ORIGINAL ARTICLE

Evaluation of a direct access cardiac arrhythmia monitoring service

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Abstract

Background: *This paper describes the clinical outcomes from a novel direct access arrhythmia monitoring service.*

Methods: *The study was carried out in the north of Scotland. Data was collected over a 29 month period between 18 June 2008 and 8 November 2010 from consecutive cases from two groups of patients, general practitioner (GP) direct access and 'redirected' consultant referrals. Monitor test results, frequency of arrhythmias requiring further care and clinic attendances were recorded. Statistical differences were analyzed using χ^2, Fisher's and Student's t-test as appropriate with the significance taken at the 0.05 level.*

Results: *239 patients were referred from 47 GP practices. There were 165 (69%) referrals through the 'direct' and 72 (31%) through the 'redirected' route. The average age was 55.5 ± ± 16.7 years with 84 (35.1%) males. 127 (53.1%) had a patient activated event recording and the remaining 112 (46.9%) had Holter monitoring. Of the 239 patients, only nine (3.8%) cases required referral to a consultant cardiologist. Of these, three were directly returned to GP care without consultant clinic review. Six patients with significant arrhythmias were reviewed at cardiology clinic. There were no adverse events.*

Conclusions: *Direct access for cardiac arrhythmia monitoring seems to provide an effective mechanism for diverting inappropriate or non-essential referrals away from the cardiology clinic.* (Cardiol J 2012; 19, 1: 70–75)

Key words: direct access, arrhythmia monitoring, primary care

Introduction

Palpitations and cardiac arrhythmias in patients are relatively common [1]. The majority of these patients are managed in primary care. The remainder may be referred to secondary care either for arrhythmia monitoring [2, 3] or clinical review. Even in this selected group of referred patients, benign arrhythmias such as ectopic beats and short-lived narrow complex tachycardia are common [4, 5]; atrial fibrillation and flutter occur less frequently [6, 7]; and more malignant arrhythmias are rare [8]. Thus, the bulk of these patients are unlikely to need specialist cardiology intervention. However, historically, many of these patients have been seen in the cardiology clinic, with significant

resources dedicated to these low risk patients [9]. There remains a significant demand capacity mismatch in many cardiology clinics. Low risk palpitation patients seem an obvious target to reduce demand on clinical services. Alternatives to referral of these patients to the cardiology clinic could include rapid access clinics [8], primary care testing [9], non-doctor led arrhythmia clinics [10], or open access services [11].

The healthcare system in this area is predominantly the United Kingdom's National Health Service (NHS), free at the point of care for patients, with few private patients. There is a low number of cardiologists with only four cardiologists in an area with a dispersed population of ~250,000. There are no local electrophysiologists, and referral for complex arrhythmias are made to the University Hospital, three hours' travel time away. Thus, in general, demand outstrips capacity in our healthcare system so there is a drive to create more efficient ways of working.

In our area, general practitioners (GPs) were offered direct access to arrhythmia monitoring as an alternative to the traditional referral pathway through the cardiology consultant. The aim was to improve access for patients to monitoring and reduce unnecessary referrals to the cardiology clinic.

This paper describes the clinical outcomes from this service and discusses issues relating to patient care, waiting times, quality, cost–effectiveness and the effect on clinical services.

Methods

Setting

The study was carried out at a regional centre in the north of Scotland serving a population of approximately 220,000 spread over a large geographical area.

