<center>**Chapter 2: Technological Innovations in Nursing**</center>

- ➢ **Impact of technology on nursing practice**
- ➢ **Telehealth and remote patient monitoring**
- ➢ **Wearable devices and sensors in healthcare**
- ➢ **Artificial intelligence and machine learning in nursing**

Innovations in Nursing

- Innovative ideas and practices offer new solutions to old problems.
- Innovation disrupts the status quo by transforming our experience; it is not about working harder or faster, but working smarter to shape the future of care.
- Nurses are well-known for their creativity and imagination when solving patient care dilemmas.
- At clinical setting, nurses unlock their creativity and bring innovations to the practice setting in order to find solutions that ultimately improve outcomes for populations of patients.
- Innovation comes from identifying solutions to problems that affect our practice and our patients as well as from piloting, operationalizing and optimizing solutions until incorporated into our clinical workflow.

Technological Innovations in Nursing

Technological Innovations in Nursing have significantly transformed the healthcare industry, improving patient care, enhancing efficiency, and enabling better communication among healthcare professionals. Here are some notable technological innovations in nursing:

1. Electronic Health Records (EHRs): EHR systems allow nurses to electronically record and access patient health information, including medical history, medication records, and diagnostic test results. EHRs streamline documentation, improve accuracy, and facilitate communication and collaboration among healthcare providers.

2. Telehealth and Telemedicine: Telehealth technologies enable nurses to provide healthcare services remotely. They can conduct virtual consultations, monitor patients remotely, and offer real-time advice and support. Telehealth expands access to care, especially for patients in remote areas or those with limited mobility.

3. Mobile Health (mHealth) Applications: Mobile applications designed for nursing professionals support various tasks such as medication management, vital signs monitoring, and patient education. These apps facilitate data collection, communication, and decision-making at the point of care.

4. Wearable Devices: Wearable devices, such as smartwatches and fitness trackers, have found applications in nursing. These devices can monitor patients' vital signs, activity levels, and sleep patterns, providing valuable data for assessment and intervention.

5. Medication Dispensing Systems: Automated medication dispensing systems help nurses accurately administer medications, reducing the risk of errors. These systems often include barcode scanning and safety checks to ensure the right medication is given to the right patient in the correct dose.

6. Point-of-Care Testing: Point-of-care testing devices allow nurses to conduct rapid diagnostic tests at the bedside, eliminating the need for sending samples to the lab and waiting for results. These devices provide immediate information, aiding in timely decision-making and treatment.

7. Robotics and Automation: Robots are increasingly used in healthcare settings to assist with tasks such as medication delivery, patient monitoring, and lifting and transferring patients. Automation technologies, such as automated vital signs monitors, help streamline routine tasks, freeing up nurses' time for direct patient care

8. Virtual Reality (VR) and Augmented Reality (AR): VR and AR technologies have shown promise in nursing education and training. They can simulate realistic patient scenarios, allowing nurses to practice clinical skills, enhance critical thinking, and improve decision-making in a safe virtual environment.

9. Artificial Intelligence (AI): AI-based tools are being developed to aid in various aspects of nursing, including decision support, predictive analytics, and data analysis. AI algorithms can help identify patterns, predict patient outcomes, and assist in personalized care planning.

10. Smart Beds and Fall Prevention Systems: Smart beds equipped with sensors can detect patient movement and pressure points, aiding in the prevention of pressure ulcers and falls.

11. Nursing Simulation Technologies: Advanced manikins and simulators are employed in nursing education to provide realistic training experiences for students to enhance their clinical skills.

12. Smart Sleeve: A Smart Sleeve is a high-tech, sleeve-like device that is worn on a patient's arm and provides information about their vital signs in real time. The Smart Sleeve can track a patient's heart rate, respiratory rate, temperature, and other vital signs, and alert nurses when a patient's vital signs go outside of normal parameters. This technology allows nurses to detect potential problems earlier and intervene more quickly.

13. Automated Charting: Automated charting is the use of software to streamline and automate the process of documenting patient care in electronic health records. This technology makes it

easier for nurses to keep accurate and up-to-date records of their patients' care, thus allowing nurses to spend more time engaging with patients instead of charting.

Impact of technology on nursing practice

Technology in Nursing: Many of the automation technology devices used and in development can help reduce a nurse's monotonous tasks. This can free nurses to spend more time with patients. Also, helping to supplement nursing care can increase job satisfaction and help with retention.

Technology has had a significant impact on nursing practice, transforming the way healthcare professionals deliver care and improving patient outcomes. Here are some key ways technology has influenced nursing practice:

1. Electronic Health Records (EHRs):
- EHRs have replaced paper-based records, allowing nurses to access patient information quickly and securely.
- EHRs improve communication and coordination among healthcare team members, reduces errors, and enables nurses to make informed decisions based on complete and up-to-date data.

