Commentary

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Specific Applications for Cardiovascular Medicine and Research in Areas Such As High-Throughput Gene Sequencing

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Description

It is possible for cellular morphology to serve as a substitute for its state and functionality. However, the standard model for cardiovascular research, primary cardiomyocytes, is highly heterogeneous cells that present methodological difficulties for analysis. As a result, we set out to develop a reliable method for dissecting the morphology of a single cardiomyocyte: Using our R package cmoRe, C-MORE (cellular morphology recognition) is a workflow for heterogeneous primary cells from the bench to data analysis. The modulation of canonical hypertrophy pathways and the linkage of genotype to phenotype in human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs) are two examples of proof-of-principle applications for which its utility is demonstrated. In our pilot study, openness of cardiomyocytes to blood plasma before versus after aortic valve substitution permits ID of an illness unique finger impression and reflects halfway reversibility following helpful mediation. C-MORE is a useful instrument for cardiovascular research that could also be used for basic research and personalized medicine. The coronavirus pandemic of 2019 (COVID-19) has a significant impact on cardiovascular medicine's day-to-day practice. The spread of infections and the upkeep of the healthcare system can be affected by healthcare workers' preparedness. The purpose of this study was to investigate the knowledge, perception, and level of confidence of health care workers in cardiovascular medicine regarding COVID-19 care. Security issues are getting worse for clinical databases, especially big data ones.

Artificial Intelligence(AI) In Cardiovascular Medicine

Blockchain, the open, decentralized, and distributed public ledger technology behind cryptocurrencies, securely records transactions without requiring verification from a third party. Decentralized blockchain networks provide a safe and interoperable gateway for clinical research and practice data in the healthcare sector. The application of blockchain and its integration with Artificial Intelligence (AI) in cardiovascular medicine are the subjects of this article, which focuses on recent advancements as well as potential future directions. To begin, we go over the fundamental ideas behind this technology and place it in the context of a variety of well-known and current applications. Then, we look at specific cardiovascular medicine applications and research in areas like wearable technologies, high-throughput gene sequencing, and clinical trials. After that, we assess both the current obstacles to efficient implementation and the directions for the future. Additionally, we provide a synopsis of the health care applications that can be realized by combining AI computing (for data analytics) and decentralized block chain computing platforms (for data security). Block chain incorporation can provide clinically meaningful predictions, help advance research methodology (such as *via* robust AI-block chain decentralized clinical trials), and provide virtual tools in clinical practice (such as tele-health, sensory-based technologies, and wearable medical devices) by utilizing high-performance computing and artificial intelligence that are capable of securely managing large and rapidly expanding medical databases.

In order to achieve the goal of providing precision cardiovascular medicine, novel solutions can be developed by combining AI and block chain approaches in a synergistic way. An integrative approach to the prevention and treatment of cardiovascular disease that takes into account an individual's genetics, lifestyle, and exposures as factors that influence their cardiovascular health and disease phenotypes is known as precision cardiovascular medicine. This has the potential to overcome the current diagnostic and treatment simplification, which assumes that all patients with the same symptoms of heart disease share a common patho-phenotype and should be treated similarly based on evidence from large-scale clinical trials. While the cardiovascular community is increasingly calling for more precise phenotyping to advance precision medicine as a strategy to improve cardiovascular health and prevent disease, not only through genomic insights but also big data analytics, digital health advancements, and artificial intelligence, precision medicine relies heavily on genomic understanding that has resulted in some successes in other medical fields. The need for clinicians to comprehend Artificial Intelligence (AI) is also growing as AI's significance in the clinical setting grows. The fundamentals of AI and the state of cardiovascular AI are the

primary topics of this review. For the purpose of evaluating tests like X-rays, electrocardiograms, echocardiograms, computed tomography, and magnetic resonance imaging, a variety of cardiovascular AIs have been developed. In terms of prognosis prediction and diagnostic support, cardiovascular AI achieves high accuracy.

Patients with Atherosclerosis

In addition, it has the capability of identifying abnormalities that were previously challenging for cardiologists to identify. The usefulness of cardiovascular AI is being confirmed through the publication of randomized controlled trials. Cardiovascular Artificial Intelligence (AI) is rapidly approaching widespread clinical application. For cardiovascular care, various types of medical AI will be utilized; however, doctors will still be needed. In order for cardiologists to effectively utilize AI to enhance patient care, we need to comprehend the benefits and drawbacks of medical AI. An unmet need exists for advice on how to tailor treatment for individual patients with atherosclerosis to prevent myocardial infarction and ischemic stroke. Computational modeling might make it possible for this kind of development. Modeling must be based on complete biological networks that capture the protein-protein interactions that are thought to propel disease progression because of the multifactorial biology of atherosclerosis. We wanted to create a scale model of atherosclerosis that was clinically relevant, calibrate it with data from individual patients, and use it to simulate the best pharmacotherapy for each patient. The availability of cutting-edge cardiovascular medications has decreased as a result of regulatory approvals. The amount of this decline connects with the last step of acquiring repayment for new medicines are obscure. In order to determine whether a new drug improves patient outcomes, quality of life, or satisfaction at a cost that is affordable in comparison to existing treatments, payers and Health Technology Assessment (HTA) bodies look beyond efficacy and safety. One of the reasons why only half of newly approved drugs are accepted for reimbursement or receive restricted or "optimized" recommendations from HTA bodies is that HTA bodies work within a limited healthcare budget.

The provision of appropriate patients with access to safe, efficient, and reasonably priced treatments is the shared objective of all stakeholders. Providing the best data is an important strategy for moving this along quickly. Early (and ongoing) discussions between all stakeholders clearly make this easier. There are formal programs in many nations that offer developers collaborative regulatory and HTA advice. Aligning the regulatory and HTA processes, making use of more real-world evidence, officially defining the decision-making process, and educating stakeholders on the factors that contribute to successful decision making are some additional strategies. Improve methods for optimal price setting, develop internal systems to collaborate with national and international stakeholders, conduct post-approval studies, and seek early engagement with HTA and regulatory bodies are all priorities for the industry. In order to capture the lived experience and priorities of those whose lives will be impacted by new treatment approvals, patient involvement in all stages of development, including HTA, is essential. An unprecedented opportunity exists to investigate the application of genome editing in cardiovascular medicine as a result of the growing appreciation of human genetics and genomics in cardiovascular disease and the technological advancements in genome editing, particularly CRISPR-Cas9.There are a variety of CRISPR-Cas systems in the ever-expanding toolbox for editing genomes that are becoming increasingly effective, precise, adaptable, and capable of targeting specific regions. Numerous genotype-phenotype associations for diseases with complex traits have been provided by the development of large-scale genotyping technologies and Genome-Wide Association Studies (GWAS) over the past ten years. Notably, a growing number of loss-of-function mutations have been linked to risk factors for cardiovascular disease that may protect against the disease. It holds great promise for elucidating novel disease mechanisms and transforming genes into medicines by combining the most recent insights into human genetics with cutting-edge technologies like CRISPR-Cas9. However, it is still difficult to turn genetic insights into novel therapeutics. The treatment of cardiovascular disease and the engineering of cardio-protection through "in body" genome editing remain mostly theoretical. The potential and challenges of CRISPR-based technologies for translating GWAS findings into genomic medicines are discussed, as are the most recent advancements of the CRISPR-based genome editing toolbox.