A system for aggregating and disseminating in-case-of-emergency (ICE) medical information to medical units. The system includes an ICE medical record server that stores medical records of respective subscribers, and automatically receive updates from health service entities visited by subscribers. When contacted by emergency dispatchers or first responders, the server sends subscribers medical information to first responders, emergency management agencies directly, via a dispatcher, or via a computer aided dispatch (CAD) system. The medical information may be arranged, emphasized, and/or filtered in a manner relevant to the on-going emergency. A communication device may wirelessly receive the medical information and pre-populate a pre-hospital care form with the information, which may be further orally annotated by the first responder. The completed PCR may then be sent to a PCR server for subsequent access by medical units that subsequently treat the subscriber. The medical server may further assist a public health agency to disseminate emergency information to selected subscribers, responders, and public health alerting systems. An ICE personal server for storing important personal documents is also disclosed. A PCR server is also disclosed that can disseminate aggregate PCR information in near real-time to an emergency management agency (EMA) system for developing incident response plans during a wide area emergency.
Fig. 1
SUBSCRIBER ENROLLS FOR THE SERVICE PROVIDED BY THE ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER CREATES DATA OBJECT FOR THE SUBSCRIBER

ICE MEDICAL RECORD SERVER RECEIVES UPDATES TO THE SUBSCRIBER MEDICAL RECORD FROM THIRD PARTY SERVER(S)

ICE MEDICAL RECORD SERVER UPDATES THE SUBSCRIBER'S MEDICAL RECORD WITH THE NEW INFORMATION

Fig.2
<table>
<thead>
<tr>
<th>FIELD TYPE</th>
<th>FIELD LABEL</th>
<th>DATA FORMAT</th>
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<tr>
<td>Subscriber's File Access</td>
<td>Subscriber's Password</td>
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<td>Information</td>
<td>Restricted Use Password</td>
<td>Alpha-numeric</td>
<td>CBS456</td>
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<td></td>
<td>Third Party Access</td>
<td>Alpha-numeric</td>
<td>John Gage Station 51 Los Angeles 4/25/06 15:24</td>
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<td>Subscriber's Demographic</td>
<td>Last Name</td>
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<td>Doe</td>
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<tr>
<td>Information</td>
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<td>Open Text</td>
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<td></td>
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</tr>
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<td>987-654-1230</td>
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<td></td>
<td>eMail Address</td>
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<td><a href="mailto:john.m.doe@domain.com">john.m.doe@domain.com</a></td>
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<td>Subscriber's In Case of</td>
<td>ICE No.</td>
<td>Random No.</td>
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<td>Emergency Contact</td>
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<td>Jane W. Doe (Wife). Tom Doe (Father)...</td>
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<td><a href="mailto:jane.w.doe@domain.com">jane.w.doe@domain.com</a></td>
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<td>ICE Comments</td>
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<td>Use cell phone no. first</td>
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<td>Subscriber's Medical</td>
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<td>Dr. Jacob T. Prescott</td>
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<td></td>
<td>Comments</td>
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</table>

Fig.3
FIRST RESPONDER SENDS ICE IDENTIFIER AND INFORMATION RELATED TO THE ONGOING MEDICAL EMERGENCY TO THE ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER ACCESSES SUBSCRIBER'S MEDICAL RECORD DATA OBJECT USING ICE IDENTIFIER

ICE MEDICAL RECORD SERVER ARRANGES, EMPHASIZES AND/OR FILTERS MEDICAL RECORD INFORMATION IN ACCORDANCE WITH ONGOING EMERGENCY

ICE MEDICAL RECORD SERVER SENDS THE SUBSCRIBER'S ARRANGED, EMPHASIZED AND/OR FILTERED MEDICAL RECORD INFORMATION TO FIRST RESPONDER

Fig.4A
FIRST RESPONDER SENDS ICE IDENTIFIER AND INFORMATION RELATED TO THE ONGOING MEDICAL EMERGENCY TO THE ICE MEDICAL RECORD SERVER.

ICE MEDICAL RECORD SERVER ACCESSES SUBSCRIBER'S MEDICAL RECORD DATA OBJECT USING ICE IDENTIFIER.

ICE MEDICAL RECORD SERVER ARRANGES, EMPHASIZES AND/OR FILTERS MEDICAL RECORD INFORMATION IN ACCORDANCE WITH ONGOING EMERGENCY.

ICE MEDICAL RECORD SERVER SENDS THE SUBSCRIBER'S ARRANGED, EMPHASIZED AND/OR FILTERED MEDICAL RECORD INFORMATION TO FIRST RESPONDER.

FIRST RESPONDER USES A PRE-POPULATED PCR OR ENTERS THE INFORMATION INTO A PCR SYSTEM.

Fig. 4B
EMERGENCY DISPATCHER RECEIVES 911 CALL AND OBTAINS THE SUBSCRIBER'S ICE IDENTIFIER AND INFORMATION RELATED TO THE ON-GOING EMERGENCY

EMERGENCY DISPATCHER SENDS ICE IDENTIFIER TO THE ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER SENDS THE MEDICAL RECORD INFORMATION TO THE EMERGENCY DISPATCHER

EMERGENCY DISPATCHER ANNOTATES THE MEDICAL INFORMATION AND SENDS IT TO THE FIRST RESPONDER

Fig. 5A
EMERGENCY DISPATCHER RECEIVES 911 CALL AND OBTAINS THE SUBSCRIBER'S ICE IDENTIFIER AND INFORMATION RELATED TO THE ONGOING EMERGENCY

EMERGENCY DISPATCHER OBTAINS INFORMATION IDENTIFYING THE FIRST RESPONDER

EMERGENCY DISPATCHER SENDS THE ICE IDENTIFIER, EMERGENCY INFORMATION, AND FIRST RESPONDER IDENTITY INFORMATION TO THE ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER SENDS THE ANNOTATED MEDICAL RECORD INFORMATION TO THE FIRST RESPONDER

Fig. 5B
EMERGENCY DISPATCHER RECEIVES 911 CALL AND OBTAINS THE SUBSCRIBER'S ICE IDENTIFIER AND INFORMATION RELATED TO THE ON-GOING EMERGENCY

EMERGENCY DISPATCHER ENTERS THE ICE IDENTIFIER AND ON-GOING EMERGENCY INFORMATION INTO THE CAD SERVER

CAD SERVER SENDS ICE IDENTIFIER TO ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER SENDS THE SUBSCRIBER'S MEDICAL RECORD INFORMATION TO THE CAD SERVER

CAD SERVER AUTOMATICALLY SENDS THE CAD INFORMATION, SUBSCRIBER'S MEDICAL RECORD INFORMATION, AND ON-GOING EMERGENCY INFORMATION TO THE FIRST RESPONDER

CAD SERVER RECEIVES A REQUEST FOR THE CAD INFORMATION, SUBSCRIBER'S MEDICAL RECORD INFORMATION, AND ON-GOING EMERGENCY INFORMATION FROM THE FIRST RESPONDER

CAD SERVER SENDS THE CAD INFORMATION, SUBSCRIBER'S MEDICAL RECORD INFORMATION, AND ON-GOING EMERGENCY INFORMATION TO THE FIRST RESPONDER

Fig. 5C
EMERGENCY DISPATCHER RECEIVES 911 CALL AND OBTAINS THE SUBSCRIBER'S ICE IDENTIFIER AND INFORMATION RELATED TO THE ON-GOING EMERGENCY

EMERGENCY DISPATCHER ENTERS THE ICE IDENTIFIER AND ON-GOING EMERGENCY INFORMATION INTO THE CAD SERVER

CAD SERVER SENDS ICE IDENTIFIER TO ICE MEDICAL RECORD SERVER

ICE MEDICAL RECORD SERVER SENDS THE SUBSCRIBER'S MEDICAL RECORD INFORMATION TO THE CAD SERVER

CAD SERVER RECEIVES A REQUEST FOR THE CAD INFORMATION, SUBSCRIBER'S MEDICAL RECORD INFORMATION, AND ON-GOING EMERGENCY INFORMATION FROM THE PCR SERVER

CAD SERVER SENDS THE CAD INFORMATION, SUBSCRIBER'S MEDICAL RECORD INFORMATION, AND ON-GOING EMERGENCY INFORMATION TO THE PCR SERVER

Fig. 5D
FIG. 6A

FIG. 6B

PREDEFINED PCR FIELDS
- CHIEF COMPLAINT
- ASSESSMENT
- PROCEDURE
- BLOOD PRESSURE
- PULSE
- RESPIRATIONS
- RESPONSIVENESS
ENABLE SPEECH RECOGNITION FEATURE

PROMPT USER TO ANNOUNCE PREDEFINED PCR FIELD

DISPLAY MESSAGE THAT VOICE COMMAND WAS NOT RECOGNIZED

RECEIVE VOICE COMMAND FROM USER

VOICE COMMAND RECOGNIZED AS A PREDEFINED PCR FIELD?