2. Telehealth and Telemedicine:
- Advances in telecommunications have made it possible for nurses to provide care remotely through telehealth and telemedicine services.
- This technology allows nurses to monitor patients, provide counseling, and deliver healthcare services over video calls, reducing the need for in-person visits and improving access to care, especially for patients in rural or underserved areas.

3. Medical Devices and Equipment:
- Technological advancements have led to the development of sophisticated medical devices and equipment that help nurses in various aspects of patient care.
- Examples include infusion pumps, patient monitoring systems, diagnostic equipment, and advanced imaging technologies.
- These tools enhance accuracy, efficiency, and patient safety.

4. Point-of-Care Technology:
- Mobile devices such as smartphones and tablets have become valuable tools for nurses at the point of care.

- They can access medical references, drug databases, and clinical decision support tools, enabling quick access to information and promoting evidence-based practice.
- Mobile apps also facilitate documentation, communication, and collaboration among healthcare providers.

5. Improved Communication:

- Technology has facilitated seamless communication among healthcare professionals.
- Nurses can use messaging apps, secure email, and electronic health systems to collaborate with other team members, leading to better coordination and faster response times.

6. Decision Support Systems:

- Nursing informatics and decision support tools aid nurses in making evidence-based decisions.
- These systems can suggest appropriate interventions and treatments based on patient data and best practices, promoting better patient outcomes.

7. Remote Monitoring and Wearable Devices:

- Remote monitoring technologies and wearable devices allow nurses to monitor patients' vital signs and health conditions from a distance.
- This is particularly useful for patients with chronic diseases or those in postoperative care.
- Nurses can receive real-time data, identify potential issues early, and intervene promptly, resulting in improved patient outcomes and reduced hospital readmissions.

8. Patient Education and Engagement:

- Technology has empowered nurses to provide education and resources to patients more effectively.
- Through interactive websites, mobile apps, and online platforms, nurses can deliver personalized health information, promote self-care, and encourage patient engagement.
- This helps patients become active participants in their own care, leading to better health outcomes.

9. Education and Training:

- Technology has transformed nursing education with the integration of simulation-based learning, virtual reality, and online courses.

- These tools enhance skills development and offer more accessible and flexible learning opportunities for nurses.

10. Data Analysis and Research:
- Nursing practice is increasingly influenced by evidence-based research, and technology plays a crucial role in data analysis and research processes.
- With electronic data collection and analysis tools, nurses can contribute to research studies, evaluate outcomes, and identify trends and patterns.
- This helps inform best practices and improve the quality of care.

11. Ethical and Legal Challenges:
- While technology offers numerous benefits, it also presents ethical and legal challenges, such as patient privacy and data security concerns.
- Nurses must navigate these issues while adhering to strict patient confidentiality guidelines.

Advantages and Disadvantages of Technology in Nursing

Nursing has always been a field renowned for its heavy reliance on technology. From the use of high-tech medical equipment to electronic medical records, technological advancements have revolutionized the way modern healthcare is delivered.

S.No.	Advantages	Disadvantages
1.	Improved Communication Leads to Improved Patient Care	A Threat to the Human Element
2.	Improved Accessibility	At the Mercy of the Server/Power
3.	Decreased Human Error	Malfunctioning equipment
4.	Better Education	Data and Security Threats
5.	Solution to Nursing Shortage	Lack of Empathy When Treating Patients

Conclusion:

Technology has transformed nursing practice by enhancing efficiency, improving patient care, and providing nurses with valuable tools for decision-making and patient engagement. As technology continues to advance, nursing practice will likely evolve further to meet the changing demands of modern healthcare.

Telehealth and remote patient monitoring

The term **Telehealth** refers to umbrella.

Thus, telehealth refers to a suite of services for delivering remote care, both in and out of traditional care settings.

Telehealth is defined as the delivery and facilitation of health and health-related services including medical care, provider and patient education, health information services, and self-care via telecommunications and digital communication technologies.

Telehealth, also referred to as telemedicine or e-medicine, is the remote delivery of healthcare services over the telecommunications infrastructure.

Innovative approaches in healthcare

Telehealth and remote patient monitoring are two innovative approaches in healthcare.

Difference between RPM and telehealth?

Remote Patient Monitoring	Telehealth
RPM uses technologies to interact with patients to interact with them from a distance	telehealth encompasses the industry as a whole and the technologies used to provide this type of healthcare
RPM uses specific technology to help clinicians and patients interact with each other at home.	Telehealth is a broader term used for the entire methodology, industry, and technologies that enable remote healthcare.

