

【DESCRIPTION】

【Invention Title】

LANGUAGE MODEL-BASED PRESCRIPTION INFORMATION PROVISION METHOD AND SYSTEM

【Technical Field】

- [1]** The present invention relates to a method and system for providing prescription information using a language model.

【Background Art】

- [2]** A musculoskeletal disease refers to pain or damage created in a musculoskeletal system, such as muscles, nerves, tendons, ligaments, bones, and surrounding tissues. The musculoskeletal disease appears in various parts of the human body such as the neck, back, arms, and legs.
- [3]** According to a report of the World Health Organization (WHO), the economic losses from the musculoskeletal disease are found to be the fourth highest of all diseases, and the musculoskeletal disease is chronic pain that affects not only daily life but also economic activity.
- [4]** Treatment of the musculoskeletal disease is, in principle, initiated with less invasive therapies, and non-pharmacological conservative treatments (e.g., exercise therapy and education, cognitive therapy, or relaxation therapy, etc.) should be first performed, followed by the consideration of pharmacological treatment and surgical treatment in sequence.
- [5]** Treatment guidelines actively recommend non-pharmacological conservative treatments for the musculoskeletal disease, and studies on methods for performing non-pharmacological conservative treatments for the musculoskeletal disease are actively being conducted mainly in the United States and Europe.

- [6] Meanwhile, as artificial intelligence (AI) technology has recently developed rapidly, a language model (e.g., ChatGPT) capable of natural conversation with humans has emerged.
- [7] Unlike conventional chatbots constructed manually and providing only limited answers, the language model communicates naturally almost like a human, shows technical prowess that provides fast and accurate information, and shows innovation in the artificial intelligence market.
- [8] In line with such trends, fields of industry that require specialized knowledge, such as the medical industry, also have an increasing need to provide services using the language model.
- [9] Even fields of industry based on off-line operations are being popularized to provide medical services through on-line means.

【Disclosure】

【Technical Problem】

- [10] The present invention relates to a language model-based prescription information provision method and system capable of searching and recommending appropriate prescription information for a patient.
- [11] In particular, the present invention relates to a language model-based prescription information provision method and system capable of searching and recommending prescription information based on a large language model.
- [12] More specifically, the present invention relates to a language model-based prescription information provision method and system capable of training a language model so as to search and recommend appropriate prescription information according to a patient condition and a doctor requirement.

【Technical Solution】

- [13]** To solve the aforementioned problems, there is provided a language model-based prescription information provision method, according to the present invention. The language model-based prescription information provision method may comprise: receiving, from a medical staff terminal logged in with a medical staff account, a prescription information recommendation request; in response to the request, extracting, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account; generating, by using the medical staff meta information and the patient meta information, a prompt of a preset format; acquiring the prescription information by using a large language model (LLM) that receives the prompt as input; and providing the acquired prescription information to the medical staff terminal.
- [14]** The present invention may further comprise: in response to an approval event for the prescription information occurring in the medical staff account, transmitting the prescription information to at least one medical system linked to the server, and the at least one medical system may comprise one of an electronic health record (EHR) system, an electronic medical record (EMR) system, an ordering communication system (OCS), a clinical information system (CIS), or a personal health record (PHR) system for a patient.
- [15]** Further, the prescription information recommendation request may be received in a state where a page of the at least one medical system is provided to the medical staff terminal, and in the transmitting of the prescription information, the prescription information may be output on the page of the at least one medical system.
- [16]** Further, the preset prompt may include a system prompt and a user prompt, the system prompt may define a role of the server as the medical staff, and the user prompt may

specify the patient to whom the prescription information is to be recommended and an indication of the patient.

- [17]** Further, in an exercise database (DB) of the server, exercise items for treatment of the indication may be group-matched for each indication, each of the exercise items for treatment of the indication may be matched with exercise difficulty level information, and in the acquiring of the prescription information, the exercise items for treatment of the indication may be searched from the exercise database (DB), and the searched exercise items may be assigned respectively to different days constituting a preset exercise period, so as to prescribe an exercise program.
- [18]** Further, the searching of the exercise item may be performed by considering at least one of: a prescription information or prescription history from the medical staff, an age of the patient, a gender of the patient, and an exercise tendency of the patient.
- [19]** Further, the present invention may further comprise: based on receiving another prescription information recommendation request from the medical staff terminal, acquiring, by using the prompt, exercise program different from the exercise program, and in the acquiring of the different exercise program, one of the exercise items may be excluded from the exercise program, and another exercise item that is matched in a same group as the excluded exercise item and is matched with same difficulty level information may be included in the exercise program.
- [20]** Further, the present invention may further comprise: performing verification on whether the prescription information satisfies a preset verification criterion; and when the preset verification criterion is not satisfied as a result of the verification, regenerating the prescription information based on the prompt and the language model, and in which the preset verification criterion may be related to at least one of a degree of relevance with a treatment of the indication of the patient, a difficulty level of the

exercise item included in the prescription information, an age of the patient, or an exercise tendency of the patient.

[21] Further, the medical staff meta information may include information regarding at least one of a specialty field of the medical staff, a hospital name, a career, or a past prescription history, and the patient meta information may include information regarding at least one of an age, a gender, an indication, a surgical history, a diagnosis name, a pain site, a pain score, a past exercise prescription record, or a tendency of the patient.

[22] Meanwhile, there is provided a language model-based prescription information provision system, according to the present invention. The language model-based prescription information provision system may comprise: a communication unit configured to receive, from a medical staff terminal logged in with a medical staff account, a prescription information recommendation request; and a control unit configured to extract, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account, in response to the request, in which the control unit may be configured to: generate, by using the medical staff meta information and the patient meta information, a prompt of a preset format; acquire the prescription information by using a large language model (LLM) that receives the prompt as input; and provide the acquired prescription information to the medical staff terminal.

[23] Meanwhile, there is provided a program stored in a computer-readable recording medium, executed by one or more processes in an electronic device, according to the present invention. The program may comprise instructions to perform: receiving, from a medical staff terminal logged in with a medical staff account, a prescription

information recommendation request; in response to the request, extracting, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account; generating, by using the medical staff meta information and the patient meta information, a prompt of a preset format; acquiring the prescription information by using a large language model (LLM) that receives the prompt as input; and providing the acquired prescription information to the medical staff terminal.

【Advantageous Effects】

[24] As described above, a language model-based prescription information recommendation method and system according to the present invention may receive a prescription information recommendation request from a medical staff terminal logged in with a medical staff account, and, in response to the request, may extract medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient, who is a treatment target linked to the medical staff account, from a server, and may generate a prompt in a preset format by using the medical staff meta information and the patient meta information. Through this, in the present invention, a large language model may recommend appropriate prescription information by considering the patient condition from the viewpoint of the medical staff.

[25] Further, the language model-based prescription information recommendation method and system according to the present invention may acquire the prescription information by using a large language model (LLM) that receives the prompt as input, and, by providing the acquired prescription information to the medical staff terminal, information of the patient and requirements of the medical staff are input into the large language model, such that appropriate prescription information is recommended, and

may enable the recommended prescription information to be reflected in the medical system.

【Description of Drawings】

- [26]** FIG. 1 is a conceptual diagram for explaining a language model-based prescription information provision environment according to the present invention.
- [27]** FIG. 2 is a conceptual diagram for explaining a language model-based prescription information provision system according to the present invention.
- [28]** FIGS. 3 and 4 are conceptual diagrams for explaining a large language model used in the present invention.
- [29]** FIGS. 5A and 5B are flowcharts for explaining a language model-based prescription information provision method according to the present invention.
- [30]** FIGS. 6, 7A, 7B, 7C, 7D, 7E, 8, 9, and 10 are conceptual diagrams for explaining a language model-based prescription information provision method provided in the present invention.

【Mode for Disclosure】

- [31]** Hereinafter, exemplary embodiments disclosed in the present specification will be described in detail with reference to the accompanying drawings. The same or similar constituent elements are assigned with the same reference numerals regardless of reference numerals, and the repetitive description thereof will be omitted. The suffixes "module", "unit", "part", and "portion" used to describe constituent elements in the following description are used together or interchangeably in order to only facilitate the description, but the suffixes themselves do not have distinguishable meanings or functions. In addition, in the description of the exemplary embodiment disclosed in the present specification, the specific descriptions of publicly known related technologies will be omitted when it is determined that the specific descriptions

may obscure the subject matter of the exemplary embodiment disclosed in the present specification. In addition, it should be interpreted that the accompanying drawings are provided to easily understand the embodiments disclosed in the present specification, and the technical teachings disclosed in the present specification are not limited by the accompanying drawings, and includes all alterations, equivalents, and alternatives that are included in the teachings and the technical scope of the present invention.

