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Role of Digital technology for better outcome in patients with Coronary Artery Disease - Review article

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Abstract:

The digital technology interventions helps in improving medication compliance, facilitating regular follow-up, and addressing healthy behavioural factors in patients with coronary artery disease. By integrating digital tools into healthcare delivery, providers can enhance patient engagement, promote adherence to treatment regimens, and enable early detection of adverse events.

The integration of digital technology with cardiac rehabilitation programs holds potential for transforming the healthcare system into a more sustainable[1] and patient-centered model. Digital platforms can enhance access to cardiac rehabilitation services, facilitate remote monitoring, and personalize interventions based on individual patient needs, ultimately improving clinical outcomes and quality of life.

However, while digital technology has shown promise in certain aspects of cardiovascular care, such as medication adherence and follow-up, its impact on reducing unhealthy behaviours like alcohol consumption, smoking, and unhealthy diet may be limited[2]. Despite efforts to integrate

digital interventions, addressing these modifiable risk factors remains challenging and may require comprehensive, multifaceted approaches that extend beyond digital technology alone.

As the field of digital health continues to evolve, there is a growing need for additional research and development to harness the full potential of technology in healthcare facilities. Collaboration between researchers, clinicians, policymakers, and technology developers will be critical in driving forward progress and ensuring that digital interventions effectively address the evolving needs of patients with acute coronary artery disease and other cardiovascular conditions.

Key Words: Digital technology, Artificial intelligence, Coronary Artery Disease, Risk factors, cardiovascular disease

Introduction:

The integration of digital technology into healthcare, particularly through digital health interventions and artificial intelligence (AI), holds immense potential for transforming patient care, improving outcomes, and enhancing overall healthcare delivery[1]. Here's a breakdown of some key points:

1. **Prevention and Management of Non-Communicable Diseases (NCDs)**: Digital health interventions are effective in supporting the prevention and management of NCDs such as cardiovascular diseases, diabetes, and obesity. These interventions leverage information and communication technologies to deliver scalable and tailored treatments at sustainable costs.
2. **Cardiovascular Disease Management**: Digital technology can play a crucial role in managing cardiovascular diseases like coronary artery disease (CAD) and acute coronary syndrome (ACS). It can aid in patient education, medication adherence, lifestyle modifications, remote monitoring, and early detection of adverse events.
3. **Patient Engagement and Adherence**: Digital health interventions can improve patient engagement and adherence to treatment plans, including cardiac rehabilitation programs. By providing personalized education, reminders, and monitoring, digital tools can empower patients to take charge of their health.
4. **Role of Artificial Intelligence (AI)**: AI, including machine learning and deep learning techniques, holds promise in various aspects of healthcare, including disease diagnosis, drug discovery, patient risk identification, and intelligent health systems. AI has the potential to reduce errors, improve clinical outcomes, and enhance data tracking over time.
5. **Challenges and Considerations**: Despite the potential benefits, the integration of digital technology into healthcare presents challenges. These include ensuring data privacy and security, addressing healthcare system responsiveness, and overcoming barriers to patient acceptance and adherence.

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Digital technology, including AI, has the capacity to revolutionize healthcare delivery, enhance patient care, and improve clinical outcomes. However, successful implementation requires addressing challenges and ensuring that digital interventions are patient-centered, secure, and effectively integrated into existing healthcare systems.

Methods:

The literature search was conducted using Google Scholar and PubMed databases, employing key terms such as 'Artificial intelligence,' 'Digital technology,' 'Risk factors,' 'Coronary Artery Disease,' and 'Cardiovascular disease' in the title/abstract fields. No limitations were imposed regarding study design or study population. Ethical considerations were addressed by providing appropriate citations and references, ensuring due credit to the original authors.

