

METHOD AND SYSTEM FOR MANAGING HEALTH RISK OF MEMBERS OF A POPULATION

TECHNICAL FIELD

[0001] The present invention relates generally to the field of health care and, more particularly, to a method and a system for managing health risk of members of a population.

BACKGROUND

[0002] The following discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that the discussion is not an acknowledgment or admission that any of the material referred to was published, known or part of the common general knowledge in any jurisdiction as at the priority date of the application.

[0003] Many government and healthcare organizations offer free or subsidized health intervention programs to improve public health, yet these programs are often underutilized. Many members of a population fail to participate in these programs due to lack of awareness, time constraints, or lack of perceived urgency. As a result, a large segment of high-risk individuals remains undiagnosed or untreated, leading to delayed interventions, increased healthcare costs, and poorer patient outcomes.

[0004] Healthcare providers are increasingly adopting data-driven approaches to address these challenges. However, conventional health management systems cannot handle large-scale, proactive population screening. These systems suffer from inflexibility, lack of automation, and difficulty integrating diverse health data sources such as Electronic Health Records (EHRs), medical imaging scans, and patient-reported data. For instance, healthcare facilities may be tasked with managing population segments comprising millions of patients, a scale that exceeds the capabilities of most existing systems. Furthermore, traditional processing logic is often tied to specific data formats or structures, which restricts the ability to integrate diverse and continuously evolving data sources. These limitations hinder healthcare facilities from efficiently identifying

eligible individuals, engaging high-risk members, and monitoring the outcomes of intervention programs.

[0005] There is, therefore, a need in the present state of art to address these challenges by enabling healthcare facilities to effectively manage population health by identifying eligible individuals for health intervention programs, stratifying them based on their risk levels, notifying high-risk individuals for health checks, and monitoring updated health data to assess the effectiveness of the programs.

[0006] Accordingly, the present invention attempts to address or to overcome at least some of the aforementioned problems.

SUMMARY OF THE INVENTION

[0007] In one embodiment, a method of managing patients' health is disclosed. In one example, the method includes receiving a query by a user on the user interface, identifying by a processor via at least one AI agent in response to the query by the user a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database. The method further includes notifying the patient having the high-risk profile by the processor via the at least one AI agent. The method further includes facilitating onboarding of the patient in response to notifying. Further, the method includes receiving multimedia data associated with the patient via one or more external devices upon onboarding. The method further includes processing the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data. Further, the method includes analysing the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition. The method further includes displaying the summarized report to at least one of the patient and a healthcare professional.

[0008] In an aspect, the EHR includes medical information of the patient, and wherein the medical information includes personal details, medical history, medical history of one or more family members, lab and test results, medications, treatment plans, and health and lifestyle information.

[0009] In an aspect, identifying the patient having the high-risk profile includes: retrieving the EHR corresponding to a plurality of patients maintained in the database, the EHR is retrieved based on a plurality of parameters corresponding to the query by the user; analysing the EHR to identify one or more medical conditions associated with each of the plurality of patients; generating a risk report for each of the plurality of patients based on the identification of the one or more medical conditions, the risk report includes information about the one or more medical conditions of each of the plurality of patients; and determining a risk profile for each of the plurality of patients based on the risk report, the risk profile is one of the high-risk profile, a medium-risk profile, and a low-risk profile.

[0010] In an aspect, notifying the patient includes determining a set of notification parameters corresponding to the patient based on the query by the user, the set of notification parameters comprises at least one communication channel, a timeslot, and a selected risk profile, and sending a notification to a user device of the patient based on the set of notification parameters.

[0011] In an aspect, facilitating the onboarding of the patient includes sending a set of questionnaires to the patient, the set of questionnaires comprises one or more health-specific queries and one or more appointment-specific queries; receiving a response corresponding to each of the set of questionnaires from the patient; and scheduling an appointment of the patient in response to receiving the response.

[0012] In an aspect, at least one AI agent is configured to generate the risk report for the patient based on a plurality of patterns learned from a training dataset, and the training dataset includes historical diagnostic reports associated with a plurality of patients.

[0013] In an aspect, storing the summarized report associated with the patient in the database for future analysis of the at least one medical condition of the patient.

[0014] In an aspect, the multimedia data includes a plurality of digital images captured using the one or more external systems, and wherein the plurality of digital images comprises Computed Tomography (CT) scans, X-Rays, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET).

[0015] In an aspect, the summarized report is used by the healthcare professional to perform a set of actions. The set of actions includes tracking a progress of the patient on the at least one medical condition, and determining a next course of treatment for the patient based on a current state of the at least one medical condition.

[0016] In an aspect, the at least one AI agent is a screening AI agent, a scheduling AI agent, and a medical imaging screening agent.

[0017] In another embodiment, a system for managing patients' health is disclosed. In one example, the system includes a processor, and a memory communicatively coupled to the processor. The memory stores processor-executable instructions, which, on execution, cause the processor to receive a query by a user on the user interface and identify, via at least one AI agent in response to the query by the user, a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database. Further, the processor-executable instructions, on execution, further cause the processor to notify the patient having the high-risk profile. Further, the processor-executable instructions, on execution, further cause the processor to facilitate onboarding of the patient in response to notifying. Further, the processor-executable instructions, on execution, further cause the processor to receive multimedia data associated with the patient via one or more external devices upon onboarding. Further, the processor-executable instructions, on execution, further cause the processor to process the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data. Further, the processor-executable instructions, on execution, further cause the processor to analyse the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition. Further, the processor-executable instructions, on execution, further cause the processor to display the summarized report to at least one of the patient and a healthcare professional.

[0018] In yet another embodiment, a non-transitory computer-readable medium storing computer-executable instructions for managing patients' health, the computer-executable instructions are configured for receiving a query by a user on the user interface, identifying via at least one AI agent in response to the query by the user a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a

database. The computer-executable instructions further configured for notifying the patient having the high-risk profile. The computer-executable instructions further configured for facilitating onboarding of the patient in response to notifying. The computer-executable instructions further configured for receiving multimedia data associated with the patient via one or more external devices upon onboarding. The computer-executable instructions further configured for processing the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data. The computer-executable instructions further configured for analysing the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition. The computer-executable instructions further configured for displaying the summarized report to at least one of the patient and a healthcare professional.

[0019] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. The dimensions of the various features or elements may be arbitrarily expanded or reduced for clarity. In the following description, various embodiments of the invention are described with reference to the following drawings, in which:

[0021] FIG. 1 illustrates a block diagram of an exemplary system for managing patients' health, in accordance with some embodiments.

[0022] FIG. 2 illustrates a functional block diagram of various Artificial Intelligence (AI) agents of the exemplary system for managing patients' health, in accordance with some embodiments.

[0023] FIG. 3 illustrates an exemplary method for managing patients' health, in accordance with some embodiments.

[0024] FIG. 4 is a block diagram depicting an overview of various components of the system for managing patients' health, in accordance with some embodiments.

[0025] FIG. 5 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0026] FIG. 6 illustrates an exemplary block diagram of various components of the system for managing patients' health, in accordance with some embodiments.

[0027] FIG. 7 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0028] FIG. 8 illustrates an exemplary block diagram of various components of the system for managing patients' health, in accordance with some embodiments.

[0029] FIG. 9 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0030] FIG. 10 illustrates an exemplary block diagram of various components of the system for managing patients' health, in accordance with some embodiments.

[0031] FIG. 11 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0032] FIG. 12 illustrates an exemplary block diagram of various components of the system for managing patients' health, in accordance with some embodiments.

[0033] FIG. 13 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0034] FIG. 14 illustrates an exemplary block diagram of various components of the system for managing patients' health, in accordance with some embodiments.

[0035] FIG. 15 illustrates an exemplary process flow of the system for managing patients' health, in accordance with some embodiments.

[0036] FIG. 16 is a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure.

DETAILED DESCRIPTION

[0037] The following detailed description refers to the accompanying drawings that show, by way of illustration, specific details and embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. Other embodiments may be utilized and structural, and logical changes may be made without departing from the scope of the invention. The various embodiments are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments.

[0038] Reference throughout this specification to “one embodiment,” “an embodiment,” “one example,” or “an example” means that a particular feature, structure, or characteristic described in connection with the embodiment or example is included in at least one embodiment of the present disclosure. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” “one example,” or “an example” in various places throughout this specification are not necessarily all referring to the same embodiment or example. Furthermore, the particular features, structures, databases, or characteristics may be combined in any suitable combinations and/or sub-combinations in one or more embodiments or examples. In addition, it should be appreciated that the figures provided herewith are for explanation purposes to persons ordinarily skilled in the art and that the drawings are not necessarily drawn to scale.