Patient selection

This service was designed for low risk arrhythmia patients. High risk patients were either admitted to hospital or referred urgently for clinic review. The definition of 'high risk' was left to the discretion of the primary care physician or the consultant cardiologist. Data was collected over a 29 month period between 18 June 2008 and 8 November 2010 from consecutive cases from two groups of patients, GP direct access and 'redirected' consultant referrals. 'Redirected' consultant referrals were those cases which were initially referred by a GP to a consultant by letter but 'redirected' by the consultant to the direct access service. Cases were excluded if the test (24 h Holter or event monitor) was cancelled, or the
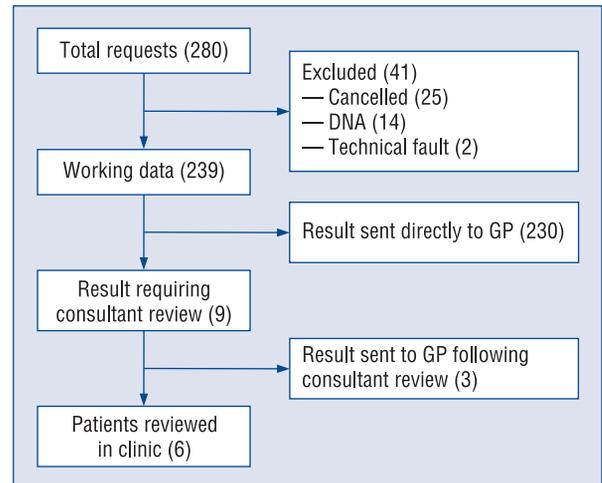

Figure 1. Data handling flow diagram, illustrating the exclusion and classification of available data; DNA — did not attend; GP — general practitioner.

patient did not attend or if there was a technical fault with the monitoring equipment (Fig. 1). All patients were contacted by phone prior to their appointment to ensure that the clinical details were accurate, and to triage patients to a Holter or event monitor.

Monitor analysis

The monitors were analyzed by fully trained cardiac physiologists who are specialists in cardiac physiology measurement and interpretation. This cohort is a recognised health professional grouping who undergo a four year vocational university honours degree program and who are registered to practice under the auspices of the Registration Council for Clinical Physiologists (RCCP) in the United Kingdom. Within our unit, we have a total of seven specialist trained physiologists to govern this ambulatory service.

Data handling and statistical analysis

Audit forms including arrhythmia monitor results and patient outcomes were completed prospectively by a senior cardiac physiologist (FD). Data was then anonymized and transferred to Excel (Microsoft Inc, USA) for statistical analysis. Statistical differences were analyzed using χ^2, Fisher's and Student's t-test as appropriate with the significance taken at the 0.05 level.

Waiting times

The waiting time was defined as the difference between the appointment date and the date of the request being made. Where the date of request was ab-

Table 1. Reporting criteria used to categorize the patient results.

Result category	Definition
Negative	Normal ECG recording with no evidence of abnormality
Positive	The general practitioners question was answered but no significant arrhythmia (e.g. paroxysmal atrial fibrillation, frequent ectopics beats)
Significant	Potentially high risk arrhthmia (e.g. ventricular tachycardia, sustained supra-ventricular tachycardia, > 3 s pauses)

Table 2. Differences between those cases referred via direct access and those referred to the consultant.

	General practitioners direct referral route (n = 165)	Consultant referral route (n = 72)	P
Event monitoring procedure (n = 127)	84 (50.6%)	43 (59.7%)	0.21 (χ^2)
Holter monitoring procedure (n = 110)	81 (48.8%)	29 (40.3%)	
Result requiring consultant advice (n = 9)	4 (2.4%)	5 (6.9%)	0.14 (Fisher's test)

sent from the audit forms, the date the request was received from primary care was used as an alternative.

Outcomes

Arrhythmia monitor results were divided into one of three categories: 'negative', 'positive' or 'significant' (Table 1).

The patient was either sent back to the GP for management in primary care, or it was decided that the case required consultant input (Fig. 1). All those results considered 'negative' or 'positive' and not requiring cardiology consultant opinion were sent directly back to the GP with no consultant input. All those cases considered 'significant' required consultant opinion. The outcome of the consultant review was either that the patient was directly returned to primary care, required a clinic appointment or had a procedure (e.g. implantable loop recording or pacemaker). If a patient had a further cardiology appointment, but was an existing cardiology patient, then it was assumed that the patient was attending due to the existing cardiac diagnosis. The medical records of patients with significant arrhythmias or who were subsequently seen in a new patient cardiology clinic were reviewed.