YES

PROMPT USER TO ANNOUNCE INFORMATION CORRESPONDING TO PREDEFINED FIELD

RECEIVE VOICE INFORMATION FROM USER

PERFORM SPEECH RECOGNITION TO CONVERT VOICE INFORMATION INTO TEXT

ANNOTATE THE PCR WITH THE TEXT INFORMATION

NO

Fig. 6C
ICE MEDICAL RECORD SERVER RECEIVES A REQUEST TO DISSEMINATE PUBLIC HEALTH INFORMATION FROM PUBLIC HEALTH OFFICIAL

IS REQUESTER AUTHORIZED?

ICE MEDICAL RECORD SERVER RECEIVES PUBLIC HEALTH EMERGENCY INFORMATION AND SELECTION CRITERIA FROM PUBLIC HEALTH OFFICIAL

ICE MEDICAL RECORD SERVER PERFORMS QUERIES AND SELECTS USER DEFINED SUBSETS OF SUBSCRIBERS AND RESPONDERS THAT MEET THE SELECTION CRITERIA

ICE MEDICAL RECORD SERVER ALERTS SELECTED SUBSCRIBERS, FIRST AND SECOND RESPONDERS, AND PUBLIC HEALTH ALERTING SYSTEMS

Fig. 7
SUBSCRIBER ENROLLS FOR THE SERVICE PROVIDED BY THE ICE PERSONAL RECORD SERVER

ICE PERSONAL RECORD SERVER RECEIVES REQUEST AND CREATES PERSONAL RECORD SPACE FOR SUBSCRIBER

ICE PERSONAL RECORD SERVER PROMPTS SUBSCRIBER FOR SPECIFIC PERSONAL INFORMATION

ICE PERSONAL RECORD SERVER RECEIVES AND STORES PROMPTED PERSONAL INFORMATION FROM SUBSCRIBER

ICE PERSONAL RECORD SERVER RECEIVES REQUEST FOR PERSONAL INFORMATION

IS REQUESTER AUTHORIZED?

IF NO, THEN REQUEST DENIED

YES

ICE PERSONAL RECORD SERVER SENDS REQUESTED PERSONAL INFORMATION TO REQUESTER

Fig. 8A
RECEIVE REQUEST TO SEND SPECIFIC INFORMATION TO SUBSCRIBERS FROM THIRD PARTY

IS REQUESTER AUTHORIZED?

YES

RECEIVE INFORMATION TO BE DISTRIBUTED FROM THIRD PARTY

RECEIVE META TAG REGARDING INFORMATION TO BE DISTRIBUTED FROM THIRD PARTY

SELECT SUBSCRIBERS BASED ON THE META TAG

SEND INFORMATION TO SELECTED SUBSCRIBERS

 Fig. 8B
ICE MEDICAL RECORD SERVER RECEIVES REQUEST FROM EMA SERVER FOR A PLURALITY OF SUBSCRIBERS' MEDICAL RECORDS IN RESPONSE TO A WIDE AREA EMERGENCY

ICE MEDICAL RECORD SERVER AGGREGATES THE SUBSCRIBERS' MEDICAL RECORDS BASED UPON A DEFINED CRITERIA FROM THE EMA SERVER

ICE MEDICAL RECORD SERVER SENDS THE AGGREGATED SUBSCRIBERS' MEDICAL RECORDS TO THE EMA SERVER

EMERGENCY CONTINUES?

PCR SERVER RECEIVES A PLURALITY OF PCRs FROM THE FIRST RESPONDERS IN RESPONSE TO THE WIDE AREA EMERGENCY

PCR SERVER AGGREGATES THE PCRs AND SENDS THEM TO THE EMA SERVER

SYSTEM AT IDLE
SYSTEM AND METHOD OF AGGREGATING AND DISSEMINATING IN-CASE-OF-EMERGENCY MEDICAL AND PERSONAL INFORMATION

CROSS REFERENCE TO A RELATED APPLICATION

[0001] This application is a continuation-in-part (CIP) and claims the benefit of the filing date of U.S. application, Ser. No. 11/223,653, filed on Sep. 8, 2005, and entitled “System and Method for Aggregating and Providing Subscriber Medical Information to Medical Units”.

FIELD OF THE INVENTION

[0002] This invention relates generally to information management systems, and in particular, to a system and method for aggregating and disseminating in-case-of-emergency (ICE) subscriber medical and personal information.

BACKGROUND OF THE INVENTION

[0003] When a person is in need of medical assistance, a first responding medical unit (typically referred to as a “first responder”) is dispatched to assist the person with the emergency. First responders are typically mobile medical units, such as paramedics and emergency medical technicians (EMTS). First responders may also be government emergency medical units, such as those under the Federal Emergency Management Agency (FEMA). In an emergency situation, first responders are tasked to provide preliminary diagnosis and treatment in order to stabilize patients for subsequent transportation to hospitals, urgent care centers, or other permanent medical facilities (termed herein as “second responders”).

[0004] In responding to an emergency, a first responder typically attempts to obtain as much medical information about the patient in order to assist in diagnosing and treating the patient. Such medical information sought typically includes the patient’s demographic information, in-case-of emergency contact information, health insurance information, current medications, allergic reactions, pre-existing conditions, primary care information, and medical history information.

[0005] However, in many emergency medical situations, a patient is unconscious and unable to provide such medical information to a first responder. Even if such patient is conscious, the patient may not be able to provide accurate information because of his/her emotional and medical state. Another problem with relying on the patient for medical information is the patient’s faulty recollection. For example, many patients have a difficult time recalling names and dosage of prescription drugs they are currently taking or the names of medical procedures they have received in the past. In any event, the medical unit has to manually enter all that information into a pre-hospital care record (PCR) form. Further, when the patient is subsequently transported to a second responder, a new medical form for the patient may need to be created.

[0006] When responding to a medical emergency, time may be of the essence. With this in mind, first responders generally have a better chance of being prepared for the emergency if they know the condition of the patient as well as his medical history while on route to the scene. Typically, emergency dispatchers inform first responders of the nature of the medical emergency and basic information about the patient, but first responders must wait until they arrive at the scene to learn the patient’s medical history. If first responders knew the emergency condition and the medical history of the patient, they may be able to transmit this information together with the facts gathered at the scene to the hospital emergency department prior to patient arrival saving valuable minutes. Generally, a well formed plan is more effective than spur of the moment decision making, potentially saving lives by avoiding mistakes.

[0007] When first responders arrive on the scene, they may in times leave their vehicles and travel long distances to the patient. The patient may be in an upstairs apartment, on a hiking trail, or in other remote locations not accessible by vehicle. While roaming away from their vehicles, first responders may need to be able to communicate with remote entities to obtain patients medical history information and transmit at least a partially completed PCR. In addition, first responders may desire to input information into a PCR using speech recognition technologies instead of text. Using voice commands may free up at least one of their hands, which may be useful in properly assisting a patient.

[0008] With regard to receiving patient’s medical history information, first responders may want to receive only particular information that is relevant to the underlying emergency of the patient. For example, a first responder attending to a patient suffering a heart attack may not want medical history information regarding a prior treatment for a broken leg. Instead, the first responder would desire medical history information related to the patient’s heart, lungs and other affected organs. This would better assist the first responder in determining the information most relevant to the condition of the patient.

[0009] In addition to emergency medical services (EMS) systems providing medical information to hospital emergency medical personnel, in certain situations, there may be a need to provide mass casualty information to public health officials. Currently, there is no automated method to transmit real-time patient outcome information in aggregated format to public health and emergency management officials. The result is a lack of information preventing emergency response planning and incident resource planning. Also, dissemination of emergency information by public health officials typically occurs over television or radio broadcast. The problem with a broadcast is that a specific medical condition audience cannot be targeted. The result is a general public emergency message which may or may not be relevant to people with certain medical conditions in certain geographic locations.

[0010] There may be a further need to communicate in-case-of-emergency (ICE) personal information, such as legal information, to certain people during a time of crisis. For example, hurricanes and other large scale natural disasters may cause widespread damage requiring evacuation. During a mass evacuation, the collection of legal and other important documents may not be feasible. Many people opt to place such documents in safety deposit boxes, but as Hurricane Katrina showed, even such measure may not be adequate. Even if the bank is not submerged, access to documents may take a long time until the area is declared safe. Dispossessed families may need access to important documents shortly after arriving at a safe haven. Additionally, other information, such as family member locations and
contact information may need to be preserved for communication of such important documents and relevant information in times of emergency.

SUMMARY OF THE INVENTION

[0011] An aspect of the invention relates to a communication system (e.g., such as a web-based communication network) that provides essentially "real-time" medical record information of a subscriber to a medical unit in order to assist the medical unit with diagnosis and treatment of the subscriber during an on-going medical emergency. In particular, the communication system comprises three servers, (hereafter referred to as) an in-case-of-emergency (ICE) medical record server, an ICE personal record server, and a Pre-Hospital Care (PCR) server. The three servers are coupled to user communication devices via a wide area network. The ICE medical record server contains a plurality of data objects pertaining to subscribers' medical records. The ICE personal record server contains a plurality of data objects pertaining to subscribers' personal records. The PCR server contains a plurality of data objects pertaining to PCRs of documented emergencies.

