EcgRuleML: A Rule-Based Markup Language for Describing Diagnostic ECG Criteria

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Computerized interpretation of the ECG is usually carried out in a black box. That is, the rules used to make the decisions are not immediately accessible to the clinician. This is due to the fact that expert systems are built by a knowledge engineer who develops rules from the clinicians description of ECG criteria and compiles them into unreadable machine code. In this study we propose the ECG Rule Markup Language (ecgRuleML) as a way to externalize decision rules used to interpret the ECG.

EcgRuleML uses the eXtensible Markup Language (XML) to provide a framework for articulating quantitative rules for measuring intervals, segments, widths, peaks, heart rate and the cardiac axis. A structure has also been set in place for articulating calculative rules, e.g. if the S wave in V1 + R wave in V5 is more than 35mm then LVH. Abstract rules such as a slurred S wave can be articulated using codes.

In this study, ecgRuleML has been used to define rules to assess ST Elevation Myocardial Infarction (STEMI) in a Lux-192 Body Surface Potential Map (BSPM). An algorithm has been integrated into a BSPM viewer where the rules have been parsed from an ecgRuleML file and executed in 63ms (mean from 10 trials) on a PC (3GHz CPU, 3GB RAM).

EcgRuleML provides a means to encapsulate rules readable to both the computer and the human. Its external nature means that identical rules can be managed and shared amongst different systems and research communities. In this regard, it promotes standardization and avoids duplication of work. Further development will involve the design of an interface where clinicians can graphically define rules, which are automatically converted into the ecgRuleML format for use in a decision support system. This work will give clinicians more control and trust over computerized decision making.