The study was approved by the local bioethical committee and all patients gave their informed consent.

Results

A total of 280 patients were referred to the service from 47 separate GP practices. Of the 280 patients, 41 (14.6%) cases were excluded (Fig. 1).

The remaining 239 cases were evaluated. There were 165 (69%) referrals through the direct access pathway and 72 (31%) via the 'redirected' route. In both cases, event recording was more common than the Holter (Table 2). Those referred through the consultant route had a slightly higher number of significant arrhythmias that required further consultant advice, although this difference did not reach statistical significance, suggesting that there was no systematic difference in the patients referred via these two routes (6.9 *vs* 2.4%; p = 0.14).

Demographics, request appropriateness and waiting times

The average age was 55.5 ± 16.7 years (range 13–92) with 84 (35.1%) males. In 188 (78.7%) cases the request was deemed appropriate, 41 (17.2%) were not appropriate (i.e. wrong test requested), while in ten (4.2%) it could not be determined whether the request was appropriate due to insufficient data. In 231 (97.5%) cases, a relevant clinical history was given. In the other six cases (2.5%), there was no clinical history given. However, the clinical history was deemed insufficient in 36 (15.1%) cases. The median waiting time was 84 days (IQR 50–112).

Test results and outcomes

Of the 239 completed tests, 127 (53.1%) had a patient activated event recording and the remaining 112 (46.9%) had Holter monitoring (Table 3). The average age of patients undergoing Holter monitoring was higher than that of those undergoing event recording. There was no difference in the

Table 3. Comparative results and outcomes between event and Holter testing. Data expressed as actual number (percentage).

	Event monitor (n = 127)	Holter monitor (n = 112)	P
Mean age [years]	52.7 ± 17.3	58.8 ± 15.5	0.005 (t-test)
Result:			
Negative	52 (40.9%)	50 (44.6%)	0.76 (χ^2)
Positive	70 (55.1%)	59 (52.7%)	
Significant	5 (3.9%)	3 (2.7%)	
Outcome:			
Back to general practitioners	121 (95.3%)	109 (97.3%)	0.51 (Fisher's test)
Requiring consultant advice	6 (4.7%)	3 (2.7%)	

Table 4. Clinical details and outcomes of 'significant' arrhythmia cases requiring consultant advice.

Test	Age	Gender	Specific arrhythmia	Outcome after consultant case review	Final outcome
Event	53	F	Paroxysmal AF with fast ventricular conduction up to 200 bpm	Back to GP with advice	No further action
Event	83	F	AV nodal re-entry tachycardia	Back to GP with advice	No further action
Event	67	F	Self terminating VT	Clinic review	Given option of ablation or medical therapy
Event	69	F	SVT (220 bpm max)	Clinic review	Referred for EP studies
Event	32	F	SVT (250 bpm)	Clinic review	Beta-blocker prescribed ablation offered
Event	32	F	SVT (214 bpm)	Clinic review	No further action
Holter	70	M	Prolonged QT interval and short runs of VT	Back to GP with advice	No further action
Holter	85	M	Self terminating VT	Clinic review	Pacemaker inserted
Holter	70	F	AF and 4 s pause	Clinic review	Pacemaker inserted

AF — atrial fibrillation; AV — atrio-ventricular; EP — electrophysiological; F — female; GP — general practitioner; M — male; SVT — supra-ventricular tachycardia; VT — ventricular tachycardia;

results of patients who had a Holter compared to an event monitor. Similarly, there was no difference in patients' outcomes between these two monitoring modalities (Table 3).

Of the 239 patients, only nine (3.8%) required consultant advice, with the remaining 230 (96.2%) returned directly to be managed by the requesting GP (Table 4). A further three of these nine cases were returned to GP care without clinic review. Patients with significant arrhythmias such as significant tachycardia and those involving long pauses (> 3 s) were reviewed at cardiology clinic for further evaluation and management (Table 4).