Methods of Innovative approaches in healthcare

1. **Telehealth:** Telehealth also known as telemedicine, refers to the delivery of healthcare services, including consultations, diagnoses, and treatment, using telecommunication technologies. It allows healthcare professionals to interact with patients remotely, eliminating the need for in-person visits. Telehealth services can be conducted through various means, such as video conferencing, phone calls, mobile apps, and online messaging platforms.

Methods of telehealth:

There are several options for telehealth care:

- Talk to your health care provider live over the phone or video chat.

- Send and receive messages from your health care provider using secure messaging, email, and secure file exchange.
- Use remote monitoring so your health care provider can check on you at home.

Parameters of patient monitor

- Heart Rate (HR) or ECG Parameter.
- Blood Pressure.
- Spo2 Saturation (Oxygen Level)
- Respiration Rate (RR)
- ETCo2 Parameters.
- Temperature parameter.

Objective of patient monitoring

The aim of patient monitoring is to give warning of early or dangerous deterioration and to achieve this by obtaining an optimal compromise involving many design factors, clinical, engineering and economic.

Functions of a patient monitor

- Patient monitors measure, record, distribute and display combinations of biometric values such as heart rate, SPO2, blood pressure, temperature and more.
- High-capability, multi-function monitors are typically used in hospitals and clinics to ensure a high level of quality patient care.

Benefits of Telehealth:

• **Accessibility:** Telehealth enables patients in remote or underserved areas to access healthcare services without traveling long distances. It helps to diagnose, treat, and advise patients via video conferencing or telephonic communication.

• **Convenience:** Patients can consult healthcare providers from the comfort of their homes, reducing travel time and costs.

• **Cost savings:** Telehealth eliminates the need for physical infrastructure, reducing overhead costs for healthcare providers and potentially lowering medical expenses for patients.

• **Continuity of care:** Patients can receive follow-up consultations, monitoring, and advice without the need for frequent in-person visits.

• **Specialist consultations:** Telehealth enables patients to access specialists who may be located far away.

- **Other benefits like**: virtual consultation, second opinion with experts, remote monitoring, mental health support and Health education.

2. Remote Patient Monitoring (RPM):

   Athelas is a leading provider of Remote Patient Monitoring services, enabling healthcare companies to collect patient data while they are at home, improve patient outcomes, and generate new revenue streams for the practice.

- Remote patient monitoring refers to the use technology to collect and transmit patient health data from a distance.
- It allows healthcare providers to monitor patients' vital signs, symptoms, and other health-related information in real-time, without requiring them to be physically present.
- RPM typically involves the use of wearable devices, such as sensors, smartwatches, or mobile health apps, which continuously monitor and transmit data to healthcare providers.

Types of patient monitor:
- Bedside patient monitoring systems
- Remote patient monitoring systems.

   Remote patient monitoring (RPM) is a type of telehealth in which healthcare providers monitor patients outside the traditional care setting using digital medical devices, such as weight scales, blood pressure monitors, pulse oximeters, and blood glucose meters

   Remote patient monitoring pairs well with telehealth, when patients need to be monitored for certain health conditions. It can also prevent health complications in patients who aren't able to easily travel.

   There are many symptoms and conditions that can be tracked through remote patient monitoring, including:
- High blood pressure
- Diabetes
- Weight loss or gain
- Heart conditions
- Chronic obstructive pulmonary disease

- Sleep apnea
- Asthma

Familiar devices used by patients:
- Weight scales
- Pulse oximeters
- Blood glucose meters
- Blood pressure monitors

Other conditions require more complicated devices that will require patient training, including:
- Apnea monitors
- Heart monitors
- Specialized monitors for dementia and Parkinson's disease
- Breathing apparatuses
- Fetal monitors

Reasons for implementing remote patient monitoring
- Advanced medical technology
- A growing awareness of telehealth for providers and patients
- The ability to monitor and prevent serious complications in remote locations

Home health monitors

There are a number of ways to share information with your patients:
- A telehealth appointment before they begin using the device
- A follow-up telehealth appointment after they've been using the device for several days
- An email or downloadable PDF explaining remote patient monitoring for their condition or symptoms

Tips for the patient to use their device:

Some products, such as a weight scale, may not need a lot of explanation. But other devices may be more high tech or confusing for patients. Here are a few tips:
- Walk your patient through operating the device in a telehealth appointment
- Refer your patient to an at-home medical equipment provider in their area who can set them up with the device and provide support
- Tell your patient what types of readings you will get from their device and how you will receive that information

- Make sure your patient has written instructions they can refer to, including paper copies, email, or downloadable PDF
- Encourage your patient to write down their questions and either call your office, email you the questions through a patient portal, or request a follow-up telehealth appointment
- Have a member of your staff let your patient know when you are receiving their information correctly from the device

Benefits of Remote Patient Monitoring:

• **Timely intervention:** Healthcare providers can identify changes in patients' health conditions promptly and intervene if necessary, potentially preventing complications or hospitalizations.

