TEAM ID :PNT2022TMID34792

Personal Assistance For Seniors Who Are Self-Reliant

CHAPTER 1

INTRODUCTION

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers UIDSand the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

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Working

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send

and act on data they acquire from their environments.IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another.

The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data.The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.

IoT can also make use of artificial intelligence (AI) and machine learning to aid in making data collecting processes easier and more dynamic.

Benefits of IOT to organizations

The internet of things offers several benefits to organizations. Some benefits are industry-specific, and some are applicable across multiple industries. Some of the common benefits of IoT enable businesses to:

- monitor their overall business processes
- improve the customer experience (CX)
- save time and money
- enhance employee productivity
- integrate and adapt business models
- make better business decisions
- generate more revenue.

IoT encourages companies to rethink the ways they approach their businesses and gives them the tools to improve their business strategies.Generally, IoT is most abundant in manufacturing, transportation and utility organizations, making use of sensors and other IoT devices; however, it has also found use cases for organizations within the agriculture, infrastructure and home automation industries, leading some organizations toward digital transformation IoT can benefit farmers in agriculture by making their job easier. Sensors can collect data on rainfall, humidity, temperature and soil content, as well as other factors, that would help automate farming techniques.

IOT In Safety

IoT SAFE provides a common mechanism to secure IoT data communications using a highly trusted SIM, rather than using proprietary and potentially less trusted hardware secure elements implemented elsewhere within the device. Leveraging a hardware secure element, or 'Root of Trust', to establish end-to-end, chip-to-cloud security for IoT products and services is a key recommendation of the GSMA IoT Security Guidelines. This requires both the provisioning and use of security credentials that are inside a secure place within the device.The SIM is best suited to function as the hardware Root of Trust in an IoT device as it has advanced security and cryptographic features and is afully standard secure element, enabling interoperability across different vendors and consistent use by IoT device makers.

Monitoring Possible Risk

One of the features that IoT software has is predictive maintenance, which is used to monitor workplace equipment. It gives room for one to notice any structural failures in any connected device before any ill-fated accident occurs.The great thing about predictive maintenance is that it allows organizations to take proactive action based on data patterns. Predictive maintenance makes use of machine learning algorithms to help predict potential issues before these can impact employees.

Instead of relying on decentralized and manual analysis of data and reports, IoT technology and data analytics can help make data monitoring and analysis more centralized and comprehensive. With a more efficient system in place, organizations have access to information that will help them monitor and prevent risks to the company whether these are possible accidents, injuries, losses and damages or other safety issues.

Application of IOT

1. Smart Agriculture

Food is an integral part of life without which we cannot survive. However, it is an unfortunate fact that a lot of food is wasted in developed countries like America while people starve in poorer countries like Chad, Sudan, etc. One way to feed everyone is better agricultural practices which can be enhanced using IoT. This can be done by first collecting data for a farm such as soil quality, sunlight levels, seed type, rainfall density from various sources like farm sensors, satellites, local weather stations, etc. and then using this data with Machine Learning and IoT to create custom recommendations for each farm that will optimize the planting procedure, irrigation levels required, fertilizer amount, etc. All this will result in better yield or crops with a focus on reducing world hunger in the future. This is done very efficiently by SunCulture, which is an initiative by Microsoft AI for Earth.

2. Smart Vehicles

Smart vehicles or self-driving cars as they can be called are pretty dependent on IoT. These cars have a lot of features that are integrated with each other and need to communicate such as the sensors that handle navigation, various antennas, controls for speeding or slowing down, etc. Here the Internet of Things technology is critical especially in the sense that self-driving cars need to be extremely accurate and all the parts need to communicate with each other in milliseconds on the road. Tesla Cars are quite popular and working on their self-driving cars. Tesla Motors' cars use the latest advancements in Artificial Intelligence and the Internet of Things. And they are quite popular as well!!! Tesla Model 3 was the most sold plug-in electric car in the U.S. in 2018 with a total yearly sales of around 140,000 cars.

3. Smart Home

Maybe the most famous application of IoT is in Smart Homes. After all, who hasn't heard about connecting all the home applications like lighting, air conditioners, locks, thermostat, etc. into a single system that can be controlled from your smartphone! These IoT devices are becoming more and more popular these days because they allow you complete freedom to personalize your home as you want. In fact, these IoT devices are so popular that every second there are 127 new devices connected to the internet. Some popular ones that you might have heard have, or even have in your home, include Google Home, Amazon Echo Plus, Philips Hue Lighting System, etc. There are also all sorts of other inventions that you can install in your home including Nest Smoke Alarm and Thermostat, Foobot Air Quality Monitor, August Smart Lock, etc.