Followed-up data was available for an average of 639 ± 246 days (range 216–1,119). Fifty (21%) of the 239 patients had an outpatient appointment following their arrhythmia monitoring. Nineteen of these were existing cardiology patients. Of the remaining 31 patients, four were seen for ongoing clinic review. The remaining 27 were all returned to GP care following cardiology outpatient review. Medical therapy was prescribed in nine cases (Fig. 2). Thus, the majority were reviewed by the consultant and the patient was re-assured with or without a change in medication and all patients discharged to the GP for ongoing management. There were no adverse events in the direct or redirected patient groups.

Discussion

This paper describes the outcomes of a pilot project utilizing direct access GP requesting of arrhythmia monitoring. It demonstrated that the vast majority of patients (96.2%) did not require referral to a cardiology clinic or consultant input and there were no reported adverse events. Furthermore, there were no differences in outcomes be-
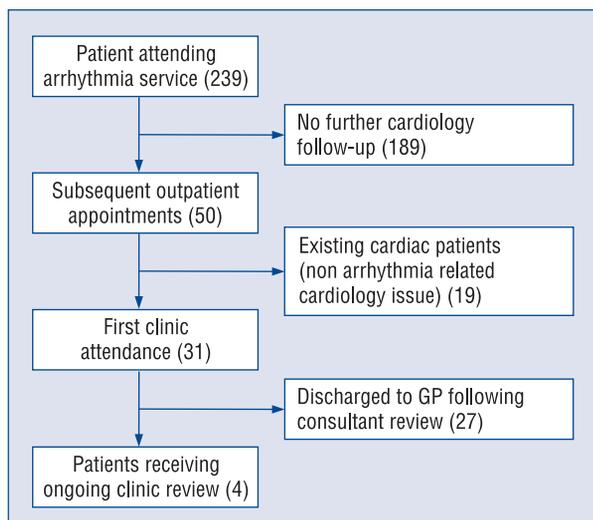
Figure 2. Patient outcomes following attendance at the arrhythmia monitoring service; GP — general practitioners.

tween the GP 'direct access' and the consultant 're-directed' groups, suggesting that the threshold for referring patients was not reduced by the availability of the direct access service. There were no adverse events and thus the direct access service appeared to achieve its aim of safely reducing unnecessary referral of low risk patients with palpitations to the cardiology clinic. However, despite the availability of the service, many GPs still referred low risk patients directly to consultants. Therefore better advertising or policing of this service is clearly required to maximize the potential benefits.

Benign cardiac arrhythmias and palpitations are common, with over one million people in the UK, or one in 85 people, having experienced an arrhythmia [12]. The majority of patients can be safely reassured based on a review of the symptoms and clinical examination, while others may require resting ECGs and further arrhythmia monitoring. Our study has shown that malignant arrhythmia was rare even in those referred to secondary care. Of the 239 cases, only two required a pacemaker insertion and three patients were considered for ablation, demonstrating that a small proportion of patients referred for arrhythmia monitoring required more aggressive therapies.

There were 19 patients who were referred to the cardiology clinic after initially being sent back to the GP for management after direct access testing. All of these patients were discharged back to GP care after a single cardiology clinic visit, suggesting that no worrying long term arrhythmia or cardiac condition was missed. Using the direct ac-

cess service in these patients may (or may not) have caused a delay to achieving consultant review, but arguably the overall benefit to the service would outweigh the possible delay in seeing a small number of low risk patients.

The median waiting time remained long at 84 days. There was a wide and unexplained range (0–285 days) demonstrating a considerable variation in waiting times for patients. In particular, the Holter monitoring waiting times increased during the summer due to seasonal staffing issues (data not shown). Clearly, demand and capacity remain an issue within this service. A solution to combat these longer waiting times could be to increase the capacity of arrhythmia monitors or by considering alternative strategies to either increase overall capacity or flexibility in the system. It should be noted that cases with higher risk features were prioritised on an *ad hoc* basis and this may have contributed to the variation in waiting times.