[0039] The ensuing description provides exemplary embodiments only, and is not intended to limit the scope, applicability, or configuration of the disclosure. Rather, the ensuing description of the exemplary embodiments will provide those skilled in the art with an enabling description for implementing an exemplary embodiment. It should be understood that various changes may be

made in the function and arrangement of elements without departing from the spirit and scope of the disclosure as set forth.

[0040] Specific details are given in the following description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits, systems, networks, processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail in order to avoid obscuring the embodiments.

[0041] Also, it is noted that individual embodiments may be described as a process that is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process is terminated when its operations are completed but could have additional steps not included in a figure. A process may correspond to a method, a function, a procedure, a subroutine, a subprogram, etc. When a process corresponds to a function, its termination can correspond to a return of the function to the calling function or the main function.

[0042] The word “exemplary” and/or “demonstrative” is used herein to mean serving as an example, instance, or illustration. For the avoidance of doubt, the subject matter disclosed herein is not limited by such examples. In addition, any aspect or design described herein as “exemplary” and/or “demonstrative” is not necessarily to be construed as preferred or advantageous over other aspects or designs, nor is it meant to preclude equivalent exemplary structures and techniques known to those of ordinary skill in the art. Furthermore, to the extent that the terms “includes,” “has,” “contains,” and other similar words are used in either the detailed description or the claims, such terms are intended to be inclusive like the term “comprising” as an open transition word without precluding any additional or other elements.

[0043] In the specification the term “comprising” shall be understood to have a broad meaning similar to the term “including” and will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of

integers or steps. This definition also applies to variations on the term “comprising” such as “comprise” and “comprises”.

[0044] In addition, as used herein, the term “or” is an inclusive “or” operator, and is equivalent to the term “and/or,” unless the context clearly dictates otherwise. The term “based on” is not exclusive and allows for being based on additional factors not described, unless the context clearly dictates otherwise. In addition, throughout the specification, the meaning of “a,” “an,” and “the” include plural references. The meaning of “in” includes “in” and “on.”

[0045] As used herein, an “electronic device”, or “portable electronic device”, or “user device” or “communication device” or “user equipment” or “device” refers to any electrical, electronic, electromechanical and computing device. The user device is capable of receiving and/or transmitting one or parameters, performing function/s, communicating with other user devices and transmitting data to the other user devices. The user device may have a processor, a display, a memory, a battery and an input-means such as a hard keypad and/or a soft keypad. The user device may be capable of operating on any radio access technology including but not limited to IP-enabled communication, Zig Bee, Bluetooth, Bluetooth Low Energy, Near Field Communication, Z-Wave, Wi-Fi, Wi-Fi direct, etc. For instance, the user device may include, but not limited to, a mobile phone, smartphone, virtual reality (VR) devices, augmented reality (AR) devices, laptop, a general-purpose computer, desktop, personal digital assistant, tablet computer, mainframe computer, or any other device as may be obvious to a person skilled in the art for implementation of the features of the present disclosure.

[0046] Further, the user device may also comprise a “processor” or “processing engine”, wherein processor refers to any logic circuitry for processing instructions. The processor may be a general-purpose processor, a special purpose processor, a conventional processor, a digital signal processor, a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits, Field Programmable Gate Array circuits, any other type of integrated circuits, etc. The processor may perform signal coding data processing, input/output processing, and/or any other functionality that enables the working of the system according to the present disclosure. More specifically, the processor is a hardware processor.

[0047] In many regions, government healthcare services and healthcare facilities offer free or subsidized health intervention programs aimed at early disease detection and preventive care. However, these programs often experience low utilization rates due to a lack of awareness, time constraints, or perceived inconvenience among eligible individuals. As a result, a significant portion of the population remains undiagnosed or untreated, leading to higher healthcare costs, preventable complications, and suboptimal health outcomes.

[0048] Existing systems for managing population health struggle to accommodate the evolving demands of large-scale, data-driven healthcare. These systems are typically complex, rigid, and unable to scale effectively, making it difficult to integrate diverse health data sources, including Electronic Health Records (EHRs), medical imaging scans, and patient-reported data. Additionally, the existing systems rely heavily on manual processes for identifying high-risk patients, notifying them, scheduling health checkups, and monitoring outcomes. Such limitations hinder healthcare providers from effectively engaging at-risk individuals and optimizing the impact of intervention programs.

[0049] To address these challenges, the present disclosure provides a method and a system for managing health risks of members of a population using Artificial Intelligence (AI) agents to facilitate screening, notification, scheduling, and medical imaging analysis. The present disclosure aims to optimize population health management by identifying individuals at high risk of medical conditions, notifying them, facilitating their onboarding, and monitoring their health through advanced medical imaging techniques.

[0050] Some of the objectives of the present disclosure, which at least one embodiment herein satisfies, are as follows.

[0051] An objective of the present disclosure is to provide a method and system for managing health risks of members of a population by utilizing Artificial Intelligence (AI) agents for screening, notification, scheduling, and medical imaging analysis.

[0052] Another objective of the present disclosure is to automate the identification of high-risk individuals based on Electronic Health Records (EHRs) using an AI-driven screening agent, thereby enabling proactive and data-driven population health management.

[0053] Another objective of the present disclosure is to enhance patient engagement by providing an AI-driven scheduling agent that autonomously notifies high-risk individuals, facilitates onboarding, and schedules health checkups without requiring manual intervention.

[0054] Another objective of the present disclosure is to provide a medical imaging screening agent that utilizes deep learning-based medical image analysis to detect early-stage diseases such as cancer, cardiovascular conditions, and other high-risk medical conditions.

[0055] Another objective of the present disclosure is to optimize healthcare resource allocation by prioritizing patient appointments based on AI-driven risk stratification, ensuring that high-risk individuals receive timely medical intervention.

[0056] Yet another objective of the present disclosure is to provide a method for orchestrating AI agents to effectively carry out health screening programs and population health programs.

[0057] Other objects and advantages of the present disclosure will be more apparent from the following description, which is not intended to limit the scope of the present disclosure.

[0058] Hereinafter, exemplary embodiments of the present disclosure will be described with reference to the accompanying drawings.

[0059] Referring now to FIG. 1, a block diagram of an exemplary system 100 for managing patients' health is illustrated, in accordance with some embodiments of the present disclosure. The system 100 may implement a computing device 102 (for example, server, desktop, laptop, notebook, netbook, tablet, smartphone, mobile phone, or any other computing device). The computing device 102 may be configured to manage the patients' health. The computing device 102 includes various AI agents (e.g., a screening AI agent, a scheduling AI agent, and a medical imaging screening agent). The functions of each AI agent is explained in detail in conjunction with FIG. 2.

[0060] As will be described in greater detail in conjunction with FIGS. 2 – 16, in order to manage patients' health, the computing device 102 first receives a query or a prompt on a user interface of

the computing device 102 from a user and proceeds to identify a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database. The user interface may be configured to receive a query from a user. The query may be any prompt that may be provided to the system. In some embodiments of the present disclosure, the prompt may be in a form of a text, a video, an audio, and the like. Embodiments of the present disclosure are intended to include and/or otherwise cover any way in which the prompt may be provided to the system. The EHR is a digital version of a patient's medical history, typically maintained by healthcare providers. The EHR includes medical information of the patient. The medical information includes, but is not limited to, personal details, medical history, medical history of one or more family members, lab and test results, medications, treatment plans, and health and lifestyle information. The EHR provides a complete view of a patient's health, enabling data-driven decision-making.

[0061] In an embodiment, a patient is considered high-risk if the patient exhibit factors that increase their likelihood of developing a severe health condition. These factors may include advanced age, family medical history, chronic conditions (e.g., diabetes, hypertension), unhealthy lifestyle behaviours (e.g., smoking, excessive alcohol consumption), abnormal lab results, or a history of hospitalizations. In an embodiment, the AI agent analyses this data to predict the patient's risk profile. Thus, the computing device 102 uses the AI agent powered by a large language model (LLM) to analyse the EHR data, extracting information to identify patients who match predefined criteria for high-risk conditions. For example, it may identify individuals with a history of smoking, advanced age, and past respiratory issues as high-risk for lung cancer.

[0062] After identifying the patient with the high-risk profile, the computing device 102 notifies the patient having the high-risk profile. In an embodiment, the notifications may be sent through various communication channels, such as SMS, email, mobile applications, patient portals, or phone calls. The computing device 102 may use the patient's preferred contact method, stored in their EHR or patient profile. The notification may include information about the patient's risk status, the importance of further evaluation, and a request to schedule a health checkup. The notification may also provide educational material about the identified health risks.