The methodology aspects of the articles were reported without presenting clinical data. This included details such as study design, data collection methods, sample size, inclusion and exclusion criteria, statistical analysis techniques, and any ethical considerations or approvals obtained. By following these methods, the literature search aimed to comprehensively identify relevant publications on the intersection of artificial intelligence, digital technology, and cardiovascular disease management, particularly focusing on Coronary Artery Disease and associated risk factors.

Artificial Intelligence in cardiology:

The application of Artificial Intelligence (AI) in cardiology has expanded to various fields beyond electrocardiography (ECG), including Echocardiography, Cardiac imaging, Electronic patient data analysis, Electrophysiology, Interventional procedures such as Coronary Angiography (CAG) and Percutaneous Transluminal Coronary Angioplasty (PTCA), as well as heart surgery. These advancements in AI technology have significantly enhanced the accuracy of diagnosis, treatment, and prediction of cardiovascular outcomes.

"**Machine learning**, a subset of artificial intelligence, achieves various tasks including supervised, unsupervised, and semi-supervised learning. Deep Learning, in particular, is gaining prominence in cardiology for its ability to extract insights from complex data. These techniques hold promise for improving diagnosis, treatment, and patient care in the field.[3]

1. Supervised Learning: Models are trained on labeled data to classify heart conditions, predict cardiovascular events, and determine treatment responses in cardiology.
2. Unsupervised Learning: Models uncover hidden patterns in unlabeled data, useful for clustering patient populations or identifying cardiac disease subtypes.
3. Semi-supervised Learning: Combining labeled and unlabeled data, this approach improves model performance when labeled data is limited, a common scenario in cardiology.

4. **Deep learning** is a subset of machine learning that utilizes artificial neural networks with multiple layers (deep architectures) to extract hierarchical representations from the input data. Deep learning has gained prominence in cardiology due to its ability to handle large and complex datasets, such as medical imaging and ECG signals. Deep learning models,

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such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), have shown promising results in tasks such as image classification, segmentation, and sequence analysis in cardiology.

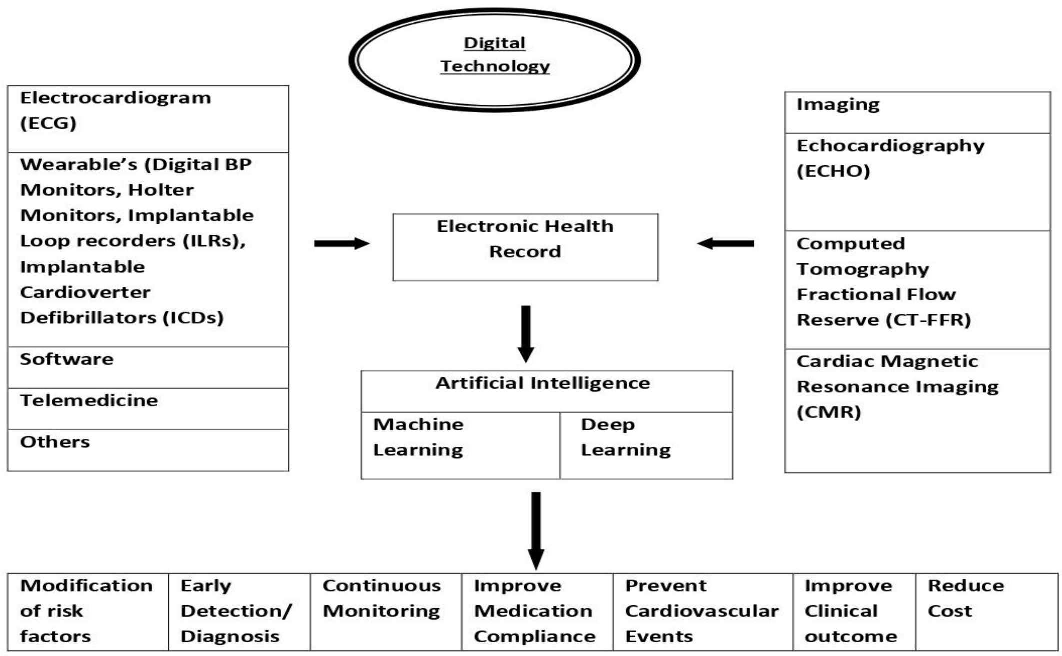

Figure 1: Role of Digital Technology in Coronary Artery Disease

Electrocardiogram (ECG):

