This is a 2 part assignment, please see attached. part 1 is a mind map. Bubbl.us is the source to grab a sample concept mapPart 2 has week 4’s assignment attached and also, chapter 8 for reference.

Informatics has changed dramatically in the last 10 years. The changes in health care alone have forced organizations to do things far differently than they once imagined. The massive amounts of data available grow every day. The purpose of this assignment is for students to use data and trends to forecast the future of the field of informatics.

**Research** recent trends to forecast what the coming years may bring for the field of informatics.

**Use** data to support your predictions.

**Format** your assignment as one of the following:

* Mind map, here are some templates you can use. You can also use <https://bubbl.us/>

**Mind Map Template.doc**

* Concept map
* Diagram
* Digital poster
* Infographic
* Another format approved by your instructor

**Include** a minimum of three peer-reviewed sources.

ssignment Content

Top of Form

**Develop** a proposal in which you evaluate the two specific products you selected in Week 4. Your goal is to persuade the directors of the health care workplace to implement your chosen informatics solution.

**Address** the following details:

* + Brief description of the administrative or clinical issue
	+ Concise overview of the two products, including an evaluation of all relevant features of each product
	+ Select one (not both) product for implementation and provide a clear explanation about why
	+ Two suggestions of how the chosen product could be implemented
	+ Two suggestions for how the chosen product would be evaluated after implementation
	+ **Identify a future trend in this area**

**Develop** a presentation using one of the following formats:

* + 7- to 10-slide presentation **with speaker notes of 50-200 words each**
	+ **Oral presentation, (podcast, etc.) including appropriate visual aid (i.e., a handout or brochure)**
	+ **Another format approved by your facilitator**

**Include** a minimum of three peer-reviewed references and you may use the product websites in this case.

**Format** your proposal and reference page according to APA guidelines

Bottom of Form

week 4 response

The functionality of Electronic Patient Records

 Twinkal Dayal

The functionality of Electronic Patient Records

Electronic Patient Records are a good way to automate the process of recording, storing, retrieving, and offering medical care to patients. Two products in this category are Athenahealth and Cerner Electronic Health Records. We shall analyze the two products to understand their functionality.

To begin with, we shall analyze the ease of use of the products. Athenahealth EHR is developed with the consideration of intuitive development of workflows (Athenahealth, 2020). This allows for easy scheduling and presentation of the patient data to represent various aspects that are necessary for the efficient delivery of care. As such, the system can be considered to be easy-to-use. Looking at Cerner EHR, the system is easy to use with the presentation of a power chart that offers all the necessary information in an easy to read mode and platform. The platform also offers a simple chart option for the patients and the healthcare provider to easily review information (Software Connect, n.d.).

Looking at reliability, both the Cerner and Athenahealth systems have a high level of reliability. Both Cerner and Athenahealth are industry leaders in the provision of healthcare systems, especially electronic health records. With a wide focus on the reduction of costs in healthcare through the integration of various aspects, there is a high risk that is associated with the full implementation of EHR systems. As such, only the best products in the industry can survive the demands of the healthcare system. However, Cerner EHR works for all sizes of hospitals, while Athenahealth has a focus on large size hospitals.

Looking at the time, we shall look at the implementation of the system and learning curve to attain fluent use. To begin with, both Cerner and Athenahealth systems have a medium learning curve (Altexsoft, 2020). This means that the systems require a fair amount for users to learn and integrate into daily use.

There is a need to look at the usefulness of the software. A product is only as successful as it is utility. The Cerner EHR system is useful in addressing a wide range of issues in the customer base. Some of the notable features include the integration of patient and physician through allowing for input from both patient and doctor that successfully scheduling the meetings to align to a physician, facility, and patient availability. Athenahealth system also has the same application. The Cerner EHR system is also adaptable to all sizes of an organization. The Athenahealth system is only adaptable to large size organizations.