- [32] The terms including ordinal numbers such as "first," "second," and the like may be used to describe various constituent elements, but the constituent elements are not limited by the terms. These terms are used only to distinguish one constituent element from another constituent element.
- [33] When one constituent element is described as being "coupled" or "connected" to another constituent element, it should be understood that one constituent element can be coupled or connected directly to another constituent element, and an intervening constituent element can also be present between the constituent elements. In contrast, when one constituent element is described as being "coupled directly to" or "connected directly to" another constituent element, it should be understood that no intervening constituent element exists between the constituent elements.
- [34] Singular expressions include plural expressions unless clearly described as different meanings in the context.
- [35] In the present application, it should be understood that terms "including", "having", and the like are intended to designate the existence of characteristics, numbers, steps, operations, constituent elements, and components described in the specification or a combination thereof, and do not exclude a possibility of the existence or addition of

one or more other characteristics, numbers, steps, operations, constituent elements, and components, or a combination thereof in advance.

[36] A storage unit 120 may be configured to include at least one of a patient database (DB) 210, a medical staff database (DB) 220, an exercise database (DB) 230, and a prescription database (DB) 240. In FIG. 2, the exercise database (DB) 230 and the prescription database (DB) 240 are illustrated as being independent (or separate); however, the exercise database (DB) 230 and the prescription database (DB) 240 may exist as linked databases (DBs) grouped together. For example, the prescription database (DB) 240 may be configured to include the exercise database (DB) 230 (that is, the exercise database (DB) may exist within the prescription database (DB)). In addition, as illustrated in FIG. 2, the exercise database (DB) 230 and the prescription database (DB) 240 may also exist independently.

[37] A patient database (DB) 210 may store and contain patient information (user information or medical information of a patient), and, for example, may include at least one of a patient's name, age, gender, surgical history, diseases (current medical history, past medical history, etc.), indication, diagnosis name, pain site, consultation history, diagnosis result, treatment process, test information (e.g., X-ray images, blood test information, etc.), details of prescribed exercise curriculum, details of prescribed medicines, patient tendency, allergy information, patient lifestyle, dietary habit, exercise habit, alcohol and smoking status, and stress level.

[38] A medical staff database (DB) 220 may store and contain medical staff information (user information or medical activity information of a medical staff). For example, the medical staff database (DB) 220 may include at least one of a name, age, career, specialty field, affiliated hospital, and research field of the medical staff.

- [39] An exercise database (DB) 230 may include a plurality of exercise items, and for each exercise item, at least some of difficulty level, description information, exercise video, and exercise method may be matched with one another. The exercise database (DB) 230 may include a plurality of exercise items grouped based on an indication, and for each of the plurality of exercise items, description information regarding the name, exercise method, exercise effect, and the like may be matched.
- [40] A prescription database (DB) 240 may store and contain at least one prescription history of a patient and/or a medical staff. A prescription history may include at least one of a prescription date, a prescribing doctor, a prescribed patient, a prescribed medicine or exercise, a diagnosis result, a treatment process, or a prescription detail.
- [41] In the present invention, the patient database (DB) 210, the medical staff database (DB) 220, the exercise database (DB) 230, and the prescription database (DB) 240 may be referred to as and described collectively as a database (200) or a storage unit.
- [42] A communication unit 130 may be configured to transmit or receive data. The communication unit 130 may receive a service request including a user query from a user terminal (20) of a medical staff, and may transmit prescription information corresponding to the user request. In addition, the communication unit 130 may be configured to receive information required in the present invention from an external server.
- [43] The communication unit 130 may support various communication methods depending on a communication standard of a device (or an electronic device) with which communication is performed. For example, the communication unit 130 may be configured to perform the communication using at least one of wireless LAN (WLAN), wireless-fidelity (Wi-Fi), wireless-fidelity (Wi-Fi) direct, digital living network alliance (DLNA), wireless broadband (WiBro), world interoperability for microwave

access (WiMAX), high speed downlink packet access (HSDPA), high speed uplink packet access (HSUPA), long term evolution (LTE), long term evolution-advanced (LTE-A), fifth generation mobile telecommunication (5G), Bluetooth™, radio frequency identification (RFID), infrared communication (infrared data association (IrDA)), ultra-wideband (UWB), ZigBee, near field communication (NFC), Wi-Fi direct, or wireless universal serial bus (wireless USB) technologies.

- [44] Meanwhile, a control unit 140 may be configured to control an overall operation of a prescription information provision system 100 related to the present invention. Specifically, the control unit 140 may process signals, data, information, and the like input or output through the above-described constituent elements, or may provide or process appropriate information and functions for a user.
- [45] As illustrated in FIG. 3, the control unit 140 may use information (e.g., patient's age, gender, diagnosis name, surgical history, pain site, pain score, past exercise, etc., 310) extracted from the database (200) and a service request (e.g., "recommend a 4-week curriculum with low difficulty-level exercises," 320) of the medical staff as an input to a large language model (LLM 142), and may acquire, as a response from the large language model (142), an exercise curriculum (330) corresponding to requirements of the medical staff.
- [46] More specifically, the control unit 140 may specify intent (requirements) of the medical staff from a user query included in the service request, and may extract meta information of a patient or a medical staff from at least one of the patient database (DB 210) and the medical staff database (DB 220). Further, the control unit 140 may generate a prompt by using the extracted meta information, and may search and recommend prescription information by using the large language model (142) that receives the prompt as input.

- [47] Furthermore, the control unit 140 may perform a series of data processes for searching and recommending prescription information corresponding to the service request of the medical staff.
- [48] The control unit 140 may analyze the intent (or requirements) of the medical staff from the service request, so as to analyze (figure out or understand) what kind of intent the medical staff had in requesting the service.
- [49] The control unit 140 may utilize at least one of various artificial intelligence technologies for intent analysis of a service request. For example, the artificial intelligence technologies may include at least one of machine reading comprehension (MRC), paraphrasing, abstract summarization, text generation (TG), question generation (QG), natural language understanding (NLU), OCR-NLP (Textandng), or natural language-based query (NL2SQL).
- [50] A prompt generation unit 141 may be configured to design (or construct or generate) an appropriate prompt in order to obtain a desired result from a language model, and may perform “Prompt Engineering” technology that utilizes a large-scale language model to perform natural language processing tasks.
- [51] Here, the prompt is an input value for generating a response (or answer or result) from the language model, in which the prompt includes an element related to an instruction or command to the language model, and the language model generates a response based thereon.
- [52] The prompt generation unit 141 may understand (analyze) requirements of the medical staff from a user query included in the service request of the medical staff through natural language processing tasks, and may extract information necessary for prompt generation from at least one of the patient database (DB), medical staff database (DB), exercise database (DB), and prescription database (DB) based on an analysis result.

- [53] The prompt generation unit 141 may generate a prompt by using the service request (user query), the analysis result, and the extracted information, so that the language model acquires prescription information corresponding to the requirements of the medical staff as a response.
- [54] In the present invention, the prompt may include at least one of a system prompt 141a or a user prompt 141b.
- [55] In the present invention, the term “system prompt” refers to an instruction or command for defining (assigning) a role of the prescription information provision system 100, and may define a persona of a medical staff who is the prescribing subject, and may be configured as a command for instructing a language model to recommend prescription information according to the defined persona (e.g., “>[INST] <<SYS>> play the role of a rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation”). That is, the system prompt may be configured to define a role of a server as the medical staff.
- [56] Furthermore, the term “user prompt” may include information that defines a target of prescription information recommendation (or prescription) by the prescription information provision system 100 (e.g., “<</SYS>> a 34-year-old male, with ankle pain level 6, diagnosed with a simple ankle sprain”). That is, the user prompt may be configured to specify a patient to be recommended (or prescribed) with the prescription information, and an indication of the patient.
- [57] The present invention is intended to provide medical services based on a large language model (LLM), and may recommend various kinds of prescription information (e.g., medicines, medical devices, medical tests, therapies, exercise curriculums, exercise programs, exercise plans, cognitive therapies, diet plans, and consultations, etc.) so that the medical staff may appropriately prescribe for a patient.

