HackMedTech 2024: The MedTech Talent Accelerator Hackathon

Challenge: Accessible, Non-Invasive Early Detection of Cardiovascular Disease

What is the problem?

Cardiovascular disease (CVD) remains the leading cause of mortality worldwide, claiming nearly 18 million lives each year. The silent progression of many CVDs often leads to delayed diagnosis and treatment, significantly impacting patient outcomes and burdening healthcare systems. Early detection is paramount, enabling timely interventions and lifestyle modifications that can prevent or mitigate the devastating consequences of CVD. However, existing diagnostic methods are often invasive, expensive, or require significant infrastructure, limiting their accessibility and early use in at-risk populations.

The challenge is to develop an innovative, accessible, noninvasive, and accurate solution for the early detection of cardiovascular diseases. This solution should ideally be deployable in various settings, from primary care facilities to remote or underserved areas. It should be tailored to detect one or more specific subsets of cardiovascular diseases.

What outcome does the industry require?

The industry requires a novel solution that can detect early signs of cardiovascular disease with high accuracy, precision, and minimal patient burden. The solution should be designed to target one or more specific CVDs (e.g., coronary artery disease, hypertension, peripheral artery disease, valvular heart disease, congenital defects, and arrhythmias) or identify shared risk factors, enabling personalized interventions. This could be a new technology or improving existing technologies that enhance accessibility and accuracy. The solution should be user-friendly, cost-effective, and easily deployable in various healthcare settings.

Parameters and Guidelines

Innovators should consider the following parameters when developing their solution, as well as provide information (if applicable) following guidelines:

1. **Describe your technology or solution:**
    - **Intended Use:** Describe the specific cardiovascular diseases your solution targets and the settings in which it will be used (e.g., primary care, home use, remote areas).

- **Design and Materials:** Outline the design, materials, and user interface. The technology should be safe, effective, and comfortable for use on the human body. Outline the system architecture and data processing pipeline.
- **Medical Device Classification:** Provide the appropriate medical device classification (as per Health Canada or FDA) and a rationale.

2. **Describe the accuracy and accessibility of your solution:**
    - **Accuracy:** Provide metrics for the sensitivity and specificity of your solution in detecting cardiovascular diseases, supported by theoretical reasoning or preliminary data.
    - **Accessibility:** Explain how your solution can be easily deployed across various settings, particularly in resource-limited environments.
3. **Discuss your plan for clinical and/or non-clinical testing:**
    - **Verification Plan:** Outline your strategy for testing the solution and quantifying its performance, including any benchtop and lab experiments.
    - **Validation Plan:** Outline your strategy for validating the solution for the intended indication, including any preclinical and clinical studies and trials.
    - **Risk Management:** Present a risk management plan that identifies potential risks associated with your solution and how these risks will be mitigated.
4. **Considerations for Scalability and Integration:**
    - **Scalability:** Discuss how your solution could be scaled for widespread use, including manufacturing considerations and cost-efficiency. Discuss and analyze the economic incentive for the healthcare system.
    - **Integration:** Explain how your solution could integrate with existing healthcare systems or complement other diagnostic tools.

This challenge may be approached from various perspectives, including biomedical engineering, data science, materials science, and clinical innovation. Teams are encouraged to explore the state-of-the-art in cardiovascular diagnostics, consider novel approaches such as AI-driven analysis or wearable technology, and propose solutions that push the boundaries of current capabilities.