Finally, there is a need to consider interoperability. This analyzes the ability of the system to work alongside the existing systems in the organization. Cerner enables interoperability at various levels by allowing the sharing and interaction of the Cerner system with other competitor systems to allow for ease in information sharing. Athenahealth system interacts with a series of networks that allow for easy reach to various parties (Athenahealth, 2020).

As such, looking at both products, they have high levels of functionality by looking into interoperability, the usefulness of the software, time, reliability, and ease of use. However, the Cerner system has a greater functionality by the fact that it can integrate into a wide range of hospital sizes.

References

Altexsoft (2020). *Electronic Health Record Systems: Features, EHR Vendors, and Adoption Advice*. Retrieved from https://www.altexsoft.com/blog/electronic-health-record-systems/

Athenahealth (2020). *Features and Services*. Retrieved from https://www.athenahealth.com/solutions/electronic-health-records

Athenahealth (2020). *Interoperability*. Retrieved from https://www.athenahealth.com/why-choose-us/interoperability

Software Connect (n.d.). *Cerner EHR*. Retrieved from https://softwareconnect.com/ehr/cerner-ehr/

Chapter 8 for reference

Chapter 8 Healthcare Information SystemsCarolyn Sipes, PhD, CNS, APN, PMP, RN-BCand Jane Brokel, PhD, RN, FNILearning ObjectivesAfter completing this chapter, you should be able to:Differe2ntiate between clinical information systems (CIS) and administrative information systems (AIS).Describe two or more applications for each type of system: CIS and AIS.State one format for representing healthcare knowledge.Discuss the definition and potential benefits for practitioners or patients of smart technology.An information system, at its simplest, is a combination of computer hardware and software that can process data into information to solve a problem. The terms healthcare information system and hospital information system (HIS) both refer to an information system used in a healthcare enterprise. The healthcare enterprise is most usually an acute-care hospital but can be a group of related hospitals and healthcare settings. A HIS typically comprises two major types of information systems: clinical information systems and administrative information systems. Clinical information systems (CISs) are large, computerized database management systems that support several types of healthcare activities, including provider/practitioner order entry, results retrieval, documentation, and decision support, across locations (a.k.a., a distributed system). Administrative information systems (AIS) support client care by managing financial and demographic information and providing reporting capabilities. This category includes client management, financial, coding, payroll, human resources, and quality assurance applications. Figure 8-1 shows the relationships between various components of a hospital information system.Figure 8-1 Relationship of the healthcare information system components.Figure 8-1 Full Alternative TextClinical and administrative information systems may have applications designed to meet the needs of a specific department(s) or organizational function(s), or the systems may have applications intended to support all organizational departments and functions. Either clinical or administrative systems can be implemented as standalone systems, or they may work with other systems to provide information sharing and seamless functionality for the users. Any one healthcare enterprise may use one or several of the CIS and AIS applications but may not use all of them.While expensive to purchase, implement, and maintain, the potential benefits of healthcare information systems are expected to offset these costs. These potential benefits include improving healthcare quality, efficiency, and use of guidelines; and reducing both the incidence and associated costs of medication errors and adverse drug events (Clinical Information SystemsClinical information systems (CISs) focus on management of clinical (patient) data and information as compared to administrative information systems. They enable practitioners and patients to be involved in acquiring, reviewing, and using data at various points of care. Clinical information systems include many applications that integrate and use the information obtained from other applications and healthcare devices. The clinical information systems provide the infrastructure to bring these applications together so healthcare professionals may have functional use of the data, information, and knowledge that is stored and/or collected for an electronic health record. Some applications that integrate within clinical information systems are described in the following paragraphs. Many of these functional applications collect and share data useful in clinical decision support applications.Computerized provider (or practitioner) order entry (CPOE) facilitates the process of selecting scripted orders that include precise start-and-stop times, timing of orders, and much more detail. Prior to electronic ordering, patient care orders were often missing details on route, dosing, timing, and indication; fixing these gaps required significant investigation in order to execute the requested orders. The CPOE applications support the prescribers’ decisions to enter orders and immediately share the orders with appropriate health professionals who execute the orders and the departments that need to dispense, schedule, or immediately deliver services to patients. Ideally, this application allows integration of nursing orders with physician orders; if so, all orders can be viewed together. The application may include team-designed evidence-based order sets or care sets and may connect orders to links that provide descriptions, context, and current evidence to support decisions for ordering a test, medicine, or intervention.Results-reporting applications facilitate the sharing of laboratory values and results from other diagnostic tests within the electronic health records for clinicians to view. The values can be displayed in different formats along with associated reference ranges to help in the interpretation of values.Electronic documentation is provided through electronic health record systems (EHRSs) and other applications reported here. Electronic documentation enhances the traditional paper-based documentation through the EHRSs’ capabilities of rapid movement of data, data-and-information sharing simultaneously from multiple locations, presenting data in multiple formats (often customized to particular groups or individuals), and removing the challenge of interpreting handwriting. Structured templates, free text, dictation, and video formats may be used for data entry. Electronic documentation also supports the use of controlled