- [58] The present invention may be configured to be plug-in compatible with a medical system using an electronic health record (EHR) and an electronic medical record (EMR).
- [59] Further, the present invention may provide a service that uses at least one of the electronic health record (EHR) or the electronic medical record (EMR) to search a prescription target for treating a patient's indication, and recommend to a medical staff prescription information including the searched information.
- [60] In the present invention, for convenience of explanation, an example will be given in which prescription information is recommended to a medical staff, targeting an indication of a patient requiring exercise therapy. The indication of a patient requiring exercise therapy may be a musculoskeletal disease, and in the present invention, based on a language model, exercise items for treating the musculoskeletal disease may be searched, and an exercise curriculum (or exercise program or exercise plan) including the searched exercise items may be recommended to the medical staff as a prescription target.
- [61] In the present invention, an exercise item may refer to an exercise motion or an exercise type, and an exercise curriculum may include at least one exercise item and an exercise method of the exercise item (e.g., exercise schedule, exercise sequence, exercise frequency, exercise time, etc.).
- [62] Further, the "language model-based prescription information provision system" according to the present invention may be referred to as a "prescription information provision system", and the system may be referred to as a "server" or a "platform".
- [63] Hereinafter, the language model-based prescription information provision method and system according to the present invention will be described in more detail with reference to the accompanying drawings. FIG. 1 is a conceptual diagram for

explaining an exercise curriculum provision environment based on a language model according to the present invention. FIG. 2 is a conceptual diagram for explaining a language model-based prescription information provision system according to the present invention, FIGS. 3 and 4 are conceptual diagrams for explaining a large language model used in the present invention, FIGS. 5A and 5B are flowcharts for explaining a language model-based prescription information provision method according to the present invention, and FIGS. 6, 7A, 7B, 7C, 7D, 7E, 8, 9, and 10 are conceptual diagrams for explaining a language model-based prescription information provision method provided in the present invention.

[64] In the present invention, by using a large language model, the prescription information corresponding to the medical service request may be recommended. For example, as illustrated in FIG. 1, in the present invention, a medical service request related to exercise curriculum prescription (e.g., “recommend a 3-week exercise curriculum”, 1) may be received from a medical staff. In the present invention, by using a large language model, an exercise curriculum (2) appropriate for prescribing to a patient according to the medical service request may be recommended. As another example, in the present invention, a prescription medical service request related to a medicine prescription (e.g., “prescribe a medicine for treating a cold symptom in a one-year-old female child”) may be received from a medical staff, and, in response to the request, a large language model may be used to recommend prescription information including a medicine to be prescribed to a patient.

[65] The medical staff may request a prescription information recommendation by inputting minimum information required for the prescription. In the present invention, various information for recommending prescription information corresponding to a service request may be extracted from a medical information server, and a prompt to be input

to the large language model may be generated by using the extracted information, and the prescription information may be searched and recommended by using the language model that has been previously trained with prompts as inputs.

[66] Here, the medical information server may include various medical information necessary for medical activities, or generated in a medical institution, such as an electronic health record (EHR) and an electronic medical record (EMR). In addition, the medical information server may provide medical services such as patient health status diagnosis, prescription, treatment, and management, based on such medical information.

[67] The present invention may provide a service by linking a program (software, etc.) of a prescription information provision system 100 or another medical service. In a case where it is linked to another medical service, the present invention may provide a service in a manner of recommending prescription information through communication with the other medical service, or additionally providing (or extendably providing) a function of the prescription information provision system 100 to the other medical service (e.g., plugin).

[68] Such a medical service may be provided by a medical system. The medical system may include one of an electronic health record (EHR) system, an electronic medical record (EMR) system, an ordering communication system (OCS), a clinical information system (CIS), or a personal health record (PHR) system for a patient.

[69] For example, as illustrated in FIG. 1, in the present invention, when another medical service is provided on a user terminal of the medical staff, an icon (or GUI, Graphical User Interface, 3) linked to the prescription information provision system 100 may be provided. The icon 3 may be provided to the user terminal so as to overlap a screen 10 (e.g., “prescription search screen”) provided by the other medical service. In the

present invention, in response to a selection of the icon 3, a page 4 (or screen) linked to the prescription information provision system 100 may be provided to the medical staff terminal. In this case, in the present invention, a page 4 of the prescription information provision system 100 may be overlapped with a certain region of a screen 10 of another medical service, and through the page 4, a service request 1 for requesting prescription information may be received.

[70] In the present invention, the term “service request (or query)” may include requirements of a medical staff, and through analysis of the service request, and may specify what patient is to be targeted and what prescription is to be desired. In FIG. 1, “recommend a 3-week exercise curriculum” includes a prescription type (exercise curriculum) and a prescription period (or exercise curriculum period 3 weeks), and although not illustrated, “recommend an exercise curriculum for a patient who dislikes repeating the same motion” includes a patient tendency (dislikes repetition of the same motion), and in the present invention, by utilizing a large language model, the prescription information corresponding to the requirements of the medical staff may be searched, recommended, and provided.

[71] Meanwhile, as illustrated in FIG. 2, the prescription information provision system 100 according to the present invention may be configured to include at least one of an input unit 110, a storage unit 120, a communication unit 130, or a control unit 140 that performs a series of controls related to providing prescription information based on a large language model (LLM 142).

[72] The input unit 110 may be configured to receive a service request (prescription information request or query) from a medical staff (U). In the present invention, the service request may be input in various formats such as text, voice, video, or image, and the input unit 110 may perform its function by utilizing a hardware configuration

of a user terminal 20 of the medical staff (U). For example, the input unit 110 may receive a user request through at least one of a keyboard, a mouse, a touch screen, and a microphone of the user terminal 20.

[73] In the present invention, the user terminal may also be referred to as an electronic device, and may include a mobile phone, a smart phone, a laptop computer, a digital broadcasting terminal, a personal digital assistant (PDA), a portable multimedia player (PMP), a navigation device, a slate PC, a tablet PC, an ultrabook, a wearable device (e.g., a smartwatch, a smart glass, or a head-mounted display (HMD)), and the like.

[74] The medical staff (U) may use a user terminal 20 possessed by the medical staff (U) to use a large language model-based prescription information recommendation service provided in the present invention. The medical staff (U) may prescribe the prescription information recommended in the present invention to a patient, and the patient may perform exercise therapy for the patient based on the prescribed prescription information through a user terminal possessed by the patient.

[75] In this case, the user terminal 20 may be understood as a terminal in which a user account of the medical staff (U) is logged in, or a terminal in which a user account of the patient is logged in. Accordingly, in the present invention, the terms “medical staff” and “medical staff account”, and the terms “patient” and “patient account”, may be used interchangeably. In addition, in the present invention, a user terminal of a medical staff (or a user terminal logged in with a medical staff account) may be referred to as a “medical staff terminal”, and a user terminal of a patient (or a user terminal logged in with a patient account) may be referred to as a “patient terminal.”

[76] The storage unit 120 may store various kinds of information required in the prescription information provision system 100 according to the present invention. The storage unit 120 may be provided inside the prescription information provision

system 100 according to the present invention, or may be provided in an external server (or in a database 200 of the external server). In the present invention, the storage unit 120 may be understood as being sufficient as a space in which information required for searching and recommending prescription information based on the large language model 142 is stored, and it may be understood that there is no limitation regarding a physical space. Accordingly, in the present invention, the storage unit 120 may be used interchangeably with a database (DB) or a memory.

[77] Meanwhile, a large language model 142 may include at least one of a prescription information generation unit 142a, a prescription information verification unit 142b, and a training unit 142c. In this case, the prescription information generation unit 142a and the prescription information verification unit 142b may be variously named depending on a type of prescription information requested by the medical staff (for example, exercise or medicine). For example, when there is an exercise curriculum recommendation request, the prescription information generation unit 142a and the prescription information verification unit 142b may also be referred to as an exercise curriculum generation unit and an exercise curriculum verification unit.

[78] The prescription information generation unit 142a may be configured to acquire, as a response from the large language model 142, the prescription information corresponding to the service request, by inputting a prompt generated by a prompt generation unit 141 into the large language model 142. Further, the prescription information verification unit 142b may be configured to verify whether the prescription information generated by the prescription information generation unit 142a corresponds to the request of the medical staff.