[0063] Upon notifying the patient, the computing device 102 facilitates onboarding of the patient. The onboarding process involves confirming patient identity, gathering additional health

information, and addressing any questions or concerns. The computing device 102 may collect health-related questionnaires, self-reported symptoms, or lifestyle data. Upon receiving a response corresponding to each of the set of questionnaires from the patient, the computing device 102 further schedules appointments of the patient for diagnostic tests, consultations, or follow-ups.

[0064] Upon successful onboarding, the computing device 102 receives multimedia data associated with the patient via one or more external devices. Multimedia data refers to digital health data captured using the one or more external devices. The multimedia data includes, but is not limited to, medical imaging scans (Computed Tomography (CT) scans, X-Rays, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET)), laboratory reports, photographs of physical symptoms, and videos of patient assessments. Examples of the one or more external devices may include medical imaging devices, diagnostic equipment, wearable health monitors, smartphones, tablets, or telehealth platforms.

[0065] Further, the computing device 102 processes the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data. ROI is a specific area within a medical image that is relevant to the patient's health condition. For example, a nodule in a lung CT scan, a lesion in a brain MRI, or an abnormal mass in a mammogram. The computing device 102 utilizes deep learning algorithms to analyse multimedia data, detect ROIs, and highlight areas with potential abnormalities. In an embodiment, techniques like image segmentation, object detection, and feature extraction may be used for accurate ROI identification.

[0066] Further, the computing device 102 analyses the image corresponding to the one or more ROIs to generate a summarized report. The summarized report includes details associated with the at least one medical condition, such as the size, shape, location, and severity of abnormalities in the identified ROIs. It may also compare the current findings with historical data for tracking disease progression. The summarized report may suggest potential diagnoses (e.g., a suspected malignancy in the case of lung nodules) and recommend further evaluations or treatments. This information assists healthcare professionals in making timely and informed decisions. Based on the AI analysis, the summarized report may categorize the patient's risk level (e.g., low, moderate, high) and recommend personalized interventions.

[0067] Further, the computing device 102 displays the summarized report to at least one of the patient and a healthcare professional. The summarized report may be accessed through a healthcare provider's dashboard, patient portal, or a healthcare application. In an embodiment, the healthcare professional (e.g., physicians, radiologists, and specialists) may review the report to validate findings, provide a diagnosis, and design personalized treatment plans. In some embodiments, the summarized report is used by the healthcare professional to perform a set of actions. The set of actions includes tracking a progress of the patient on the at least one medical condition, and determining a next course of treatment for the patient based on the current state of the at least one medical condition.

[0068] In some embodiments, the computing device 102 may include a processor 104 and a memory 106. The memory 106 may include any non-transitory storage device including, for example, volatile memory such as random-access memory (RAM), or non-volatile memory such as erasable programmable read only memory (EPROM), flash memory, and the like. Further, the memory 106 may store instructions that, when executed by the processor 104, cause the processor 104 to manage patients' health. The memory 106 may also store various data (for example, patient health records, medical imaging data, appointment schedules, risk assessment reports, notification preferences, AI agent parameters, training datasets, historical diagnostic reports, and the like) that may be captured, processed, and/or required by the system 100.

The system 100 may further include a display 108. The system 100 may interact with a user via a user interface 110 (e.g., Graphical User Interface (GUI)) of the display 108. In particular, the user interface 110 may enable the user (e.g., healthcare professionals, administrators, or patients) to input a query, input prompts, view and analyse information such as patient health data, medical imaging results, appointment schedules, and risk assessment reports) through various methods, such as touchscreen interactions, keyboard input, mouse clicks, voice commands, or stylus-based navigation. The user interface 110 may ensure authorized personnel can access sensitive patient information while maintaining data privacy and compliance with healthcare regulations. The user interface is coupled to processing circuitry that includes an AI agent manager designed to dynamically divide the one or more tasks received from the UI into smaller tasks and assign them to appropriate AI agents (e.g., the EHR screening agent 204, the onboarding and appointment scheduling agent 206, and the medical image screening agent 208) based on the query.

[0069] The system 100 may also include one or more user devices 112. In some embodiments, the computing device 102 may interact with the one or more user devices 112 over a communication network 114 for sending or receiving various data, including, but not limited to, patient health records for assessment and monitoring, appointment notifications and reminders for patients, medical imaging data for remote analysis and second opinions, risk assessment updates for healthcare providers to make informed decisions. The one or more user devices 112 may be utilized by healthcare providers, patients, and administrative staff to access the system 100 remotely, receive notifications, schedule appointments, and review patient records. The user devices 112 may include, but may not be limited to, a tablet, a computer, a smartphone, or another computing system. The communication network 114 may include a wireless card or some other transceiver connection to facilitate this communication. In another embodiment, the communication network 114 may be implemented as or include any of a variety of different communication technologies such as a wide area network (WAN), a local area network (LAN), a wireless network, a mobile network, a Virtual Private Network (VPN), the Internet, the Public Switched Telephone Network (PSTN), or the like. In an embodiment, the communication network 114 may include, by way of example but not limitation, at least a portion of one or more networks having one or more nodes that transmit, receive, forward, generate, buffer, store, route, switch, process, or a combination thereof, etc. one or more messages, packets, signals, waves, voltage or current levels, some combination thereof, or so forth.

[0070] Referring now to FIG. 2, a functional block diagram 200 of various Artificial Intelligence (AI) agents of the exemplary system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 2 is explained in conjunction with the FIG. 1. In an embodiment, the processor 104 may include an AI agent manager 202. The AI agent manager 202 may include various AI agents (e.g., an Electronic Health Record (EHR) screening agent 204, an onboarding and appointment scheduling agent 206, and a medical image screening agent 208).

[0071] In an embodiment, AI agent manager 202 is configured to receive one or more tasks from the UI (e.g., UI 110). The task is received by a query or a prompt by a user into the UI. The AI agent manager 202 further divides the one or more tasks received from the UI into smaller tasks and delegates them to appropriate AI agents (e.g., the EHR screening agent 204, the onboarding and appointment scheduling agent 206, and the medical image screening agent 208) based on the task type. The EHR screening agent 204 is configured to screen the electronic health records

(EHRs) of patients stored in a healthcare management platform. The EHR screening agent 204 is a large language model (LLM) prompt engineered to analyse patient health records and identify individuals at high risk for specific medical conditions. Prompt engineering is a technique and process used to structure or craft an instruction in order to produce the best possible output from the LLM to perform the specific functions. A prompt is natural language text describing the task that the AI agent should perform. A prompt for a LLM can be a query, a command, or a longer statement including context, instructions, and conversation history. The EHR screening agent 204 processes and analyses structured and unstructured data from the EHR data to identify patterns and risk factors associated with specific medical conditions. The EHR data include, but is not limited to, personal details, medical history, medical history of one or more family members, laboratory test results, medications, treatment plans, health and lifestyle information, patient demographics, clinical notes, and imaging reports. The EHR screening agent 204 includes a data pre-processing module that cleans and organizes incoming EHR data, followed by a feature extraction module that identifies relevant health indicators, such as lab results, medication history and demographic data. The EHR screening agent employs a large language model capable of understanding medical terminology and context, allowing it to draw insights from clinical narratives and structured data. The EHR screening agent may also include a risk assessment algorithm that utilizes the extracted features to generate a risk score for each patient. This score indicates the likelihood of developing specific medical conditions, enabling healthcare providers to prioritize interventions for high-risk individuals. The EHR screening agent 204 may be integrated into the healthcare management platform through an application programming interface (API) that facilitates secure and efficient data access.

[0072] The healthcare management platform hosting the EHRs may maintain health records for a large population of patients across various healthcare facilities. These records are stored in a database 210 to ensure accessibility, compliance with regulatory standards, and patient privacy. The platform may include a dashboard interface that allows authorized healthcare professionals to define and adjust screening criteria based on predefined parameters. These parameters may include, but are not limited to, patient age range, medical history, pre-existing conditions, genetic predispositions, lifestyle factors (e.g., smoking, alcohol consumption), and family health history.

[0073] In an exemplary operation, the EHR screening agent 204, based on the query or prompt provided by the user, inputs the EHR data through the EHR screening agent to identify patients

who exhibit a high-risk profile for specific medical conditions. The screening criteria may be dynamically adjusted to accommodate emerging health concerns or epidemiological patterns. Upon identifying patients meeting the criteria, the EHR screening agent 204 filters and compiles the relevant health records and transmits them to the onboarding and appointment scheduling agent 206 for further processing. The details of this operation will be further described in conjunction with FIG. 7.