terminologies.Laboratory-information systems (LISs) provide functionality to receive requests, schedule the tests, and track specimen collection and trajectory through the appropriate laboratory. The transmission of test results is accompanied by referenced knowledge for accurate interpretation of the findings. Current LISs permit the display of values over time to show trends and ranges. When the values are critical, processes are in place to ensure the relevant practitioners are notified, and documentation of the notification is timed and captured.Radiology-information systems (RISs) have functionality to receive requests; ­schedule imaging, including people, rooms, and equipment; provide patient-focused information that helps patients prepare for scheduled diagnostic imaging, manage image storage, and store and report the radiologists’ interpretations. Picture archiving and communication system (PACS) applications support the wide-spread use of digitized medical imaging for x-rays, magnetic resonance imaging (MRI), computerized tomography, and ultrasound. A PACS is designed specifically for storage, retrieval, presentation, and sharing of digital images. These images may be viewed simultaneously by multiple healthcare team members and electronically transmitted to remote locations.Pharmacy information systems (PISs) combine administrative and patient-care functions. On the administrative side, functions may include inventory control, billing, and preparation of documentation such as patient profiles, medication labels, and fill lists. Clinical functions address order entry (or receipt of orders from a CIS), tracking of drug dispensing, alerting practitioners and pharmacists of prescription errors and potential interactions, patient education, and providing access to clinical information (El.Mahalli, El-Khafif, & Yamani, 2016).Physiological monitoring systems are applications that obtain and store real-time data about various physiological (versus anatomical) aspects of a patient. Karunanithi’s article in 2010 on physiological monitoring is an informative and still relevant discussion of this topic. Monitoring is done to track changes in the monitored parameter from a baseline. Aspects that can be monitored today include basic vital signs, arterial blood pressure, intracranial pressures, cardiac rhythm and waveform trends, fetal heart rate, pulse oximetry, continuous video EEG monitoring, electromyography, phonocardiograph, and many more (Karunanithi, 2010). Because these applications usually are integrated with a CIS, the data are collected automatically and stored for review and decision-making by healthcare professionals. Devices not directly integrated usually have mechanisms for uploading data into a CIS.Operating room information systems (ORISs) a.k.a., surgical-information systems (SISs) or perioperative information systems provide managerial functions to manage the OR case times and assignment of rooms (a.k.a., surgical scheduling), which helps to minimize the costs of unused OR time and the performance of elective cases outside of normal allocated OR time. Patient tracking, perioperative nursing and anaesthesia documentation, tissue tracking, integration of medical devices, and revenue and materials management, and real-time displays of ongoing OR activity are additional functions found in ORISs (A report card on OR info systems, 2011). Current ORISs integrate preadmission testing and scheduling and align nursing and anaesthesia documentation with all stages of the perioperative experience.Anaesthesia information management systems are separate, specialized applications for the surgical setting. These systems are connected to physiological monitors, anaesthesia machines, other devices, and—ideally—to the facility’s clinical information system. Anaesthesia personnel can enter other data into the online anaesthesia record, such as intubation status, induction time, and extubation (Deng & Hickey, 2015).Critical care information systems (CCISs) incorporate or integrate most of the prior applications as well as interfacing with multiple bedside devices to automatically capture physiological dataand fluid intake and output; facilitating calculation of clinical indices; and helping to organize and manage the large volume of data assessments to reduce diagnosis and treatment time (Ehteshami, Sadoughi, Ahmadi, & Kashefi, 2013). Remote support for critical care practitioners can be found in many facilities. This support is provided by a team of expert nurses and physicians, working at a distance, who have access to the CCIS and to cameras, speakers, and microphones placed in each patient room. If a nurse or doctor has a question, or the remote staff identify an emergent problem, two-way communications and problem-solving are engaged.Clinical decision support systems (CDSSs) (a.k.a., computerized decision support systems) are applications that support healthcare practitioners in making patient-care decisions. A CDSS combines one patient’s specific data, available because of integration with the facility CIS, with up-to-date clinical knowledge to generate recommendations or guidelines for that particular patient (Moja, L., Friz, H. P., Capobussi, M., Kwag, K., Banzi, R., ­Ruggiero, F., et al., 2016). The clinical knowledge is applied through using modeling, data-processing techniques specific to medical data, and methods of artificial intelligence. Results of CDSS action include clinical guidelines and reminders; drug-dosing support; and alerts for drug allergy, drug-drug interaction, and drug-laboratory interaction (Castaneda et al., 2015). A critical element in decision support systems is making sure the knowledge base being used can grow in order to provide up-to-date reasoning (Gurupur & Gutierrez, 2016).Knowledge RepresentationIn a still-relevant article, Davis, Shrobe, and Szolovits (1993) explained that, as a concept, knowledge representation refers to methods for presenting something from the real world; a specific knowledge representation is a substitute or surrogate for a real thing. Formalized, systematic methods for representing knowledge facilitate communication, reasoning, and decision-making. Standardized nomenclatures, such as the Systematized Nomenclature of Medicine (SNOMED), Current Procedural Terminologies (CPT), and Nursing Interventions Classification (NIC) are examples of textual knowledge representations for concepts in medicine and nursing. Bowen and Evans (2014) noted that visual symbols and metaphors are knowledge representations that support visual thinking (e.g., the double helix of DNA). The development of health-related knowledge representations is a formal process that includes clinical experts representing specialties and healthcare professionals who understand the science, research evidence, and presenting of information for interpretation and comprehension.ADE) (Campanella et al., 2015).

