dental services)). After finalization, the agreement can be analyzed again by the developed system for supporting the decision.

5. Examples of the Operating the System for Supporting the Decision about the Possibility of Concluding the Civil Law Agreements for Medical, Therapeutic and Dental Services

Let's consider an example of the operation of the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services using the example of the analysis of three civil law agreements (one agreement for general medical services, one agreement for therapeutic services and one agreement for dental services), provided by the dispensary of family medicine of the Ozerna microdistrict (Khmelnytskyi, Ukraine).

First, let's analyze the agreement for general medical services. After determining the type of agreement, a semantic analysis of the agreement takes place, during which the essential conditions of the corresponding agreement, which are mandatory, are searched for – the search for the values of the elements of the reference set *CMS*.

As a result of the conducted semantic analysis of the relevant agreement, a set of essential conditions is formed, which are contained in a real civil law agreement for general medical services (*RCMS* = *{psp*, *acc*, *pra*, *rpi*, *sqt*, *mip*, *pcd*, *ttm*, *tmi*, *tmc*, *tvo}*); a set of missing essential conditions in a real civil law agreement for medical services (*AECMS* = {*csj*, *crs*, *ccs*, *ccb*}).

Based on the obtained sets of present and absent mandatory essential conditions, the rules for making a decision on the possibility of concluding a civil law agreement for medical services, developed on the basis of the general rule represented by equation (3), are checked. Since $AECMS \neq \varnothing$, then the civil law agreement for medical services cannot be concluded. Since a conclusion has been formed about the impossibility of concluding the agreement, a request is made for the finalization of the relevant agreement for medical services indicating the reasons for the impossibility of concluding the agreement, namely the missing essential conditions in the agreement (values of the elements of the set *AECMS* “the subject of the agreement”, “the result of the agreement”, “the price of the agreement”, "terms of termination of the agreement")). After finalization, the agreement can be analyzed again by the developed system for supporting the decision.

Next, let's analyze the agreement for therapeutic services. After determining the type of agreement, a semantic analysis of the agreement takes place, during which the essential conditions of the corresponding agreement, which are mandatory, are searched for – the search for the values of the elements of the reference set *CTSP*.

As a result of the conducted semantic analysis of the relevant agreement, a set of essential conditions is formed, which are contained in a real civil law agreement for

therapeutic services (*RCTSP = {cs, ta, pt, ldc, dd, rd, rbd, dc, rc, rbc, ps, pp, tm, ss, mce, mie, oc, pc, ids, mh, lh, sd, gm, lm, pd, fd, dn, pps, dcf, fs, dcm, dcb, opr, odr, ohr, mt, pht,, sm, spa}*); a set of missing essential conditions in a real civil law agreement for therapeutic services ($AECT = \varnothing$).

Based on the obtained sets of present and absent mandatory essential conditions, the rules for making a decision on the possibility of concluding a civil law agreement for therapeutic services, developed on the basis of the general rule represented by equation (6), are checked. Since $AECT = \varnothing$, then the civil law agreement for therapeutic services can be concluded. Since a conclusion has been formed about the possibility of concluding the agreement, further concluding and signing of the relevant agreement took place.

Next, let's analyze the agreement for dental services. After determining the type of agreement, a semantic analysis of the agreement takes place, during which the essential conditions of the corresponding agreement, which are mandatory, are searched for – the search for the values of the elements of the reference set *DSC*.

As a result of the conducted semantic analysis of the relevant agreement, a set of essential conditions is formed, which are contained in a real civil law agreement for dental services (*RDSC = {rpt, dpt, rbp, tds, pds, pmt, trs, rrp, ipc, phs, pdh, pcs, pad}*); a set of missing essential conditions in a real civil law agreement for dental services ($AEDSC = \{lcn, cdc, bds, grt, nvd\}$).

Based on the obtained sets of present and absent mandatory essential conditions, the rules for making a decision on the possibility of concluding a civil law agreement for dental services, developed on the basis of the general rule represented by equation (9), are checked. Since $AEDSC \neq \varnothing$, then the civil law agreement for dental services cannot be concluded. Since a conclusion has been formed about the impossibility of concluding the agreement, a request is made for the finalization of the relevant agreement for dental services indicating the reasons for the impossibility of concluding the agreement, namely the missing essential conditions in the agreement (values of the elements of the set *AEDSC* ("the license number of the medical and preventive institution", "the price of the agreement", "the payment procedure for dental services", "guarantee term", "date of the next visit")). After finalization, the agreement can be analyzed again by the developed system for supporting the decision.

So, as the considered examples of systems' operation have shown, the developed system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services ensures the legal correctness of the civil law agreement for medical, therapeutic or dental services, provides an opportunity to quickly and free check the presence of all mandatory essential conditions for the concluding such the agreement, protects the doctor and the patient from legal conflicts, and also provides recommendations for further finalization of the agreement – the reasons for the impossibility of concluding the agreement, namely the absence of essential conditions in the agreement (in the case of forming the conclusion about the impossibility of concluding the agreement).

6. Conclusions

The development of the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services is currently an urgent task, the solution of which is devoted to this study.

The review of known decisions showed that currently there are no systems and technologies for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services. Although the analyzed systems and technologies have considerable potential for the field of medicine, as they are designed to support medical decision-making, these systems and technologies do not take into account the requirements of the civil law of any country and do not provide the possibility of checking the correctness of civil law agreements for medical, therapeutic and dental services before their concluding.

The paper models the decision-making support process on the possibility of concluding the civil law agreements for medical, therapeutic and dental services, which is the theoretical basis for the development of rules, methods and system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services.

The paper also developed the system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services, which automatically and free determines the possibility or impossibility of concluding the corresponding civil law agreement for the provision of a corresponding medical service. In the case of formation of a conclusion about the possibility of concluding the agreement, further conclusion and signing of the corresponding agreement takes place. In the case of forming a conclusion about the impossibility of concluding the agreement, a request is made for finalizing the relevant agreement for the provision of the relevant medical service, indicating the reasons for the impossibility of concluding the agreement – missing essential conditions in the agreement. After finalization, the agreement can be analyzed again by the developed system for supporting the decision.

The currently developed system for supporting the decision about the possibility of concluding the civil law agreements for medical, therapeutic and dental services allows

determining the possibility/impossibility of concluding a corresponding agreement only on the basis of the current civil legislation of Ukraine, but it can be adapted to the legislation of any country – for this it is necessary to conduct an analysis of civil law regarding mandatory essential conditions of agreements for medical services, therapeutic services and dental services of a certain country, after which the reference sets of essential conditions for determining the possibility of concluding the civil law agreements for medical, therapeutic and dental services should be supplemented or changed taking into account the analysis of the civil law of a certain country.

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