The development of the electrocardiogram (ECG) marked a pivotal moment in the utilization of technology in cardiology. Augustus Waller and Willem Einthoven's pioneering work in recording electrical activity using a mercury capillary electrometer laid the groundwork for modern ECG. Einthoven's refinements in ECG recordings have established it as an indispensable tool in cardiac assessment and management[4].

ECG remains a fundamental and widely utilized test for recording electrical activity and assessing heart rhythm. Machine learning models, particularly within the subfield of deep

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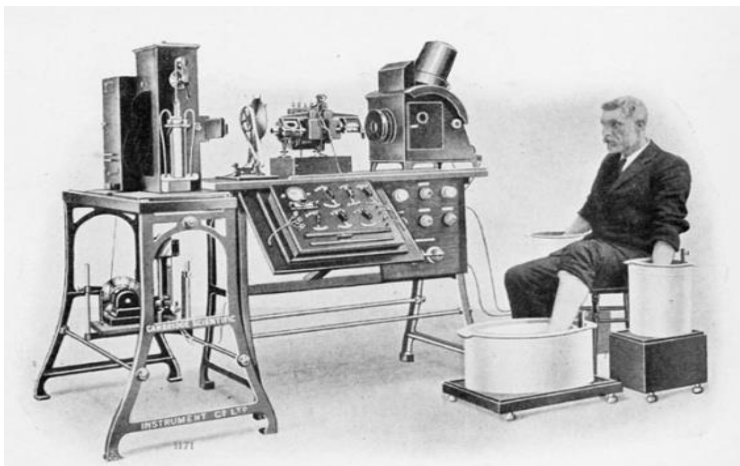
learning, have been leveraged to identify abnormalities in ECG readings, leading to a reduction in interpretation time[5]. These AI-driven approaches facilitate more efficient and accurate detection of cardiac anomalies, aiding in timely diagnosis and treatment decisions.

Integrating ECG data with clinical variables indeed enhances the predictive capability for future cardiovascular events such as arrhythmias, myocardial infarction, stroke, and sudden cardiac death. This integration allows for personalized risk estimation and improves accuracy in identifying individuals at higher risk. While cardiologists play a crucial role in interpreting ECGs, understanding the patient's clinical context, including age, sex, comorbidities, previous cardiovascular events, and medications, further enhances the assessment and accuracy of ECG interpretations[6].



Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution

Figure 2: Willem Einthoven and the electrocardiogram

Artificial Intelligence (AI) in Imaging

Echocardiography: is a crucial diagnostic tool in cardiology, providing valuable insights into blood flow through the heart and heart valve function. With recent advancements in artificial intelligence (AI), there is potential for automated interpretation of echocardiograms, leading to more accurate and consistent analyses. This AI-driven approach aims to reduce human error and enhance diagnostic performance.

By leveraging AI technology, automated interpretation of echocardiograms can lead to several benefits in clinical practice. These include:

1. Improved Accuracy: AI algorithms can analyze echocardiographic images with high precision, leading to more accurate diagnosis of cardiovascular conditions.
2. Consistency: Automated interpretation ensures consistent analysis across different healthcare settings and among various practitioners, reducing variability in diagnostic results.

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3. Enhanced Clinical Decision Making: AI-generated interpretations provide clinicians with valuable insights, facilitating more informed and timely clinical decisions.
4. Reduction in Unnecessary Investigations: By streamlining the diagnostic process and improving accuracy, AI-driven echocardiography interpretation can help reduce the need for additional, often invasive, investigations.
5. Better Patient Outcomes: Timely and accurate diagnosis facilitated by AI interpretation can lead to improved patient outcomes by enabling appropriate interventions and treatment plans.