Administrative Information SystemsAdministrative information systems support client care by managing administrative, financial, and demographic data and information and providing reporting capabilities that support the overall functions of an organization. In contrast to clinical systems, the administrative systems include client-management services such as registration and scheduling, coding for billing, financial, payroll, human-resources, and quality-assurance and risk-­management systems.Registration and Scheduling SystemsThe client registration and scheduling system is critical to the effective operation of many other systems within the healthcare setting. The system applies predetermined rules for determining how resources and client information should be used to schedule a particular type of appointment.This system collects and stores all client identification and demographic data, which is verified and updated at the time of each visit. Today, with mobile devices and patient kiosks, patient scheduling offers many opportunities for patients to self-schedule and cancel appointments, receive text reminders of appointments, and complete registration-intake forms online before arriving for the scheduled appointments. After the appointments, patients can access test results and other communication through a patient portal. With integrated, cross-department EHRSs, if patients do not have mobile devices or other access to a portal, healthcare staff can effectively and quickly obtain the information once the patient has arrived for the appointment. Increased use of information technology increases productivity and the potential ability to see more patients. The data for the management of patients crosses to the CIS, where patient information combines to include client care and billing. The benefits associated with using a registration-and-scheduling system include increased staff productivity, increased client satisfaction, and cost savings to the organization.An admission/discharge/transfer (ADT) system is used in healthcare organizations to support the process of providing client care. This system is integrated with other administrative and clinical systems and tracks a patient’s activities and location from hospital or clinic admission through any and all transfers within the facility and, finally, through discharge.Patient Acuity/Staff SchedulingIn the past, patient-acuity levels and complexity-of-care information was labor intensive to collect and evaluate and not timely when staffing schedules needed to be done quickly. Today, there are a number of information systems that can instantly provide data to be analysed, trended, and accessed to create staffing models that address evolving acuity levels. These systems have the capability to calculate acuity levels and complexity by scanning clinical documentation; for example, scanning the minutes of care provided and resources required to complete care.Financial SystemsFinancial systems, the first information systems implemented in healthcare-delivery organizations, are integrated with registration systems and ensure that patients’ demographic data and insurance information could be accessed to charge for services provided and receive reimbursement. As the sophistication of information technology increased, it became possible to charge patients automatically once a clinical service was completed. For this reason, all other information systems were typically built around financial systems.Risk-Management SystemsA risk-management system enhances an organization’s ability to identify potential risks and develop strategies to deal with them. In addition to vendor systems that include risk-assessment software packages, professional organizations, such as the Healthcare Information and Management Systems Society (HIMSS), as well as the Department of Health and Human Services (2014) provide tools to conduct reviews as well as training on how to conduct a risk assessment and mitigate threats.One of the first risk assessments needed is a review of the organization’s security, which is required by the HIPAA Security Rule and the Center for Medicare and Medicaid Services (CMS) Meaningful Use Incentive Program. Due to the need to understand an organization’s security, Wright et al. (2015) developed and piloted a self-assessment instrument, using clinical decision support (CDS) functionality, for assessing a healthcare organization’s ability to mitigate malpractice risk. Seven organizations conducted the self-assessment based on malpractice data and found they could mitigate risk and prevent loss using CDS assessments. If loss does occur and a risk-management system is in place, the loss can be tracked back to the point of origin to pinpoint and address specific issues and liabilities. Both small and large organizations benefit from risk-management systems. Increasingly, features in these systems include dashboard views; regular emailing of reports; and the ability to manage policies, claims, litigation, and other insurable risk information.Payroll and Human-Resources SystemsHuman-resources information systems come with a variety of software, including processes for tracking, depending on the organizational needs. The systems can provide tracking mechanisms from attendance—including vacation, time sheets—tracking for payroll purposes; health benefits, including insurance information; and career development. The goal of such a system is to connect, track, and provide data within one system.Quality Assurance SystemsEmploying the use of a quality-assurance (QA) or continuous-quality-improvement (CQI) system is a way of checking that the organization is continuously improving what it does and how it does it. This is done through continuous monitoring and evaluation of performance and through the collection and processing of data and other evidence. The capability to track quality defects and documents, control user access, track software versions and revisions, and provide training depends on organizational needs, and the availability and functionality of a QA or CQI system. The systems can also manage audits; track compliance with permits, licensing, and legal requirements; monitor and control identified issues as a risk-management function, and track emergency responses.Contract-Management SystemsContract-management (CM) software provides invaluable assistance to organizations to better manage their resources and improve efficiency. Healthcare institutions typically have multiple contracts with third-party payers as well as with vendors and various suppliers. CM software provides greater efficiencies and effective time savings, thereby, reducing costs as well as reducing risks because documents can be better tracked and audited. Basic functions include tracking, storage, and retrieval of key documents with the ability to quickly access needed information. CM software supports contract creation, report capability, eprocurement, alerts, and notifications on key business events, and can even support automation of the entire contract process.Summary of Administrative SystemsVarious administrative systems may be used in healthcare. Box 8-1 provides a brief review of many of these systems; some of these were described here.BOX8-1 Administrative Information Systems Used in the Healthcare SettingFinancial systems provide the facility with accounting functions. Accurate tracking of financial data is critical for enabling the organization to receive reimbursement for services.Payroll and human resource systems track employee time and attendance, credentials, performance evaluations, and payroll-compensation information.Contract-management systems manage contracts with third-party payers.Risk-management systems track and plan prevention of unusual occurrences or incidents.Quality-assurance systems monitor outcomes and produce reports that are used to guide quality improvement initiatives.Physician-management systems support patient registration, scheduling, coding, and billing in the physician’s office and may support results retrieval. These systems also provide better protection of patient privacy than paper records.Executive-information systems provide administrators with easy access to summarized information related to the financial and clinical operations of the organization.Materials-management systems facilitate inventory control and charging of supplies.