4. Smart Pollution Control

Pollution is one of the biggest problems in most of the cities in the world. Sometimes it’s not clear if we are inhaling oxygen or smog! In such a situation, IoT can be a big help in controlling the pollution levels to more breathable standards. This can be done by collecting the data related to city pollution like emissions from vehicles, pollen levels, airflow direction, weather, traffic levels, etc using various sensors in combination with IoT. Using this data, Machine Learning algorithms can calculate pollution forecasts in different areas of the city that inform city officials beforehand where the problems are going to occur. Then they can try to control the pollution levels till it’s much safer. An example of this is the Green Horizons project created by IBM’s China Research Lab.

5. Smart Healthcare

There are many applications of IoT in the Healthcare Industry where doctors can monitor patients remotely through a web of interconnected devices and machines without needing to be in direct contact with them. This is very useful if the patients don’t have any serious problems or if they have any infectious diseases like COVID-19 these days. One of the most common uses of IoT in healthcare is using robots. These include surgical robots that can help doctors in performing surgeries more efficiently with higher precision and control. There are also disinfectant robots that can clean surfaces quickly and thoroughly using high-intensity ultraviolet light (which is pretty useful these days!) Other types of robots also include nursing robots that can handle the monotonous tasks that nurses have to perform for many patients day in and day out where there is little risk to the patients.

6. Smart Cities

Cities can be made more efficient so that they require fewer resources and are more energy-efficient. This can be done with a combination of sensors in different capacities all over the city that can be used for various tasks ranging from managing the traffic, controlling handling waste management, creating smart buildings, optimizing streetlights, etc. There are many cities in the world that are working on incorporating IoT and becoming smarter such as Singapore, Geneva, Zurich, Oslo, etc. One example of creating smart cities is the Smart Nation Sensor Platform used by Singapore which is believed to be the smartest city in the world. This platform integrates various facets of transportation, streetlights, public safety, urban planning, etc. using sensors in conjugation with IoT.

7. Smart Retail

There is a way to make shopping even more exciting for customers and that's to use the latest tech like IoT of course! Retail stores can make use of IoT in a wide range of operations to make shopping a much smoother experience for customers and also easier for the employees. IoT can be used to handle the inventory, improve store operations, reduce shoplifting and theft, and prevent long queues at the cashiers. A prime example of this is the Amazon Go stores which provide an IoT enabled shopping experience. These stores monitor all their products using IoT so that customers can pick up any products and just walk out of the store without stopping at the cashier's queue. The total bill amount is automatically deducted from the card associated with the customer's Amazon account after they leave the store.

CHAPTER 2

LITERATURE REVIEW

Architecture of a wireless Personal Assistant for telemedical diabetes care

Advanced information technology, joined to the increasing use of continuous medical devices for monitoring and treatment, have made possible the definition of a new telemedical diabetes care scenario based on a hand-held Personal Assistant (PA). This paper describes the architecture, functionality and implementation of the PA, which communicates different medical devices in a personal wireless network

The PA is a mobile system for patients with diabetes connected to a telemedical center. The software design follows a modular approach to make the integration of medical devices or new functionalities independent from the rest of its components. Physicians can remotely control medical devices from the telemedicine server through the integration of the Common Object Request Broker Architecture (CORBA) and mobile GPRS communications. Data about PA modules’ usage and patients’ behavior evaluation come from a pervasive tracing system implemented into the PA

The PA architecture has been technically validated with commercially available medical devices during a clinical experiment for ambulatory monitoring and expert feedback through telemedicine. The clinical experiment has allowed defining patients’ patterns of usage and preferred scenarios and it has proved the Personal Assistant's feasibility. The patients showed high acceptability and interest in the system as recorded in the usability and utility questionnaires. Future work will be devoted to the validation of the system with automatic control strategies from the telemedical center as well as with closed-loop control algorithms.