[0074] In an exemplary operation, the onboarding and appointment scheduling agent 206 is configured to notify the identified high-risk patients and facilitate their onboarding process. The notification may occur through various communication channels, such as phone calls, text messages, emails, or dedicated healthcare applications, depending on the patient's communication preferences. The notification may include information regarding the patient's health risk, recommended screening procedures, and guidance on scheduling a health checkup.

[0075] To simplify the onboarding process, the onboarding and appointment scheduling agent 206 may engage the patient through interactive queries to verify their identity, confirm their health status, and obtain additional health-related information. In various embodiments, the onboarding and scheduling agent 206 utilizes large language models (LLM) to understand patient responses and guide the conversation effectively. For example, the onboarding and scheduling agent 206 may use one of the following LLMs, clinical text analysis models, symptom checkers, virtual health assistants, conversational agents to guide conversations. Such agents address patient inquiries, clarify screening procedures, and assess the patient's willingness to participate in preventive health measures. Once the patient agrees to participate, the onboarding and appointment scheduling agent 206 schedules an appointment for the recommended health checkup, optimizing the time slots based on the availability of healthcare providers and the patient's convenience. The details of this operation will be further described in conjunction with FIG. 9.

[0076] Upon successful onboarding and scheduling, the patient undergoes the recommended health checkup, which may include diagnostic procedures like medical imaging scans (e.g., CT scans, MRIs, X-rays, PET scans). The medical image screening agent 208 is configured to analyse the multimedia data associated with the patient, including medical images captured during the health checkup. The medical image screening agent 208 utilizes advanced deep learning models

trained on annotated medical imaging datasets to identify regions of interest (ROIs) indicative of potential abnormalities.

[0077] The medical image screening agent 208 extracts relevant ROIs from the medical images, analyses the identified areas for abnormalities, and generates a summarized report. This summarized report may include diagnostic information, quantitative measurements (e.g., size, volume, and density of detected anomalies), and a comparison with historical imaging data to monitor changes over time. In an embodiment, the summarized report associated with the patient is stored in the database 210 for future analysis of the at least one medical condition of the patient.

[0078] In various embodiments, the medical image screening agent 208, is a machine learning model designed to enhance patient health management through the analysis of medical imaging data. In embodiments, this agent employs advanced machine learning techniques, particularly deep learning models, to ensure accurate and efficient identification of potential abnormalities in medical images. Upon the completion of a patient's health checkup, which may include various diagnostic imaging procedures such as CT scans, MRIs, X-rays, and PET scans, the medical image screening agent 208 is activated. The medical image screening agent 208 receives as input multimedia data associated with the patient, specifically the medical images captured during these procedures. In various embodiments, the medical image screening agent 208 utilizes deep learning models that have been trained on extensive annotated medical imaging datasets. These models are specifically designed to recognize patterns and features within the images that are indicative of abnormalities. The training process involves feeding the model a diverse range of medical images along with corresponding annotations that highlight areas of interest, allowing the model to learn to differentiate between normal and abnormal findings. For example, the medical image screening agent 208 systematically analyses the medical images to extract regions of interest (ROIs). These ROIs are specific areas within the images that the model identifies as potentially abnormal, such as tumours, lesions, or other pathological findings. The extraction process is critical as it narrows down the focus to the most relevant parts of the images for further analysis. Once the ROIs are identified, the medical image screening agent 208 conducts a detailed analysis of these areas to assess the presence and nature of any abnormalities. This analysis may involve quantitative measurements, such as the size, volume, and density of detected anomalies, which are essential for determining the severity and potential implications of the findings.

[0079] After completing the analysis, the medical image screening agent 208 generates a summarized report. This report includes diagnostic information derived from the analysis, quantitative measurements of the identified abnormalities, and a comparison with historical imaging data to track changes over time. The summarized report is displayed to authorized healthcare professionals through a secure user interface, enabling them to validate findings, provide accurate diagnoses, and design personalized treatment plans. The summarized report may also be accessible to the patient through a patient portal or application, along with educational resources to understand their health status. The details of this operation will be further described in conjunction with FIG. 11.

[0080] In an embodiment, integrating these AI agents (e.g., EHR screening agent 204, onboarding and appointment scheduling agent 206, and medical image screening agent 208) creates a cohesive, AI-driven system for managing patients' health. This interconnected framework enables healthcare providers to perform large-scale, data-driven screening, automate patient engagement, optimize resource allocation, and ensure timely health interventions. The system 100 is designed to be scalable, adaptable, and compatible with existing healthcare infrastructures, enhancing its applicability in diverse healthcare environments.

[0081] It should be noted that all such aforementioned AI agents 202 – 208 may be represented as a single agent or a combination of different agents. Further, as will be appreciated by those skilled in the art, each of the AI agents 202 – 208 may reside, in whole or in parts, on one device or multiple devices in communication with each other. In some embodiments, each of the AI agents 202 – 208 may be implemented as dedicated hardware circuit comprising custom application-specific integrated circuit (ASIC) or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. Each of the AI agents 202 – 208 may also be implemented in a programmable hardware device such as a field programmable gate array (FPGA), programmable array logic, programmable logic device, and so forth. Each of the AI agent may be a specialized AI-powered module that operates through a series of distinct technical processes that includes a data pre-processing module, a feature extraction module, or a risk assessment algorithm. Each AI agent can be implemented as part of a larger healthcare management platform through Application Programming Interface (API) integration, data processing workflow and LLM optimization techniques. Alternatively, each of the AI agents 202 – 208 may be implemented in software for execution by various types of processors (e.g., processor

104). An identified module of executable code may, for instance, include one or more physical or logical blocks of computer instructions, which may, for instance, be organized as an object, procedure, function, or other construct. Nevertheless, the executables of the AI agents 202 – 208 need not be physically located together but may include disparate instructions stored in different locations which, when joined logically together, include the agent and achieve the stated purpose of the agent. Indeed, a module of executable code could be a single instruction, or many instructions, and may even be distributed over several different code segments, among different applications, and across several memory devices.

[0082] Referring now to FIG. 3, an exemplary method 300 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 3 is explained in conjunction with FIGs. 1 and 2. The method 300 may be implemented by at least one AI agent (e.g., EHR screening agent 204, onboarding and appointment scheduling agent 206, and medical image screening agent 208).

[0083] In order to manage the patient's health, initially, at step 301, the AI agent manager 202 is configured to receive one or more queries from the User Interface (UI) (e.g., UI 110). The UI is configured to receive a query from a user in one or more modalities, for example, text, image, audio or video. Upon receiving the query, the AI agent manager 202 analyses, segments, and optimally distributes tasks among various AI agents to ensure efficient execution. Specifically, the AI agent manager 202 decomposes complex tasks into smaller, manageable sub-tasks and delegates them to the appropriate AI agents, including the EHR screening agent 204, the onboarding and appointment scheduling agent 206, and the medical image screening agent 208. This distributed task allocation enables parallel processing, improves system responsiveness, and enhances the overall efficiency of patient health management by ensuring that each AI agent performs its designated function effectively.

[0084] Upon receiving one or more queries from the UI, the AI Agent Manager performs the following steps:

Task Decomposition: The manager decomposes complex tasks into smaller, manageable sub-tasks. This decomposition is essential for ensuring that each sub-task can be effectively handled by the appropriate AI agent, thereby improving the overall workflow.

Task Segmentation: The AI Agent Manager analyses the nature of each task to determine its specific requirements and the best-suited AI agent for execution. This involves evaluating the capabilities of each agent and matching them with the task's needs.

Optimal Distribution: After segmentation, the manager distributes the sub-tasks among the AI agents. This distribution is based on several factors, including the agents' current workload, processing capabilities, and the urgency of the tasks. By optimizing the allocation of tasks, the AI Agent Manager ensures that resources are utilized efficiently.

[0085] In an embodiment, the AI Agent Manager interacts with various AI agents as follows:

- **EHR Screening Agent 204:** The AI Agent manager delegates tasks related to identifying high-risk patients based on their Electronic Health Records (EHR). The EHR Screening Agent retrieves and analyses patient data to generate risk profiles.
- **Onboarding and Appointment Scheduling Agent 206:** For tasks related to patient onboarding and scheduling, the AI Agent manager ensures that the appropriate information is passed to this agent, facilitating timely communication with patients.
- **Medical Image Screening Agent 208:** The AI Agent manager coordinates tasks involving the analysis of medical images, ensuring that the Medical Image Screening Agent receives the necessary data for processing and generating diagnostic outputs.