Smart TechnologyThe advent of EHRs has made it easier to access data and to enter data one time and see it flow across systems from the first patient engagement until the patient is seen by a provider at the point of care. From this point, patient information is gathered; orders are written and entered into the electronic system; and then moved seamlessly to areas such as scheduling, laboratory, or pharmacy, eliminating steps for both the patient and provider. These features when used with other technology that can support, patient care, are often referred to as smart technology.What Is Smart Technology?Smart technology is the functionality behind the scenes that provides the capability of the electronic system to send real-time messages to all of the various areas required during a patient visit, where providers document the visit, order the medications while also checking alerts for errors, schedule appointments, and generate bills, to name just a few of the functions of an EHRS. All of this is done because the different systems are tied or interfaced together so the electronic messages can cross systems. For example, if a particular system is not interfaced, messages such as an order for x-ray will not flow or follow the workflow from where the order was placed by the provider in the patient record to the radiology system.Benefits for CliniciansSmart technology can benefit clinicians. An advantage of sending real-time messages from the patient point of care increases efficiencies for clinician and patients alike. It can increase communication between care providers as information is more quickly transmitted. For example, clinicians can receive an alert that a specific medication is due or late, eliminating errors of omission. Alerts also send messages that a particular task, such as a dressing change, may be due. When completed, the tasks are quickly documented in the mobile computer system in the patient’s room. A provider can receive an alert if the medication has already been ordered, thus eliminating duplicate medication orders. An alert can inform the provider of the potential for a drug-drug interaction with an order. Further, smart technology includes bar code-scanning capability where the patient’s armband is scanned as well as the medication pulled from the medication cart. If there is no match of patient-to-medication, the medication cannot be given.With any EHRS, the organization’s leadership selects the functionality required and can choose to eliminate some functionality such as medication alerts. For example, medication-alerts functionality would not be beneficial if providers would routinely override the alerts, due to alert fatigue, too many alerts, or other factors. There are many capabilities within a system’s design that can be very beneficial for all clinicians and that will potentially decrease workload and increase efficiencies, if they are used properly.Benefits for Patients and FamiliesSmart technology can benefit patients through improved efficiencies such as dramatically decreasing wait-times for patients to be seen. Today, a patient may arrive to an appointment and be greeted in the lobby by someone from registration/scheduling who is carrying a tablet device. This registrar/scheduler collects the patient’s name, date of birth, and a few other demographics; confirms the appointment and department; and sends the patient on in less than three to four minutes. With the increased use of information technology, there is increased productivity and potential for providers to see more patients and benefits to patients by not having to wait in long lines to check-in and register before being seen.In the hospital, patients access tablet computers in their rooms to order meals as they wish, as well as other items, such as extra blankets, water, or other needs. Patients can also send and receive messages to and from family members. They can select educational ­materials to explain a new diet, explain a procedure and follow-up requirements, as well as post their own questions. A plan of care may be posted, with information regarding expectations of scheduled tests. Patients can be monitored electronically for vital signs without the interruptions necessitated by a clinician coming into the room to use a manual device to take a reading.