[0012] Another aspect of the invention relates to an ICE medical record server adapted to automatically receive updates to subscribers' medical records from electronic medical records (EMR) servers of health service entities, such as physician practices, pharmacies, and hospitals. In particular, the ICE medical record server is adapted to create a medical record data object including medical information of a subscriber; receive updates to the medical information from an EMR server of a health service entity visited by the subscriber; modify the medical record data object to incorporate the updates to the medical information; receive a request for the updated medical information from a communication device of a first responder; and send the updated medical information to the communication device of the first responder.

[0013] Another aspect of the invention relates to an ICE medical record server suitable for arranging, emphasizing, and/or filtering medical information requested by first responders based on the nature of the emergencies. In particular, the ICE medical record server is adapted to create a medical record data object including medical information of a subscriber; receive a request for the medical information from a communication device of a first responder, wherein the request includes information related to an on-going emergency experienced by the subscriber; access the medical information from the medical record data object in response to the request; arrange, emphasize, and/or filter the medical information in accordance with the information related to the on-going emergency; and send the arranged, emphasized, and/or filtered medical information to the communication device of the first responder.

[0014] Another aspect of the invention relates to an ICE medical record server that may send requested medical record information in response to a request from an emergency dispatcher. In one embodiment, the medical record server is adapted to create a medical record data object including medical information of a subscriber; receive a request for the medical information from a communication device of an emergency dispatcher; access the medical information from the medical record data object in response to the request; send the medical information to the communication device of the emergency dispatcher.

[0015] In another embodiment, the medical record server is adapted to create a medical record data object including medical information of a subscriber; receive a request for the medical information from a communication device of an emergency dispatcher, wherein the request includes information identifying a first responder and annotations related to the on-going emergency affecting the subscriber; access the medical information from the medical record data object in response to the request; and send the medical information including the annotations to a communication device of the first responder using the first responder identity information.

[0016] In yet another embodiment, the emergency dispatcher enters the patient's ICE identifier and information related to the on-going emergency to a computer aided dispatch (CAD) server. Using the patient's ICE number, the CAD server sends the ICE identifier along with a request for the patient's medical record information to the ICE medical record server. In response to the request, the ICE medical record server accesses the patient's record and sends the corresponding medical information to the CAD server. The CAD server then broadcasts, or receives, a request for the, subscribers information, CAD information, and on-going emergency information. Then, in response to a request from a first responder, the CAD server then sends the CAD information, subscriber medical record and on-going emergency information to the first responder.

[0017] Another aspect of the invention relates to a communication system for use by a first responder that allows the medical unit to remain fairly mobile while capable of communicating with the ICE medical record and PCR servers, and allows the medical unit to annotate a PCR using voice commands. The communication system comprises a mobile communication unit for wireless communication with a pre-hospital care (PCR) server and an ICE medical record server; and a portable communication unit for wirelessly communicating with the mobile communication unit. The portable communication unit may communicate with the mobile communication unit via a short-range wireless protocol, such as Bluetooth. The mobile communication unit may communicate with the servers via a long-range wireless and redundant protocol, such as via a WiFi mesh.

[0018] The portable communication unit may include a speech capturing module for receiving speech from the first responder and generating an audio file of the speech. The portable or mobile communication unit may include a speech recognition module to generate text from the speech in the audio file. The speech recognition module may be adapted to recognize a limited set of voice commands related to particular fields of a PCR form. The portable or mobile communication unit may include a PCR module to pre-populate a PCR form with medical information received from the ICE medical record server and text based on the speech received from the first responder. The speech recognition module may be adapted to open and annotate specific fields in a PCR form upon receiving specific voice commands. For example, the first responder may say, "blood pressure". Upon recognizing the phrase "blood pressure", the speech recognition module may prompt the first responder for the measured blood pressure, receive the audio of the first responder announcing the blood pressure measurement, and then annotate the PCR form with the information. The mobile communication unit may send the completed PCR to the PCR server for subsequent access by other medical units. Alternatively, instead of the speech
recognition module located in the portable or mobile communication unit, it may be located in the PCR server. In such a case, the mobile communication unit sends the audio file of the first responder's voice commands or prompts to the PCR server for conversion into text by speech recognition.

Another aspect of the invention relates to a PCR server suitable for generating a PCR from medical information and an audio file received from a communication device of a first responder. In particular, the PCR server is adapted to receive medical information of a subscriber from a communication device of a first responder; receive an audio file from the communication device of the first responder; convert speech in the audio file into text; and generate a pre-hospital care (PCR) record including the medical information and the text.

Another aspect of the invention relates to a medical record server suitable for disseminating emergency medical information to subscribers meeting a selection criteria. In particular, the medical record server is adapted to create a database including a plurality of medical record data objects containing medical information of respective subscribers; receive a request to disseminate an emergency message based on a selection criteria; search the database to determine subscribers that meet the selection criteria; and send the emergency message to the selected subscribers. The medical record server may further be adapted to create a database of first responders; search the database to determine first responders that meet the selection criteria; and send the emergency message to the selected first responders, subscribers and public health alerting systems.

Another aspect of the invention relates to an ICE personal record server for electronically storing important personal documents which can be retrieved in case the originals documents are lost or destroyed in an emergency. In particular, the ICE personal record server is adapted to send a prompt to a communication device of a subscriber for one or more specific personal documents; receive the one or more specific personal documents from the communication device of the subscriber; and create a personal record data object containing the one or more specific personal documents. The server may be further adapted to receive a request for the one or more specific personal documents from a communication device of a requesting party, and send the one or more personal documents to the communication device of the requesting party. The specific personal documents may relate to legal, medical, and/or insurance matters.

Yet another aspect of the invention relates to an ICE personal record server that assists third parties sending relevant information to selected subscribers. In this regard, the ICE personal record server receives information-to-be-distributed and meta tag information from an authorized third party; selects subscribers based on the meta tag information; and sends the information-to-be-distributed to the selected subscribers. Thus, as an example, if an pharmaceutical company want to send specific research and/or drug to a subscriber or a class of subscribers, the ICE personal record server may assist the pharmaceutical company to identify subscriber who may want the information and then to subsequently send the information to the selected subscribers.

In yet another aspect of the invention relates to an ICE medical record server and PCR server that can send aggregate information to an emergency management agency (EMA) server in response to a wide area emergency so that the latter can incorporate near real-time emergency medical services resources when conducting incident response planning and emergency management. The ICE medical record server aggregates the subscribers personal medical records based upon defined criteria from the EMA server. The ICE medical record server then sends a plurality of subscriber medical records to the EMA server so that emergency medical resources can be assessed, allocated, or dispersed prior to first responder deployment. If the emergency continues, the PCR server receives a plurality of PCRs from first responders arriving on scene providing emergency medical treatment. The PCR server then aggregates the PCRs and first responder resources, and then sends this information to the EMA server in near real-time. This would enable near real-time incident response resource planning and emergency management.

Other aspects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**Fig. 1** illustrates a block diagram of an exemplary communication system in accordance with an embodiment of the invention.

**Fig. 2** illustrates a flow diagram of an exemplary method of updating an in-case-of-emergency (ICE) subscriber medical record in accordance with another embodiment of the invention.

**Fig. 3** illustrates a diagram of an exemplary subscriber medical record in accordance with another embodiment of the invention.

**Fig. 4A** illustrates a flow diagram of an exemplary method of sending arranged, emphasized, and/or filtered subscriber medical record information to a communication device of a first responder in accordance with another embodiment of the invention.

**Fig. 4B** illustrates a flow diagram of an exemplary method of sending arranged, emphasized, and/or filtered subscriber medical record information to a PCR system in accordance with another embodiment of the invention.

**Fig. 5A** illustrates a flow diagram of an exemplary method of providing subscriber medical record information to a first responder initiated by an emergency dispatcher in accordance with another embodiment of the invention.

**Fig. 5B** illustrates a flow diagram of another exemplary method of providing subscriber medical record information to a first responder initiated by an emergency dispatcher in accordance with another embodiment of the invention.

**Fig. 5C** illustrates a flow diagram of an exemplary method of providing subscriber medical record information, CAD information, and information related to the on-going emergency to a first responder initiated by a CAD system in accordance with an embodiment of the invention.

**Fig. 5D** illustrates a flow diagram of another exemplary method of providing subscriber medical record information, CAD information, and information related to the on-going emergency to a PCR server in accordance with another embodiment of the invention.

**Fig. 6A** illustrates a block diagram of an exemplary communication device of a first responder in accordance with an embodiment of the invention.
FIG. 6B illustrates a table depicting some examples of predefined pre-hospital care record (PCR) fields for speech recognition in accordance with another embodiment of the invention.

FIG. 6C illustrates a flow diagram of an exemplary method of annotating a pre-hospital care record (PCR) using voice commands in accordance with another embodiment of the invention.

FIG. 7 illustrates a flow diagram of an exemplary method of receiving and disseminating emergency information from a public health agency to subscribers in accordance with another embodiment of the invention.

FIG. 8A illustrates a flow diagram of an exemplary method of receiving and disseminating medical information in accordance with another embodiment of the invention.