- [79] The training unit 142c may be configured to train the large language model 142 so that, from the large language model 142, a prompt corresponding to a service request and prescription information corresponding to the prompt are generated as a response.
- [80] As illustrated in FIG. 4(b), the training unit 142c may construct training data 400 so that appropriate prescription information is recommended to a specific patient according to a role assigned to the prescription information provision system 100. In this case, the training unit 142c may construct the training data 400 by referring to at least one of a patient database (DB) 210, a medical staff database (DB) 220, an exercise database (DB) 230, and a prescription database (DB) 240, so that know-how for prescribing prescription information to a patient, based on actual prescription histories of medical staff, is reflected. The training unit 142c may perform training of the large language model (LLM 142) by using the training data 400. The training data 400 may be composed of sample datasets 410, 420, and 430 of a preset format (data structure).
- [81] A format of the sample datasets 410, 420, and 430 may be predefined so as to include data corresponding to at least one category (attribute or field). As illustrated in FIG. 4(a), the categories may include at least some of: i) a “system role definition” category (C1), ii) a “information of target to be recommended” category (C2), iii) a “recommendation target” category (C3), and iv) a “recommendation result” category (C4).
- [82] The training unit 142c may train the large language model 142 to derive, as a result, at least one of a prompt corresponding to a service request and a response corresponding to the prompt, through learning on the sample datasets 410, 420, and 430.
- [83] For example, the sample datasets 410 and 420 may include: i) data values 411 and 421 corresponding to the “system role definition” category C1, such as: “play the role of a

rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation”, “play the role of a rehabilitation medicine specialist who has worked for 10 years at OO hospital and is in charge of elderly rehabilitation field”, ii) data values 412 and 422 corresponding to the “information of target to be recommended” category C2, such as: “a 34-year-old male, with ankle pain level 6, diagnosed with a simple ankle sprain.”, “a 71-year-old female, with a history of lumbar disc surgery, dislikes exercising for more than 20 minutes, and has average flexibility for her age group”, iii) data values 413 and 423 corresponding to the “recommendation target” category (C3), such as: “recommend a 3-week exercise curriculum.”, “recommend a 10-week exercise curriculum”, and iv) data values 414, 424 corresponding to the “recommendation result” category (C4), such as: “[/INST] [”ankle lift”, ...]”, or “The following exercise curriculum is recommended: waist bending 10 times...”.

[84] In the present invention, for convenience of explanation, the prompt generation unit 141, the prescription information generation unit 142a, the prescription information verification unit 142b, and the training unit 142c may not be separately distinguished, and all of them may be collectively referred to and described as the control unit 140 and the LLM 142.

[85] Meanwhile, the large language model (LLM 142) may be configured to generate, as a response, a prompt corresponding to a service request and an exercise curriculum corresponding to the prompt,

based on the learning performed on the training data 400. Hereinafter, the language model-based recommendation information provision system 100 according to the present invention will be described in more detail with reference to the accompanying drawings. As described above, in the present invention, various types of prescription information (e.g., medicine, exercise, diet plan, consultation, cognitive therapy, etc.)

may be provided, and for convenience of explanation below, a method of recommending “an exercise curriculum (or exercise program)” as the prescription information will be described as an example.

- [86]** In the present invention, a process of receiving a prescription information recommendation request from a medical staff terminal logged in with a medical staff account may be performed (S510, refer to FIG. 5A).
- [87]** The control unit 140 may receive a service request including a user query input by the medical staff, from a user terminal 20 logged in with a medical staff account.
- [88]** As described above, in the present invention, a service request including a user query may be directly received from a medical staff through the prescription information provision system 100, or the service request may be received from the medical staff through another medical service linked to the prescription information provision system 100.
- [89]** For example, the control unit 140 may provide a service page provided by the prescription information provision system 100 to a user terminal of the medical staff, and may receive a service request input by the medical staff on the service page. In another example, as illustrated in FIG. 1, when a function of the prescription information provision system 100 is executed in a state in which another medical service (e.g., screen 10 of another medical service) is provided on the user terminal of the medical staff, the control unit 140 may provide an input field 5 for inputting service request information to the user terminal.
- [90]** In the present invention, the “service request” may include a user query of the medical staff. For example, as illustrated in FIG. 6, a service request 610 may include a user query related to exercise curriculum recommendation, such as “recommend a 3-week

exercise curriculum.” The service request may be composed of various data types such as text, voice, video, image, or signal.

- [91] In the present invention, in response to the request, a process may be performed of extracting, from a server, medical staff meta information of the medical staff linked to the medical staff account, and patient meta information of a patient, who is a treatment target, linked to the medical staff account (S520, refer to FIG. 5A).
- [92] The control unit 140, when the service request is received, may specify a medical staff to prescribe an exercise curriculum and a patient to be prescribed the exercise curriculum. The control unit 140 may generate a system prompt that assigns a role of the specific medical staff to the prescription information provision system 100, and a user prompt that specifies (or describes) a patient to be prescribed the exercise curriculum.
- [93] The control unit 140 may input the system prompt and the user prompt into the large language model 142, and may acquire, as a response, an exercise curriculum recommended by the specific medical staff to the described patient.
- [94] In the present invention, a role of the prescription information provision system 100 may correspond to an actual medical staff or to a virtual medical staff.
- [95] The control unit 140 may specify a role (or persona) of the prescription information provision system based on at least one of the medical staff account or the user query included in the service request.
- [96] The control unit 140 may specify a role of the prescription information provision system 100 based on which user account of a medical staff the service request has been received from. For example, the control unit 140 may specify Doctor A as the role of the prescription information provision system 100, based on the fact that the service request is received from a user account of Doctor A.

- [97]** In addition, the control unit 140 may specify a role of the prescription information provision system 100 through analysis of a user query included in a service request. For example, the control unit 140 may extract, from the user query, information that may specify a medical staff, such as a name, specialty field, or career of the medical staff, and may specify the role of the prescription information provision system 100 based on the extracted information.
- [98]** Furthermore, the control unit 140 may, in a first stage, specify the role of the prescription information provision system 100 based on a user account of the medical staff, and, in a second stage, may modify the role of the prescription information provision system, which was specified in the first stage, based on the user query.
- [99]** More specifically, the control unit 140 may refer to the medical staff database (DB) 220 to check a medical staff corresponding to the user account that requested the service. The control unit 140 may compare information of the medical staff who requested the service (e.g., name, gender, age, career, specialty field, hospital of employment, etc.) with the medical staff corresponding to the user query.
- [100]** As a result of the comparison, when the medical staff who requested the service and the medical staff corresponding to the user query are identical, the control unit 140 may specify the medical staff who requested the service as the role of the prescription information provision system 100. For example, it is assumed a service request, including a user query saying, “as a rehabilitation medicine specialist, recommend an exercise curriculum” from a rehabilitation medicine specialist A, is received. Based on the fact that the specialist A who requested the service and the medical staff included in the user query (“rehabilitation medicine specialist”) are identical, the control unit 140 may specify the role of the prescription information provision system 100 as specialist A.

- [101]** In contrast, as a result of the comparison, when the medical staff who requested the service and the medical staff corresponding to the user query are different, the control unit 140 may specify the role of the prescription information provision system 100 based on the user query. For example, assume that a rehabilitation medicine specialist A sends a service request, “as an orthopedic specialist with 30 years of experience, recommend an exercise curriculum.” The control unit 140 may specify the role of the prescription information provision system 100 as a virtual “orthopedic specialist with 30 years of experience”, not as the rehabilitation medicine specialist A.
- [102]** When the role of the prescription information provision system 100 is specified, the control unit 140 may extract medical staff meta information 620 from the medical staff database (DB) 220 to generate a system prompt to be input into the large language model 142, as illustrated in FIG. 6.
- [103]** In the present invention, the “medical staff meta information” may be understood as information used to implement a role of the prescription information provision system 100, and may be understood as information related to a specific medical staff. For example, the medical staff meta information may include at least one of a specialty field, hospital name, career, age, gender, hospital of employment, or research field of a specific medical staff.
- [104]** When the control unit 140 specifies the medical staff who requested the service as a role of the prescription information provision system 100, the control unit 140 may extract medical staff information matched with the medical staff who requested the service, from the medical staff database (DB) 220, as meta information. Even when the control unit 140 does not receive detailed personal information input by the medical staff who requested the service, the control unit 140 may extract the medical staff meta information from the medical staff database (DB) 220, so that the prescription

information provision system 100 may perform the role of the corresponding medical staff. For example, a rehabilitation medicine specialist A may input a user query such as “recommend an exercise curriculum,” without providing any particular information about himself or herself, and the control unit 140 may extract the medical staff meta information related to specialist A from the medical staff database (DB) and assign the role of specialist A to the prescription information provision system 100.