• **Wearable Devices:** Patients can use wearable devices like smartwatches, fitness trackers, or medical-grade sensors to monitor parameters such as heart rate, blood pressure, blood glucose levels, and more.

• **Chronic disease management:** RPM is particularly useful for managing chronic conditions like diabetes, hypertension, or heart disease, as it allows for ongoing monitoring and early detection of any deterioration.

• **Patient empowerment:** Remote patient monitoring enables patients to take an active role in managing their health by providing them with real-time data and insights about their conditions.

• **Improved efficiency:** Continuous monitoring and early detection can lead to more proactive and targeted interventions, optimizing healthcare resource utilization

• **Cost-effectiveness:** By preventing hospitalizations or emergency visits through timely intervention, remote patient monitoring can help reduce healthcare costs.

Other benefits of Remote Patient Monitoring:
- Reduced hospitalizations
- Shorter hospital stays if the patient can be discharged with a remote monitoring device to use at home
- Fewer visits to the emergency room
- Better health outcomes for patients in rural areas
- Better preventative management for chronic conditions
- Reduced risk of illnesses for patients and health care workers.

Advantage of remote patient monitoring in Nursing Profession

- Greater peace of mind for patients and their families
- Fewer unnecessary office visits, saving providers and patients time and money
- More individualized patient interactions based on up-to-the-minute data
- Timely interventions that can prevent relapses or hospitalizations
- Better patient feedback and personalized care for chronic conditions

Disadvantage of remote patient monitoring

- RPM has some drawbacks, such as its reliance on technology that not all patients can afford.
- RPM systems need reliable internet connections. Some of your patients may not have broadband access, making it harder for them to participate in RPM setups.
- RPM entails cyber liability risks. Because remote monitoring devices transmit patient data, the risk of a data breach exists if the information is not adequately encrypted. HIPAA requires that all personal health information (PHI) be encrypted when transmitted.

Common problems with patient monitoring:

- Complicated artifacts
- Information overload
- Tangled cables
- Issues switching between monitors made from different manufacturers
- Difficulties arising from human performance.

Common problems Faced with patient monitoring equipments

- The Patient Monitor Turns On And There Is No Display. ...
- The Patient Monitor has A White Screen or A Blurred Screen. ...
- ECG No Waveform. ...
- The ECG waveform on the patient monitor is cluttered.
- ECG Baseline Drift in Patient Monitors

Both telehealth and remote patient monitoring have seen significant growth and adoption in recent years, especially due to the advancements in technology and the need for more flexible healthcare solutions. These technologies have the potential to improve access to care, enhance patient outcomes, and reduce healthcare costs by minimizing unnecessary hospital visits. However, it is important to address privacy and security concerns when implementing these technologies to ensure the protection of patient data and compliance with healthcare regulations.

Wearable devices and sensors in healthcare

Wearable healthcare technology

Wearable devices in healthcare are designed to collect the data of users' personal health and exercise, and can even send a patient's health information to a doctor or other healthcare professional in real-time.

Wearable healthcare technology refers to health monitoring devices worn on the body, such as the wrist, to help monitor the wearer's health data. These devices use biosensors to collect different data from the patient, such as heart rate, blood pressure, sleep patterns, and activity.

Over the years, wearable medical devices have become increasingly popular due to the advancements in sensor technology and the ability to make sensors and batteries very small.

Wearable medical technology is used for various reasons and can accurately monitor fitness, heart rate, general wellness, and disease management. They can also provide medication reminders and store patient health information.

Wearable devices and sensors

Wearable devices and sensors have revolutionized the healthcare industry by providing continuous monitoring of various health parameters. These devices are typically worn on the body and can collect real-time data, allowing healthcare professionals to track patients' health status, detect early warning signs, and personalize treatment plans. Here are some common examples of wearable devices and sensors used in healthcare:

1. Fitness trackers: These are perhaps the most well-known wearable devices. They monitor physical activities, such as steps taken, distance traveled, heart rate, and sleep patterns. They can provide valuable insights into a person's overall health and encourage individuals to engage in a more active lifestyle.

2. Smartwatches: In addition to fitness tracking features, smartwatches offer more advanced health monitoring capabilities. They can measure heart rate variability, blood oxygen levels, and even perform electrocardiograms (ECGs) to detect irregular heart rhythms. Some smartwatches also have fall detection and emergency alert features.

3. Continuous glucose monitors (CGMs): CGMs are used by individuals with diabetes to monitor their blood glucose levels continuously. These devices typically consist of a small sensor placed under the skin, which measures glucose levels in the interstitial fluid. The data is

transmitted wirelessly to a receiver or a smartphone, allowing users to track their glucose levels in real time.