BDI personal medical assistant

Personal assistant agents can have an important role in healthcare as a smart technology to support physicians in their daily work, helping to tackle the increasing complexity of their task environment. In this paper we present and discuss a personal medical assistant agent technology for trauma documentation and management, based on the Belief-Desire-Intention (BDI) architecture. The purpose of the personal assistant agent is twofold: to assist the Trauma Team in doing precision tracking during a trauma resuscitation, so as to (automatically) produce an accurate documentation of the trauma, and to generate alerts at real-time, to be eventually displayed either on smart-glasses or room-display.

Generally speaking, the generation of alerts in the healthcare domain aims at warning caregivers of risks, thus improving patient safety. During a trauma resuscitation, physicians must perform several concurrent actions in very short time, such as monitoring several vital signs at a time, verifying if they change as expected after making an ad-hoc action, keeping track of *time-dependent* procedures – e.g., tourniquet must be activated for a fixed time. Given the fast-paced scenario this becomes a challenging task and alerts can support physicians warning about, for instance, time passed or unexpected changes in vital signs. Trauma Tracker (TT) has been conceived and designed by taking in consideration the structure and work organization of the Trauma Team. The team leader – called *Trauma Leader*, usually a senior official – supervises the work of the team during trauma resuscitation and is in charge of producing the documentation paper (report) at the end of the trauma management.

The first main objective of the system is to track relevant information of traumas managed in the Trauma Center, to increase both the quality and quantity of the collected data and to provide a flexible and comprehensive way to manage and analyze such data, structured in reports.

Thus carried on by the Trauma Team using a prototype implementation of the system for several months allowed to see in practice the value of the tool for improving the quality of the documentation, the accuracy about timings in particular – which is fundamental in time dependent diseases – as well as the quality of the performance of the Team, in general. Besides, the daily use of the tool made it possible to stress current limitations of the approach, suggesting significant future works and research directions. A first main direction is about investigating techniques to further automate tracking, reducing the need of using the mobile device by the Trauma Team and fully exploiting hands-free interfaces enabled by wearable devices such as the smart-glasses. Another important direction is about improving the openness and customizability of TraumaTracker so as to be easily exploited by different Trauma Centres.In future version, all the terms and concepts will be aligned to standard thesauri, including an explicit reference to them. The improvement related to customizability is about providing explicit support to allow users (the Trauma Team) to (partially) customize the set of tracked procedures/drugs, including the GUI, without changing the application code. A medium-term direction is about exploring further the level of assistance that can be useful to the Trauma Team. A simple one is about reminding and suggesting the workflow of steps to follow in peculiar cases that require an ad-hoc treatment. In the model discussed so far, the generation of alerts by the Trauma

Assistant Agent is based solely on the knowledge about the ongoing trauma. A further step is to consider for that purpose also the corpus of knowledge related to trauma management and the documentation about the trauma done in the past, big data collecting information from different hospitals and trauma centers, and the use of cognitive computing techniques to get insights from that Big Data. Cognitive computing refers to a set of tools and techniques – including Big Data and Analytics, machine learning, Internet of Things, Natural Language Processing, causal induction, probabilistic reasoning, and data visualization – which makes it possible to devise a “cognitive system” which is capable of learning, remembering, analyzing, resolving problems in specific contexts – healthcare and life science are a primary one . An interesting open research issue is then the design of a personal assistant agent that combines the capabilities of cognitive agents and the support of cloud-based cognitive services in. Finally, we are interested to investigate and develop a general framework for developing BDI-based personal medical assistant agents – eventually integrated with cognitive services – beyond the specific case about trauma management and alerting.