FIG. 8B illustrates a flow diagram of an exemplary method of disseminating third party information to selected subscribers in accordance with another embodiment of the invention.

FIG. 9 illustrates a flow diagram of an exemplary method of sending aggregate subscriber medical information and PCR records to an emergency management agency (EMA) server in accordance with another embodiment of the invention.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

FIG. 1 illustrates a block diagram of an exemplary communication system 100 in accordance with an embodiment of the invention. In summary, the communication system 100 includes one or more servers adapted to receive in-case-of-emergency (ICE) medical and personal information related to subscribers, and provide such information to authorized requesting parties, such as first responders, second responders, public health officials, emergency management officials, subscribers, and persons designated by subscribers. The communication system 100 comprises a wide area network (WAN) 102, such as the Internet, to facilitate the communication of information between the various entities of the system 100.

In particular, the communication system 100 comprises an ICE medical record server 104 for storing medical history information of subscribers, and providing the information to authorized parties, such as first responders, upon request. For example, when a subscriber is in a medical emergency situation, a first responder (e.g., a paramedic, emergency medical technician (EMT), FEMA agent, etc.) obtains an in-case-of-emergency (ICE) identifier from the subscriber. The ICE identifier may be located on the subscriber, for example, in the form of a wallet-size card, bracelet, dog tag, radio frequency identification (RFID) tag, and/or in other forms.

Using a communication device 120, the first responder transmits the ICE identifier to the ICE medical record server 104 via the WAN 102. In response, the ICE medical record server 104 accesses the subscriber’s medical record data object using the ICE identifier, and sends the corresponding medical information to the communication device 120 of the first responder via the WAN 102. Having the medical record information of the subscriber on hand, the first responder may be able to better diagnose and treat the subscriber.

In another embodiment, the first responder, using the communication device 120, transmits the subscriber ICE identifier as well as information related to the on-going emergency (e.g., a code) to the ICE medical record server 104 via the WAN 102. Using the ICE identifier, the ICE medical record server 104 accesses the subscriber’s medical record data object. Using the on-going emergency code, the ICE medical record server 104 arranges, emphasizes, and/or filters the information in the subscriber’s medical data object. The ICE medical record server 104 sends the arranged, emphasized, and/or filtered medical record information to the communication device 120 of the first responder via the WAN 102. For example, if the on-going emergency is that the subscriber’s is undergoing a heart attack, the ICE medical record server 104 may arrange the information so that heart-related information is displayed first on the first responder’s communication device 120, and/or the heart-related information is highlighted, bold, underscored etc. when displayed by the first responder’s communication device 120, and/or information related to other medical conditions (e.g., a broken bone) not related to the heart may not be sent to the first responder’s communication device 120.

The ICE medical record server 104 is further adapted to disseminate a subscriber’s medical record information at the request of an emergency dispatcher (e.g., a 911 dispatcher). For example, a subscriber (or someone on behalf of the subscriber) calls an emergency dispatcher with a medical emergency, and provides the dispatcher with the subscriber’s ICE identifier as well as information related to the emergency. Using a communication device 118, the dispatcher transmits the ICE identifier to the ICE medical record server 104 via the WAN 102. In response to receiving the ICE identifier, the ICE medical record server 104 sends the subscriber medical record information to the communication device 118 of the dispatcher. The dispatcher may then annotate the information to include a brief description of the emergency situation. Using the communication device 118, the dispatcher may send the annotated original medical record information to the communication device 120 of the first responder via the WAN 102. In this way, the first responder may have the subscriber’s medical record information as well as information related to the on-going emergency while en route to the subscriber.

In another embodiment, the dispatcher, using the communication device 118, enters the subscriber’s ICE identifier and information related to the on-going emergency into a computer aided dispatch (CAD) system 128. The CAD system or server 128 sends the subscriber’s ICE identifier with a request for information to the ICE medical record server 104. In response, the ICE medical record server 104 accesses the subscriber medical record data object using the ICE identifier and sends the corresponding medical information to the CAD server 128. The CAD server 128 then sends the subscriber’s medical record information, CAD information (e.g., location of injured, time, etc.), and information to the first responder related to the on-going emergency. In this embodiment, the first responder may request and receive the subscribers medical record information, CAD information, and on-going emergency information from the CAD server 128 using its communication device 120, while en route to the subscriber.

Upon the communication device 120 of the first responder receiving the subscriber medical information, the
communication device 120 may automatically pre-populate a PCR form with at least some of the subscriber medical information. The first responder may further annotate the PCR with information related to the subscriber’s current medical condition and any treatment provided to the subscriber. Using the communication device 120, the first responder may then send the completed PCR to the PCR server 108 via the WAN 102 for subsequent access by a second responder (e.g., a hospital) and/or other authorized parties. Alternatively, or in addition to, the first responder may send the completed PCR using its communication device 120 directly to a communication device 122 of a second responder via the WAN 108. After the first responder transports the subscriber to the second responder, the second responder using the information in the completed PCR provides further diagnosis and treatment to the subscriber.

[0048] As discussed in more detail further, the communication device 120 of the first responder may include the ability to capture voice to allow the first responder to orally annotate PCRs. The communication device 120 may further include speech recognition capability to convert the first responder’s speech communication into text. The communication device 120 can subsequently annotate a PCR with the text. Alternatively, the communication device 120 may be able to send the pre-populated PCR with an audio file containing the first responder’s oral annotation to the PCR server 108 via the WAN 108. The PCR server 108 may include speech recognition to convert the audio file into text, and subsequently annotate the PCR with the text. The voice capture and/or speech recognition capabilities allow the first responder to annotate the PCR essentially hands free. In some situations, this may be very useful since the first responder may require both hands to effectively diagnose and treat the subscriber.

[0049] Also, as discussed in more detail further, the communication device 120 may comprise a portable communication unit carried personally by the first responder, and a mobile communication unit located in an emergency vehicle of the first responder. The portable communication unit communicates wirelessly with the mobile communication unit, for example, by a short-range wireless technology, such as Bluetooth. The mobile communication unit communicates wirelessly with the ICE medical record server 104 and the PCR server 108, for example, by a long-range, redundant wireless technology, such as a WiFi mesh. In such configuration, the first responder may roam beyond the emergency vehicle in order to gain access to the subscriber in need of medical assistance, while capable of communicating with the servers 104 and 108 to access the subscriber’s medical record and to upload the PCR.

[0050] The ICE medical record server 104 may receive subscriber medical record information directly from a subscriber and/or by way of an electronic medical record (EMR) server of a health service entity, such as a physician practice, pharmacy, and/or hospital. For example, during enrollment of a subscriber, the ICE medical record server 104 receives medical information from the subscriber communication device 110 via the WAN 102. Using the medical information received, the ICE medical record server 104 creates a medical record data object containing the medical information of the subscriber. Also, during the enrollment process, the ICE medical record server 104 generates and sends an ICE identifier associated with the medical record data object to the enrolling subscriber communication device 110 via the WAN 102. The subscriber generally keeps the ICE identifier on hand as discussed above. Using the communication device 110, the subscriber may send updates to his/her medical record to the ICE medical record server 104 via the WAN 102.

[0051] The ICE medical record server 104 may receive subscriber’s medical record information from the subscriber’s health management organization (HMO), preferred physician organization (PPO), physician, pharmacist, and/or hospital with the consent from the subscriber. For example, when a subscriber enrolls with a health organization, the subscriber may consent or request for the in-case-of-emergency (ICE) service provided by the ICE medical record server 104. The organization may subsequently establish a medical record for the subscriber on the ICE medical record server 104. As the subscriber visits physicians, pharmacies, and/or hospitals, medical information of the subscriber may be automatically sent as updates to the ICE medical record server 104 from electronic medical record (EMR) servers of these entities.

[0052] For example, when the subscriber visits a physician for a skin rash condition, information related to that condition and treatment may be automatically sent to the ICE medical record server 104 by the physician practice EMR server 112 via the WAN 102. Similarly, when the subscriber receives a new drug from a pharmacist, information related to the drug may be automatically sent to the ICE medical record server 104 by the pharmacy EMR server 114 via the WAN 102. As another example, when the subscriber visits a hospital for a medical condition, information related to that condition and treatment may be automatically sent to the ICE medical record server 104 by the hospital EMR server 116 via the WAN 102. In this way, the information in the subscriber’s medical record is kept up-to-date without the subscriber having to manually update the information.

[0053] The ICE medical record server 104 may also assist in disseminating emergency and public awareness information to selected subscribers and/or first responders in response to instruction received from a public health official. For example, a public health official may have detected an outbreak of a particular illness in a particular geographical region. The public health official may want to alert people that are susceptible to such illness and that reside in that particular geographical region of the illness so that they can take pre-cautionary measures.

[0054] Using a communication device 124, the public health official sends information related to the public health issue to the ICE medical record server 104 via the WAN 102. The information may include the description of the illness or emergency, the number of people affected by the illness or emergency, the location of the people affected by the illness or emergency, etc. Based on the information, the ICE medical record server 104 searches its database to determine which subscribers to alert based on the received information from the public health official. After making this determination, the ICE medical record server 104 sends alerts to the communication devices of the subscribers, first responders, and public health alerting systems via the WAN 102. These constituents, now being informed of the on-going illness outbreak or emergency, can take pre-cautionary measures, and/or provide emergency services and management.