[105] In addition, the control unit 140 may extract, as meta information, information of other medical staff corresponding to a specific medical staff specified as the role of the prescription information provision system 100, from the medical staff database (DB) 220. For example, the control unit 140 may extract, as meta information, information of other medical staff corresponding to “rehabilitation medicine specialists like Doctor A,” from the medical staff database (DB) 220.

[106] Furthermore, when the control unit 140 specifies a virtual medical staff as the role of the prescription information provision system 100, the control unit 140 may extract medical staff information corresponding to the virtual medical staff, as meta information, from the medical staff database (DB) 220. For example, when a virtual “orthopedic specialist with 30 years of experience” is specified as the role of the prescription information provision system 100, the control unit 140 may refer to the exercise database (DB) 230 and extract various meta information linked to the virtual “orthopedic specialist with 30 years of experience”.

[107] Meanwhile, when the service request is received from a medical staff account, the control unit 140 may specify which patient the service request relates to, among the patients associated with the medical staff account.

[108] The control unit 140 may specify which patient the service request relates to, based on which prescription process the service request is received from. For example, assume

that a prescription page linked to patient B is being provided on the user terminal of the medical staff, and that the service request is received in that state. The control unit 140 may specify that the service request is for the specific patient, based on the fact that the service request is received.

[109] In this case, the control unit 140 may receive patient information such as a name or personal details of the patient, together with the service request.

[110] In addition, the control unit 140 may also specify which patient the service request relates to, through analysis of the user query included in the service request. The user query may include information capable of specifying a patient (e.g., “recommend an exercise curriculum for patient Kim Cheol-Soo”), and the control unit 140 may specify the patient to be prescribed the exercise curriculum from the user query. In another example, the user query may include information capable of specifying an indication or tendency of a patient (e.g., “recommend an exercise curriculum for a patient with an ankle sprain”), and the control unit 140 may specify the patient to be prescribed the exercise curriculum from the user query.

[111] When the control unit 140 specifies the patient to be prescribed the exercise curriculum, the control unit 140 may extract patient meta information 630 from the patient database (DB) 210 to generate a user prompt to be input into the large language model 142, as illustrated in FIG. 6.

[112] In the present invention, the “patient meta information” may be information for describing the patient to whom the exercise curriculum is to be prescribed. For example, the patient meta information may include at least one of: patient tendency (e.g., whether the patient likes to exercise, what kind of personality the patient has,

what lifestyle the patient maintains, etc.), surgical history, age, gender, exercise prescription record, diagnosis name, pain site, pain score, or past exercise.

- [113]** In the present invention, a process of generating a prompt of a preset format may be performed by using the medical staff meta information and the patient meta information (S530, refer to FIG. 5A).
- [114]** The control unit 140 may generate a prompt for deriving an exercise curriculum recommendation response from the large language model, by using at least a part of the user query included in the service request and the extracted meta information.
- [115]** As described above, in the present invention, the prompt may include at least one of a system prompt and a user prompt.
- [116]** In the present invention, the “system prompt” may be an instruction or command for defining (assigning) a role of the prescription information provision system 100, which may be comprised of and defines a persona of a medical staff prescribing the exercise curriculum, and commands the language model to recommend the exercise curriculum according to the defined persona (e.g., “>[INST] <<SYS>> play the role of a rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation”). The role of the server may thus be configured to be defined as the medical staff.
- [117]** Furthermore, the “user prompt” may include a patient profile and patient clinical information that define a target to be recommended (or prescribed) the exercise curriculum by the prescription information provision system 100 (e.g., “<</SYS>> a 34-year-old male, with ankle pain level 6, diagnosed with a simple ankle sprain”). That is, the user prompt may be configured to specify the patient to whom the exercise curriculum is to be recommended and an indication of the patient.

- [118]** The control unit 140 may generate a prompt of a preset format to be input into the large language model, including at least one of the system prompt and the user prompt. The control unit 140 may utilize the preset format prompt and the large language model to assign a specific medical staff role to the prescription information provision system 100, and may acquire, as a response from the large language model having the assigned specific medical staff role, an exercise curriculum for treatment of the indication of the specific patient.
- [119]** In the present invention, the preset format of the prompt may be configured to include at least one category (attribute or field) and a data value corresponding to the category, so as to correspond to the training data (refer to reference numeral 400 in FIG. 4(a)) learned by the large language model.
- [120]** As illustrated in FIG. 6, the categories may include at least some of: i) a “system role definition” category (C1), ii) a “information of target to be recommended” category (C2), or iii) a “recommendation target” category (C3).
- [121]** The control unit 140 may arrange the categories C1, C2, and C3 and the data values 641, 642, and 643 corresponding to the categories according to the preset format, and may generate a prompt 640.
- [122]** Here, the “system role definition” category C1 and the corresponding data value 641 may also be understood, in the present invention, as a “system prompt”, which is a command or instruction for defining a role of the prescription information provision system 100. Further, the category C2 “information of target to be recommended” and the corresponding data value 642 may also be understood, in the present invention, as a “user prompt”, which is information describing the patient to whom the exercise curriculum is to be prescribed (or recommended).

- [123] The control unit 140 may sequentially arrange the specific category and the data value corresponding thereto, so that the large language model 142 may recognize which data value corresponds to which category. For example, as illustrated in FIG. 6, the control unit 140 may sequentially arrange, in succession to the category C1 “system role definition,” the data value 641 “play the role of a rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation,” and may generate the prompt 640. The large language model 142 receiving the prompt 640 may recognize that the data value 641 “play the role of a rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation” belongs to the category C1 “system role definition”.
- [124] In addition, the control unit 140 may generate the data values 641, 642, and 643 corresponding to the categories C1, C2, and C3 by using keywords matched with the categories. For example, the data value 641 corresponding to the category C1 “system role definition” may include a keyword “role 641a,” and the data value 642 corresponding to the category C2 “information of target to be recommended ” may include a keyword of indication name (e.g., “ankle sprain,” 642a). Further, the data value 643 corresponding to the category C3 “recommendation target” may include the keyword “recommendation 643a.”
- [125] Meanwhile, in the preset prompt 640, the category C3 “recommendation target” and the corresponding data value 643 may include a script corresponding to the target to be recommended. The control unit 140 may generate the data value 643 corresponding to the recommendation target category by using the user query included in the service request 610 (e.g., “recommend a 3-week exercise curriculum”).
- [126] The control unit 140 may analyze the user query, may analyze an intention for the service request, and may analyze (figure out or understand) what intention the medical

staff had when requesting the service. The control unit 140 may utilize at least one of various artificial intelligence technologies for intent analysis of a service request. For example, the artificial intelligence technologies may include at least one of machine reading comprehension (MRC), paraphrasing, abstract summarization, text generation (TG), question generation (QG), natural language understanding (NLU), OCR-NLP (Textandng), or natural language-based query (NL2SQL).

[127] In the present invention, a process of acquiring the exercise curriculum may be performed by using the large language model (LLM) that receives the prompt as input (S540, refer to FIG. 5A). Further, in the present invention, a process of providing the acquired prescription information to the medical staff terminal may be performed (S550, refer to FIG. 5A).

[128] The large language model 142 may be understood as a language model trained to generate an exercise curriculum according to a patient condition and requirements of medical staff, based on the training data 400.

[129] The control unit 140 may input-process the prompt including the system prompt and the user prompt into the large language model, may assign a specific medical staff role to the prescription information provision system 100, and may generate, as the specific medical staff, an exercise curriculum for a patient.

[130] For example, as illustrated in FIG. 6, the control unit 140 may input-process, into the large language model, a data value (for example, “play the role of a rehabilitation medicine or orthopedic specialist who recommends exercises for patient rehabilitation,” 641) corresponding to the category C1 “system role definition,” so as to assign to the prescription information provision system 100 a role according to the data value. Further, the control unit 140 may, based on a data value corresponding to the category C2 “information of target to be recommended” (for example, “a 34-year-

old male, with ankle pain level 6, diagnosed with a simple ankle sprain,” 642), specify a patient to be prescribed the exercise curriculum, and may input the prompt into the large language model 142 so that the exercise curriculum according to the data value 643 corresponding to the category C3 “recommendation target” is recommended for the specific patient.

