Under the patronage of **H.E. Dr. Abdullah Belhaif Al Nuaimi -** Minister of Infrastructure Development

CONFERENCE
OMAINTEC
2019
EXHIBITION

17th Edition

International Operations & Maintenance Conference in the Arab Countries

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Le Meridien Dubai Hotel
& Conference Centre
United Arab Emirates

Under the Theme:
Enhancing Maintenance Through Big Data Management

Automation and Digitization in Health Technologies

Healthcare – Impact of Technologies

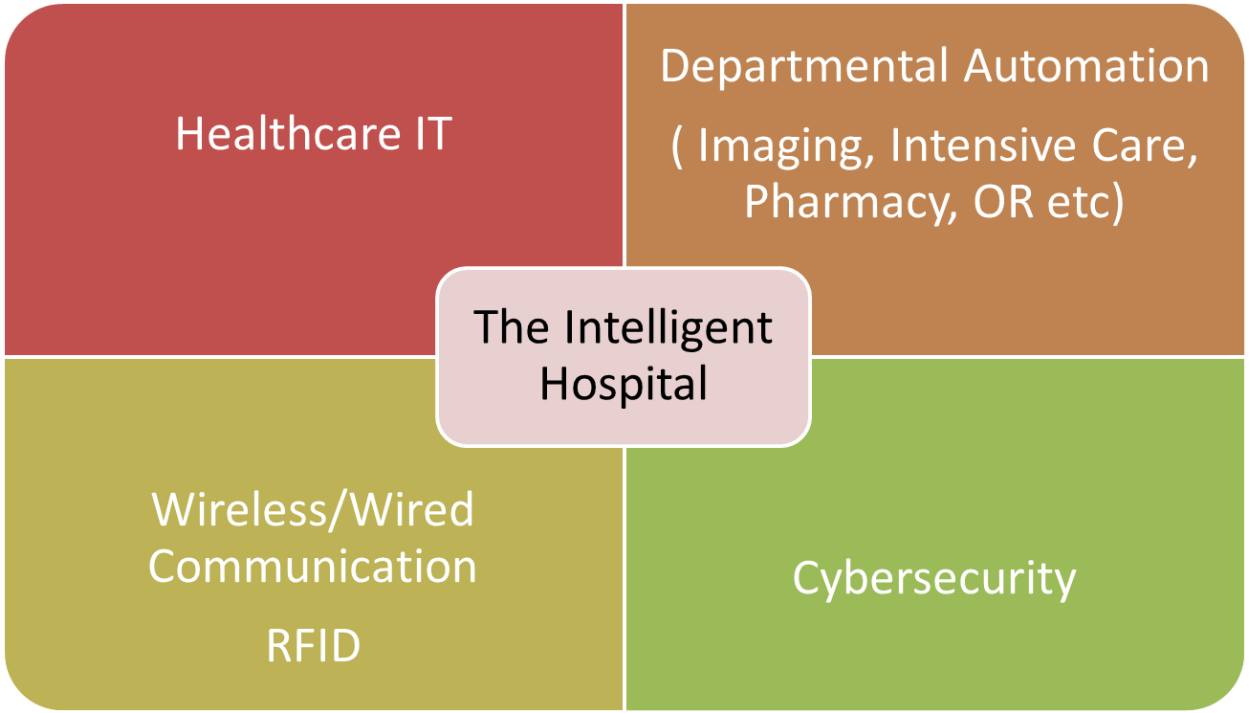
- Technology improves ***Clinical Outcomes***, ***reduces costs*** and ***improves quality of life***
- Technology has significantly impacted the way physicians deliver care e.g. Electronic Health Records, AI, Blockchain etc.
- There have been major workflow changes in hospitals
- Overall Technology has the potential and to a considerable extent LOWERED healthcare costs IN THE LONG RUN

Technology Overview – a MacroView

Innovations in Healthcare Technologies

- **1950s and earlier**
  - Artificial Kidney
  - X ray
  - Electrocardiogram
  - Cardiac Pacemaker
  - Cardiopulmonary bypass
  - Antibiotic Production technology
  - Defibrillator
- **1960s**
  - Heart valve replacement
  - Intraocular lens
  - Ultrasound
  - Vascular grafts
  - Blood analysis and processing
- **1970s**
  - Computer assisted tomography
  - Artificial hip and knee replacements
  - Balloon catheter
  - Endoscopy
  - Biological plant food engineering
- **1980s**
  - Magnetic resonance imaging
  - Laser surgery
  - Vascular grafts
  - Recombinant therapeutics
- **Present day**
  - Genomic sequencing and microarrays
  - Positron Emission tomography
  - Image guided surgery