[0055] The communication system 100 further comprises an ICE personal record server 106 for storing important personal information of subscribers for use in case of an
emergency. The subscriber may use the personal record as a personal vault for securely storing information in case the original information is destroyed in an emergency. Such information may include life insurance policies, mortgage documents, wills, deeds, family member location and contact information, etc. Using the communication device 110, the subscriber may create a personal record, send personal information to, and access the personal information via the WAN 102. In this way, the information is secured, even in case of emergency, and the subscriber can obtain access to it virtually anytime. The ICE personal record server 106 may also be able to direct information from third parties to selected subscribers meeting an input selection criteria.

[0056] The communication system 100 further comprises a PCR server 108 and ICE medical record server 104 that can send aggregate information to an emergency management agency (EMA) server 126 in response to a wide area emergency so that the latter can develop an incident response plan. In this regard, the ICE medical record server 104 sends subscribers’ aggregated medical record information to the EMA server 126 in responding to a request from the EMA server 126. During an emergency, first responders PCR information is then aggregated by the PCR server 108 and sent to the EMA server 126 from which a public health organization can develop an incident response plan to deal with the wide area emergency.

[0057] The communication system 100 described herein is merely an exemplary embodiment. The servers and the communication devices may be coupled to the WAN 102 each by way of a wired and/or wireless communication link. Although the servers 104, 106, and 108 are shown as separate servers, it shall be understood that the servers may be virtual servers running on the same machine, separate servers running on respective machines, or any combination thereof. The communication devices may be any device capable of sending and receiving data to and from the servers by way of the WAN. Such communication devices include desktop computers, laptop computers, cellular telephones, personal digital assistants (PDA), mobile data terminals, etc.

[0058] In more detail, the following describes an exemplary method of automatically updating a subscriber medical record stored in the ICE medical record server 104; an exemplary method of sending subscriber medical record information to a first responder that is arranged, emphasized, and/or filtered based on the ongoing emergency; a couple of exemplary methods of providing subscriber medical record information to a first responder initiated by an emergency dispatcher; an exemplary voice capture and/or speech recognition wireless communication device of a first responder; an exemplary method of receiving and disseminating emergency information initiated by a public health agency; and an exemplary method of storing and retrieving in-case-of emergency personal record documents in accordance with another embodiment of the invention.

[0059] FIG. 2 illustrates a flow diagram of an exemplary method 200 of updating a subscriber’s medical information stored in the ICE medical record server 104 in accordance with an embodiment of the invention. According to the method 200, the subscriber enrolls for the service provided by the ICE medical record server 104 (block 202). The subscriber may enroll directly with the server 104 or may enroll through a mass-enrollment initiated by a health care institution. For example, using the communication device 110, the subscriber may access an enrollment document provided by the server 104, complete the enrollment document including providing the subscriber’s medical history information, and send the enrollment document to the server 104 via the WAN 102. Once the enrollment information is verified and approved, the server 104 creates a subscriber medical record data object and generates an identifier for the data object (block 204). The server 104 then sends an enrollment confirmation including ICE identifier to the communication device 110 of the subscriber. As discussed above, the ICE identifier is used by a first responder to gain access to the subscriber’s medical record information during an emergency involving the subscriber.

[0060] Alternatively, or in addition to, the subscriber may enroll for the service provided by the ICE medical record server 104 through a mass enrollment initiated by a health care institution, such as a health maintenance organization (HMO), preferred physician provider (PPO), health insurance provider, etc. In this regard, the subscriber enrolls for health care service with the health care institution (block 202). During enrollment, the health care institution may ask the subscriber to sign an information release form so that the institution can provide the subscriber medical information to the server 104. This may be in compliance with the Health Insurance Portability and Accountability Act (HIPAA), Privacy Act of 1974 & 1988, and/or other applicable laws, rules, and regulations, governing the release of medical information to third parties. Once the release is obtained, the health care institution enrolls the subscriber and possible others in a mass enrollment process, and sends the medical information to the server 104. The server 104 creates medical record data objects for the subscriber and other enrollees, and sends the corresponding identifiers to the institution (block 204).

[0061] The subscriber and/or the health care institution informs the subscriber’s physicians, pharmacies, and hospitals of the subscriber’s enrollment for service provided by the ICE medical record server 104. The respective electronic medical record (EMR) servers 112, 114, and 116 of the subscriber’s physician, pharmacy, and hospital are adapted to send updates to the subscriber’s medical record data object to the server 104 via the WAN 102 as the subscriber visits these entities (block 206). The server 104, in turn, receives the new information, and updates the subscriber’s data object accordingly (block 208). The EMR servers 112, 114, and 116 may send the information in a number of ways, such as periodically (e.g., once a month or quarter), after each visit by the subscriber, upon receiving a request from the server 104, etc. In this way, the information in the subscriber’s medical record data object is kept current without the subscriber manually updating the information. The information being current generally helps first responders to better diagnose and treat subscribers.

[0062] FIG. 3 illustrates a diagram of an exemplary subscriber medical record in accordance with another embodiment of the invention. As discussed above, the exemplary subscriber medical record includes information that is typically requested by a pre-hospital care record (PCR) form. This would facilitate the seamless transfer of the information from the ICE medical record server 104 to the first responder’s communication device 120, and subsequently to the PCR server 108 and the second responder’s communication device 122. In particular, the subscriber medical record may be organized into several field types, for example, subscrib-
er’s file access information, subscriber’s demographic information, subscriber’s in-case-of-emergency contact information, subscriber’s medical insurance and primary care information, and subscriber’s health information.

For each field type, there may be several fields containing certain information about the subscriber. For instance, within the subscriber’s file access information, the fields may include “subscriber’s password” for accessing and editing the file, a “restricted use password” for providing third party restricted access to the file (e.g., time limited, or number of access limited), and a “third party access” which provides information as to who has previously accessed the file. Each of the fields includes a data format. For example, for these three fields, the data format may be alpha-numeric. In this example, the subscriber’s password is “ABC123”, the restricted use password is “CBS456”, and the third party access is “John Gage, Station 51, Los Angeles, Apr. 25, 2006, 15:24.”

Within the subscriber’s demographic information field type, the fields may include subscriber’s last name, middle initial (MI), first name, gender, date of birth, age, height, weight, home address, home and work telephone numbers, email address, and social security number (SSN). Each of the fields includes a data format. For example, the last name, middle initial (MI), first name, and home address may have an open text data format allowing a subscriber to enter text into the corresponding fields. The gender, height, and state may have a drop down data format. Whereas, the date of birth, age, weight, zip code, telephone numbers, and SSN may have a numeric data format. An example subscriber’s demographic information field for subscriber, John M. Doe, is shown.

Within the subscriber’s in-case-of-emergency contact information field type, the fields may include the ICE identifier, contact name, contact telephone numbers, contact email address, relationship to the subscriber, and comments. The ICE identifier includes a read-only random alphanumeric data format. The contact sequence, name, email, relationship and comments may have an open text data format. And, the contact telephone numbers may have a numeric data format. As this example illustrates, subscriber, John M. Doe, has listed Jane W. Doe, his wife, as the primary in-case-of-emergency contact, and Tom Doe, his father, as the secondary in-case-of-emergency contact.

Within the subscriber’s medical insurance and primary care information field type, the fields include insurance carrier, policy number, group number, secondary insurance, policy number for the secondary insurance, group number for the secondary insurance, the primary physician, and the primary physician’s telephone number. All of the fields in this field type may have an open text data format, except for the primary’s physician telephone number which may be of the numeric type. As this example illustrates, subscriber, John M. Doe, has Global Health Net as his primary insurance, CureAll Health Group as his secondary insurance, and Dr. Jacques T. Prescott as his primary care physician.

Within the subscriber’s health information field type, the fields may include primary condition, blood type, current medication, dosage, frequency, allergies, allergic reactions, past medical histories, and comments. All of the fields of this field type may have an open text data format. In this example, the subscriber, John M. Doe, has diabetes as his primary condition, has A+ as his blood type, takes 2.5-500 mg of Glucovance twice a day, is allergic to penicillin, has allergic reactions to latex, has a past history of heart disease, and also has limited mobility. It shall be understood that the medical record is merely an example, and the amount and nature of the information it contains may vary.

FIG. 4A is a flow diagram of an exemplary method 400 of sending subscriber medical record information to first responders in accordance with another embodiment of the invention. When a first responder arrives at a subscriber in-distress, the first responder obtains the subscriber’s ICE identifier and information related to the on-going emergency. Using the communication device 120, the first responder sends the subscriber’s ICE identifier and information related to the subscriber’s medical emergency to the ICE medical record server 104 via the WAN 102 (block 402). In response, the ICE medical record server 104 accesses the subscriber’s medical record data object using the ICE identifier (block 404). The ICE medical record server 104 then arranges, emphasizes and/or filters the subscriber medical record information in accordance with the on-going medical emergency (block 406). The server 104 then sends the arranged, emphasized, and/or filtered information to the communication device 120 of the first responder via the WAN 102 (block 408).