Early Dementia Detection through Conversations to Virtual Personal Assistant

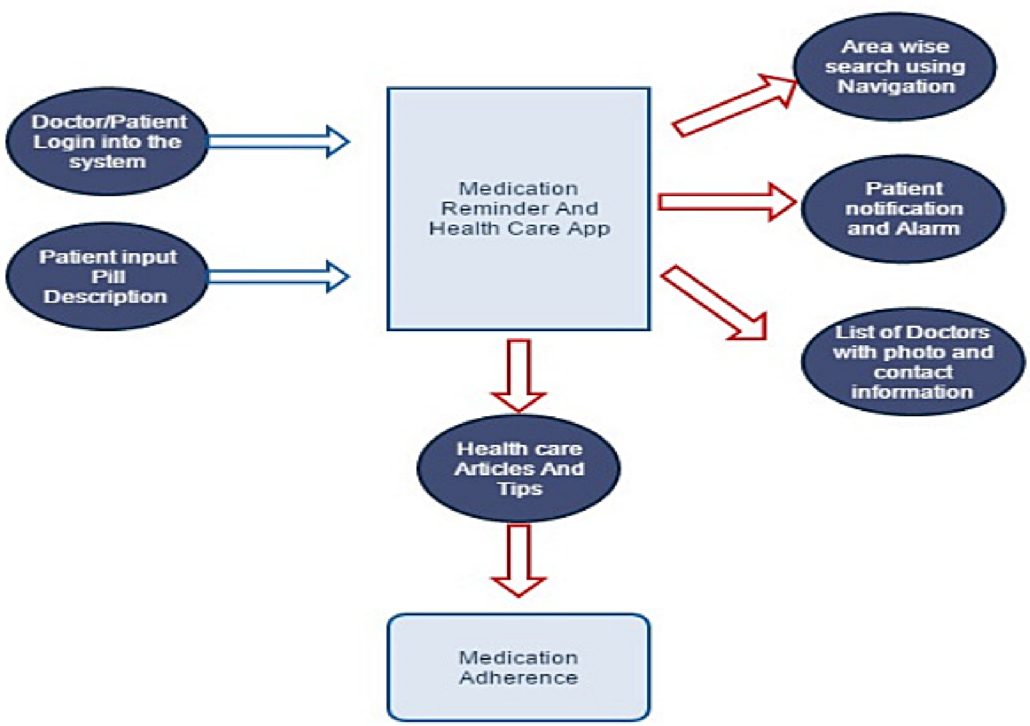
Early detection of dementia are important because it can slow down the progress of the disease. One of the popular way to detect dementia is based on cognitive tests. The tests are usually done in the clinical setup with the help of a psychometrically trained examiner. Revised Hasegawa's Dementia Scale (HDS-R) is one of the prominent screening tests for dementia. We propose a method for early dementia detection by using a Virtual Personal Assistant (VPA) on a computer that has a natural language user interface, such as Amazon Echo, Apple Siri, Google Home, Microsoft Cortana, Softbank Pepper, Sharp RoBoHon, etc. In our proposal, we consider HDSR as a guideline to examine dementia. A VPA extracts the necessary features from the verbal and interactive response of the patient to compute the level of dementia. Such implicit checking is physically and mentally much more comfortable for old people. We believe the proposed method will be able to contribute future society

First, we have a patient for whom the cognitive test will be conducted. VPA, which facilitates the proposed model by providing text-to-voice and voice-to-text conversion features to interact with the patient. After that the conductor, which will maintain interactions (the question and answer sessions). It will monitor the conversation as well as the response delay of the patient. Finally, the evaluator will verify the patient responses as stated in the previous section. It will compute the level of dementia in HDS-R scale, too. According to the HDS-R test, a patient is examined by asking nine questions in Figure 1, which basically test the memory recalling and reasoning capability of the patient. In normal situations, we call it ”normal state”, the proposed system just monitoring conversation between a person and a VPA. The system examines each interaction whether it is close to one of the nine HDS-R questions. If the similarity of an interaction is close to a HDS-R question, the system evaluates the interaction based on the HDS-R score. The system monitors the score within a certain period of time. If the score of the time exceeds a certain threshold, the system changes the state into ”warning state”. In the warning state, a VPA is forced to ask the nine questions of HDS-R and evaluate answers of the questions. Most recent VPAs are capable to do such interactions in a natural language user interface, which is physically and mentally comfortable for the person.

For developing our proposed dementia detection system application, now we are in the preliminary testing stage. We have just checked and verified our system by collecting data as a mimic dementia patient. The speech of old people is different, so we need extra care to recognize their speech. It also needs extra care to deal with the mental situation of old people. Privacy of each individual is also vital, we have to secure and anonymize their sensitive data. All VPA are the proprietary systems of the different corporations, so we need proper collaboration with them. As a future work, we will convey a series of experiments on real subjects and determine the effectiveness of the model. Moreover, from the voice activity, we believe it will also be possible to examine some other features that could be found in a dementia patient like hesitation, emotional problems, etc.

Medication Reminder And Healthcare–An Android Application

This is an Android-based application in which an automatic alarm ringing system is implemented. It focuses on doctor and patient interaction. Patients need not remember their medicine dosage timings as they can set an alarm on their dosage timings. The alarm can be set for multiple medicines and timings including date, time and medicine description. A notification will be sent to them through email or message inside the system preferably chosen by the patients. They can search doctors disease wise. The patients will get the contact details of doctors as per their availability. Also the users can see different articles related to medical fields and health care tips. The system focuses on easy navigation and good user interface. Many such Medical Reminder Systems have been developed where a new hardware is required but in our work we have made an attempt to develop a system which is economical, time-saving and supports medication adherence.



