Doctors' interpretation of the electrocardiogram is shockingly bad – time for an electrified solution!

The electrocardiogram (ECG) is one of the oldest medical devices still in modern use. It is critically important in the recognition of potentially life-threatening heart disease such as heart attack and abnormal heart rhythms. These conditions can lead to death if not recognized and treated quickly. Our research study which was published in the International Journal of Cardiology and a subsequent study published in the Annals of Noninvasive Electrocardiography demonstrates that doctors' ability to identify common or life-threatening heart conditions on an ECG is around 50%. In other words, you might as well flip a coin as to whether your doctor can correctly recognize your heart condition!

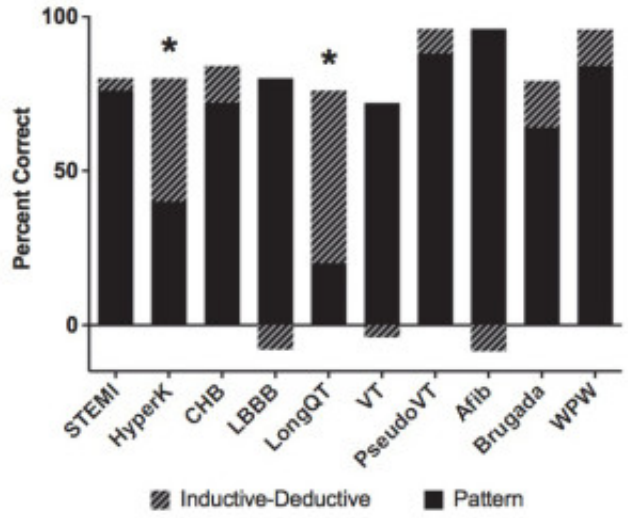

Fig. 1. Accuracy of diagnosis for individual ECGs using pattern recognition (black bars). The percentage change in accuracy using inductive-deductive reasoning strategies compared to pattern recognition is depicted in the grey bars. *P less than 0.05.

Even today, no one is sure how to teach doctors to read an ECG. One method is to have doctors look at 1000 ECGs for each heart condition and memorize how the pattern looks on paper. We feel that a better method is to learn to understand how different diseases present as an ECG pattern. Therefore, when given a patient's symptoms along with their previously existing medical conditions (which can affect the risk of having heart disease), doctors will be better at identifying different heart conditions on an ECG. Our research study supports this theory, as doctors' accuracy improved on average by 15% when given information about the patient instead of relying on pattern recognition alone.

One of the major problems in training doctors to read an ECG is how to evaluate their knowledge and understanding after they have been taught about how important heart diseases look on an ECG tracing. The old way of doing this was to provide a stack of sample paper ECGs for a classroom of doctors in training to analyze, and then grade them by hand. As one can imagine, this requires a lot of time, man power and money! We felt strongly that a new solution to fixing this problem was needed.

So we developed an on-line ECG exam that did the marking for us. And then we tested it in a whole bunch of doctors to make sure it works – and it did!

There are five ways that our new digital educational tool is better than the old method of evaluating ECG interpretation in junior doctors. First, an online exam is a convenient method to evaluate doctors' skills because it can be completed wherever there is internet access. Second, because the exam can be completed on a computer or tablet device, there is no limit to the number of doctors that can be tested at any one time (an exam hall big enough to fit them is not required). Third, the exam can be tailored to different levels of expertise making it usable across multiple different educational environments. Fourth, without the need to print ECGs on paper and hire a bunch of people to mark it, the tool is cheap to use!

Finally, and perhaps the most significant strength of our tool, is that it does the marking for us. By using a set of predefined answers, the computer is able to automatically mark a large portion of the exam on its own. And as more people continue to complete the exam, the list of predefined answers grows, which makes the computer even more efficient in its marking. The result so far is a 50% reduction in marking time for the exam.

Because of this reduction in marking time, we have been able to analyze and present the results to participants of the exam the same day they complete it, which helps our future doctors learn their mistakes faster, so they make less of them and take better care of your heart when have a problem with it!

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Publication

Feasibility of a novel digital tool in automatic scoring of an online ECG examination.
Quinn KL, Baranchuk A.
Int J Cardiol. 2015 Apr 15