FIG. 4B is a flow diagram of an exemplary method 450 of sending subscriber medical record information to a PCR server 108 in accordance with another embodiment of the invention. The method 450 is similar to the method 400 previously discussed in that it includes the operations of the first responder requesting subscriber’s medical record information from the ICE medical record server 104 (block 402), the ICE medical record server 104 accessing the information from a local database (block 404), the ICE medical record server 104 arranging, emphasizing, and/or filtering the information in accordance with the on-going emergency (block 406), and the ICE medical record server 104 sending the information to the communication device of the first responder (block 408). Additionally, the first responder sends a pre-populated PCR including the subscriber’s medical record information to or manually enters the information into the PCR system or server 108 (block 452).

For example, if the subscriber is suffering a heart attack, the ICE medical record server 104 may arrange the information so that the subscriber’s heart-related medical information (e.g., prior heart attacks, prior medical treatment including bypass, valve replacement, installing of a pacemaker device, historical blood pressure and rate information, diabetes, etc.) is displayed first on the communication device 120 of the first responder. Alternatively, or in addition to, the information may be configured so that it is emphasized on the first responder’s communication device 120. For example, the heart-related medical information may be displayed on the device 120 in bold, underlined, in a different font and/or color, etc. Alternatively, or in addition to, some information in the subscriber’s medical record may be filtered so that it is not sent to the communication device 120 of the first responder. For example, information related to a broken bone injury and treatment of the subscriber may not be sent to the device 120 since it may not be relevant to the subscriber’s heart attack.

FIG. 6A illustrates a flow diagram of an exemplary method 500 of providing subscriber medical record information to a first responder initiated by an emergency dispatcher in accordance with another embodiment of the
invention. In many cases, a first responder is alerted about an emergency from an emergency dispatcher receiving a 911 telephone call from the subscriber or someone on behalf of the subscriber. It would be useful for the emergency dispatcher to assist in the first responder obtaining the subscriber's medical record information while en route to the subscriber. This would allow the first responder to be better informed about the subscriber's medical history when the first responder arrives at the emergency scene.

According to the method 500, an emergency dispatcher receives a 911 telephone call regarding an emergency experienced by a subscriber, and obtains the subscriber's ICE identifier in addition to information related to the on-going emergency (block 502). Using the communication device 118, the emergency dispatcher sends the ICE identifier to the ICE medical record server 104 via the WAN 102 (block 504). In response to receiving the subscriber's ICE identifier, the ICE medical record server 104 accesses and sends the medical record information to the communication device 118 of the emergency dispatcher (block 506). The emergency dispatcher may then annotate the medical information to document the on-going emergency, and send the annotated information to the communication device 120 of the first responder via the WAN 102 (block 508). As discussed above, forewarned of the condition of the subscriber and having access to the subscriber's ICE medical record should allow the first responder to formulate a more effective plan of action for dealing with the emergency.

FIG. 5C illustrates a flow diagram of another exemplary method 570 of providing subscriber medical record information to a first responder initiated by an emergency dispatcher in accordance with another embodiment of the invention. In the prior example, the emergency dispatcher obtained the subscriber medical record information, annotated it with the on-going emergency, and forward it to the first responder. In this example, the emergency dispatcher sends the ICE identifier, information related to the on-going emergency, and information identifying the first responder to the ICE medical record server 104. In response, the server 104 sends the subscriber medical record information including any annotation received from the emergency dispatcher directly to the communication device 120 of the first responder.

More specifically, the emergency dispatcher receives a 911 telephone call regarding an emergency experienced by a subscriber, and obtains the subscriber's ICE identifier in addition to information related to the on-going emergency (block 552). The emergency dispatcher then obtains information identifying a first responder assigned or to be assigned to handle the emergency (block 554). For example, the emergency dispatcher may have that information on-hand, or obtain it by contacting the organization that will dispatch the first responder. Using the communication device 118, the emergency dispatcher sends the subscriber's ICE identifier, information related to the on-going emergency, and information identifying the first responder to the ICE medical record server 104 via the WAN 102 (block 556). In response to receiving the information, the ICE medical record server 104, using the first responder's identity information, sends the subscriber's medical record information including the emergency annotations to the communication device 120 of the first responder (block 558). Again, forewarned of the condition of the subscriber and having access to the subscriber's ICE medical record should allow the first responder to formulate a more effective plan of action for dealing with the emergency.

FIG. 5D illustrates a flow diagram of another exemplary method 590 of providing subscriber medical record information, CAD information, and information related to the on-going emergency to a PCR server in accordance with another embodiment of the invention. The method 590 is similar to the method 570 previously discussed in that it includes the operations of an emergency dispatcher receiving a 911 telephone call and obtaining information the on-going emergency information and subscriber's ICE identifier (block 572), the emergency dispatcher entering the ICE identifier and on-going emergency information related into the CAD system 128 (block 574), the CAD server 128 sending the ICE identifier to the ICE medical record server 104 for the purpose of retrieving the subscriber's medical record information (block 576), and the ICE medical record server 104 sending the information to the CAD server 128 (block 578). The CAD server 128 may then receive a request for the subscriber's medical record information, CAD information, and on-going emergency information from the PCR server 108 (block 592), and then send the information to the PCR server 108 (block 594).

FIG. 6A illustrates a block diagram of an exemplary communication system 600 in accordance with another embodiment of the invention. As discussed above, during an emergency, the first responder may receive the subscriber's medical record information from the ICE medical record server 104. The communication device 120 of the first responder, or communication device 122 of the second responder, may then pre-populate a pre-hospital care (PCR) form with at least some of the information received from the server 104. The first responder, or second responder, then begins to diagnose and treat the subscriber. While diagnosing and treating the subscriber, the first responder typically needs to document the diagnosis and treatment of the subscriber. This documentation is added to the PCR form for
subsequent transmission to a medical facility to which the subscriber will be transported.

[0078] The ability of the communication device 120 to pre-populate a PCR form with the subscriber’s medical record information helps the first responder substantially. However, for information that is gathered at the emergency scene, typically that information had to be entered manually. This would require a first responder to type all that information into the communication device, which could take up substantial time and detract the first responder’s focus from the subscriber. Accordingly, the communication system 600 further assists in the first responder in documenting the emergency, and allowing the first responder to maintain substantial mobility.

[0079] In particular, the communication system 600 comprises a portable communication unit 602 adapted to be carried by the first responder, and a mobile communication unit 604 to be located in the vehicle used by the first responder. The portable communication unit 602 may communicate with the mobile communication device 604 via a short-distance wireless communication protocol, such as Bluetooth. The mobile communication unit 604, in turn, may communicate with an ICE medical record server 104 and a PCR server 108 via a redundant long-distance wireless communication protocol, such as a WiFi mesh. Such a system 600 would allow a first responder to roam away from his/her vehicle in order to assist the subscriber if located in an area in which the vehicle cannot gain access to (e.g., a wooded area, inside a building, etc.).

[0080] The portable communication unit 602 may also have voice capturing and/or speech recognition capabilities. For example, with regards to voice capturing, the portable communication unit 602 may include a microphone to generate an analog audio signal of the first responder’s speech annotation, a signal conditioner to condition the audio signal, an analog-to-digital converter (ADC) to convert the conditioned analog signal into a digital audio signal, and an audio compression unit to compress the audio signal and generate an audio file in, for example, .wav or mp3 format. With regard to speech recognition, the portable communication unit 602 may include a speech recognition module to convert the compressed or uncompressed audio into text. The portable communication unit 602 may further include a PCR module to add the text into a PCR that also contains the subscriber’s medical record information previously received from the ICE medical record server 104. The portable communication unit 602 includes a short-range wireless transmission model (e.g., Bluetooth) to send the annotated PCR to the mobile communication unit 604, which, in turn, wirelessly relays the PCR to the PCR server 108.

[0081] In an alternative embodiment, the PCR module may be instead located in the mobile communication unit 604. In such a case, the mobile communication unit 604 receives the text from the portable communication unit 602, and adds the text to the PCR. The mobile communication unit 604 includes a wireless transmission unit for transmitting the PCR to the PCR server 108.

[0082] In yet another alternative embodiment, the speech recognition and PCR modules are located in the mobile communication unit 604. In such a case, the mobile communication unit 604 receives either the compressed or uncompressed audio file from the portable communication unit 602, converts the audio file into text using the speech recognition module, adds the text into the PCR using the PCR module, and sends the PCR to the PCR server 108 via the wireless transmission module.

[0083] In still another alternative embodiment, the speech recognition module may be located in the PCR server 108. In such a case, the mobile communication unit 604 receives the compressed or uncompressed audio file from the portable communication unit 602, and wirelessly transmits it to the PCR server 108. The mobile communication unit 604 also transmits the subscriber medical record information to the PCR server 108. The PCR server 108, in turn, includes a speech recognition module to convert the audio file into text, and a PCR module to add the text and the subscriber’s medical record information to a PCR. The PCR server 108 may send, upon authorized request, the completed PCR to the communication device 122 of a second responder and/or the communication device 120 of the first responder, via the WAN 102.