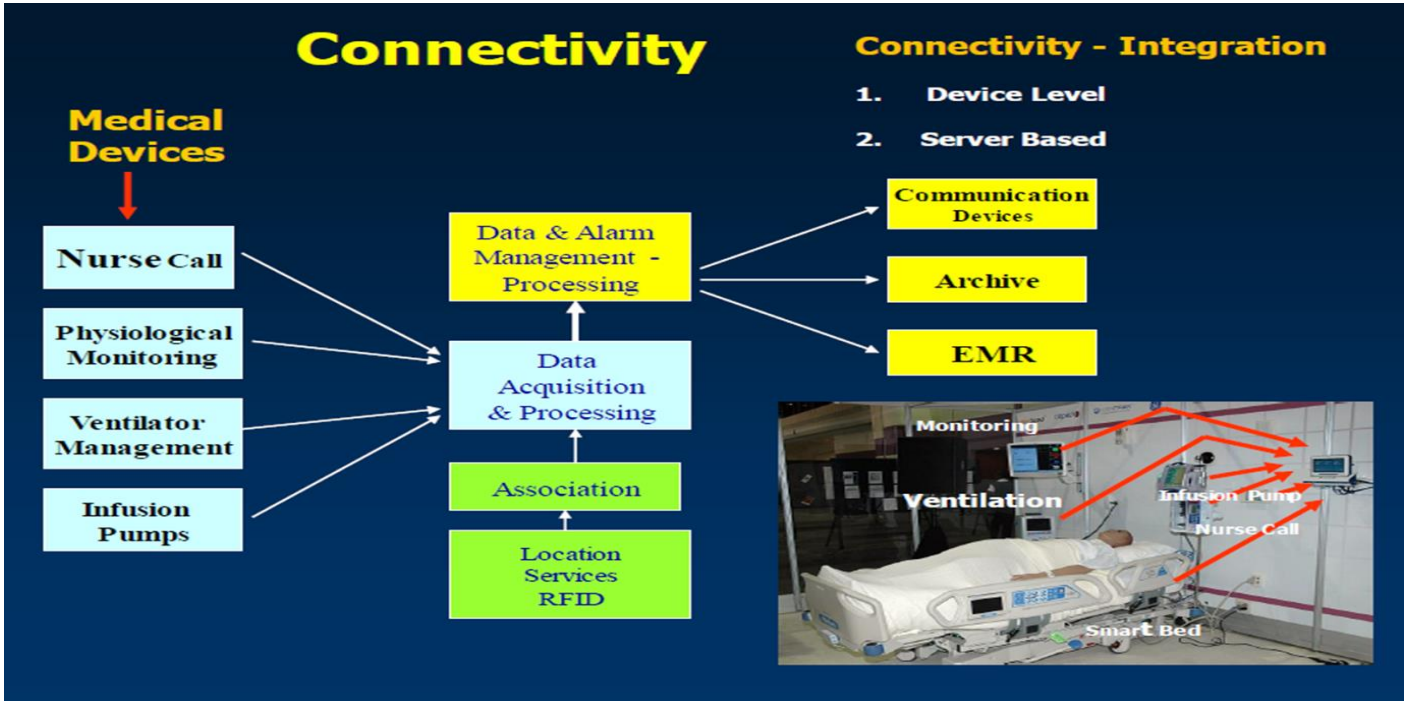
Major Disruptive Technologies



Technology Components of an Intelligent Hospital

Transducers and Sensors	Advanced Medical Devices	Connectivity	Physiological and Alarm Management
Real Time Location systems	Accurate Patient Identification and Association	Device Tracking	Medication Administration
Imaging and Video	Visualization of units and rooms	Enhanced Communication	Point of care Information Delivery
Inventory Management	Supply Chain Management for high value supplies	Network and Wireless Infrastructure	

Connectivity Architecture



Departmental Automation

Imaging

PLANNING

Radiology Reporting : Are Radiology reports capable of being integrated into the Medical Record and cross referenced with other clinical information. Standardization, such as the structured report facilitates this.

Voice recognition is becoming widely used for report generation. This is a time, and cost saving requirements and requires integration.

There could be possibility of research to mine the reports and correlate the findings with Biomarkers. This requires IT expertise in report design and database mining.

Systems Integration in a multi vendor environment is a challenge.

Increasingly images are required to be shared outside the working environment (sent to clinicians' home if required). This poses major IT Security issues.

Portable Imaging Units in the Hospital with Digital Radiology, Mobile CT is a challenge to the IT Infrastructure.

Management of large volume of Imaging data: data overload needs to be managed by the It department.