The integration of artificial intelligence into echocardiography interpretation holds promise for optimizing diagnostic accuracy, reducing unnecessary interventions, and ultimately improving patient outcomes[7].

Computed Tomography Fractional Flow Reserve (CT-FFR):

Nowadays, non-invasive methods for detecting coronary artery disease (CAD) are gaining prominence as a viable alternative. The primary approach in this regard is coronary computed tomography angiography (CCTA)[8]. Although CCTA boasts high sensitivity in detecting CAD, it has its limitations. Specifically, CCTA is prone to producing false positive results and does not evaluate physiological function.

Non-invasive computed tomography-derived Fractional Flow Reserve (CT-FFR) was introduced as a means to assess ischemia without additional invasive procedures. Specifically, CT-FFR has been proposed as an alternative diagnostic tool for patients with stable angina, offering equivalent clinical outcomes, improved quality of life (QoL), and lower costs compared to traditional care. Moreover, it has shown to reduce the rate of unnecessary invasive coronary angiography. In this context, the development of artificial intelligence algorithms and deep neural networks has further enhanced diagnostic accuracy and outcome prediction through deep learning-CT-FFR[9].

CT-FFR (Computed Tomography Fractional Flow Reserve) has the ability to overcome one of the major limitations of CCTA (Coronary Computed Tomography Angiography), which is low specificity in detecting myocardial ischemia. While CCTA provides detailed anatomical information about the coronary arteries, it may not accurately assess the functional significance of detected lesions in terms of their impact on blood flow and myocardial perfusion. CT-FFR addresses this limitation by providing a quantitative assessment of fractional flow reserve based on computational fluid dynamics, allowing clinicians to determine whether a detected stenosis is causing significant ischemia. By integrating functional information with anatomical data, CT-FFR enhances the diagnostic accuracy of CCTA and facilitates more informed treatment decisions, ultimately improving patient care and outcomes[10].

Cardiac Magnetic Resonance Imaging (CMR):

The potential impact of AI in cardiovascular magnetic resonance (CMR) is significant, offering opportunities to improve diagnostic accuracy, efficiency, and patient outcomes.Emerged as a valuable tool in the evaluation of Coronary Artery Disease (CAD). It provides comprehensive information on both the anatomical and functional aspects of CAD. While congenital coronary

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anomalies are rare in the general population, they can be a significant cause of sudden cardiac death, particularly in athletes. CMR serves as an accepted gold standard for assessing these anomalies[11].

In addition to its role in congenital anomalies, CMR is also useful in characterizing atherosclerotic plaques. Techniques such as black blood imaging show promise in assessing plaque formation and coronary vessel wall remodeling[12]. Although recent advances, including the use of contrast agents and higher field strength, have improved image quality by increasing the signal-to-noise ratio, challenges remain.

Issues such as field inhomogeneities can lead to artifacts, which may affect the accuracy of CMR imaging. However, ongoing research and technological advancements aim to address these challenges and further enhance the utility of CMR in the evaluation of CAD. Overall, CMR represents a valuable imaging modality for clinicians in the comprehensive assessment of CAD, offering insights into both anatomical and functional aspects of the disease[10].

Cardiac catheterization:

Werner Forssmann, a German surgeon, performed the first catheterization of the living human heart in 1929. He conducted this groundbreaking procedure on himself in Eberswalde, Germany[13]. Forssmann inserted a catheter into his own arm vein and advanced it into his own heart, with the assistance of a nurse. This daring act demonstrated the feasibility of cardiac catheterization and laid the foundation for the modern field of interventional cardiology.