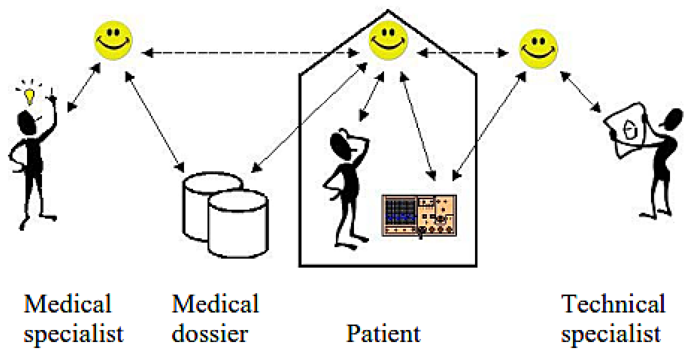
It reflects the overview of the app. Input to the system is the information entered by the patient which includes date, time, medicine name, doctor’s name, etc. The output of the system focuses on “Medication Adherence”. Medication adherence usually refers to whether patients International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT) Vol. 6, No. 2, June 2015 42 take their medications as prescribed (eg, twice daily), as well as whether they continue to take a prescribed medication. Medication nonadherence is a growing concern to clinicians, healthcare systems, and other stakeholders (eg, payers) because of mounting evidence that it is prevalent and associated with adverse outcomes and higher costs of care.

Many Medication Reminder Systems have been developed on different platforms. Many of these systems require special hardware devices to remind the patients about the medicine in-take timings. Purchasing new hardware devices becomes costly and more time and money consuming. So in the given work an attempt has been made to implement a system which is economical, easily accessible and improves medication adherence. The patients will get the schedule of medicine in-take time with medicine description, starting and ending date of medicine, notification through message or email,automatic alarm ringing system and navigation system. It fails to focus on the overall performance of the system. Also, interaction between patients and doctors through video calling and secure prescription will be focused upon. Some more ways to achieve medication adherence will be focused.

Personal Assistants for Healthcare Treatment at Home

This paper describes the research plans in the SuperAssist project, introducing personal assistants in the care of diabetes patients, assisting the patients themselves, the medical specialists looking after the patients' healthcare, and the technical specialists responsible for maintaining the health of the devices involved. The paper discusses the issues of trust and cooperation as the critical success factors within this multi-user multi-agent (MUMA) project and within the future of agent-based healthcare attempting to increase the self-help abilities of individual patients.

The aim is to establish effective and efficient distributed supervision of networked information compilations and technical equipment, which is trustworthy for the user and takes place in a socially approved manner. Specific innovative project results are: communication and interaction model for these assistants; methods for joint human-computer supervision; improved test methods, tools and criteria for systematic assessment of user experience; "best practice" implementation-method and guidelines; and a "proof of concept" in the transmural health care domain (e.g. diabetes). For the medical application domain, the SuperAssist framework aims to reduce the costs by improving the local, self-care capacity of people by efficient employment of remote, distributed expertise. It provides a possible setting for the SuperAssist framework in which both, a patient, the medical specialists who treat the patient, and a technical specialist who looks after the proper functioning of the medical equipment involved are all provided with personal assistants to facilitate their own tasks as well as to support cooperative tasks which might occur, for instance, with the introduction of new drugs and therapies or with the inevitable malfunctioning or erroneous use of the medical equipment.



Situation with users and personal assistants

The project's business partners - Science & Technology, Philips Research, Pemstar and Sigmax PDA Solutions - bring in their technology and contribute to the development and validation of SuperAssist elements. The joint activities are included in cognitive engineering cycles, in which the foundation, specification and demos of the SuperAssist concept are being refined and extended. The SuperAssist research takes place in the medical domain, but it aims at a generic solution for the distributed supervision of complex environments.