Current Topics in Healthcare Information SystemsThis section brings information on the concept of big data, obstacles and risks to keeping information systems current, and costs of maintaining functional HISs,Big DataCurrently, a main concern with the increasing numbers of organizations implementing EHRSs, is the huge amounts of data—known as big data—being collected without the knowledge or processes in place to properly analyze and utilize it. This includes patient data, such as x-rays, pharmacy, and therapy data, as well as other research information. Currently, this data resides in unstructured databases with much of it inaccessible because it is not categorized in ways understood by current systems; therefore, it cannot be retrieved. The need is great for better understanding of methods to retrieve data, and implementation of structured data management systems is now a priority for many organizations.Obstacles and RisksA consideration with maintaining current information technology is the age of many computer systems. For example, when an older, slower system cannot handle large volumes of information and data movement during peak work periods nor additional users on the system at the same time, it may cause the system to become inaccessible, which is also known as downtime. When this happens, procedures are implemented that all must use, which often includes reverting back to documenting on paper until the system can be fixed and brought back up. This disruption causes major obstacles since data is not readily accessible, orders cannot quickly flow to appropriate departments, and there may be duplicate orders and documentation when the system does come back up because there are both paper and electronic versions of the same items.CostsImplementing and maintaining computer systems is very expensive, as they must be upgraded every two to three years with new software and hardware to keep them functioning properly and accurately and with increased speed. Systems also need to be optimized, meaning if a particular function was put aside during the original implementation to wait until the next phase, it is now time to add that functionality. Adding this delayed functionality can cause problems because the added functionality must be correctly interfaced with the current system, which is now two to three years older. The best approach is to optimize quickly, within a few months after the original system has been implemented.The areas discussed above—current state of health IT, obstacles, risks, and expenses—are only a few examples of the many topics that apply to information systems and information technology in health care. Today’s healthcare world is rapidly changing to meet increased and evolving demands. In the future, these topics may not be applicable as described, as they may totally change the way we consume healthcare.Future DirectionsThe health IT research agenda of the Agency for Healthcare Research and Quality (AHRQ) (Dimitropoulos, 2014) identifies advances in healthcare information technology expected to emerge in the near future. These include advanced decision support tools, analysis of big data, display and communication of health data, use of health IT to support distributed care models and improve efficiency, and health IT safety monitoring and testing. The AHRQ will prioritize funding for research and demonstration projects in these areas.An innovation under development for CDS is a process of translating guidelines from a narrative form to semi formal forms that are machine-interpretable. The result is an ability to use a CDS across multiple EHRS and in diverse care settings (Mardon et al., 2014).A few of the administrative information system applications and functionality used today were discussed above. The overall goal of these applications is to increase usability and efficiencies and decrease workload for clinicians. The future holds even more promise. A few examples of recent and unfolding developments are discussed in the following paragraphs.Advancement of smart technology includes smart wearable devices, which range from wristbands, bras, contact lenses, braces, and clothes with smart buttons. The wearable devices have the potential to increase patient mobility and provide telehealth home-health monitoring systems where clinicians can closely monitor chronic conditions such as diabetes, and congestive heart failure. Khan et al. (2016) discussed how advances in wireless technology—when composed of silicon-based, low-powered