Today, cardiac catheterization is a routine procedure performed worldwide to diagnose and treat various cardiovascular conditions, such as coronary artery disease, heart valve abnormalities, and congenital heart defects. Modern catheterization procedures utilize sophisticated imaging techniques, such as fluoroscopy and angiography, to visualize the heart and blood vessels in real-time, allowing for precise diagnosis and targeted interventions. The use of fluoroscopy has been pivotal in interventional cardiology, but new technologies have introduced several techniques to overcome its limitations in two-dimensional (2D) imaging. Assistant robots controlled by humans and cardiovascular imaging modalities are employed in catheterization laboratories and hybrid theatres[14].

The introduction of robotics into coronary interventions marks a significant advancement in the field, revolutionizing procedures in the catheterization laboratory. Robotics not only ensures precision and safety during complex interventions but also shields operators from radiation exposure. Looking ahead, the integration of AI-enhanced operations and remote robotics holds promise for the future of cardiovascular interventions. This technology has the potential to extend the reach of advanced procedures to remote areas and facilitate neurological interventions for conditions like stroke and aneurysms. Such advancements could reshape the landscape of medical practice and improve patient outcomes worldwide[15].

Moreover, advancements in catheter-based treatments, such as percutaneous coronary intervention (PCI) and transcatheter aortic valve replacement (TAVR), have revolutionized the management of cardiovascular diseases, offering minimally invasive alternatives to traditional open-heart surgery. These advancements have led to improved patient outcomes, reduced hospital stays, and enhanced quality of life for individuals with heart conditions.

Figure-3: Forssmann self catheterization

A novel AI framework has been developed for automated plaque characterization in IVOCT, demonstrating excellent diagnostic accuracy in both internal and external validation. This model holds the potential to mitigate subjectivity in image interpretation and streamline the quantification of plaque composition using IVOCT. Its applications extend to both research and guiding Percutaneous Coronary Intervention (PCI) procedures based on IVOCT findings[16].

The current focus of AI-based computational research in cardiovascular medicine aims to provide two strata of admissible evidence[17]:

1. Precise imaging of intravascular structures to anticipate plaque composition and location, thereby enabling accurate stent placement and expansion.
2. Limiting the development of symptomatic complications from myocardial injury and enhancing the quality of life."

AI holds great promise for advancing catheterization procedures by enhancing diagnostic accuracy, guiding treatment decisions, improving patient outcomes, and driving continuous quality improvement. We can anticipate less-invasive, objective, and automated diagnosis of coronary artery disease (CAD) in the near future, particularly in the realm of invasive coronary angiography (ICA). Continued research in this area within the catheterization laboratory has the potential to enhance treatment allocation, risk stratification, and cath lab logistics by integrating AI-driven ICA analysis with other clinical characteristics[18].

Future of AI in coronary artery disease:

The future of AI in CAD holds tremendous promise for revolutionizing how we prevent, diagnose, and treat this prevalent and life-threatening condition. By harnessing the power of AI-driven innovations, we can improve patient outcomes, reduce healthcare costs, and ultimately save lives.

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At the forefront of current research is the development of automated algorithms for interpreting coronary angiographies. These algorithms show promise in offering additional information beyond traditional evidence of coronary stenoses. They aim to provide more focused and reliable measurements of various parameters, including the hemodynamic impact of coronary lumen geometry, calcification, or tortuosity. Furthermore, these algorithms enable the complex integration of multiple layers of information to guide the entire clinical process effectively[9].

At the current pace of AI developments, less-invasive, objective, and automated diagnosis of coronary artery disease (CAD) through the analysis of invasive coronary angiography (ICA) can be expected in the near future. Continued research on this technology in the catheterization laboratory may significantly improve treatment allocation, risk stratification, and cath lab logistics by integrating ICA analysis with other clinical characteristics[19].

In the future, artificial intelligence (AI) will become an integral part of every cardiologist's daily routine, offering opportunities for effective patient phenotyping and predictive model design for various diseases. AI will revolutionize non-invasive diagnostics, reducing the reliance on costly and invasive tests for diagnosing conditions such as coronary artery disease (CAD). Cardiologists will be empowered to predict and prevent life-threatening conditions in asymptomatic patients, such as lethal arrhythmias or myocardial infarctions (MI) [20].