[0086] In various embodiments, the AI Agent Manager also includes a performance monitoring mechanism that tracks the execution of tasks by each AI agent. This monitoring allows the manager to:

- **Evaluate Efficiency:** Assess the performance of each AI agent in real-time, identifying bottlenecks or delays in task execution.
- **Adjust Task Allocation:** Based on performance data, the manager can reallocate tasks dynamically to ensure that the system remains responsive and efficient.
- **Generate Reports:** The AI Agent manager compiles performance reports that provide insights into the overall effectiveness of the task management process, which can be used for further optimization.

[0087] At step 302, the EHR screening agent 204 identifies a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in the database (210) in response to a query by a user. In an embodiment, the EHR includes medical information of the patient. The medical information includes personal details, medical history, medical history of one or more family members, lab and test results, medications, treatment plans, and health and lifestyle information.

[0088] In an embodiment, to identify the patient having the high-risk profile, the EHR screening agent 204 first retrieves the EHR corresponding to a plurality of patients maintained in the database. The EHR is retrieved based on a plurality of parameters that corresponds to the query by the user. The plurality of parameters used by the EHR screening agent 204 to retrieve the EHRs of patients may include various criteria that help to identify individuals at a high risk of specific medical conditions. These parameters may include demographic factors such as age, gender, ethnicity, and geographic location, which may influence the prevalence and susceptibility to certain health conditions. For example, individuals above a particular age threshold or belonging to specific ethnic groups may be more prone to diseases like cardiovascular disorders or genetic conditions. Additionally, medical history parameters such as past diagnoses, family medical history, medication history, and prior surgical interventions may also be considered. Patients with a history of chronic conditions like hypertension, diabetes, or respiratory disorders may be flagged as high-risk. Furthermore, the plurality of parameters may include lifestyle factors such as smoking history, alcohol consumption, dietary habits, physical activity levels, and substance abuse. These lifestyle factors are significant indicators of health risks, influencing conditions like cancer, metabolic disorders, and cardiovascular diseases.

[0089] Further, the EHR screening agent 204 analyses the EHR to identify one or more medical conditions associated with each of the plurality of patients. Further, the EHR screening agent 204 generates a risk report for each of the plurality of patients based on the identification of the one or more medical conditions. The risk report includes information about the one or more medical conditions of each of the plurality of patients. In an embodiment, the EHR screening agent 204 is configured to generate the risk report for the patient based on a plurality of patterns learned from a training dataset. The training dataset includes historical diagnostic reports associated with a plurality of patients. Additionally, the EHR screening agent 204 determines a risk profile for each

of the plurality of patients based on the risk report. The risk profile is one of the high-risk profile, a medium-risk profile, and a low-risk profile.

[0090] At step 304, the onboarding and appointment scheduling agent 206 notifies the patient having the high-risk profile. In an embodiment, to notify the patient, the onboarding and appointment scheduling agent 206 determines a set of notification parameters corresponding to the patient or to the query by the user. The set of notification parameters includes at least one communication channel, a timeslot, and a selected risk profile. Further, the onboarding and appointment scheduling agent 206 sends a notification to a user device 112 of the patient based on the set of notification parameters.

[0091] At step 306, the onboarding and appointment scheduling agent 206 facilitates the onboarding of the patient in response to notifying. In an embodiment, to facilitate the onboarding of the patient, the onboarding and appointment scheduling agent 206 sends a set of questionnaires to the patient. The set of questionnaires includes one or more health-specific queries and one or more appointment-specific queries configured by the user. Further, the onboarding and appointment scheduling agent 206 receives a response corresponding to each of the set of questionnaires from the patient. In response to receiving the response, the onboarding and appointment scheduling agent 206 schedules an appointment for the patient.

[0092] At step 308, the medical image screening agent 208 receives multimedia data associated with the patient via one or more external devices. In an embodiment, the multimedia data includes a plurality of digital images captured using the one or more external systems. The plurality of digital images includes Computed Tomography (CT) scans, X-Rays, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET).

[0093] At step 310, the medical image screening agent 208 processes the multimedia data to extract an image corresponding to one or more ROIs associated with the at least one medical condition of the patient from the multimedia data. In an embodiment, the medical image screening agent processes the multimedia data based on a query from the user to extract an image corresponding to one or more ROIs associated with at least one medical condition of the patient from the multimedia data. Further, at step 312, the medical image screening agent 208 analyses

the image corresponding to the one or more ROIs to generate a summarized report. The summarized report includes details associated with the at least one medical condition.

[0094] At step 314, the medical image screening agent 208 displays the summarized report to at least one of the patient and a healthcare professional via a Graphical User Interface (GUI). In an embodiment, the summarized report is used by the healthcare professional to perform a set of actions. The set of actions includes tracking a progress of the patient on the at least one medical condition, and determining a next course of treatment for the patient based on a current state of the at least one medical condition.

[0095] Referring now to FIG. 4, a block diagram 400 depicting an overview of various components of the system 100 for managing the patients' health, in accordance with some embodiments. FIG. 4 is explained in conjunction with the FIGs. 1, 2, 3, and 4. In an embodiment, the software-based and data components of the system 100 include a User Interface (UI) 402, an AI agent manager 404, a data management system 406, voice-enabled agents 408, text-based agents 410, medical image screening agents 412, patient onboarding and scheduling agent 414, and EHR screening agent 416. Portions of these components are encoded as computer-readable instructions using a programming language such as Python. Portions of these components may be implemented using commercially available software products, including open-source software. The function of each component is further explained in conjunction with FIG. 5.

[0096] Referring now to FIG. 5, an exemplary process flow 500 of the overview components of the system 100 for managing the patients' health is illustrated, in accordance with some embodiments. FIG. 5 is explained in conjunction with the FIGs. 1, 2, 3, and 4.

[0097] As shown in FIG. 5, at step 502, the UI 402 provides a control surface to input a query or a prompt, which then determines, visualize, manage and delegate tasks to the AI agent manager 404. At step 504, the AI agent manager 404 divides the tasks (in the form of a prompt by a user) received from the UI 402 into smaller tasks and delegates them to various AI agents as appropriate. At step 506, the data management system 406 handles data storage, retrieval and transmission as instructed by the AI agent manager 404. At step 508, the selected AI agents execute tasks assigned by the AI agent manager 404. For example, the EHR screening agent 416 searches through the

EHR system to identify patients with a high risk of a specific disease. This is further explained in conjunction with FIG. 7.

[0098] Further, at step 508, the onboarding and appointment scheduling agent 414 notifies the identified patients and facilitates onboarding and appointment scheduling based on the same prompt or another prompt input by the user. This is further explained in conjunction with FIG. 9. Further, at step 508, the medical image screening agent 412 may read the medical scan images of the patient and produce various outputs to assist with diagnosis. This is further explained in conjunction with FIG. 11.

[0099] Referring now to FIG. 6, an exemplary block diagram of various components 600 of the system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 6 is explained in conjunction with the FIGs. 1, 2, 3, 4, and 5. In an embodiment, the software-based and data components of the system 100 include an EHR system 602, patient information 604, an EHR screening agent 606 (analogous to EHR screening agent 204), risk information 608, onboarding and appointment scheduling agent 610 (analogous to onboarding and appointment scheduling agent 206), and patient information of immediate family members 612. Portions of these components are encoded as computer-readable instructions using a programming language such as Python. Portions of these components may be implemented using commercially available software products, including open-source software. The function of each component is further explained in conjunction with FIG. 7.

[00100] Referring now to FIG. 7, an exemplary process flow 700 of the system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 7 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, and 6.

[00101] As shown in FIG. 7, at step 702, authentication with a healthcare organization's Fast Healthcare Interoperability Resources (FHIR) server is made to access information from a hospital's EHR system 602. In an embodiment, the authentication with the healthcare organization's FHIR server is a Single-Sign On (SSO) that allows a medical practitioner or user to access the healthcare facility's software platform and required modules instead of having to access each platform individually. After obtaining the access token at step 704, a list of patients from the healthcare organization is used to identify the required patients, and their patient's

information 604 is queried via a prompt by a user on the user interface and formatted at step 706. The information 604 being queried includes, but is not limited to, patient name and age, social history, conditions history, and family member list.

[00102] At step 708, the family member details 612 are queried in the same way as at step 706 but only obtaining a list of their conditions. At step 710, the list of conditions is fed into the EHR screening agent 606, which determines whether there is a presence of specific disease among the conditions in the list.

[00103] After collecting all this information, at step 712, it is sent to EHR screening agent 606 that determines whether the patient is suitable for health screening. Finally, at step 714, a list of patients with a high disease risk as noted in risk information 608, is produced and sent to the onboarding and appointment scheduling agent 610. The present process flow 700 demonstrates how the AI system may leverage EHR data and AI agents to assess a patient's disease risk by analysing their immediate family members' health records. The risk information may then inform preventive health screenings.