4. Blood pressure monitors: Some wearable devices can measure blood pressure throughout the day. These devices usually employ optical sensors to detect blood volume changes in the wrist or finger. They provide a convenient way to monitor blood pressure trends over time and can be useful for individuals with hypertension or those at risk of cardiovascular diseases.

5. Wearable ECG monitors: These devices allow individuals to record their electrocardiogram (ECG) on-the-go. They usually come in the form of a small patch or chest strap and can detect abnormal heart rhythms or signs of potential heart conditions. The recorded ECG data can be analyzed by healthcare professionals for diagnosis and treatment planning.

6. Trackers: Wearable devices designed for sleep monitoring can track the quality and duration of sleep. They use various sensors, such as accelerometers, to detect movement and determine different sleep stages. Sleep trackers can provide insights into sleep patterns, helping users identify potential sleep disorders or improve their sleep hygiene.

7. Smart clothing: Innovative fabrics and textiles embedded with sensors can monitor vital signs, such as heart rate, respiration rate, and body temperature. Smart clothing offers a non-intrusive and comfortable way to collect health data, and it has applications in sports performance monitoring, remote patient monitoring, and eldercare.

8. Early detection and prevention: Wearable sensors can detect subtle changes in health metrics, allowing for early detection of potential health issues. By identifying these issues at an early stage, healthcare providers can intervene before they develop into more serious conditions.

9. Post-operative monitoring: After surgeries or medical procedures, wearable devices can monitor patients' vital signs and recovery progress, helping healthcare providers ensure a smooth and safe recovery process.

10. Medication adherence: Some wearables are equipped with reminders and alerts to help patients remember to take their medications on time, improving medication adherence and treatment efficacy.

11. Elderly care: Wearable devices are especially beneficial for elderly individuals, as they can track their activity levels, falls, and vital signs, providing peace of mind to caregivers and family members.

12. Clinical research and data collection: Wearable devices play a significant role in clinical research, allowing researchers to collect large-scale, real-world data on patients' health and behavior. This data can lead to valuable insights and advancements in healthcare.

13. Telemedicine integration: Wearable devices seamlessly integrate with telemedicine platforms, enabling healthcare professionals to conduct remote consultations while having access to essential health data.

14. Empowerment and patient engagement: Wearable devices empower patients to take a more active role in their health management. By visualizing their health data, patients can set goals, track progress, and make informed decisions about their lifestyle and treatment choices.

Wearable sensors for healthcare monitoring

Wearable sensor-based health monitoring systems may comprise different types of flexible sensors that can be integrated into textile fiber, clothes, and elastic bands or directly attached to the human body.

Sensors used in wearable healthcare technology

Medical technology uses biosensors to take accurate health data measurements from the patient. These sensors use biological molecules like enzymes to detect or measure specific substances like glucose, cholesterol, drugs, or health data, such as heart rate, blood pressure, or breathing rate.

Biosensors detect biological, chemical, or physical signals and convert them into measurable electrical or optical signals.

There are two main types of biosensors used in wearable medical devices:

1. Photodiode sensor. This type of sensor converts light energy into electrical energy. Similar to the strip on a solar-powered calculator, this sensor converts the data from a vein into usable data translated back to the wearable device to transmit information to the user. Although not known to be the most accurate sensor in a healthcare device, it's a much less expensive option for manufacturers.

2. Complementary metal–oxide–semiconductor (CMOS) sensors. The CMOS is known on the market for its accuracy and intelligence. Like a high-end DSLR camera lens, the CMOS sensor can accurately direct its focus and even cancel out other noises and light that may affect a reading. In addition, the CMOS sensor can also detect atrial fibrillation (Afib), a common heart condition.

Types of wearable sensors

- Accelerometer. Accelerometers are sensors used in wearables. ...
- Gyroscopes. Gyroscopes are also a common wearable sensor. ...
- Magnetometers. ...
- Global positioning system (GPS) ...
- Pressure sensors. ...
- Integration of sensors into wearables.

Common sensor devices

There are various kinds of smart sensors available, but the most commonly used ones are

- Level sensors
- Electric current sensors
- Humidity sensors
- Pressure sensors
- Temperature sensors
- Proximity sensors
- Heat sensors
- Flow sensors
- Fluid velocity sensors
- Infrared sensors

The types of medical sensors include

- Blood pressure
- EEG
- EEG
- Oxygen saturation heart rate
- Magnetic field
- Life-supporting implants
- Remote monitoring of vital signs

Purpose of wearable sensors

- Wearable sensor technology enables recording and analyzing physical, chemical, and electrophysiological parameters in real-time and in a non-invasive way.
- The continuous monitoring of clinically relevant information aims at the prevention, treatment, and management of diseases and the well-being of the users.

Six examples of active sensors

- Scanning electron microscopes
- LiDAR
- Radar
- GPS
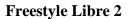- X-ray
- Sonar, infrared and seismic.