[131] The control unit 140 may utilize the large language model 142 and the prompt to generate, as the specific medical staff, an appropriate exercise curriculum considering the indication condition of the patient.

[132] As described above, in the present invention, “the exercise curriculum” may include at least one exercise item and an exercise method of the exercise item (e.g., exercise schedule, exercise order, exercise frequency, exercise time, etc.). Further, the term “exercise item” may mean an exercise motion or an exercise type.

[133] The control unit 140 may search, from the exercise database (DB) 230, for an exercise item necessary for the treatment of the indication of the patient who is to be prescribed the exercise curriculum. In this case, the control unit 140 may, based on the role of the prescription information provision system 100 included in the prompt and in consideration of the indication, tendency, age, gender, and the like of the patient described in the prompt, search for at least one exercise item necessary for the treatment of the indication of the patient.

[134] In the exercise database (DB) 230 of the present invention, a plurality of exercise items, difficulty levels of each exercise item, description information, exercise videos, and exercise methods may be matched with each other, at least in part. The exercise database (DB) 230 may include a plurality of exercise items grouped based on an indication, and for each of the plurality of exercise items, description information regarding the name, exercise method, exercise effect, and the like may be matched.

- [135]** The control unit 140 may generate an exercise curriculum for a patient by using the searched plurality of exercise items. In this case as well, the control unit 140 may, based on the role of the prescription information provision system 100 and the description of the patient, generate an exercise curriculum including the exercise order, exercise time, exercise date, exercise frequency, exercise method, and the like of the plurality of exercise items for the treatment of the indication of the patient.
- [136]** The large language model 142, based on the training data 400, may search, among all the exercise items included in the exercise database (DB) 230, the exercise items reflecting the patient condition, exercise prescription situation, requirements of medical staff, and the like, and may generate an appropriate exercise curriculum with the searched exercise items. More specifically, the large language model may be trained, as the role defined by the system prompt, to generate an exercise curriculum for the treatment of the indication of the patient specified by the user prompt, for a preset prescription period.
- [137]** The large language model 142 may refer to the exercise database (DB) 230, search at least one exercise item, and generate an exercise curriculum by assigning the exercise items to each of a plurality of different days (Days) constituting the preset prescription period.
- [138]** The control unit 140 may specify the prescription period from the service request. The control unit 140 may, when the service request (e.g., “prescribe an exercise curriculum for three weeks”) includes the prescription period, specify the corresponding period as the prescription period of the exercise curriculum. In addition, the control unit 140, based on the service request and the patient meta information specified from the patient database (DB) 210, may specify an appropriate prescription period for prescribing the exercise curriculum to the patient.

- [139]** As illustrated in FIG. 6, the control unit 140 may acquire a target dataset 650 from the large language model 142, in which the prompt and a result (exercise curriculum) corresponding to the prompt are included as a pair. More specifically, the target dataset 650 may include: i) a data value 651 corresponding to the category C1 “system role definition”, ii) a data value 652 corresponding to the category C2 “information of target to be recommended”, iii) a data value 653 corresponding to the category C3 “recommendation target”, and iv) a data value 654 corresponding to the category C4 “recommendation result”. Here, the data value 654 corresponding to the category C4 “recommendation result” (e.g., “[/INST] [”ankle lift”, ...]”) may include information about the exercise curriculum according to the prompt.
- [140]** In the present invention, the fact that the exercise curriculum (or response) corresponding to the prompt has been acquired from the large language model may be understood as having acquired the target dataset 650, or the data value 654 corresponding to the category C4 “recommendation result” included in the target dataset 650.
- [141]** Meanwhile, in the present invention, in the exercise database (DB) 230, the exercise items for the treatment of the indication may be group-matched for each indication, and each of the exercise items for the treatment of the indication may be matched with exercise difficulty level information.
- [142]** The control unit 140, according to the prompt, may control the large language model 142 to search from the exercise database (DB) 230 exercise items for the treatment of the indication of the patient, to assign the searched exercise items respectively to different days (Days) or weeks constituting the preset exercise period, and to generate the exercise curriculum.

- [143] In this case, the control unit 140, according to the prompt, may further consider at least one of the exercise curriculum prescription history of the medical staff, the age of the patient, the gender of the patient, and the exercise tendency of the patient, and may control the large language model to search the exercise items, to assign the searched exercise items, and to generate the exercise curriculum.
- [144] Meanwhile, the control unit 140, in response to the occurrence of an approval event in the medical staff account with respect to the exercise curriculum, may transmit the prescription information to at least one medical system linked to the server.
- [145] As described above, in the present invention, the medical system may include any one of an electronic health record (EHR) system, an electronic medical record (EMR) system, an ordering communication system (OCS), a clinical information system (CIS), or a personal health record (PHR) system for a patient.
- [146] The control unit 140 may receive, in a state where a page of the at least one medical system is provided to the medical staff terminal. In this case, the control unit 140 may transmit the prescription information to the medical system so that the prescription information is output on a page of at least one medical system.
- [147] More specifically, the control unit 140, based on the response acquired from the large language model, may generate prescription information recommendation information (also referred to as a report) corresponding to service request information of the medical staff. Further, the control unit 140 may provide the prescription information recommendation information to the user terminal of the medical staff.
- [148] As described above, the prescription information provision system 100 according to the present invention may provide various types of prescription information (e.g., medicine, medical device, medical test, treatment, exercise curriculum, exercise program, exercise plan, cognitive therapy, diet plan, consultation, etc.) as

recommendation information. For example, as illustrated in FIG. 7A, based on receiving a medicine prescription request from the medical staff, the control unit 140 may generate a prompt 700a for medicine prescription information recommendation. Further, the control unit may provide, to the medical staff, the prescription information 700 including an appropriate medicine to be prescribed to the patient, by inputting the prompt 700a into the large language model 142. As another example, as illustrated in FIG. 7B, based on receiving an exercise curriculum prescription request from the medical staff, the control unit 140 may generate a prompt 710a for exercise curriculum prescription information recommendation. Further, the control unit 140 may provide, to the medical staff, the prescription information 710 including the exercise curriculum to be prescribed to the patient, by inputting the prompt 710a into the large language model 142.

[149] Meanwhile, the control unit 140 may generate the format of the prescription information in various types (kinds, formats, or attributes). For example, the control unit 140 may provide the exercise curriculum recommendation information as at least one of: a prescription type (refer to reference numerals “700” in FIG. 7A and 710 in FIG. 7B), a different medical service type (refer to reference numeral “720” in FIG. 7C), a medical service type of the prescription information provision system (100) (refer to reference numeral “730” in FIG. 7D), or a medical service type provided to a patient (e.g., an application type installed in a patient terminal, refer to reference numeral “740” in FIG. 7E).

[150] The control unit 140, based on the user query included in the service request (e.g., “show the exercise curriculum in a prescription-type report”), may specify in which type of recommendation information the exercise curriculum is to be provided.

- [151] In addition, the control unit 140, based on the medical service (e.g., another medical service, the medical service of the prescription information provision system 100, etc.) that is provided (or executed) on the medical staff terminal, may specify the type of recommendation information of the exercise curriculum. That is, the control unit 140 may provide the exercise curriculum in the same format (or chart) as the service page that the medical staff is currently receiving.
- [152] Once the control unit 140 has specified in which type of recommendation information the exercise curriculum is to be provided to the medical staff, the control unit 140 may generate a prompt such that the exercise curriculum according to the specified recommendation information type is acquired from the large language model 142.
- [153] The control unit 140 may generate a prompt so that information about the recommendation information type of the exercise curriculum is included. Further, the control unit 140, based on the prompt, may control the large language model so that the exercise curriculum of the specified recommendation information type is acquired.
- [154] For example, it is assumed that the service request includes a user query that specifies the recommendation information type as “prescription.” As illustrated in FIG. 7B, the control unit 140 may include, in the prompt 710a input to the large language model, an instruction 710b indicating an exercise curriculum of “prescription” type (e.g., “show the exercise curriculum as a prescription-type report”).
- [155] As another example, it is assumed that another medical service (e.g., an EHR medical service or an EMR medical service) is being provided on the medical staff terminal. As illustrated in FIG. 7C, the control unit 140 may include, in the prompt 720a input to the large language model, an instruction 720b indicating an exercise curriculum of

“another medical service” type (e.g., “input it into the EMR system chart and show the exercise curriculum”).