IMPLEMENTATION

The IT professional's issue with Imaging is simply to make data available at all time and in all locations.

CT is responsible for maximum data generation. As new CT scanners with thinner slices hit the market, the data generated is increased by multiple factors and IT has to manage the data overload

Images from all current technologies are digital, and therefore software and data intensive, creating not only significant opportunities but also challenges.

Remote data access, multiuser access, and institutional sharing of imaging data impose significant requirements on the IT department.

PACS is the centre point of modern digital imaging

Determining which devices being considered for purchase will be able to communicate with others is a critical part of equipment selection process. IT participation is an integral requirement.

As portable medical equipment becomes widespread transmission of large volumes of data over wireless networks will have to be managed.

Tracking and maintaining multiple data storage requirements

►► Intensive Care Systems

PLANNING

- ❑ Decision on connecting physiological monitoring systems, including printers and notification devices to the It Network
- ❑ Identify and address network security, data integrity, and quality of service issues
- ❑ Identify and add wireless network requirements and frequency allocations
- ❑ Identity IT resource allocations (training, staffing, new policies and procedures)

IMPLEMENTATION

- ❑ Wireless Patient Monitoring can be beneficial in some circumstances but require extra attention in implementation and maintenance. Wireless systems are preferred in critical care areas such as ICU because of the criticality of Medical Alarms
- ❑ IT is getting closer to the patient interface and is integral to patient safety. The Quality of service for patient data must be considered – especially for medical alarms where 100% reliability is required.
- ❑ IT's proximity to the patient has impact on security issues such as HIPAA regulations and the increased need for network and data security.
- ❑ Physiologic Monitoring Systems require 24x7 operations. This can affect how IT manages servicing and troubleshooting of problems, software installation, upgrades and patches
- ❑ The criticality of physiologic monitoring systems means that IT should play an increased role in planning, procurement and ongoing support.

▶▶ Infusion Technologies

PLANNING

Decisions on Infusion Pumps are made on safety software and connectivity. As logs of Infusion pumps are maintained by IT Staff, their involvement is critical to assessment.

If Infusion pumps are connected into the network, there is need for an Infusion Pump server to hold log data, drug libraries and supplier's log analysis besides library editing software.

Safe, Effective deployment of infusion pumps requires a robust IT Infrastructure.

The current trend is wireless communication capability for transferring data (such as logs or drug libraries) to and from a centralized server over a hospital wireless network. In some cases, the pump server is the gateway to other information systems.

Pumps are one part of an interconnected system
ıat includes CPOE, Smart Pumps, Pharmacy
formation Systems, bar code administration
ystems, and Electronic Medical Administration
ecord systems

IMPLEMENTATION

Any patient identifying information within a pump log may be considered personal health information and will need to ensure HIPAA compliance

Implementation of Pumps with Dose Error Reduction Systems will require extensive planning and therefore significant foresight during the purchasing process.

IT Staff and Administrators can help clinicians a biomedical engineers by participation in purchasing decisions, and planning and implementing appropriate infrastructure.

As Infusion Systems are among the most HAZARDOUS technologies in the hospital, the IT Department can make a significant contribution to patient safety.

Anesthesia Information Systems

PLANNING

The Medical Devices with which Anesthesia Information Management Systems (AIMS) interfaces are Physiological Monitors and Infusion Pumps. As with any Information System, interfacing is an issue that requires close monitoring.

AIMS should be kept up to date with supplier updates as needed. However IT Department will have to work closely with all IT system vendors to ensure that updates will not affect interfaces to other networked systems such as third-party billing or scheduling software

IMPLEMENTATION

Depending on the hardware and software offered by the supplier, some AIMS and other information systems can be interfaced with each other and various medical devices. Compatibility of AIMS, systems and devices must be confirmed before system purchase and verified by IT Department.

A thorough definition of system needs is critical in defining purchase options and system performance metrics. This must be verified by IT.

Operating Room Integration and Surgical Video systems

PLANNING

Although not a traditional IT domain, clinicians and others deciding on OR Integration increasingly rely on the IT Department for assistance in selection of Video Components and formats. Video signals are commonly distributed between components by established TV connection standards. However with advent of HD, signal routing even over short distances is a challenge. Distribution of HD requires high quality cables.

Analog/Digital : signals characterized as HD as well as those associated with the highest resolution are digital, but not all digital signals are HD. The decision to use analog or digital will be based on specific requirements.

Equipment is now available that takes advantage of IT technologies like streaming, vide compression etc. IT involvement is required to plan the bandwidth necessary for such applications.