Best health monitoring devices:

1. Blood pressure monitors

The Qardioarm Blood Pressure Monitor — this device is the best on the market and has over 2K 5-star reviews. The monitor is placed on the right or left arm and accurately provides the user with a blood pressure reading right to their phone. The at-home blood pressure cuff is still the most accurate device on the market, and the Quardioram Blood Pressure Monitor cuff can connect to a smartphone to store blood pressure and pulse data.

Qardioarm Blood Pressure Monitor

Freestyle Libre 2

2. Glucose meters

The **Freestyle Libre 2 —** this advanced blood glucose reading device is known to be the best on the market for diabetic glucose monitoring. It offers a device placed on the upper arm and uses a

phone sensor to measure the reading from the device. This device is ideal because it lessens the need for patients to "prick" their fingers, as the device can be used for up to seven days at a time.

3. ECG monitors

The Apple Watch — Apple technology is always ahead of the competition. The Apple Watch is the only wearable device to detect abnormal heart rhythms and accurately provide ECG readings. However, although the Apple Watch technology is advanced, it cannot detect heart attacks, blood clots, strokes, or other heart-related conditions, such as congestive heart failure.

Apple Watch   **Fitness trackers**

4. Fitness trackers

Fitbit Charge 5 — This smartwatch is known to be one of the most accurate and easiest-to-navigate fitness trackers available. This sleek and compact design accurately monitors everything from heart rate to steps and has a battery life that lasts up to 7 days. Fitbit has changed its technology over time and has very accurate and updated software to monitor and store your health and fitness information accurately.

5. Integrated Activewear

NADI X Activewear — Innovative technology has now been integrated into activewear and is available in all different shapes and sizes. The NADI X has hundreds of 5-star reviews. The brand uses mild vibrations from sensors integrated into the clothing to tell the wearer if they are practicing yoga moves accurately. This can help overall balance and lead to achieving better fitness goals.

NADI X Activewear

Future role in healthcare by wearable technology:

- The future of wearable technology in healthcare looks very promising.
- Using the most accurate sensors and technology, engineers can provide the user with the best and most precise healthcare monitoring.
- Wearable health technology has the potential to revolutionize healthcare by enabling patients to take a more proactive approach to their health and well-being.
- Many great wearable healthcare monitoring devices on the market allow users to measure healthcare data accurately.
- The Apple Watch is known to be the most advanced smartwatch on the market, but other brands are close behind.
- New and innovative technology, such as NADI X, is reaching new heights and allowing users to perfect their practices while monitoring their health.
- These are just a few examples of how wearable devices and sensors are being utilized in healthcare. As technology continues to advance, we can expect even more sophisticated devices that will further enhance the accuracy and breadth of health monitoring in the future.

Key takeaways:

- Wearable healthcare technology is healthcare monitoring devices worn on the body to monitor healthcare data through the use of biosensors.
- Wearable healthcare technology accurately monitors pulse, fitness data, and sleep; however, some devices, such as smartwatches, cannot accurately monitor blood pressure.
- Biosensors are used in smartwatch technology. We have outlined two main types of biosensors: photodiode sensors and complementary metal oxide semiconductor (CMOS) sensors.

- There are numerous wearable healthcare technology products on the market, so we have outlined the leaders in each category.

Artificial intelligence and machine learning in nursing

Artificial intelligence (AI) technology holds significant potential to create more sophisticated and complex simulations that can help nursing students develop critical thinking skills and prepare for real-world patient care situations.

Machine learning in healthcare is used to draw insights from large medical data sets to enhance clinicians' decision-making, improve patient outcomes, automate healthcare professionals' daily workflows, accelerate medical research, and enhance operational efficiency.

Artificial Intelligence Examples

- Manufacturing robots.
- Self-driving cars.
- Smart assistants.
- Healthcare management.
- Automated financial investing.
- Virtual travel booking agent.
- Social media monitoring.
- Marketing chatbots.

Types of machine learning

Machine learning involves showing a large volume of data to a machine so that it can learn and make predictions, find patterns, or classify data. The three machine learning types are

- Supervised
- Unsupervised
- Reinforcement learning.

Application of AI in health care

AI is used in various areas of healthcare such as diagnosis processes, drug research sector, medicine, patient monitoring care centre, etc. In the healthcare industry, AI helps to gather past data through electronic health records for disease prevention and diagnosis.

AI and ML are being utilized in nursing:

Artificial intelligence (AI) and machine learning (ML) have the potential to greatly impact the field of nursing by enhancing patient care, improving workflow efficiency, and supporting clinical decision-making. Here are some ways AI and ML are being utilized in nursing:

1. Data analysis and prediction: AI and ML algorithms can analyze large amounts of patient data, such as electronic health records (EHRs), to identify patterns, trends, and potential risks. This

information can help nurses and other healthcare professionals make more informed decisions about patient care and develop personalized treatment plans.