[0084] In summary, the exemplary communication system 600 is adapted to utilize a wireless mesh networking technology to extend the range a first responder may travel while still maintaining communications with the ICE medical record server 104 and PCR server 108. The decentralized nature of a wireless mesh network is desirable in case of large scale catastrophes because the system should dynamically by-pass nodes that are damaged or destroyed. Once the first responder’s communication device reaches an uplink node, the first responder can access the ICE medical record server and/or PCR server.

[0085] The speech recognition module further enhances the “hands free” capability of the first responder’s remote communication device, by converting verbal communication into text. As discussed, the speech recognition module may be implemented client side or server side. On the client side, the speech recognition module may be a component of the portable communication unit 602 or a part of the mobile communication unit 604. On the server side, the speech recognition module can be a component of the PCR server 108. Whichever the embodiment, the first responder’s data is updated to the PCR server 108 where the annotation is accessible as text data.

[0086] FIG. 6B illustrates a table depicting some examples of predefined pre-hospital care record (PCR) fields for speech recognition in accordance with another embodiment of the invention. In any of the above devices, a speech recognition module may be adapted to recognize a pre-defined set of voice commands indicative of particular fields of the PCR. For example, the speech recognition module may be adapted to recognize such voice commands as “chief complaint”, “assessment”, “procedure”, “blood pressure”, “pulse”, “respiration”, “responsiveness” and/or other. As explained in more detail in the following example, a first responder annunciates the voice commands to cause the speech recognition module to identify the PCR field to which the following oral information received from the first responder pertains.

[0087] FIG. 6C illustrates a flow diagram of an exemplary method 600 of annotating a pre-hospital care record (PCR) using voice commands in accordance with another embodiment of the invention. According to the method, the speech recognition module receives a voice command to enable the speech recognition feature from the first responder (block 652). Any of the above devices may include a “hard” or “soft” button to enable this feature. In response, the speech
recognition module prompts the first responder to announce a predefined PCR field (block 654). This could be a visual or oral prompt. Thereafter, the speech recognition module receives the voice command from the first responder (block 656). The speech recognition module then attempts to recognize the voice command (block 658).

If the speech recognition module cannot recognize the voice command, the speech recognition module displays and/or announces a message indicating that the voice command received was not recognized (block 660). Thereafter, the speech recognition module returns to block 654 in an attempt to receive a new voice command from the first responder. If, on the other hand, the speech recognition module recognizes the voice command, the module prompts the first responder to announce information corresponding to the recognized predefined field. For example, the voice command could have been “pulse”, and thus the announced information received could have been 92 pulses per minute. Then speech recognition module 664 may then perform speech recognition to convert the received information into text (block 665). The speech recognition module then annotates the PCR with the text information (block 668). The speech recognition module then returns to block 654 to receive another predefined voice command. This process continues until the first responder completes the PCR with voice commands or decides to enter additional information manually with a keyboard.

[Fig. 7 illustrates a flow diagram of an exemplary method 700 of providing emergency medical information to selected subscribers and first responders in response to a request received from a public health agency in accordance with another embodiment of the invention. As previously discussed, public health agencies, such as the Federal Emergency Management Agency (FEMA), may want to convey public health information to subscribers and first responders. Such information may include disease outbreaks in a certain geographical area, adverse environmental condition (e.g., toxic fumes, radioactivity) in a certain geographical area, and catastrophes (e.g., the breaking of a levy) in a certain geographical area. The public health agency may want to communicate such information to subscribers, first responders and/or public health alerting systems so that they can take precautionary measures as well as prepare for the emergency. As discussed below, the ICE medical record server 104 may assist in disseminating such information.

According to the method 700, the ICE medical record server 104 receives a request to disseminate public health information from the communication device 124 of a public health official via the WAN 102 (block 702). In response, the ICE medical record server 104 determines whether the public health official is authorized to disseminate the requested information (block 704). If the server 104 determines that the public official is not authorized, the server 104 denies the request (block 706).

If the server 104 determines that the public health official is authorized, the ICE medical record server 104 prompts for and subsequently receives public health information which is to be disseminated including a selection criteria (block 708). The selection criteria may include the affected geographical areas, routes of evacuation, location of command centers, etc. The ICE medical record server 104 then searches its database to determine subscribers and/or responders that meet the selection criteria (block 710). The ICE medical record server 104 may then send emergency-related medical or public health information to the communication devices of subscribers, responders (first and/or second) and public health alerting systems via the WAN 102 (block 712).

For example, suppose an outbreak of meningitis has occurred in Corpus Christi, TX. FEMA may deem the outbreak only sufficiently dangerous to those residing within a certain perimeter around the city. Instead of providing an alert via local radio or television, which may cause widespread panic, FEMA may wish to direct the precautionary emergency public health only to subscribers residing in the designated area. In this regard, the ICE medical record server 104 would alert only those subscribers and responders in those zip codes via their communication devices. The alerts may be adapted to include email, cell phone text, voice mail, etc. sent to the subscribers’ and responders’ communication devices.

[Fig. 8A illustrates a flow diagram of an exemplary method 800 of receiving, storing, and providing in-case-of-emergency (ICE) personal information in accordance with another embodiment of the invention. As discussed above, a subscriber may create and use an ICE personal record as a personal vault for securely storing information in case the original information is destroyed in an emergency. Such information may include life insurance policies, mortgage documents, wills, deeds, etc. Using the communication device 110, the subscriber enrolls with the ICE personal record server 106 to create a personal medical record data object, receives a prompt from the server for specific personal information, sends the prompted personal information to the server 106, and access or have a designated party access the personal information from the server 106 via the WAN 102. In this way, the information is secured, even in case of emergency, and the subscriber or one designated by the subscriber to gain access to it virtually anytime.

According to the method 800, a subscriber, using the communication device 110, sends a request to enroll for the service provided by the ICE personal record server 106 via the WAN 102 (block 802). The ICE personal record server 106 receives the request and creates a personal record data object for the subscriber (block 804). The ICE personal record server 106 may send generate and send an identifier for the personal record data object to the communication device 110 of the subscriber. In addition to sending the identifier, the ICE personal record server 106 prompts the subscriber for specific information and documents (block 806). The specific information and documents are those that may be needed at a time of emergency. For example, the server 106 may prompt the subscriber for a designated contact person, legal information and/or documents, insurance policy information and/or documents, mortgage information and/or documents. In response to the prompt, the subscriber uploads the prompted personal information to the ICE personal record server 106. The subscriber personal record server 106 then receives the and stores personal information from the communication device 110 via the WAN 102 (block 808).

Subsequently, possibly during an emergency, the ICE personal record server 106 receives a request for personal information from the subscriber or a party authorized by the subscriber (block 810). The server 106 then determines whether the requester is authorized to receive the requested information (block 812). If not, the server denies the request (block 814). If the requester is authorized, the
server 106 sends the requested personal information to the requester via the WAN 102 (block 816). Alternatively, or in addition to, the server 106 may send the requested information to the contact person identified in the subscriber personal record.

The method 850 may be implemented by the ICE personal record server 106 to disseminate information from third parties to subscribers selected on the basis of the information contained in his/her personal file. As an example, a pharmaceutical company may want to send information regarding a new medical research and/or drug to subscriber having a certain medical condition. With the method 850, the ICE personal record server 106 assists the pharmaceutical company in identifying such subscribers and disseminating the relevant information to them.

More specifically, according to the method 850, the ICE personal record server 106 receives a request to send specific information to subscribers from a third party (block 852). In response, the ICE personal record server 106 determines whether the third party is authorized (block 854). If the personal record server 106 determines that the third party is not authorized, the server 106 sends a message denying the request to the third party (block 856). Otherwise, the ICE personal record server 106 prompts for and receives the information to be distributed from the third party (block 858). In the example above, the information to be distributed may be related to a new drug for the cure of breast cancer.

The ICE personal record server 106 then prompts for and receives metadata regarding information to be distributed from the third party (block 860). For example, the metadata may specify breast cancer policy. In response, the ICE personal record server 106 selects subscribers based on the metadata (block 862). In this example, the ICE personal record server 106 selects subscribers having been previously diagnosed with breast cancer or a family history of breast cancer. The ICE personal record server 106 then sends the information to be distributed to the subscribers (block 864).

FIG. 9 illustrates a flow diagram of an exemplary method 900 of sending aggregate subscriber medical information and PCR records to an emergency management agency (EMA) server in accordance with another embodiment of the invention. The method 900 may be applicable to wide area emergency where there may be a need to relay aggregate information regarding victims, or potential victims, and/or required emergency medical resources to the EMA server 126 for further dissemination to public health agencies. In this regard, the method 900 entails the ICE personal record server 104 receiving a request from the EMA server 126 for a plurality of subscribers’ medical records in response to a wide area emergency (block 902). The ICE personal record server 104 aggregates the subscribers’ medical records based on a defined criteria from the EMA server 126 (block 904). The ICE personal record server 104 then sends the aggregated subscribers medical records to the EMA server 126 (block 906).