[00104] Referring now to FIG. 8, an exemplary block diagram of various components 800 of the system 100 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 8 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, and 7. In an embodiment, the software-based and data components of the system 100 of the present FIG. 8 include an EHR screening agent 802, patient risk information 804, a notification system 806, a notification database 808, notification preferences and history 810, EHR 812, patient information 814, an onboarding and appointment scheduling agent 816, an appointment system 818, and appointment data 820. In an embodiment, the components 800 are managed and controlled by a software-based control and coordination system. The function of each component is further explained in conjunction with FIG. 9.

[00105] Referring now to FIG. 9, an exemplary process flow 900 of the system 100 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 9 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, and 8.

[00106] As shown in the present FIG. 9, at step 902, patient risk information 804 is received from the EHR screening agent 802. At step 904, notification preferences and history 810 are retrieved from notification database 808. At step 906, patient contact information is extracted from patient information 814 retrieved from the EHR 812. At step 908, the patient is notified using the contact information extracted at step 906. The criteria for notification are based on the patient's notification preferences and history 810.

[00107] At step 910, the onboarding and appointment scheduling agent 816 facilitates onboarding the patient by answering any queries the patient may have. At step 912, the onboarding and appointment scheduling agent 816 checks the eligibility of patient for screening procedure as per relevant requirements by asking the patient questions including any social habits, duration of the habits, whether the patient has quit, any health problems that might influence willingness or ability for treatment if outcome of screening procedure is positive. At step 914, the onboarding and appointment scheduling agent 816 verifies the identity of the patient by asking for personal information, which is checked against the patient information 814 stored in the EHR 812. When the patient decides to make an appointment for the health screening, appointment data 820 is retrieved from the appointment system 818, described in step 916.

[00108] After the appointment is confirmed by the patient, the appointment data 820 is stored in the appointment system 818, described at step 918. The patient is informed of the appointment details after the appointment is confirmed, described in step 920. The onboarding and appointment scheduling agent 816 answers question(s) the patient might have regarding the screening procedure or appointment described in step 922 before terminating the conversation. Once the appointments for health checks are completed and scans (e.g. health appointments that require CT scans, MRI, etc.) have been performed on the patients, scan records are uploaded to the corresponding EHR records. Due to the thousands of completed scans of individual patients, the medical imaging screening agent may scan these records for high-risk profiles. The medical imaging screening agent is a deep learning AI agent that identifies high risk profile individuals. In the case of identifying high risk individuals with lung cancer or high-risk profile individuals that may be susceptible to lung cancer, the medical imaging screening agent uses annotated CT scans with cancerous nodules for analysis.

[00109] Referring now to FIG. 10, an exemplary block diagram of various components 1000 of the system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 10 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, and 9. In an embodiment, the software-based and data components of the system of FIG. 10 include a Picture Archiving and Communication System (PACS) 1002, medical image data 1004, detection AI model 1006, modified Digital Imaging and Communications in Medicine (DICOM) 1008, extracted region of interest 1010, segmentation AI model 1012, DICOM with segmentation overlay 1014, size & volumetric measurement data 1016, summary report 1018, dashboard 1020. Portions of these components are encoded as computer-readable instructions using a programming language such as python, bash. Portions of these components may be implemented using commercially available software products, including open-source software. The function of each component is further explained in conjunction with FIG. 11.

[00110] Referring now to FIG. 11, an exemplary process flow 1100 of the system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 11 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.

[00111] As shown in the present FIG. 11, at step 1102, medical images are stored in the PACS 1002. At step 1104, medical image 1004 is extracted, and the detection AI model 1006 may be used to perform predictions using the data from step 1102. The detection AI model 1006 is a machine learning engine specifically designed to analyse medical images for the purpose of identifying and predicting the presence of specific medical conditions, such as nodules in radiological scans. This model operates within a structured framework that integrates various components and processes to ensure accurate and reliable outcomes. Prior to analysis, the medical images may undergo preprocessing to enhance quality and standardize formats. This may involve noise reduction, normalization, and resizing to ensure consistency across the dataset. In an embodiment, the detection AI model 1006 employs a convolutional neural network (CNN) architecture, which is particularly effective for image analysis tasks. The CNN consists of multiple layers, including convolutional layers for feature extraction, pooling layers for dimensionality reduction, and fully connected layers for classification. The detection AI model 1006 is trained on a large dataset of annotated medical images, where each image is labelled with the presence or absence of specific conditions. The training process involves supervised learning, where the model learns to recognize patterns associated with various medical conditions through backpropagation

and optimization techniques such as stochastic gradient descent. Once trained, the detection AI model 1006 analyses new medical images to predict the likelihood of conditions such as nodules. The output is a modified Digital Imaging and Communications in Medicine (DICOM) file 1008, which includes the original image along with annotations indicating detected regions of interest (ROI) where nodules are present. A modified DICOM 1008 may be the output from the detection AI model 1006. This modified DICOM 1008 may be sent back to the PACS, as described at step 1114.

At step 1106, an algorithm may be utilized to obtain this extracted region of interest 1010. This region of interest 1010 refers to the nodules that have been detected by the detection AI model 1006. At step 1108, the extracted region of interest 1010 may be used as inputs to the segmentation AI model 1012. The DICOM with segmentation overlay 1014 may be the outputs of the segmentation AI model 1012. DICOM with segmentation overlay 1014 may be sent back to the PACS 1002, described at step 1116. At step 1110, the size & volumetric measurement data 1016 may be measured using the outputs from the DICOM with segmentation overlay 1014. Finally, at step 1112, a summary report 1018 is generated from all the accumulated data from all the previous steps or operations. The summary report 1018 may be used as inputs to the dashboard 1020 at step 1122, where data can be visualized.

[00112] In other embodiments, the output from the detection AI model 1006 is utilized by subsequent components in the system, such as the segmentation AI model 1012, which further refines the detected regions and prepares data for volumetric measurements. This integration ensures a seamless workflow from detection to reporting. The model incorporates a feedback mechanism where the results of its predictions can be validated against clinical outcomes. This continuous learning process allows for model refinement and improvement over time, enhancing its accuracy and reliability.

[00113] The summary report 1018 may also be sent back to the PACS 1002, described at step 1120. If the screening outcome is positive, the patient onboarding and scheduling agent may be notified to schedule a consultation appointment as described in FIG. 13. If the screening outcome is negative, the onboarding and scheduling agent may be notified to schedule a regular screening appointment as described in FIG. 13. At step 1122, the dashboard 1020 may separately display the size and volumetric measurements extracted from the summary report 1018, to be used

for two cases; 1) the normal screening where patients are not undergoing treatments. 2) tracking of the progress of patients undergoing treatment.

[00114] Referring now to FIG. 12, an exemplary block diagram of various components 1200 of the system 100 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 12 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11. In an embodiment, the software-based and data components of the system of FIG. 12 include EHR system 1202, patient information 1204, patient screening outcome 1206, onboarding and appointment scheduling agent 1208, appointment system 1210, appointment data 1212 and notification system 1214. The function of each component is further explained in conjunction with FIG. 13.

[00115] Referring now to FIG. 13, an exemplary process flow 1300 of the system for managing patients' health is illustrated, in accordance with some embodiments. FIG. 13 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12.

[00116] As shown in the present FIG. 13, at step 1302, patient information 1204 is retrieved from the EHR system 1202. At step 1304, patient screening outcome information 1206 is retrieved from the EHR system 1202. At step 1306, the onboarding and scheduling agent 1208 uses both patient information 1204 and patient screening outcome information 1206 to determine if patient requires regular screening as per requirement. If the screening outcome is positive, a consultation appointment may be scheduled by the appointment system 1210, described at step 1308. If the screening outcome is negative, a regular screening appointment will be scheduled by the appointment system 1210, described at step 1308. After the appointment is scheduled, appointment data 1212 is retrieved from the appointment system 1210, described at step 1310. At step 1312, the patient is informed of the appointment details via notification system 1214, described in in a similar process as described in FIG. 8.

[00117] Referring now to FIG. 14, an exemplary block diagram 1400 of various components of the system 100 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 14 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11, 12, and 13. In an embodiment, the software-based and data components of the system of FIG. 14 include data management system 1402, database 1404, patient information 1406, patient journey

tracking system 1408, telecommunication provider 1410, Instant Messaging Provider 1412, In-app chat integration 1414. The function of each component is further explained in conjunction with FIG. 15.

[00118] Referring now to FIG. 15, an exemplary process flow 1500 of the system 100 for managing patients' health is illustrated, in accordance with some embodiments. FIG. 15 is explained in conjunction with the FIGs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11, 12, 13 and 14.