2. Clinical decision support: AI-based clinical decision support systems can provide real-time recommendations to nurses based on patient data, guidelines, and research evidence. These systems can assist in diagnosing conditions, suggesting appropriate interventions, and alerting healthcare providers to potential medication interactions or adverse events.

3. Monitoring and early detection: AI-powered monitoring systems can continuously collect and analyze patient data, such as vital signs, to detect early signs of deterioration or changes in health status. Nurses can receive alerts when abnormalities are detected, enabling them to intervene promptly and potentially prevent complications.

4. Virtual nursing assistants: Chatbots and virtual nursing assistants equipped with AI capabilities can provide patients with basic health information, answer common questions, and offer guidance on self-care. These tools can alleviate the workload of nurses by handling routine inquiries and allowing them to focus on more complex patient needs.

5. Workflow optimization: AI and ML algorithms can help optimize nurse workflow by predicting patient demand, identifying bottlenecks, and suggesting improvements. This can enhance resource allocation, staffing decisions, and patient flow within healthcare facilities, leading to improved efficiency and reduced waiting times.

6. Patient triage and prioritization: AI algorithms can assist nurses in triaging patients based on the urgency of their conditions. By analyzing symptoms, medical history, and other relevant factors, AI systems can help prioritize patients and allocate appropriate resources accordingly.

7. Personalized care and patient engagement: AI can facilitate personalized care by tailoring treatment plans and educational materials to individual patients' needs and preferences. Additionally, AI-powered platforms can support patient engagement by providing reminders, monitoring progress, and offering guidance for self-management.

8. Predictive analytics for patient outcomes: AI and ML models can analyze patient data to predict potential adverse events, such as hospital readmissions or infections. This proactive approach allows nurses to intervene early and provide targeted interventions to prevent complications.

How AI can improve patient care?

Predictive analytics powered by AI can predict and reduce patient no-shows in healthcare systems. With improved diagnostic accuracy and patient outcome predictions, AI has tremendous potential to improve patient outcomes by 30-40% while reducing treatment costs up to 50%.

AI healthcare startups in India

- Niramai is a deep-tech healthcare startup founded by Geetha Manjunath and Nidhi Mathur in 2016. ...
- Pharmeasy is a Mumbai-based health-tech startup founded by Dharmil Sheth, Dhaval Shah and Mikhil Innani in 2015. ...
- Qure.aiwas founded by Prashant Warier and Pooja Rao in 2016.

New Technology in Nursing

Seven ways that technological innovations continue to improve nursing and patient care in 2023

1. Predictive Analytics

One new technology in nursing that holds great promise for improved patient outcomes is predictive analytics. With help from AI, predictive analytics considers data from past patients to suggest a course of treatment with the best possible outcome.

Beyond treatment plans, predictive analytics allows health care professionals to analyze patient data quickly, which saves valuable time and improves patient outcomes. For example, AI may detect the need for a blood test quicker than a human could, which could lead to faster test collection and ultimately quicker results.

This information allows the care team to work with unprecedented flexibility. They can adapt to their patient's needs quickly, using the data to switch medications or change the dosage, if needed, to further improve the patient's condition.

Predictive analytics can also help providers determine a patient's risk level for developing other chronic conditions, such as heart disease, obesity and diabetes. This information then informs a course of treatment best suited to the patient.

2. Clinical Mobility

The term "clinical mobility" refers to the use of handheld digital devices—mobile computers, tablets and smartphones—by health care professionals in hospitals and clinics. Such devices offer greater mobility across the facility, allowing them to create a new, convenient point of care based on the location of each patient or family member.

Clinical mobility devices allow nurses to do their jobs more effectively, sharing real-time patient data with their care team, which can save lives. Clinical mobility benefits providers and patients in several ways, including the following:

- Higher quality patient care
- Better informed clinicians
- More efficient workflows

By adding new clinical mobility technology to nursing, providers can streamline once arduous processes, sharing information quickly and effectively with their entire care team and a patient's family.

3. Mobile Robotic Systems

In addition to caring for patients, nurses juggle a complex mix of daily responsibilities—everything from taking vital signs and administering medications to maintaining accurate records and providing updates to patients' family members. The ongoing nursing shortage has made it harder than ever for nurses to tackle demanding on-the-job duties and still prioritize adequate time for direct patient care. Fortunately, the field of mobile robotics offers some helpful solutions.

Robots are capable of completing the following common nursing duties:

- Making point-to-point deliveries of lab specimens, medications or supplies
- Greeting patients and signing them in
- Conducting contactless triage interviews in the emergency department

Robots are another technology with many benefits for nursing. With large swaths of accurate data, robotics technologies can help nurses assess health and safety risks and make more informed patient decisions.