[156] As another example, it is assumed that the medical service of the prescription information provision system 100 is being provided on the medical staff terminal. As illustrated in FIG. 7D, the control unit 140 may include, in the prompt 730a input to the large language model, an instruction 730b indicating an exercise curriculum of “the medical service type of the prescription information provision system 100” (e.g., “show the exercise curriculum of medical staff digital therapeutic prescription”).

[157] Further, the control unit 140 may control so that the exercise curriculum obtained from the large language model is provided on a patient terminal that is not the terminal of the medical staff. As illustrated in FIG. 7E, the control unit 140 may generate a prompt 740a so that an instruction 740b (“show it in a patient application”) is included, whereby the exercise curriculum is provided on the patient terminal.

[158] The control unit 140 may acquire, according to the prompt input to the large language model, exercise curriculums having various types. As described above, the control unit 140 may acquire, from the large language model, information about the exercise curriculum or a target dataset including the exercise curriculum.

[159] In such an exercise curriculum or target dataset, different data may be included depending on in which recommendation information type the exercise curriculum is provided. The control unit 140, based on the data acquired from the large language model, may recommend the exercise curriculum to the medical staff terminal in various types.

[160] For example, as illustrated in FIG. 7B, the control unit 140 may provide the exercise curriculum 711 in the prescription type 710. Also, as illustrated in FIG. 7C, the control unit 140, by linking with another medical service (e.g., an EHR medical service

or an EMR medical service), may output the exercise curriculum 721 to another medical service type (e.g., a patient prescription information chart, etc., 720). Also, as illustrated in FIG. 7D, the control unit 140 may recommend the exercise curriculum 731 in the format of the medical service type 730 provided by the prescription information provision system 100 (e.g., digital therapeutic). In addition, as illustrated in FIG. 7E, the control unit 140 may control so that the exercise curriculum 741 is output to the patient terminal in an application type 740 installed in the patient terminal.

- [161]** Meanwhile, the control unit 140 may perform verification on the prescription information in order to secure reliability of the prescription information.
- [162]** The control unit 140 may perform verification on whether the exercise program satisfies a preset verification criterion. As a result of the verification, when the preset verification criterion is not satisfied, the control unit 140 may regenerate the prescription information based on the prompt and the language model. The preset verification criterion may be related to at least one of a degree of relevance with the treatment of the indication of the patient, a difficulty level of the exercise item included in the prescription information, the age of the patient, or the exercise tendency of the patient.
- [163]** More specifically, as illustrated in FIG. 8, the control unit 140 may utilize the large language model to generate the prescription information (S810). The control unit 140 may perform verification on the generated prescription information.
- [164]** The control unit 140 may verify whether the prescription information generated from the large language model corresponds to the treatment of the disease of the patient and may determine whether such verification is completed (S820).

- [165]** As a result of the determination, based on that the verification of the prescription information has been completed, the control unit 140 may provide the corresponding prescription information to at least one of the medical staff or the patient (S821, S830). In this case, the control unit 140, based on that a confirmation (or medical staff verification information reception) regarding the verified prescription information has been completed from the medical staff account, may provide the verified prescription information to a patient account (or patient terminal).
- [166]** Conversely, when the control unit 140, based on the verification result, determines that the prescription information does not correspond to the treatment of the indication of the patient, the control unit 140 may utilize the large language model to generate new prescription information (S822, S840). The control unit 140 may perform verification of other prescription information, and may determine, based on the verification result, whether to provide the other prescription information to at least one of the medical staff or the patient. In this case, the control unit 140 may receive, from the medical staff account, a regeneration request for the prescription information (S822), and, based on the received regeneration request, may re-perform the above-described series of processes so that other prescription information, different from the previous prescription information, is generated.
- [167]** The method of verifying the prescription information may vary. The control unit 140, by referring to the databases (at least one of patient database (DB) 210, medical staff database (DB) 220, exercise database (DB) 230, and prescription database (DB) 240), may check a treatment progress of the actual patient according to the prescription information. The control unit 140, based on the checking result that the treatment progress of the patient's indication according to the prescription information is improved, may verify that the prescription information corresponds to the treatment of

the patient's indication. Conversely, the control unit 140, based on the checking result that the treatment progress of the patient's indication according to the prescription information is worsened, may verify that the exercise curriculum does not correspond to the treatment of the patient's indication.

[168] Meanwhile, the verification of the exercise curriculum may be performed by the medical staff. As illustrated in FIG. 9(a), the control unit 140 may provide the exercise curriculum 911 in a specific region 910 of the user terminal of the medical staff. Further, the control unit 140 may provide, around the exercise curriculum 911, a function icon for receiving a prescription request for an exercise curriculum (e.g., "prescribe as it is," 912) and a function icon for receiving another exercise curriculum request (e.g., "receive another exercise curriculum recommendation," 913).

[169] The control unit 140, based on that the function icon 912 linked to the prescription request is selected from the user terminal of the medical staff, may prescribe the exercise curriculum 911 to the patient.

[170] On the other hand, the control unit 140, based on that the function icon 913 linked to another exercise curriculum request is selected from the user terminal of the medical staff, may use the prompt to generate another exercise curriculum different from the exercise curriculum 911.

[171] The control unit 140, based on receiving the other exercise curriculum recommendation request from the medical staff terminal, may use the prompt and the large language model 142 to acquire another exercise program different from the exercise program.

[172] In this case, the control unit 140 may exclude one of the exercise items from the exercise program, and, on the exercise database (DB) 230, may include, in the exercise program, another exercise item that is matched with the same group as the excluded

exercise item and that is matched with the same difficulty level information, thereby updating the exercise curriculum and acquiring another exercise curriculum.

[173] More specifically, the control unit 140, by inputting into the large language model the prompt that was used to generate the exercise curriculum 911, may acquire another exercise curriculum from the large language model 142. The large language model, when the same prompt is input, may generate an exercise curriculum that is different from the previously generated exercise curriculum. In this case, the control unit 140 may regenerate another exercise curriculum in which at least one of the exercise items, exercise order, exercise time, exercise frequency, and exercise method included in the previously generated exercise curriculum is different.

[174] Further, the control unit 140 may receive, from the medical staff, a request for modification (replacement or substitution) of at least one exercise item 911a among the plurality of exercise items included in the exercise curriculum 911. As illustrated in FIG. 9(a), in a state where a specific exercise item 911a among the plurality of exercise items included in the exercise curriculum 911 is selected, based on that the function icon 913 linked to the other exercise curriculum request is selected, the control unit 140 may receive, from the user terminal of the medical staff, a modification request for the specific exercise item 911a. The control unit 140, in response to the modification request, may change the specific exercise item 911a to another exercise item 911b. Meanwhile, although in FIG. 9(a) all the plurality of exercise items included in the exercise curriculum 911 are illustrated as being identical, it is apparent that the plurality of exercise items may be different from each other.

[175] As illustrated in FIG. 9(b), the control unit 140, in response to the replacement request for the specific exercise item 911a, may generate a prompt 920 that commands (or instructs) the modification of the specific exercise item. More specifically, the

control unit 140 may modify the prompt 920 such that the target exercise item to be changed 921a is specified, for example, by modifying the data value 921 of the category C3 “recommendation target” in the preset-format prompt to be “recommend another exercise curriculum. Replace ‘heel raise with chair support’ with another exercise.”

[176] The control unit 140 may input the modified prompt 920 into the large language model, and may acquire another exercise curriculum in which the specific exercise item has been changed. The control unit 140 may control the large language model such that, by searching, from the exercise database (DB) 230, another exercise item having the same treatment objective of the indication and the same difficulty level as the target exercise item to be changed, the exercise curriculum is regenerated with the searched another exercise item included in place of the target exercise item to be changed.

[177] As illustrated in FIG. 9(c), in the exercise database (DB) 230, each exercise item 932 may be matched with an indication 931 and a difficulty level 933. For example, the indication “ankle sprain” 931a may be matched with the exercise items such as “heel raise with chair support” 932a, “ankle movement while standing” 932b, and “passive ankle dorsiflexion” 932c, and each of the exercise items 932a through 932c may be matched with respective difficulty level information 933a through 933c. The control unit 140, by referring to the exercise database (DB) 230, may control the large language model 142 to generate a new exercise item by including, in place of the target exercise item to be changed (“heel raise with chair support,” 932a), another exercise item (“ankle movement while standing,” 932b) that has the same indication (“ankle sprain,” 931a) and the same difficulty level (e.g., “difficulty level 1,” 933a, 933b).