IMPLEMENTATION

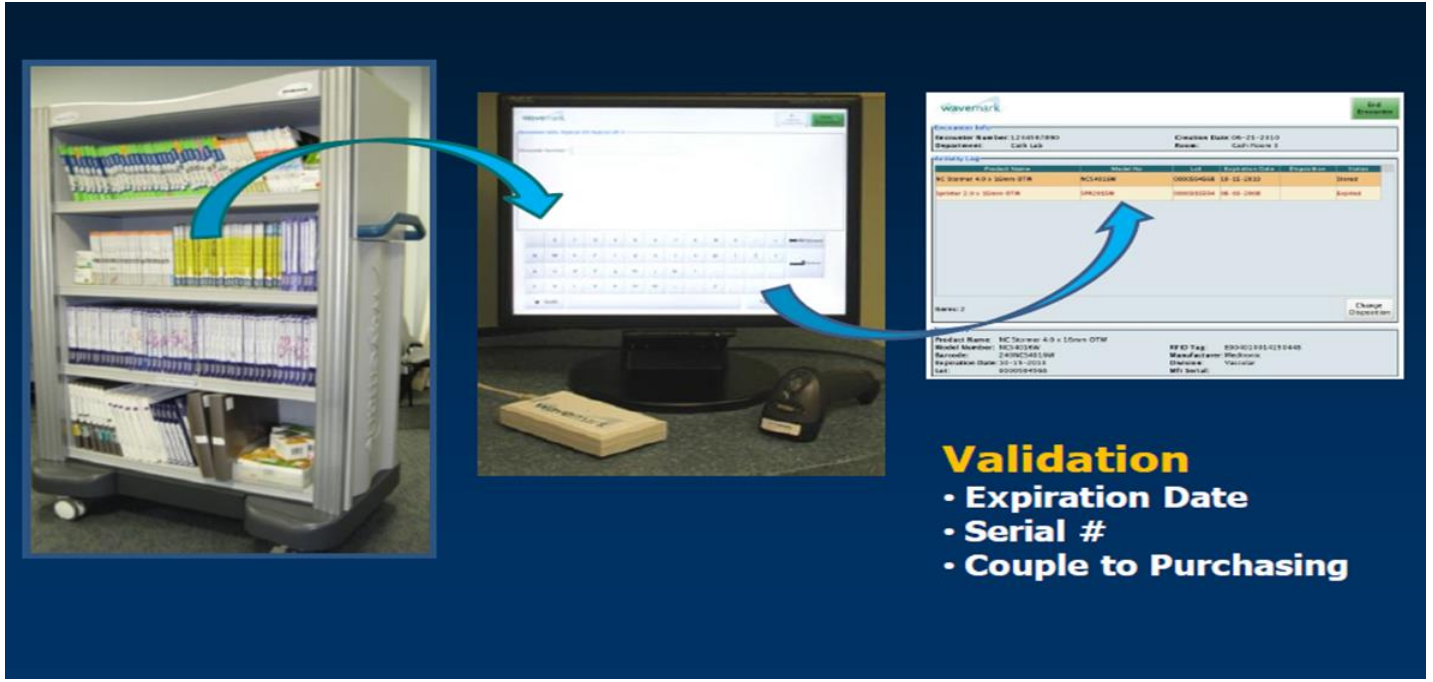
The capture, display, distribution and storage of AV signals from surgical procedures are dependent on OR integration systems.

Measures should be taken while planning and installation to allow signals from all sources in the OR to be handled.

An important OR Integration safety measure is to ensure that only components meeting appropriate safety standards are installed in the surgical field.

The involvement of the IT department in planning Video distribution, streaming technologies, appropriate compression, standards of integration and bandwidth is mandatory

RFID Enabled Inventory Management



Clinical Information Systems

Clinical information systems (CIS) are computer-based information systems that facilitate the dissemination and manipulation of administrative information at the patient's bedside. Clinical information systems can be limited to certain clinical areas of interest (pharmacy, laboratory, radiology, bedside etc.), or encompass multiple systems. The systems can also provide the tracking of the patient's condition (vital signs etc.) and can assist in clinical report generation.

Why clinical information systems are important?