The predominant provider of healthcare in the UK is the NHS. The majority of staff are therefore on a fixed salary or contracted to undertake work. In the north of Scotland there is minimal private health care provision. Thus, in general, demand outstrips capacity in our healthcare system and there is a drive to create more efficient ways of working within limited resources. However, this model may not be attractive in other healthcare systems, especially where there is predominantly private healthcare or there is a fee for service contract.

Alternative models

The optimum mechanism for assessing and investigating low risk patients with suspected arrhythmia is not known. Potential alternative models to traditional review in clinic include rapid access clinics [8], testing in primary care [9], or nurse led arrhythmia clinics [10]. Each of these options has pros and cons. While our current model seemed to be efficient in terms of reducing consultant workload, there remained an issue with waiting times and physical access to the hospital for remote patients. The current service has long waiting times for both Holter and event monitors. Furthermore, our hospital serves a dispersed population and thus there are geographical barriers to patients attending hospital. These are compelling reasons to consider other models.

Nurse led arrhythmia clinics have been used in the past. They are very similar to the current direct access system, in that it is a non-cardiologist with training in arrhythmia monitoring who carries out the testing and interprets the results. It is accepted that nurse led clinics divert those with low

risk palpitation symptoms away from the cardiology clinic. However, in one study of 389 patients who visited a nurse led clinic, 20 patients with high risk features had to wait on average 70 extra days to be seen by a cardiologist when compared with those who were seen directly by a cardiologist [10]. A nurse led service does not address monitor capacity issues, and may be a relatively expensive model.

Primary care testing was the subject of an article in 2009 [9], where a 24 h and seven day ECG monitoring service was introduced to the North East Essex Primary Care Trust covering 52 practices. Eight practices in the area offer primary care testing and accept patients from the whole Primary Care Trust. Testing was carried out by the practice and the recordings sent electronically to be analyzed elsewhere by either a consultant or a private company. The aim was to reduce the number of low risk palpitation patients attending secondary care. Those thought to be high risk were referred to secondary care. Around 80% of the patients were found to have no abnormality, and the primary care testing had therefore prevented the need for referral to secondary care. However, to set up such a service requires start-up costs in terms of buying the testing equipment, continuous costs in terms of analyzing the tapes, and the need for GPs to have an interest in cardiology. Primary care testing would certainly overcome some of the geographical barriers faced by remote populations distant from secondary care services. Indeed, at least ten practices in our area already have monitors for arrhythmia monitoring. However, to maintain high quality of monitoring and interpretation of results, monitors must be fitted correctly to obtain high quality diagnostic recordings and there are concerns that those carrying out such testing infrequently may not develop, or may lose, skills that are more easily achieved in large hospitals. Internal review and quality monitoring may also be more challenging in a dispersed service.

A hospital based rapid access arrhythmia clinic could be an effective way of carrying out arrhythmia monitoring and should ensure patients are seen quickly. The current monitor waiting times in this study were considerable, and a regular rapid access clinic might cut these times. However, such a clinic would need significant resources in terms of staff and equipment. Furthermore, the current study demonstrated that 96% did not need specialist advice, and in our remote area a centralized service would offer less equitable access compared to primary care testing.

Limitations of the study

This study reports the experience of a single center and thus may not be representative of other areas. Nevertheless, the cohort was large, based in a NHS regional centre and studied over a long period, and thus we believe it is representative of the general cardiology population in the UK, although the situation in other countries may differ.

Conclusions

Direct access for cardiac arrhythmia monitoring seems to provide an effective mechanism for successfully diverting patients away from formal review at a cardiology clinic. Challenges remain within a busy NHS department in ensuring that waiting times remain low. Alternative approaches could be considered in areas with remote populations.

Conflict of interest: none declared

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