electronics—have the potential to interface with skin to monitor vital signs such as temperature, heart rate, blood pressure, pulse oxygenation, and blood glucose.Other wearable devices can be in the form of T-shirts that have sensors embedded in the ­fabric capable of capturing cardiac and respiratory signs, which can transmit data to snap-fastener terminals that connect to an external device such as a Holter monitor (Trindade et al., 2016).With closer monitoring, detrimental changes in patients’ conditions can be quickly managed before they get out of hand. The data from wearable devices can be sent back for ­analysis using the Internet, which is transformational for healthcare and has analysis capabilities based on the technology of cloud computing. Alerts from the wearable devices regarding a patient’s condition can quickly be sent to cloud computing, collected, then sent on to an external system. With real-time tracking and alerts that support quick interventions to a patient’s condition, improved outcomes can be realized for both treatments and disease management. Rapid sharing of data and information will increase patient satisfaction, as well as decrease healthcare costs through decreased hospital admissions and shorter stays.According to Meyyappan (2016), researchers in biomedical engineering have been working on a system for early diagnosis and prevention to mitigate and prevent debilitating illness, which will help reduce healthcare spending overall. The system, known as a lab-on-a-chip has “point of care diagnostics for the routine monitoring of health-related vital information and status of chronic diseases as well as the detection of contagious diseases in settings outside of the hospital or clinic” (Meyyappan, 2016, p. 4).Liao, Leeson, and Higgins (2016) discussed needs of the aging population and presented a wireless body area network (WBAN), which is a specialized communication network that integrates miniature sensors/devices in the human body to enable the remote monitoring of the vital signs of patients, that can transmit information to care providers using the Internet. Other sensors implanted in the in the body can also measure pacemaker function and other data. On-body sensors, usually put on clothes or portable devices, can gather and transmit heartbeat frequency, electrocardiograph (EKG) data, and other information.Ahanathapillai et al. (2015) discussed the development of a wrist wearable unit (WWU), also known as an android smart-watch, to monitor the physical activity of people older than 60-years old. The device would continuously measure activity levels, such as step counts, and recognize a change in health status. The data is sent over the Internet to a system where data is collected, stored, and processed. Their research indicates this type of a system is more reliable than self-reported measurements.Vettoretti et al. (2016) presented research related to how continuous glucose monitoring (CGM) sensors used today remain inaccurate. From their research, they found a way to greatly improve the accuracy of CGM by evaluating signals from sensors that used a new calibration method. The improved performance of CGM impacts diabetes technology research including improving the accuracy of the artificial pancreas.According to Li and Diamandis (2016) recent advances in medical diagnostics can transform medicine as we know it today. Consumers wishing instant health information can test themselves where or whenever they chose by using smartphones integrated with microfluidics and microelectronics. The authors caution this functionality is in development stages. Evidence that these advances are successful in preventing or detecting diseases is currently lacking.Ma et al. (2016) studied possible uses of a self-powered biomedical monitor that does not use an external power source. The monitor is a flexible, implantable triboelectric active sensor (iTEAS) that can provide real-time continuous monitoring of multiple clinical signs, including cardiac arrhythmias such as atrial fibrillation and ventricular premature contraction. It can also monitor respiratory rates by analyzing variations of the output peaks of the iTEAS, and blood pressure can also be estimated by calculating the velocity of blood flow with the aid of a separate arterial pressure catheter.In summary, the examples above provide a small glimpse into the future of what we can expect using smart technology. The advances in medicine, healthcare, and technology are limitless.