Potential limitations of AI:

Cardiology indeed stands at the forefront of AI integration in medicine, benefiting from advancements in signal processing, image segmentation, and structured data analysis. These developments have led to significant achievements across various domains of cardiology, including ECG analysis, automatic interpretation of imaging studies, and risk prediction.

Despite these advancements, it's important to acknowledge the potential limitations and challenges associated with AI implementation in cardiology:

1. **Interpretation Errors**: AI algorithms may still encounter errors in interpretation, particularly in complex cases or when dealing with noisy data. These errors can affect diagnostic accuracy and may lead to inappropriate clinical decisions if not carefully validated.
2. **Validity and Generalizability**: The validity and generalizability of AI models depend on the quality and diversity of the data used for training. Biases in training data or lack of representativeness may limit the applicability of AI models to diverse patient populations or clinical settings.
3. **Safety Concerns**: Incorrect interpretations or recommendations by AI systems can pose safety risks to patients if not adequately monitored or validated by healthcare professionals. Ensuring the safety and reliability of AI applications in cardiology is paramount.
4. **Ethical Considerations**: Ethical concerns arise regarding patient privacy, consent, and data security when deploying AI technologies in cardiology. Transparency in AI

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algorithms and adherence to ethical guidelines are essential to maintain patient trust and confidentiality.

Addressing these challenges requires collaborative efforts from clinicians, researchers, technologists, and policymakers. Robust validation processes, transparency in AI algorithms, ongoing monitoring of performance, and adherence to ethical principles are essential for the responsible integration of AI in cardiology practice. By addressing these concerns proactively, AI has the potential to revolutionize cardiology care while ensuring patient safety and ethical integrity.

It’s fascinating to see how AI continues to revolutionize the field of cardiology, enhancing patient care and outcomes. The future of cardiology is indeed promising with the integration of AI.

Effect of Artificial intelligence on Modification of risk factors:

The points highlighted from the INTERHEART study underscore the multifaceted nature of cardiovascular disease (CVD) risk factors and the importance of addressing them comprehensively. Here's a breakdown of the key insights and potential strategies mentioned:

1. **Understanding Risk Factor Development**: Rather than just focusing on treating established risk factors, there's a call to understand why these risk factors develop in certain individuals and populations. This involves delving into societal factors like urbanization, food policies, sedentary lifestyles, and urban structures. By understanding these mechanisms, it becomes possible to develop strategies for primordial prevention, which aims to prevent the development of risk factors in the first place.
2. **Preventive Measures**: The identified risk factors like hypertension, diabetes, smoking, dyslipidemia, and obesity are major contributors to coronary artery disease (CAD). Addressing these risk factors through lifestyle modifications, such as increasing physical activity, adopting healthier diets rich in fruits and vegetables, and managing stress, can significantly reduce the risk of acute myocardial infarctions.
3. **Challenges with Cardiac Rehabilitation**: While cardiac rehabilitation programs have been shown to effectively reduce CVD risk factors, their underuse and ineffectiveness are concerning. Barriers such as lack of motivation, education on the benefits of lifestyle modification, and adherence need to be addressed to improve the uptake and effectiveness of these programs.
4. **Role of Technology**: Advancements in technology present opportunities to overcome some of the barriers to cardiac rehabilitation. Technology can be leveraged to provide education, motivation, and support to patients, thereby enhancing their participation in rehabilitation programs.

   Wearable devices like smart watches and fitness trackers have revolutionized how individuals monitor and manage their health and fitness. The integration of various sensors enables these devices to collect a wide range of data, providing users with

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valuable insights into their well-being. This data includes metrics such as heart rate, sleep patterns, physical activity levels, and even stress levels in some cases.