- Improve patient safety
- Reduce medical errors
- Automate patient verification
- Improve clinical decision accuracy
- Reduce redundant documentation
- Quickly access patient data
- Access patient records remotely
- Paperless patient records
- Increase patient care quality
- Improve treatment and outcomes through effective decision support tools
- Continuously evaluate outcomes to improve care quality

►► PACS (Picture Archiving and Communication systems)

Technology

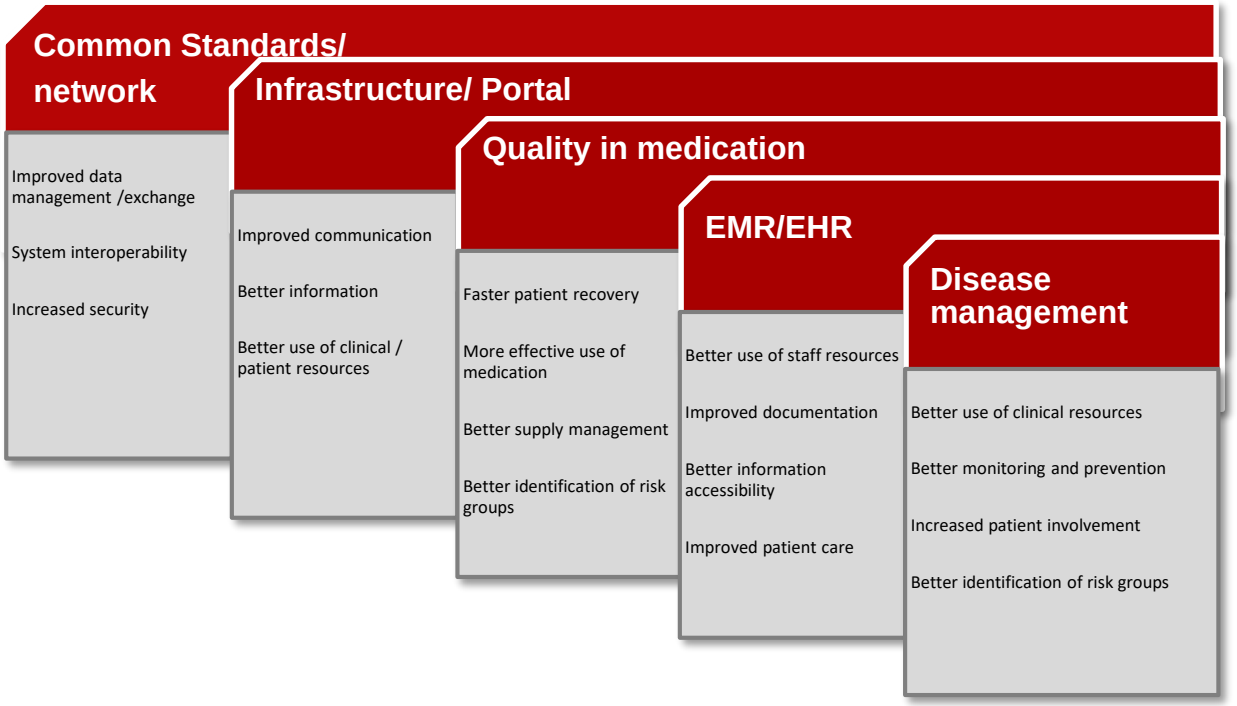
- Remote diagnostic imaging in Real Time

Patient Benefits

- Allows for real time consultations for a variety of sites at once

New Frontiers

The Digital Revolution – Transformation of Healthcare through Information Management