Summary

A healthcare information system is actually comprised of multiple, interfaced computer systems that are used to support clinical care and administrative functions.While clinical or administrative systems can stand alone, the ability to share information with other information systems provide greater benefits for clinicians and patients.Clinical information systems (CISs) focus upon the acquisition, review, and use of patient data. Functions may include order entry, results-reporting, scheduling, and documentation.Clinical information systems may be specific to certain areas such as the laboratory, radiology, or pharmacy, or to particular patient populations such as perioperative or critical care settings.The Picture Archiving and Communication System (PACS) facilitates storage, transmission, and sharing of medical images. including x-rays, magnetic resonance imaging (MRI), computerized tomography, and ultrasound.Clinical decision support systems use patient-specific data and up-to-date clinical knowledge to provide guidelines and alerts to aid clinicians.Administrative systems can include registration and scheduling; tracking through admission, transfer and discharge; patient acuity and staff scheduling; financial or accounting systems; risk management; payroll and human resources; quality assurance; and contract management functions.Smart technology provides behind the scenes functionality with cumulative benefits for patient safety and improved efficiencies.Current areas of interest in healthcare information systems include big data, aging technology, and controlling the high costs associated with the implementation and maintenance of HIT.Emerging areas in HIT include advanced decision support tools, greater use of big data, display and communication of health data, HIT to support new care models, and closer examination of HIT safety.Increased numbers and types of wearable devices for consumers are becoming available, changing the way patients are monitored, and supporting the delivery of more services in the community.