[00119] As shown in FIG. 15, at step 1502, the data management system 1402 handles requests from the AI agent manager and routes the requests to the appropriate system depending on the type of request. At step 1504, the database 1404 handles requests for data storage and retrieval required for functions of the various systems. At step 1506, patient information 1406 is processed by the patient journey tracking system. At step 1508, the patient journey tracking system tracks the clinical progress of each patient, including engagement progress, appointment progress and treatment progress. It manages subsequent appointments required by the patient, including regular screening appointments. The process of scheduling appointments is handled by the system, as already described in FIG. 8 and FIG. 9. At step 1510, telecommunication provider 1410 handles requests for sending SMS and placing voice calls via the telecommunications network. The contents of the SMS or voice calls received by the telecommunication provider 1410 may be relayed back to the AI agent manager 404 before being processed by the patient onboarding and scheduling agent 414, as described in FIG 4.

[00120] At step 1512, the instant messaging provider 1412 handles requests for sending text messages via the Internet. The contents of the text messages received by the instant messaging provider 1412 may be relayed back to the AI agent manager 404 before being processed by the patient onboarding and scheduling agent 414 as described in FIG 4. At step 1514, the In-app chat integration 1414 manages the communication in a mobile app between the app user and the AI agents. The contents of the text messages received by the In-app chat integration 1414 may be relayed back to the AI agent manager 404 before being processed by the patient onboarding and scheduling agent 414, as described in FIG 4.

[00121] As will be also appreciated, the above-described techniques may take the form of computer or controller implemented processes and apparatuses for practicing those processes. The disclosure can also be embodied in the form of computer program code containing instructions embodied in tangible media, such as floppy diskettes, solid state drives, CD-ROMs, hard drives, or any other computer-readable storage medium, wherein, when the computer program code is loaded into and executed by a computer or controller, the computer becomes an apparatus for practicing the invention. The disclosure may also be embodied in the form of computer program code or signal, for example, whether stored in a storage medium, loaded into and/or executed by a computer or controller, or transmitted over some transmission medium, such as over electrical wiring or cabling, through fiber optics, or via electromagnetic radiation, wherein, when the computer program code is loaded into and executed by a computer, the computer becomes an apparatus for practicing the invention. When implemented on a general-purpose microprocessor, the computer program code segments configure the microprocessor to create specific logic circuits.

[00122] The disclosed methods and systems may be implemented on a conventional or a general-purpose computer system, such as a personal computer (PC) or server computer. Referring now to FIG. 16, an exemplary computing system 1600 that may be employed to implement processing functionality for various embodiments (e.g., as a SIMD device, client device, server device, one or more processors, or the like) is illustrated. Those skilled in the relevant art will also recognize how to implement the invention using other computer systems or architectures. The computing system 1600 may represent, for example, a user device such as a desktop, a laptop, a mobile phone, personal entertainment device, DVR, and so on, or any other type of special or general-purpose computing device as may be desirable or appropriate for a given application or environment. The computing system 1600 may include one or more processors, such as a processor 1602 that may be implemented using a general or special purpose processing engine such as, for example, a microprocessor, microcontroller or other control logic. In this example, the processor 1602 is connected to a bus 1604 or other communication medium. In some embodiments, the processor 1602 may be an Artificial Intelligence (AI) processor, which may be implemented as a Tensor Processing Unit (TPU), or a graphical processor unit, or a custom programmable solution Field-Programmable Gate Array (FPGA).

[00123] The computing system 1600 may also include a memory 1606 (main memory), for example, Random Access Memory (RAM) or other dynamic memory, for storing information and

instructions to be executed by the processor 1602. The memory 1606 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by the processor 1602. The computing system 1600 may likewise include a read only memory (“ROM”) or other static storage device coupled to bus 1604 for storing static information and instructions for the processor 1602.

[00124] The computing system 1600 may also include a storage devices 1608, which may include, for example, a media drive 1610 and a removable storage interface. The media drive 1610 may include a drive or other mechanism to support fixed or removable storage media, such as a hard disk drive, a floppy disk drive, a magnetic tape drive, an SD card port, a USB port, a micro-USB, an optical disk drive, a CD or DVD drive (R or RW), or other removable or fixed media drive. A storage media 1612 may include, for example, a hard disk, magnetic tape, flash drive, or other fixed or removable medium that is read by and written to by the media drive 1610. As these examples illustrate, the storage media 1612 may include a computer-readable storage medium having stored there in particular computer software or data.

[00125] In alternative embodiments, the storage devices 1608 may include other similar instrumentalities for allowing computer programs or other instructions or data to be loaded into the computing system 1600. Such instrumentalities may include, for example, a removable storage unit 1614 and a storage unit interface 1616, such as a program cartridge and cartridge interface, a removable memory (for example, a flash memory or other removable memory module) and memory slot, and other removable storage units and interfaces that allow software and data to be transferred from the removable storage unit 1614 to the computing system 1600.

[00126] The computing system 1600 may also include a communications interface 1618. The communications interface 1618 may be used to allow software and data to be transferred between the computing system 1600 and external devices. Examples of the communications interface 1618 may include a network interface (such as an Ethernet or other NIC card), a communications port (for example, a USB port, a micro-USB port), Near field Communication (NFC), etc. Software and data transferred via the communications interface 1618 are in the form of signals which may be electronic, electromagnetic, optical, or other signals capable of being received by the communications interface 1618. These signals are provided to the communications interface 1618 via a channel 1620. The channel 1620 may carry signals and may be implemented using a wireless medium, wire or cable, fiber optics, or another communications medium. Some

examples of the channel 1620 may include a phone line, a cellular phone link, an RF link, a Bluetooth link, a network interface, a local or wide area network, and other communications channels.

[00127] The computing system 1600 may include Input/Output (I/O) devices 1622. Examples may include, but are not limited to a display, keypad, microphone, audio speakers, vibrating motor, LED lights, etc. The I/O devices 1622 may receive input from a user and also display an output of the computation performed by the processor 1602. In this document, the terms “computer program product” and “computer-readable medium” may be used generally to refer to media such as, for example, the memory 1606, the storage devices 1608, the removable storage unit 1614, or signal(s) on the channel 1620. These and other forms of computer-readable media may be involved in providing one or more sequences of one or more instructions to the processor 1602 for execution. Such instructions, generally referred to as “computer program code” (which may be grouped in the form of computer programs or other groupings), when executed, enable the computing system 1600 to perform features or functions of embodiments of the present invention.

[00128] In an embodiment where the elements are implemented using software, the software may be stored in a computer-readable medium and loaded into the computing system 1600 using, for example, the removable storage unit 1614, the media drive 1610 or the communications interface 1618. The control logic (in this example, software instructions or computer program code), when executed by the processor 1602, causes the processor 1602 to perform the functions of the invention as described herein.

[00129] Thus, the disclosed method and system try to overcome the technical problem of managing patients' health. The method and system analyse patient data, including EHRs and medical imaging data, to assess health risks accurately and systematically. By offering patients clear and data-driven information into their health risks, the system helps individuals to understand their vulnerability to medical conditions and encourages timely preventive measures. This proactive approach reduces patient hesitation, increases participation in health intervention programs, and promotes early detection of potential health issues. Further, the method and system automate critical aspects of patient engagement, such as onboarding, appointment scheduling, and follow-up, minimizing the need for manual intervention and enhancing healthcare accessibility. The automated processes significantly reduce the time required for patient evaluation, resulting in

faster diagnosis, improved care coordination, and optimized healthcare resource utilization. The system also includes mechanisms to validate patient identity and maintain compliance with healthcare data regulations, ensuring data privacy and security. Additionally, the method and system facilitate seamless integration with healthcare platforms, enabling interoperability and scalability to accommodate large patient populations. By analysing comprehensive health data, including lifestyle factors, clinical history, and genetic predispositions, the system provides healthcare professionals to design personalized treatment plans, enhancing patient outcomes. Moreover, the method and system may be implemented across various healthcare settings, such as hospitals, clinics, telehealth platforms, and government health programs, demonstrating its versatility and potential for broader impact in population health management.

[00130] In light of the above-mentioned advantages and the technical advancements provided by the disclosed method and system, the claimed steps as discussed above are not routine, conventional, or well understood in the art, as the claimed steps enable the following solutions to the existing problems in conventional technologies. Further, the claimed steps clearly bring an improvement in the functioning of the system itself as the claimed steps provide a technical solution to a technical problem.