Block Chain Architecture

Technology

- Brings together patient, financial and other systems

Patient Benefits

- Allows for greater visibility and control of processes

Artificial Intelligence in Healthcare

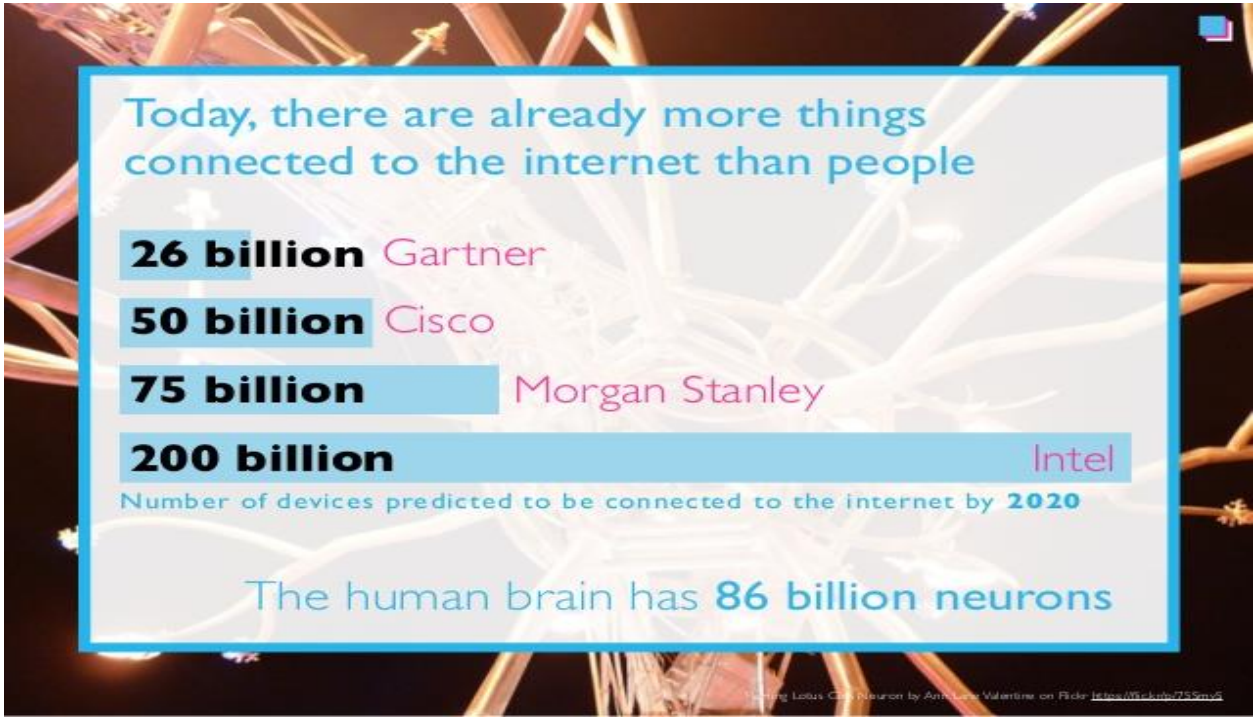
- **Technology**
  - Supports the analysis of data and design making using Clinical and Business Operations Data
- **Patient Benefits**
  - Diagnostic Support
  - Quality Control & Benchmarking
  - Financial Analysis
  - Operations Analysis
  - Efficiency/Effectiveness Studies
  - Process Engineering
  - Improved Customer Service
  - Improved Patient Care

What is Internet of things (IoT) and Internet of Medical Things (IoMT)

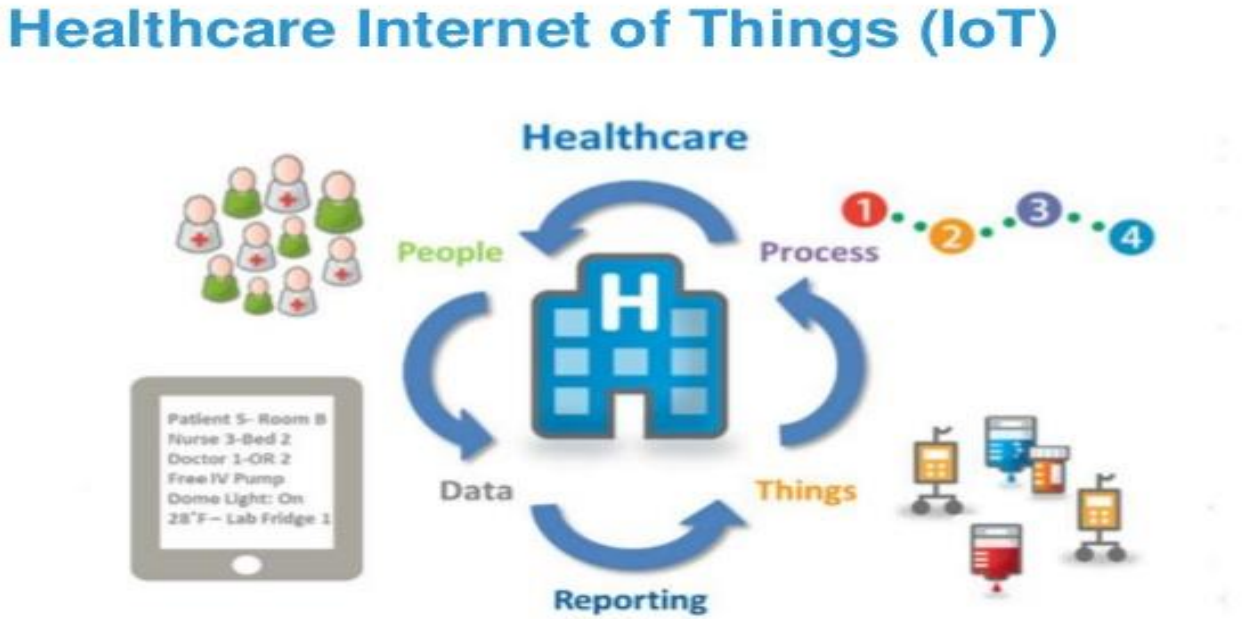
- **The internet of things** (IoT) is a computing concept that describes the idea of everyday physical objects being connected to the internet and being able to identify themselves to other devices. The term is closely identified with RFID as the method of communication, although it also may include other sensor technologies, wireless technologies or QR codes.