This experiment is designed to use an error diagnosis task in the malfunction of the measurement unit in order to investigate a complex distance of cooperative problem-solving between the patient and the assistant. On the one hand, the experiment investigates the influence of different amounts of knowledge and cognitive skills involved. Knowledge and skills vary from one task to the other and they vary between different patient-users. The experiment will investigate the participants personal characteristics, also obtaining relevant cognitive capacities which are assumed to potentially influence the problem-solving process, to examine possible predictive value. The participants fill out a number of tests and will be observed while performing three maintenance and six problem-solving cases concerning the operation of a fairly complex HbA1c blood glucose analyzer (Bayer, DCA 2000+). Figure 2. User-Assistant cooperation 230 On the other hand, the experiment investigates the type of cooperation to provide in order to achieve optimal performance Different conditions provide the patient user with a manual, a cooperative, or an autonomous personal assistant:

Manual: The patient-user must browse through a (online) manual possibly supported by a search index.

Cooperative: Supervision takes place in a patient-user – personal-assistant dialogue.

Autonomous: The personal assistant relieves the patient-user -as far as possible- of any required decisions and actions. Ideally it only presents solutions.

The manual assistant indicates that the participant must follow instructions in manual. The cooperative assistant enables diagnosis through dialogue (dichotomous) and presents matching compensatory actions. The autonomous assistant solely presents compensatory actions while the assistant independently performs diagnostic phase/ troubleshooting.

Based upon the acquired knowledge and from a market review, a number of papers have been written, and several demonstration systems and prototypes have been developed for the purpose of investigating, opening-up for discussion, and empirically evaluating proposed solutions.

Finally, steps are being taken to establish relations with other telemedicine projects and apply the SuperAssist concepts in other healthcare areas such as COPD, children's diabetes I, and obesity.

Prevalence of Burnout Syndrome in Medical Assistants Working in Hospitals Affiliated with Urmia University of Medical Sciences

Stress and strain are an inevitable part of a professional life and originate from work-related experiences. Since the residents are highly exposed to burnout aroused by physical, psychological, and emotional stress, this study aimed to investigate the frequency of burnout syndrome in medical assistants working in hospitals affiliated with the Urmia University of Medical Sciences.

This descriptive cross-sectional study examined all residents working in the hospital affiliated with the Urmia University of Medical Sciences using the census method. Two demographic and burnout questionnaires were distributed to collect the required information. Data were collected and imported to SPSS software version 20 and then analyzed using descriptive statistics.

In this study, the results showed that out of 147 assistants in the study, 78 (53.1%) were male and 69 (46.9%) were female, and 104 (70.7%) were married. The mean score of the questions was 34.66 ± 13. The mean score of burnout was 51.53 ± 11.15 among the male residents and 53.61 ± 11.74 among the female residents. The burnout score was 51.82 ± 11.29 among the married assistants and 54.19 ± 11.77 among the single assistants. Moreover, There was no relationship between gender and burnout score (P = 0.275) and between marriage and burnout score (P = 0.26).

In this study, the results indicate that most residents suffer from burnout symptoms; hence, appropriate measures and planning are required to detect and eliminate the causes of burnout.

Voice-Controlled Intelligent Personal Assistants in Health Care: International Delphi Study

This study aimed to develop a plausible scenario for the further development of VIPAs in health care to support decision making regarding the procurement of VIPAs in health care organizations.Voice-controlled intelligent personal assistants (VIPAs), such as Amazon Echo and Google Home, involve artificial intelligence–powered algorithms designed to simulate humans. Their hands-free interface and growing capabilities have a wide range of applications in health care, covering off-clinic education, health monitoring, and communication. However, conflicting factors, such as patient safety and privacy concerns, make it difficult to foresee the further development of VIPAs in health care.

We conducted a two-stage Delphi study with an internationally recruited panel consisting of voice assistant experts, medical professionals, and representatives of academia, governmental health authorities, and nonprofit health associations having expertise with voice technology. Twenty projections were formulated and evaluated by the panelists. Descriptive statistics were used to derive the desired scenario.

The panelists expect VIPAs to be able to provide solid medical advice based on patients' personal health information and to have human-like conversations. However, in the short term, voice assistants might neither provide frustration-free user experience nor outperform or replace humans in health care. With a high level of consensus, the experts agreed with the potential of VIPAs to support elderly people and be widely used as anamnesis, informational, self-therapy, and communication tools by patients and health care professionals.

According to the surveyed experts, VIPAs will show notable technological development and gain more user trust in the near future, resulting in widespread application in health care. However, voice assistants are expected to solely support health care professionals in their daily operations and will not be able to outperform or replace medical staff.