- [178]** Meanwhile, the control unit 140 may use various kinds of information to generate a prompt and may acquire, from the large language model, the exercise curriculum to be prescribed to the patient by using the prompt.
- [179]** As described above, the control unit 140 may use the medical staff meta information to specify the role of the prescription information provision system 100, and may use the patient profile and the patient clinical information to specify the patient to be prescribed (or recommended) the exercise curriculum. In addition, the control unit 140 may use various kinds of information necessary for an optimal exercise curriculum recommendation, including the prescription history previously prescribed by the medical staff, the feedback information received from the medical staff, the patient tendency information, and the like.
- [180]** The control unit 140 may generate a prompt of a preset format by using various kinds of information. In the present invention, the prompt may include at least a part of i) the category “system role definition” (C1), ii) the category “information of target to be recommended” (C2), or iii) the category “recommendation target” (C3). The control unit 140 may configure the above plurality of categories C1, C2, and C3 by using various kinds of information. For example, the control unit 140 may use the patient tendency information to configure the data value of the category C2 “information of target to be recommended”. Further, the control unit 140 may generate a prompt by also including, in addition to the categories C1, C2, and C3, a new category and a data value corresponding to the new category.
- [181]** For example, as illustrated in FIG. 10, the control unit 140 may extract, from at least one of the medical staff database (DB) 220 and the prescription database (DB) 240, the past prescription history information 1010 of the medical staff who requested the service (e.g., prescription contents, prescription reason, post-prescription progress

observation information, etc.). Further, the control unit 140 may use the past prescription history information 1010 of the medical staff who requested the service to configure the data value 1020 corresponding to the category C5 “system prescription history.” In this case, the control unit 140 may also use the past prescription history information 1010 of the medical staff to configure the data value corresponding to the category “system role definition” C1.

[182] In another example, the control unit 140 may extract, from at least one of the patient database (DB) 210 and the user query, the patient tendency information 1030, and may use the extracted patient tendency information to configure the data value 1040 of the category C2 “information of target to be recommended.” (e.g., “this patient dislikes repeating the same motion many times”).

[183] As described above, the control unit 140 may generate the prompt 1050 by using various kinds of information, and may acquire, by inputting the prompt 1050 into the large language model, a patient-customized exercise curriculum. As described earlier, the control unit 140 may also acquire the target data set 1060 consisting of the plurality of categories and the data values corresponding to the respective categories.

[184] As described above, a language model-based exercise curriculum recommendation method and system according to the present invention may receive an exercise curriculum recommendation request from a medical staff terminal logged in with a medical staff account, and, in response to the request, may extract medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient, who is a treatment target linked to the medical staff account, from a server, and may generate a prompt in a preset format by using the medical staff meta information and the patient meta information. Through this, in the present

invention, a large language model may recommend an appropriate exercise curriculum by considering the patient condition from the viewpoint of the medical staff.

[185] Further, the language model-based exercise curriculum recommendation method and system according to the present invention may acquire the exercise curriculum by using a large language model (LLM) that receives the prompt as input, and, by providing the acquired exercise curriculum to the medical staff terminal, information of the patient and requirements of the medical staff are input into the large language model, so that an appropriate exercise curriculum may be recommended, and the recommended exercise curriculum may be reflected in the medical system.

[186] Meanwhile, the computer-readable medium includes all kinds of recording devices for storing data readable by a computer system. Examples of computer-readable media include hard disk drives (HDDs), solid state disks (SSDs), silicon disk drives (SDDs), ROMs, RAMs, CD-ROMs, magnetic tapes, floppy discs, optical data storage devices, and the like.

[187] Further, the computer-readable medium may be a server or cloud storage that includes storage and that the electronic device is accessible through communication. In this case, the computer may download the curriculum according to the present invention from the server or cloud storage, through wired or wireless communication.

[188] Further, in the present invention, the computer described above is an electronic device equipped with a processor, that is, a central processing unit (CPU), and is not particularly limited to any type.

[189] Meanwhile, it should be appreciated that the detailed description is interpreted as being illustrative in every sense, not restrictive. The scope of the present invention should be determined on the basis of the reasonable interpretation of the appended claims, and all of the alterations within the equivalent scope of the present invention belong to the

scope of the present invention.

【CLAIMS】

【Claim 1】

A language model-based prescription information provision method, comprising:

receiving, from a medical staff terminal logged in with a medical staff account, a prescription information recommendation request;

in response to the request, extracting, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account;

generating, by using the medical staff meta information and the patient meta information, a prompt of a preset format;

acquiring the prescription information by using a large language model (LLM) that receives the prompt as input; and

providing the acquired prescription information to the medical staff terminal.

【Claim 2】

The language model-based prescription information provision method of claim 1, further comprising:

in response to an approval event for the prescription information occurring in the medical staff account, transmitting the prescription information to at least one medical system linked to the server,

wherein the at least one medical system comprises one of an electronic health record (EHR) system, an electronic medical record (EMR) system, an ordering communication system (OCS), a clinical information system (CIS), and a personal health record (PHR) system for a patient.

【Claim 3】

The language model-based prescription information provision method of claim 2, wherein the prescription information recommendation request is received in a state where a page of the at least one medical system is provided to the medical staff terminal, and

wherein, in the transmitting of the prescription information, the prescription information is output on the page of the at least one medical system.

【Claim 4】

The language model-based prescription information provision method of claim 1, wherein the preset prompt includes a system prompt and a user prompt,

wherein the system prompt defines a role of the server as the medical staff, and

wherein the user prompt specifies the patient to whom the prescription information is to be recommended and an indication of the patient.

【Claim 5】

The language model-based prescription information provision method of claim 4, wherein in an exercise database (DB) of the server, exercise items for treatment of the indication are group-matched for each indication,

wherein each of the exercise items for treatment of the indication is matched with exercise difficulty level information, and

wherein in the acquiring of the prescription information, the exercise items for treatment of the indication are searched from the exercise database (DB), and the searched exercise items are assigned respectively to different days constituting a preset exercise period, so as to prescribe an exercise program.

【Claim 6】

The language model-based prescription information provision method of claim 5, wherein the searching of the exercise item is performed by considering at least one of: a

prescription information or prescription history from the medical staff, an age of the patient, a gender of the patient, and an exercise tendency of the patient.

【Claim 7】

The language model-based prescription information provision method of claim 5, further comprising:

based on receiving another prescription information recommendation request from the medical staff terminal, acquiring, by using the prompt, prescription information different from the prescription information,

wherein, in the acquiring of the different prescription information, one of the exercise items is excluded from the exercise program, and another exercise item that is matched in a same group as the excluded exercise item and is matched with same difficulty level information is included in the prescription information.

【Claim 8】

The language model-based prescription information provision method of claim 1, further comprising:

performing verification on whether the prescription information satisfies a preset verification criterion; and

when the preset verification criterion is not satisfied as a result of the verification,

regenerating the prescription information based on the prompt and the language model,

wherein the preset verification criterion is related to at least one of a degree of relevance with a treatment of the indication of the patient, a difficulty level of the exercise item included in the prescription information, an age of the patient, or an exercise tendency of the patient.

【Claim 9】

A language model-based prescription information provision system, comprising:

a communication unit configured to receive, from a medical staff terminal logged in with a medical staff account, a prescription information recommendation request; and

a control unit configured to extract, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account, in response to the request,

wherein the control unit is configured to:

generate, by using the medical staff meta information and the patient meta information, a prompt of a preset format;

acquire the prescription information by using a large language model (LLM) that receives the prompt as input; and

provide the acquired prescription information to the medical staff terminal.

【Claim 10】

A program stored in a computer-readable recording medium, executed by one or more processes in an electronic device,

wherein the program comprises instructions to perform:

receiving, from a medical staff terminal logged in with a medical staff account, a prescription information recommendation request;

in response to the request, extracting, from a server, medical staff meta information of a medical staff linked to the medical staff account and patient meta information of a patient who is a treatment target linked to the medical staff account;

generating, by using the medical staff meta information and the patient meta information, a prompt of a preset format;

acquiring the prescription information by using a large language model (LLM) that receives the prompt as input; and

providing the acquired prescription information to the medical staff terminal.