- The **Internet of Medical Things** (IoMT) is the collection of **medical** devices and applications that connect to healthcare IT systems through online computer networks. **Medical** devices equipped with Wi-Fi allow the machine-to-machine communication that is the basis of IoMT

The Universe of IoT



IoT Healthcare Applications



IoT Product Spectrum

Available to buy or in development today...

ELECTRONIC PILL DISPENSERS

Designed to remind individuals to take their medication at the right time and to ease the burden of complex medication regimens, electronic pill dispensers such as my uBox and MedMinder alert both the patient and their caregivers.

ELECTRONIC BOTTLES, CAPS AND POUCHES

Wireless smart pill bottles, such as Adheretech, measure the volume of tablets or liquid left in a bottle, while GlowCaps use light and sound to signal when it's time to take your medication. Inhaler attachments, such as GeckoCap and Asthmapolis, monitor

'PHARMACY ON A CHIP'

Currently undergoing clinical trials, microchips drug delivery technologies administer controlled doses of a drug at precisely the right time via a microchip inserted on the waist. Still in its infancy, the technology holds promise for improved patient adherence

BIOMONITORING DRUGS

Ingestible sensors as small as a grain of sand exist today. Helius by Proteus Digital Health is a digital health feedback system. Embedded in a tablet, sensors communicate with a patch worn on the stomach. This then relays information to your phone, and further to

SMART WATCHES

Already designed to act as a health and fitness companion with all the capabilities of a fitness tracker, smart watches (such as Apple Watch) have the potential to integrate with multiple technologies,

Source : Frost and Sullivan Research reports 2019

IoT Defibrillators for Automation of Hospital Support

The **LIFEPAK 15** portable heart monitor and defibrillator allows medics in the field to capture patient data and send this information directly to the hospital. Such M2M technology enables faster response times. It also ensures that patients are routed to the correct hospital for treatment, appropriate caregivers are notified and swift diagnosistic decisions are made.

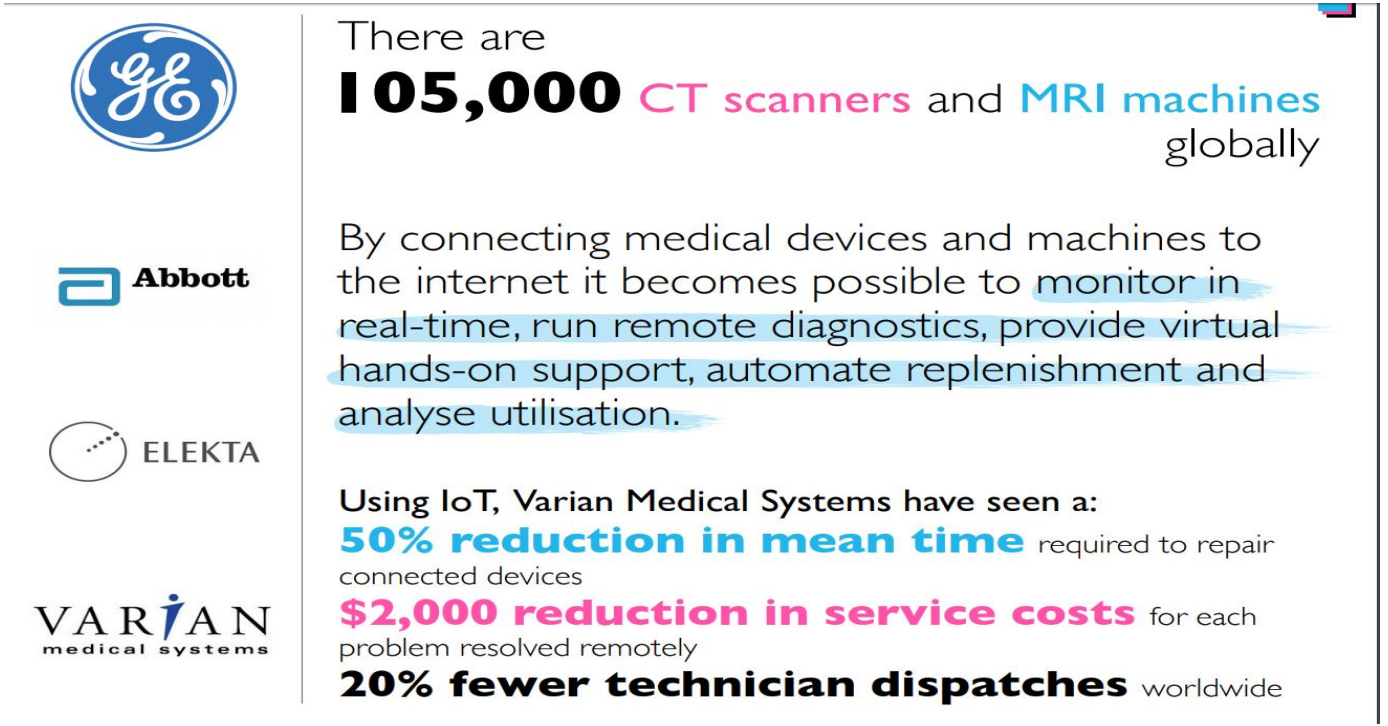
IBM are working on a host of predictive solutions designed to improve healthcare in real-time, enable faster interventions and save lives.

