Since the invention of Willem Einthoven’s string galvanometer in 1901, the electrocardiogram (ECG) has been the most utilized cardiovascular diagnostic tool and is an essential part of clinical practice[[1]](#footnote-1). Over the last century the technology in electrocardiography has advanced substantially and greatly increased our understanding of cardiovascular pathology such as acute coronary syndromes and cardiac arrhythmias[[2]](#footnote-2),[[3]](#footnote-3). The expense for a modern high quality device often exceeds thousands of dollars, and poses a significant constraint for hospitals and clinics in developing areas of the world that simply cannot afford it. Because electrocardiography has such broad applicability and diagnostic importance to a clinician, it is an understatement to emphasize how essential it is in the healthcare system.

In this article, we introduce the design and validation of a high quality, open-source ECG machine that costs in the range of $300-500. The goal of this project is to provide a rigorously validated machine that is approved by Health Canada so users can be assured its safe and quality use. To achieve this goal much of the design and validation testing was done using increasingly available resources that have been provided using PhysioNet[[4]](#footnote-4),[[5]](#footnote-5). It serves as an open source database and software toolkit to acquire, test, and validate known signals for our manufactured ECG machine.

By making the design of this device freely available, it is our hope that ministries of health, hospitals, and health care providers will be able to make and modify their own devices to suit their needs at a much reduced cost. Electrocardiography is a diagnostic procedure that saves lives, and by breaking the financial constraints that developing healthcare systems face we are able to give patients access to the care they need.

1. Kligfield et al., “Recommendations for the Standardization and Interpretation of the Electrocardiogram Part I.” [↑](#footnote-ref-1)
2. Fye, “A History of the Origin, Evolution, and Impact of Electrocardiography.” [↑](#footnote-ref-2)
3. Fye, “Disorders of the Heartbeat.” [↑](#footnote-ref-3)
4. Goldberger et al., “PhysioBank, PhysioToolkit, and PhysioNet.” [↑](#footnote-ref-4)
5. Silva and Moody, “An Open-Source Toolbox for Analysing and Processing PhysioNet Databases in MATLAB and Octave.” [↑](#footnote-ref-5)