ECG interpretation in primary care- a role for telemedicine?

The electrocardiogram (ECG) is a routine investigation for most patients with heart disease and hypertension. The number of ECGs which need to be performed is increasing steadily year on year due to QOF and QIPP requirements, the increasing prevalence of atrial fibrillation and the recognition that prompt diagnosis of cardiac conditions is beneficial to the patient and cost saving to the health service. In younger patients there is increasing emphasis on the diagnosis of relatively rare but important causes of syncope and sudden death. Although these can be diagnosed with a 12 lead ECG, they may be intermittent, the changes may be subtle and expert opinion is often required (Figure 1).

Figure 1. ECG from a patient presenting with syncope who subsequently suffered a VF arrest. The coved ST elevation in lead V₁ is highly suggestive of Brugada syndrome, a cause of unexplained sudden death in young people.

The National Service Framework (NSF) Chapter 8 on Arrhythmias and Sudden Cardiac Death emphasises the need for high quality, timely and appropriate investigation of patients suffering from or at risk of arrhythmias. Recent policy changes in the NHS favour patient choice and a preference for conditions to be managed in primary care wherever possible. As a result patients who may have been referred to secondary care for an ECG and its interpretation may prefer to have their investigation performed in the primary care setting. Primary care providers may find themselves being expected to interpret and act on ECG findings.
Problems with ECG interpretation

ECG interpretation even in the hospital setting is of variable and often poor quality (1). Relying on a computer-generated report is potentially hazardous as such reports are sensitive but lack specificity. A significant number of false positive abnormal reports are generated which may lead to unnecessary referral and patient anxiety. The primary care physician must therefore be capable of interpreting the ECG and acting upon the results.

Clinical studies suggest that primary care physicians have difficulties interpreting all types of ECG compared with reference diagnoses made by cardiologists (2-5). For example, 49 general practitioners and 49 practice nurses took part in a prospective study of 2595 participants being screened for atrial fibrillation (6). The general practitioners detected 79 of 99 cases of atrial fibrillation on 12-lead ECG (sensitivity 80%, 95% CI 71 to 87) and misinterpreted 114 of 1355 cases of sinus rhythm as atrial fibrillation (specificity 92%, 95% CI 90 to 93). The report concluded that many primary care professionals cannot accurately detect atrial fibrillation on an ECG, and interpretative software is not sufficiently accurate to circumvent this problem, even when combined with interpretation by a general practitioner.

In the UK there are no formal guidelines regarding ECG training or interpretation, The American College of Cardiology suggest at least 500 ECGs should be interpreted under supervision to obtain initial competency with 100 supported ECGs being reported per year to maintain that competency together with a certification process (7). Time constraints and lack of training facilities mean that it is unlikely that such competencies could be achieved by the majority of NHS primary care providers.

A role for telemedicine?

Compared to many clinical imaging modalities the ECG consumes only a small amount of data and would therefore seem ideally placed for electronic reporting. Electronic ECG reporting is already performed at many centres across the UK but may be limited by one or more of the following issues

1. Only the ECG is available to the reporter. Little or no clinical information accompanies the referral so the ECG is interpreted out of context
2. The ECG may be interpreted by a cardiac physiologist rather than a cardiologist leading to a technical report which still requires clinical interpretation
3. If clinical information accompanies the report it is sent in a way which does not conform to information governance rules and data protection legislation pertaining to transfer of clinical information.

An ideal telemedicine system would link the primary care physician with a consultant cardiologist and allow the latter secure access to patient information to provide an “e-consult” based on clinical data plus the ECG rather than a technical report. This would

1. Empower primary care physicians to manage appropriate patients in primary care
2. Reduce inappropriate referrals to secondary and tertiary care
3. Improve the quality of referral to secondary and tertiary care
4. Put in place a direct link between referrer and the expert
5. Shorten referral to treatment time

Dr David Berger, GP and inventor of the investment community Motley Fool, said "Linking diagnostics with expert, context-based interpretation can only help the primary care physician and ultimately work to reduce referral rates."

**An Expert-led diagnostic Cardiology e-consult**

Medical Efficiencies Online (MEO) (Figure 2) is a secure on-line system which enables MeoMed’s UK wide team of specialist NHS consultant cardiologists to create a bespoke patient care plan to assist the GP with both diagnosis and treatment without the need to refer the patient to hospital. The linking of tertiary level expertise with primary care need is vital for continued quality improvement (QIPP) in the setting of the cost savings required by the current world financial situation.
Figure 2. The MEO e-consult system.

MEO is the only currently available N3-compatible IT infrastructure which enable primary care physicians to securely access our reporting specialist consultant cardiologists and receive a bespoke e-consult report. Due to its unique design the system is able to accept data from all ECG machines (12 lead and longer term event recorders).

Our field research has demonstrated that GPs are keen to have ECG tests undertaken ‘in house’, but are concerned that their own skills & experience are insufficient to use just the technical reports for diagnosis and creating a treatment plan. They suspect that this insecurity leads to an increase in unnecessary referrals at increased expense to the commissioning body. The ready availability of consultant-reported context-appropriate ECG rightly places the initial management of cardiovascular disease in primary care.

Dr Neil Hobson, Consultant Cardiologist/ Electrophysiologist and co-inventor of MEO says, ‘MEO was borne out of frustration. My clinics are always bursting and a significant percentage of the patients should either not have been there, or could have very easily been treated at the GP’s surgery. The time is right to utilise cutting edge technology to have specialists support the GPs in the earlier diagnosis and treatment of patients. Having consultants support GPs is no longer an option, but a necessity due to cost constraints and quality improvement expectations.’
The MEO ECG e-Consult project has been awarded an Arrhythmia Alliance research grant to better demonstrate the benefits of having experts guide GPs in the early stages of patient management. Trudie Lobban, Trustee of Arrhythmia Alliance (The Heart Rhythm Charity) says, “The MEO concept is a great opportunity for the NHS to improve patient care whilst reducing diagnostic costs. The quality of ECG interpretation is variable at best across the UK, and having a specialist ‘electrical’ Cardiologist on tap to report on the data and create a care plan is the Gold Standard for our patients. The aspirations we have for the MEO project is reflected in this being our first ever research award.”

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References