Project Artemis, developed in collaboration with the University of Ontario Institute of Technology and the Toronto Sick Kids Hospital, allows subtle changes to be detected in nosocomial infected infants 12 to 24 hours before any outward signs appear.

Other projects aim to detect complications in brain injured patients, stroke victims and critical patients in ICU before they occur.

Source : Medtronic, 2019

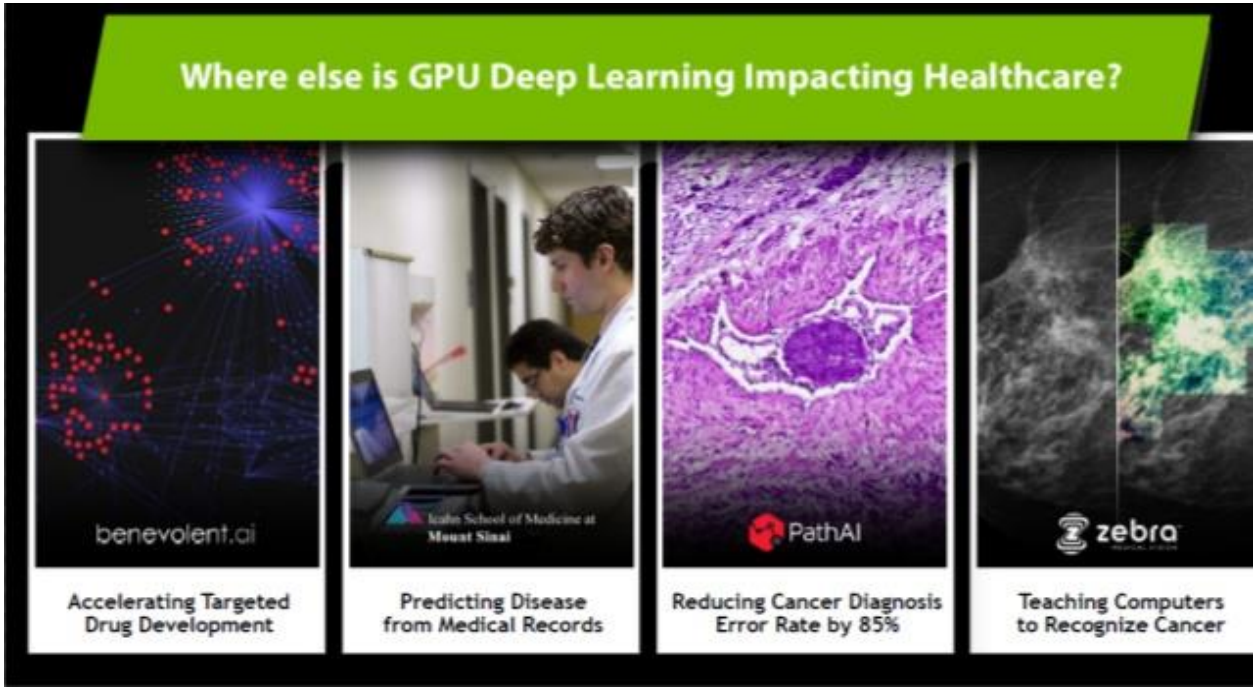
Better Utilization of critical medical systems



Source :IoTforall

Artificial Intelligence Applications in Healthcare

Artificial Intelligence and Cancer Therapy



Use of AI in IBM Watson Systems

Watson Tackles Cancer

- Watson was tested on 1,000 cancer diagnoses made by human experts. **In 99% of them**, Watson recommended the same treatment as the oncologists
- **In 30% of the cases, Watson also found a treatment option the human doctors missed**
- Some treatments were based on research papers that the doctors had not read — more than 160,000 cancer research papers are published a year
- Other treatment options surfaced in new clinical trials the oncologists had not yet seen announced on the web.

Thank You