Healthcare providers are increasingly recognizing the potential of wearable technology in patient care. By leveraging the continuous stream of data generated by these devices, healthcare professionals can gain a more comprehensive understanding of their patients' health statuses. This real-time data allows for more proactive monitoring of chronic conditions, early detection of health issues, and the ability to intervene promptly when necessary.

Moreover, wearable devices facilitate remote patient monitoring, allowing healthcare providers to keep track of patients' progress without requiring them to visit a healthcare facility frequently. This can be particularly beneficial for individuals with chronic diseases, the elderly, or those recovering from surgery who may need ongoing monitoring and support.

Additionally, wearable technology can play a significant role in preventive healthcare by encouraging users to adopt healthier lifestyles and behaviours. Through features like activity tracking, goal setting, and personalized feedback, these devices motivate individuals to stay active, get sufficient sleep, and manage stress effectively, thereby reducing their risk of developing chronic diseases.

By integrating these insights and leveraging technological advancements, healthcare professionals can enhance patient outcomes, reduce the global burden of CVD, and improve overall public health. The INTERHEART study also points out that lack of physical activity, low fruit and vegetable consumption, and stress contribute to more than 90% of acute myocardial infarctions in South Asia [21]. However, it's essential to ensure that these technological solutions are accessible, user-friendly, and culturally appropriate to maximize their impact across diverse populations.

Role of AI on medication compliance and regular follow up:

The role of artificial intelligence (AI) in medication compliance and regular follow-up in healthcare, particularly in the context of cardiovascular diseases like acute coronary syndrome (ACS), is becoming increasingly significant. Here's how AI can contribute:

1. **Medication Compliance**: AI-powered systems can assist in improving medication compliance by providing personalized reminders and alerts tailored to individual patient needs. These systems can analyze patient data, including medication schedules, medical history, and lifestyle factors, to generate timely reminders for medication intake. AI algorithms can also adapt to changes in patient behavior and health status, optimizing the effectiveness of reminders over time.
2. **Regular Follow-Up**: AI-enabled platforms can facilitate regular follow-ups by automating communication between patients and healthcare providers. These platforms can schedule appointments, send appointment reminders, and provide educational materials to patients between visits. AI algorithms can analyze patient data to identify

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trends or abnormalities that may require attention, enabling early intervention and proactive management of cardiovascular risk factors.

3. **Personalized Care**: AI technologies can analyze vast amounts of patient data to personalize medication regimens and follow-up plans based on individual characteristics, preferences, and risk profiles. This personalized approach can improve patient engagement, adherence, and outcomes by tailoring interventions to meet the specific needs of each patient.
4. **Telemedicine and Remote Monitoring**: Telemedicine platforms allow healthcare providers to remotely monitor CAD patients, especially those in rural or underserved areas. Telemedicine encompasses a range of activities beyond just communication with patients. It involves the transmission of medical data, including patient history, diagnostic images, and test results, through telecommunications technology. This can include real-time interactions with patients to gather medical information[22], as well as remote monitoring of vital signs and symptoms. Additionally, telemedicine includes the interpretation of this data by healthcare providers to make diagnoses, develop treatment plans, and provide medical advice. Overall, telemedicine enables the remote delivery of healthcare services, leveraging technology to bridge the gap between patients and healthcare providers.

   Remote monitoring can enhance patient convenience, reduce the need for in-person visits, and enable early detection of complications or worsening symptoms. Internet of Things (IoT) enabled remote monitoring has the potential to improve patient outcomes, enhance the efficiency of healthcare delivery, and reduce healthcare costs by preventing hospitalizations and complications associated with chronic diseases. As technology continues to advance, we can expect further innovations in IoT healthcare solutions, driving improvements in patient care and population health management.