[00131] The specification has described method and system for managing patients' health. The illustrated steps are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

[00132] Furthermore, one or more computer-readable storage media may be utilized in implementing embodiments consistent with the present disclosure. A computer-readable storage medium refers to any type of physical memory on which information or data readable by a processor may be stored. Thus, a computer-readable storage medium may store instructions for

execution by one or more processors, including instructions for causing the processor(s) to perform steps or stages consistent with the embodiments described herein. The term “computer-readable medium” should be understood to include tangible items and exclude carrier waves and transient signals, i.e., be non-transitory. Examples include random access memory (RAM), read-only memory (ROM), volatile memory, non-volatile memory, hard drives, CD ROMs, DVDs, flash drives, disks, and any other known physical storage media.

[00133] It is intended that the disclosure and examples be considered as exemplary only, with a true scope and spirit of disclosed embodiments being indicated by the following claims.

[00134] While the invention has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

Claims

1. A method for managing patients' health, the method comprising:
 - receiving, by a user interface, a query by a user;
 - orchestrating, by an AI agent manager, a multi-stage workflow in response to the query, wherein the AI agent manager divides tasks into sub-tasks and delegates them to a plurality of AI agents, the multi-stage workflow comprising:
 - identifying, by a screening AI agent, a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database;
 - notifying, by a scheduling AI agent, the patient having the high-risk profile;
 - facilitating, by the scheduling AI agent, an onboarding of the patient in response to notifying, wherein the onboarding results in scheduling a health checkup;
 - receiving, by a processor, multimedia data associated with the patient via one or more external devices upon completion of the health checkup;
 - processing, by a medical imaging screening AI agent, the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data;
 - analysing, by the medical imaging screening AI agent, the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition; and
 - displaying, by the processor via a Graphical User Interface (GUI), the summarized report to at least one of the patient and a healthcare professional.

2. The method of claim 1, wherein the EHR comprises medical information of the patient, and wherein the medical information includes personal details, medical history, medical history of one or more family members, lab and test results, medications, treatment plans, and health and lifestyle information.

3. The method of claim 1, wherein identifying the patient having the high-risk profile comprises:
 - retrieving, by the processor, the EHR corresponding to a plurality of patients maintained in the database, wherein the EHR is retrieved based on a plurality of parameters corresponding to the query by the user;

analysing, by the screening AI agent, the EHR to identify one or more medical conditions associated with each of the plurality of patients;

generating, by the screening AI agent, a risk report for each of the plurality of patients based on the identification of the one or more medical conditions, wherein the risk report comprises information about the one or more medical conditions of each of the plurality of patients; and

determining, by the screening AI agent, a risk profile for each of the plurality of patients based on the risk report, wherein the risk profile is one of the high-risk profile, a medium-risk profile, and a low-risk profile.

4. The method of claim 1, wherein notifying the patient comprises:

determining, by the scheduling AI agent, a set of notification parameters corresponding to the patient based on the query by the user, wherein the set of notification parameters comprises at least one communication channel, a timeslot, and a selected risk profile; and

sending, by the processor, a notification to a user device of the patient based on the set of notification parameters.

5. The method of claim 1, wherein facilitating the onboarding of the patient comprises:

sending, by the scheduling AI agent, a set of questionnaires to the patient, wherein the set of questionnaires comprises one or more health-specific queries and one or more appointment-specific queries;

receiving, by the scheduling AI agent, a response corresponding to each of the set of questionnaires from the patient; and

scheduling, by the scheduling AI agent, an appointment of the patient in response to receiving the response.

6. The method of claim 1, wherein the screening AI agent is configured to generate the risk report for the patient based on a plurality of patterns learned from a training dataset, and wherein the training dataset comprises historical diagnostic reports associated with a plurality of patients.

7. The method of claim 1, further comprising:

storing, by the processor, the summarized report associated with the patient in the database for future analysis of the at least one medical condition of the patient.

8. The method of claim 1, wherein the multimedia data comprises a plurality of digital images captured using the one or more external systems, and wherein the plurality of digital images comprises Computed Tomography (CT) scans, X-Rays, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET).

9. The method of claim 1, wherein the summarized report is used by the healthcare professional to perform a set of actions, wherein the set of actions comprises tracking a progress of the patient on the at least one medical condition, and determining a next course of treatment for the patient based on a current state of the at least one medical condition.

10. A system for managing patients' health, the system comprising:

a memory; and

a processor coupled to the memory, configured to:

receive, by a user interface, a query by a user;

orchestrate, via an AI agent manager, a multi-stage workflow in response to the query, wherein the AI agent manager divides tasks into sub-tasks and delegates them to a plurality AI agents, the workflow comprising:

identifying, by a screening AI agent, a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database;

notifying, by a scheduling AI agent, the patient having the high-risk profile;

facilitating, by the scheduling AI agent, an onboarding of the patient, wherein the onboarding results in scheduling a health checkup;

receiving multimedia data associated with the patient via one or more external devices upon completion of the health checkup;

processing, by a medical imaging screening AI agent, the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data;

analyse, by the medical imaging screening AI agent, the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition; and

display, via a Graphical User Interface (GUI), the summarized report to at least one of the patient and a healthcare professional.

11. The system of claim 10, wherein the EHR comprises medical information of the patient, and wherein the medical information includes personal details, medical history, medical history of one or more family members, lab and test results, medications, treatment plans, and health and lifestyle information.

12. The system of claim 10, wherein, to identify the patient having the high-risk profile, the processor is configured to:

retrieve the EHR corresponding to a plurality of patients maintained in the database, wherein the EHR is retrieved based on a plurality of parameters corresponding to the query by the user;

analyse, by the screening AI agent, the EHR to identify one or more medical conditions associated with each of the plurality of patients;

generate, by the screening AI agent, a risk report for each of the plurality of patients based on the identification of the one or more medical conditions, wherein the risk report comprises information about the one or more medical conditions of each of the plurality of patients; and

determine, by the screening AI agent, a risk profile for each of the plurality of patients based on the risk report, wherein the risk profile is one of the high-risk profile, a medium-risk profile, and a low-risk profile.

13. The system of claim 10, wherein, to notify the patient, the processor is configured to:

determine, by the scheduling AI agent, a set of notification parameters corresponding to the patient, wherein the set of notification parameters comprises at least one communication channel, a timeslot, and a selected risk profile; and

send a notification to a user device of the patient based on the set of notification parameters.

14. The system of claim 10, wherein, to facilitate the onboarding of the patient, the

processor is configured to:

send, by the scheduling AI agent, a set of questionnaires to the patient, wherein the set of questionnaires comprises one or more health-specific queries and one or more appointment-specific queries;

receive, by the scheduling AI agent, a response corresponding to each of the set of questionnaires from the patient; and

schedule, by the scheduling AI agent, an appointment of the patient in response to receiving the response.

15. The system of claim 10, wherein the screening AI agent is configured to generate the risk report for the patient based on a plurality of patterns learned from a training dataset, and wherein the training dataset comprises historical diagnostic reports associated with a plurality of patients.

16. The system of claim 10, wherein the processor is further configured to: store the summarized report associated with the patient in the database for future analysis of the at least one medical condition of the patient.

17. The system of claim 10, wherein the multimedia data comprises a plurality of digital images captured using the one or more external systems, and wherein the plurality of digital images comprises Computed Tomography (CT) scans, X-Rays, Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET).

18. The system of claim 10, wherein the summarized report is used by the healthcare professional to perform a set of actions, wherein the set of actions comprises tracking a progress of the patient on the at least one medical condition, and determining a next course of treatment for the patient based on a current state of the at least one medical condition.

19. A computer program product comprising a non-transitory computer-readable medium comprising instructions that, when executed by one or more processors, cause the one or more processors to perform a method of managing patients' health using Artificial Intelligence (AI), the method comprising:

receiving, by a user interface, a query by a user;

orchestrating, by an AI agent manager, a multi-stage workflow in response to the query, wherein the AI agent manager divides tasks into sub-tasks and delegates them to a plurality of AI agents, the multi-stage workflow comprising:

identifying, by a screening AI agent, a patient having a high-risk profile for at least one medical condition based on a corresponding Electronic Health Record (EHR) maintained in a database;

notifying, by a scheduling AI agent, the patient having the high-risk profile;

facilitating, by the scheduling AI agent, an onboarding of the patient in response to notifying, wherein the onboarding results in a completion of a health checkup;

receiving multimedia data associated with the patient via one or more external devices upon completion of the health checkup;

processing, by a medical imaging screening AI agent, the multimedia data to extract an image corresponding to one or more Regions of Interest (ROIs) associated with the at least one medical condition of the patient from the multimedia data;

analysing, by the medical imaging screening AI agent, the image corresponding to the one or more ROIs to generate a summarized report including details associated with the at least one medical condition; and

displaying, via a Graphical User Interface (GUI), the summarized report to at least one of the patient and a healthcare professional.