Then a determination as to whether the wide area emergency continues (block 908). If the emergency no longer exists, the system 104 and 108 goes idle with respect to the emergency (block 910). If, on the other hand, the emergency continues, the PCR server 108 receives a plurality of PCRs from first responders treating the subscribers affected by the wide area emergency (block 912). The PCR server 108 then aggregates the PCR information, and sends it to the EMA server (block 914). The EMA server 126 compiles the information, from which an emergency management agency may generate an incident response plan to identify emergency medical resources required deal with the wide-spread emergency event. The EMA server 126 may send multiple requests for subscribers’ medical records and PCR information as indicated by the arrow connecting block 914 to 902.

As discussed above, the communication system 100 facilitates the communication of medical information so as to deal with individual or wide spread emergencies in various different manners. Any entity (104-128) of the system 100 may communicate any of the above discussed information with any other one or more entities of the system 100 directly or via any one or more entities of the system 100 to achieve a particular objective with respect to subscribers’ medical and personal information, and dealing with emergencies and public health in general.

While the invention has been described in connection with various embodiments, it will be understood that the invention is capable of further modifications. This application is intended to cover any variations, uses or adaptations of the invention following, in general, the principles of the invention, and including such departures from the present disclosure as come within the known and customary practice within the art to which the invention pertains.

What is claimed is:
1. A medical record server adapted to:
create a medical record data object including medical information of a subscriber;
receive one or more updates to said medical information from an electronic medical record (EMR) server of a health service entity that provided service to said subscriber;
modify said medical record data object to incorporate said one or more updates to said medical information;
receive a request for said updated medical information from a communication device of a first responder; and
send said updated medical information to said communication device of said first responder.
2. The medical record server of claim 1, wherein said health service entity includes a physician practice visited by said subscriber.
3. The medical record server of claim 1, wherein said health service entity includes a pharmacy visited by said subscriber.
4. The medical record server of claim 1, wherein said health service entity includes a hospital visited by said subscriber.
5. The medical record server of claim 1, wherein said one or more updates to said medical information is received by way of a wide area network.
6. The medical record server of claim 1, wherein said one or more updates are received on a periodic basis.
7. The medical record server of claim 1, wherein said one or more updates are received in response to said subscriber visiting said health service entity.
8. The medical record server of claim 1, further adapted to send a request for said one or more updates to said electronic medical record (EMR) server of said health service entity.

9. A medical record server adapted to:
create a medical record data object including medical information of a subscriber;
receive a request for said medical information from a communication device of a first responder, wherein said request includes information related to an on-going emergency experienced by said subscriber;
access said medical information from said medical record data object in response to said request;
arrange, emphasize, and/or filter said medical information in accordance with said information related to said on-going emergency; and
send said arranged, emphasized, and/or filtered medical information to said communication device of said first responder.

10. The medical record server of claim 9, wherein said request includes an identifier associated with said medical record data object.

11. The medical record server of claim 10, further adapted to use said identifier to access said medical information from said medical record data object.

12. The medical record server of claim 9, wherein said request for said medical information is received from said communication device of said first responder by way of a wide area network.

13. The medical record server of claim 9, wherein said arranged, emphasized, and/or filtered medical information is sent to said communication device of said first responder by way of said wide area network.

14. A medical record server adapted to:
create a medical record data object including medical information of a subscriber;
receive a request for said medical information from a communication device of an emergency dispatcher;
access said medical information from said medical record data object in response to said request; and
send said medical information to said communication device of said emergency dispatcher.

15. The medical record server of claim 14, wherein said request includes an identifier associated with said medical record data object.

16. The medical record server of claim 14, wherein said request for said medical information is received from said communication device of said emergency dispatcher by way of a wide area network.

17. The medical record server of claim 14, wherein said medical information is sent to said communication device of said emergency dispatcher by way of said wide area network.

18. A medical record server adapted to:
create a medical record data object including medical information of a subscriber;
receive a request for said medical information from a communication device of an emergency dispatcher, wherein said request includes information identifying a first responder;
access said medical information from said medical record data object in response to said request; and
send said medical information to a communication device of said first responder using said information identifying said first responder.

19. The medical record server of claim 18, wherein said request further includes information related to an on-going emergency experienced by said subscriber, and further adapted to send said information related to said on-going emergency to said communication device of said first responder.

20. A communication system for use by a first responder, comprising:
a mobile communication unit for wireless communicating with a pre-hospital care (PCR) server and a medical record server; and
a portable communication unit for wirelessly communicating with said mobile communication unit.

21. The communication system of claim 20, wherein said mobile communication unit is adapted to communicate with said pre-hospital care (PCR) server via a long-distance wireless protocol.

22. The communication system of claim 21, wherein said long-distance wireless protocol includes a WiFi mesh protocol.

23. The communication system of claim 20, wherein said portable communication unit is adapted to communicate with said mobile communication unit via a short-distance wireless protocol.

24. The communication system of claim 23, wherein said short-distance wireless protocol includes a Bluetooth protocol.

25. The communication system of claim 20, wherein said portable communication unit comprises a voice capturing module to generate an audio file from speech received from said first responder.

26. The communication system of claim 25, wherein said portable communication unit comprises a speech recognition module to recognize predefined voice commands pertaining to PCR fields from said audio file.

27. The communication system of claim 26, wherein said portable communication unit comprises a pre-hospital care (PCR) form module adapted to:
receive medical information of a subscriber from said medical record server by way of said mobile communication unit;
pre-populate a pre-hospital care (PCR) form with at least some of said medical information of said subscriber; and
add at least some of said text to said PCR form to generate a filled PCR form.

28. The communication system of claim 27, wherein said portable communication unit is further adapted to wirelessly transmit said filled PCR form to said mobile communication unit, and wherein said mobile communication unit is further adapted to wirelessly transmit said filled PCR form to said pre-hospital care (PCR) server.

29. The communication system of claim 26, wherein said mobile communication unit comprises a pre-hospital care (PCR) form module adapted to:
receive medical information of a subscriber from said medical record server;
pre-populate a pre-hospital care (PCR) form with at least some of said medical information of said subscriber;
receive said text from said portable communication unit;
add at least some of said text to said PCR form to generate a filled PCR form; and wirelessly transmit said filled PCR form to said pre-hospital care (PCR) server.

30. The communication system of claim 20, wherein said mobile communication unit comprises a speech recognition module to recognize predefined voice commands pertaining to PCR fields from said audio file received from said portable communication device.

31. The communication system of claim 20, wherein said mobile communication unit is further adapted to: receive said audio file from said portable communication unit; and wirelessly transmit said audio file to said pre-hospital care (PCR) server.

32. A pre-hospital care (PCR) server adapted to: receive medical information of a subscriber from a communication device of a first responder; receive an audio file from said communication device of said first responder; convert speech in said audio file into text; and generate a pre-hospital care (PCR) record including said medical information and said text.

33. A medical record server adapted to: create a database including a plurality of medical record data object containing medical information of respective subscribers; receive a request to disseminate an emergency message based on a selection criteria; receive a request to disseminate aggregated emergency data based on a selection criteria; search said database to determine subscribers that meet said selection criteria; and send said aggregated emergency data to a selected entity.

34. The medical record server of claim 33, further adapted to: create a database of first responders; search said database to determine first responders that meet said selection criteria; and send said emergency message to said selected first responders.

35. The medical record server of claim 33, wherein said selection criteria relates to a particular geographical area.

36. The medical record server of claim 33, wherein said selection criteria relates to a medical or environmental condition.

37. A personal record server adapted to: send a prompt to a communication device of a subscriber for one or more specific personal documents; receive said one or more specific personal documents from said communication device of said subscriber; and create a personal record data object containing said one or more specific personal documents.

38. The personal record server of claim 37, further adapted to: receive a request for said one or more specific personal documents from a communication device of a requesting party; and send said one or more specific personal documents to said communication device of said requesting party.

39. The personal record server of claim 37, wherein said one or more specific personal documents are respectively one or more legal documents.

40. The personal record server of claim 37, wherein said one or more specific personal documents are respectively one or more mortgage documents.

41. The personal record server of claim 37, wherein said one or more specific personal documents are respectively one or more medical record documents.

42. The personal record server of claim 37, wherein said one or more specific personal documents are respectively one or more insurance documents.

43. The personal record server of claim 37, further adapted to: receive information-to-be-distributed and meta tag information from a third party; select subscribers based on the meta tag information; and send the information-to-be-distributed to the selected subscribers.

44. A medical record server adapted to: create a medical record data object including medical information of a subscriber; receive a request for said medical information from a computer aided dispatch (CAD) server; access said medical information from said medical record data object in response to said request; and send said medical information to the CAD server.

45. A pre-hospital care record (PCR) server adapted to: receive a plurality of PCRs from communication devices of first responders; aggregate the information from the PCRs; and send the aggregated PCR information to an emergency management agency (EMA) server.

46. An ICE medical record server adapted to: receive a request for aggregated subscriber medical record information from an EMA server; access said subscriber medical record information from said ICE medical record server in response to said request; and send said subscriber medical information to the EMA server.

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