AI has the potential to revolutionize medication compliance and regular follow-up in cardiovascular care by leveraging data-driven insights, personalized interventions, and remote monitoring capabilities. The COVID-19 pandemic has indeed accelerated the acceptability and implementation of a range of digital technologies[23]. These technologies have the potential to improve medication compliance and reduce morbidity and mortality[24], thereby enhancing overall patient outcomes. As digital health technologies continue to evolve, AI will play an increasingly important role in improving patient outcomes and enhancing the delivery of cardiovascular care.

Impact of AI on clinical outcome:

The impact of digital technology on clinical outcomes, particularly in the context of cardiovascular diseases, is substantial and multifaceted. Digital technology has the potential to improve patient outcomes, satisfaction, and prevent recurrent cardiovascular events such as fatal myocardial infarction (MI), target lesion revascularization (TLR), target vessel revascularization (TVR), death due to cardiovascular cause and non-fatal MI, and repeat hospitalization for cardiovascular cause [1]

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Studies have shown that digital technology intervention use increases motivation and participation in cardiac rehabilitation programs. Mobile apps enable continuous monitoring of patient health status and provide awareness about the disease. During the COVID-19 pandemic, outpatient visits have been replaced by virtual visits to limit disease transmission[25]. Digital technology has revolutionized cardiovascular care, offering personalized and accessible solutions to improve patient outcomes.

Discussion:

The potential of AI and digital technology in raising awareness about the pathogenesis of atherosclerosis and promoting healthy lifestyle behaviours to mitigate cardiovascular risk factors. These technologies can disseminate educational materials, audiovisual content, and interactive sessions to educate individuals about the detrimental effects of risk factors such as smoking, excessive alcohol consumption, and unhealthy dietary habits rich in saturated and trans fats.

Moreover, digital platforms can highlight the benefits of consuming fruits, vegetables, and unsaturated fats to improve lipid profiles, particularly by increasing high-density lipoprotein (HDL) levels. Additionally, these technologies can encourage physical activity by recommending various forms of exercise, such as walking, jogging, swimming, and yoga, which can contribute to overall cardiovascular health.

Furthermore, AI-powered systems can play a crucial role in guiding patients by providing alerts or notifications for emergency symptoms associated with cardiovascular events, as well as post-procedure complications in cardiac surgical patients[26]. This real-time assistance can aid in early detection and prompt intervention, potentially improving patient outcomes.

However, alongside these advancements, it's essential to establish regulations to ensure the safe and responsible use of AI in cardiology and medicine[25]. Implementing regulatory frameworks can help mitigate potential risks associated with AI applications, such as ensuring patient safety, data privacy, and algorithmic transparency.

In summary, AI and digital technology have the potential to significantly impact cardiovascular care by enhancing patient education, promoting healthy behaviours, and facilitating timely intervention. By integrating these technologies into clinical practice while adhering to regulatory standards, healthcare providers can optimize patient care and improve outcomes in cardiology and beyond.

Conclusion:

The excerpt highlights the significant potential of digital technology interventions in improving the management and outcomes of patients with acute coronary syndrome (ACS). By leveraging digital tools and platforms, healthcare providers can enhance various aspects of ACS care, including risk factor identification, diagnostic procedures, treatment planning, and patient monitoring. Additionally, digital technology interventions can facilitate medication compliance, streamline administrative tasks, and promote regular follow-up, ultimately leading to improved treatment adherence, quality of life, and reduced cardiovascular events and mortality in ACS patients.

Furthermore, digital technologies have the potential to reduce the financial burden on patients by optimizing resource utilization and minimizing unnecessary healthcare expenditures. However, it's crucial to prioritize patient privacy and confidentiality when implementing digital interventions in clinical practice.

The review underscores the importance of continued research and development in the field of digital health to further enhance its capabilities and address the evolving needs of healthcare facilities and providers. By embracing digital technology and fostering innovation, healthcare systems can maximize their effectiveness in delivering high-quality care to patients with ACS and other cardiovascular conditions, ultimately shaping the future of healthcare delivery.

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Conflicts of interest

There are no conflicts of interest.

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