4. Artificial Intelligence in Clinical Decision Support

In health care, AI is invaluable for helping patients make clinical decisions or take action concerning a diagnosis or treatment plan. AI uses information technology to automate the conversion of data into knowledge that helps guide the patient to the next steps.

New AI technology in nursing can offer much-needed clinical decision support. This technology trend helps nurses sort high volumes of patient data and understand new information. The advantages of nurses using AI in clinical decision-making include the following:

- Quickly analyzing large volumes of data

- Accurately identifying at-risk patients

- Identifying and advocating to improve care gaps

AI applications in nursing include the following:

- Identification of disease presence in asymptomatic patients
- Fall risk prediction and precaution implementation

- Guided decision trees to prevent infection from catheterization

Nurses will play an essential role in AI technology integration in hospitals and clinics. They can help identify new opportunities to automate existing processes to gain more time to spend with patients. Chief information officers (CIOs) in health care systems can ensure that nurses and nursing leadership have their voices heard regarding the development and implementation of AI.

5. Streamlined User Interfaces

Many nurses still use outdated systems that "are lacking basic usability," and this leads to fatigue, disrupted work processes and increasingly burdensome documentation. Digital health user interfaces (UIs) can help nurses streamline their work, making accessing patient data more user-friendly and straightforward. According to Health Tech Magazine, streamlined UIs include the following benefits:

- Reduced screen time

- Natural language processing tools for dictation

- Access through gestures such as vision or voice prompts
    - σ These significant benefits have the power to change nursing in the future. With less screen time, nurses can reduce eye strain and improve their focus.
    - σ Meanwhile, natural language processing tools and vision or voice prompts are examples of Zero User Interface (Zero UI) technology.

σ They save nurses time when using EHRs, increase their comfort levels with technology and enhance their ability to adapt to new digital tools in the future.

Digital health UIs can help nurses communicate in real-time with their care team and do their jobs more efficiently. This frees up time to care for more patients and handle other essential day-to-day responsibilities, such as charting, administering medication and reviewing lab test results with colleagues.

6. Remote Patient Monitoring

RPM tracks patient health outside the clinical setting, using technology to transmit patient health data between patients and providers in real time. RPM is an important new technology in nursing because it allows patients to participate in their care from their homes, yielding psychosocial benefits and allowing nurses to stay abreast of any changes in their patients' health.

7. Telehealth

Telehealth, or telemedicine, is a significant technology predicted to change the future of nursing. The term "telehealth" refers to virtual visits, usually through an internet-based video call conducted over a computer, tablet or smartphone, between health care providers and patients in separate locations. The ability to connect patients with the health care system is especially significant for patients in rural or hard-to-reach locations who might otherwise face a geographic barrier to care or go without it.

Virtual visit technology allows NPs to deliver quality, effective care remotely by:

- Determining whether a patient needs in-person treatment

- Delivering mental health counseling

- Diagnosing minor infections

- Prescribing or renewing medications

- Delivering lab test or X-ray results

- Providing follow-up after procedures or surgeries

- Offering speech, occupational or physical therapy

How Will Technology Change Nursing in the Future?

Now and into the foreseeable future, health care technology will be routinely developed and applied to the nursing profession. The positive outcomes associated with new technology in nursing are likely to include the following:

- Reduced human error, such as documenting patient information and administering medications
- Streamlined patient care offered in increasingly convenient ways
- Greater human interaction, leading to more personal relationships between nurses and patients
- As new digital innovations are introduced, technology will change nursing in the future. Anticipated challenges associated with this new technology could include the following:
- Increased expenses to acquire new technology and train staff to use it
- Growing patient loads as nurses administer more direct care
- Potential cybersecurity risks concerning private patient health data
- Adoption of new technology by all nurses, particularly those who are less technical

Despite these challenges, the adoption of new technology offers unparalleled benefits. To make sure that new technology enters the realm of health care in the safest, most effective way, nurses can and should actively participate in its development and adoption.

Nurses and nurse leaders should demand digital technology to replace outdated systems, fulfill standard deliveries and complete other time-consuming routine tasks that can easily be automated. Additionally, strong nursing leadership will be essential as nurses navigate complex new technology, such as AI and robotic systems.

Can AI replace nurses?

AI can help ease staffing pressures, but it will not replace the nurse. Teletriage nursing is a big job, and decision support software helps make it easier.

Despite the numerous benefits AI and ML bring to nursing, it's essential to address potential challenges and concerns, such as data privacy, security, and the ethical use of AI in healthcare. A collaborative effort between nurses, healthcare providers, and AI experts is crucial to developing and implementing AI technologies that align with ethical guidelines and ensure patient safety and confidentiality