**Title: Cardiovascular genetics from diagnosis to therapy**

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Cardiovascular disorders including heart failure and arrhythmias are under genetic influence. Genetic testing now plays a key role in identifying single genetic changes that are sufficient to lead to progressive cardiomyopathy or life- threatening arrhythmias. Genetic testing for cardiomyopathy and arrhythmias utilizes large gene panels (approximately 50-150 genes) to identify rare genetic variation that contributes to disease, and recommendations for genetic testing are now included in care guidelines. The genes implicated in cardiomyopathies and arrhythmias overlap, with certain genes, e.g. LMNA, FLNC, DSP, SCN5A, RBM20 and others, have high incidence atrial and ventricular arrhythmias associated with cardiomyopathy. Classification of genetic variation follows guidelines set by the American College of Medical Genetics and Genomics and may misclassify some variants, emphasizing the importance of interpretation of genetic variation by the practicing cardiologist. Nearly all pathogenic gene variation that contributes to cardiomyopathy and arrhythmias displays variable expressivity and penetrance, and in some cases the specific genetic variants are considered risk alleles to inform clinical screening and management. With progress in identification of genetic pathology, there are advances in imaging and monitoring to assist in defining clinical risk and providing high useful prognostic information for patient management. Additionally, early institution of medical management may prove useful in slowing disease progression. Gene-specific therapies have emerged, and many are in development. Viral gene therapy is being pursued for genetic disorders where gene replacement can be used to replace missing genes or to augment haploinsufficient gene expression. At present, delivering gene therapy is limited by the need for high viral doses. Gene editing, including base and prime editing, is undergoing rapid technological advances, making genetic correction or genetic intervention a viable treatment possibility.