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Initial experience with a rapid access blackouts triage clinic

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ABSTRACT – Transient loss of consciousness (T-LOC), or blackout, is common in acute medicine. Clinical skills are not done well, with at least 74,000 patients misdiagnosed and mistreated for epilepsy in England alone. The aim of this study was to provide a rapid, structured assessment and an electrocardiogram (ECG) for patients with blackouts, aiming to identify high risk, reduce misdiagnoses, reduce hospital admission rates for low-risk patients, diagnose and treat where appropriate, and also provide onward specialist referral. The majority of patients had syncope, and very few had epilepsy. A high proportion had an abnormal ECG. A specialist-nurse-led rapid access blackouts triage clinic (RABTC) provided rapid effective triage for risk, a comprehensive assessment format, direct treatment for many patients, and otherwise a prompt appropriate onward referral. Rapid assessment through a RABTC reduced re-admissions with blackouts. Widespread use of the web-based blackouts tool could provide the NHS with a performance map. The UK has low rates of pacing compared to Western Europe, which RABTCs might help correct. The RABTC sits between first responders and specialist referral, providing clinical assessment and ECG in all cases, and referral where appropriate.

KEY WORDS: blackout, misdiagnosis, transient loss of consciousness (T-LOC), triage clinic

Introduction

'Collapse?cause' is common in primary and secondary care, with most cases precipitated by a blackout.[1] In secondary care, the triage process for assessment of risk, testing for a diagnosis and access to further specialist care may be variable and delayed. The three common causes of blackout are syncope, epilepsy and a psychogenic cause.[2] Hospital Episode Statistics data for England and Wales indicate 15 million emergency attendances a year, with 1:200 cases being due to blackout (75,000 emergencies).[3] Elsewhere, syncope alone is reported to be responsible for 3–5% of emergency room visits and 1–3% of hospital admissions.[4]

It is known that clinical evaluation and an electrocardiogram (ECG) give a diagnosis in 50–94% of syncope patients,[5–8] and are far more cost-effective than complex testing. Capturing an episode of transient loss of consciousness (T-LOC) is unusual, and commonly patients appear quite normal when they are subsequently evaluated. Importantly, the extent to which syncope may mimic generalised epilepsy is underappreciated. In syncope, cerebral hypoperfusion can lead to an anoxic seizure. The cause is a lack of cerebral blood flow, but symptoms include:

- a sudden collapse without warning
- widespread alarming jerking of the limbs, face and eyes
- urinary and sometimes faecal incontinence
- prolonged unconsciousness
- some confusion and headache during recovery.

Abnormal movements can be easily misinterpreted as generalised epilepsy, although in cerebral anoxia they tend to occur later after the loss of consciousness.

Doctors faced with uncertainty over diagnosis and risk, features associated with epilepsy, and a need to evaluate patients hurriedly, often resort to admission, even of low-risk cases. Once admitted, patients often wait to undergo unnecessary investigations, leading to wasted resources.[4] Even where the final conclusion is that the patient had a convulsion, failure to consider convulsive syncope may result in a misdiagnosis of epilepsy. A parliamentary report found that 74,000 patients in England have been wrongly diagnosed with epilepsy and are taking antiepileptic drugs.[9] The cost of this was calculated at nearly £200 million, but the health, social, educational, employment and welfare costs are much higher for those misdiagnosed and their families. The National Institute for Health and Clinical Excellence guidance for epilepsy advises rapid access for 'first fit' patients – among such patients a high proportion have been found to have syncope.[10,11] At the same time the National Service Framework (NSF) for Elderly Care prescribed rapid access to falls clinics for the elderly,[12] and many of these have also been shown to have syncope. Such requirements could result in patients with syncope being seen and managed in different parts of a hospital, which might waste resources and create delays and confusion. Equally, it could result in a patient who needs a pacemaker not getting one.

For these reasons, it was argued that a multidisciplinary clinic (a rapid access blackouts triage clinic (RABTC)) was needed to assess patients with blackouts as suggested by the NSF for Heart

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Disease and the Department of Health's 18-week commissioning pathway for blackouts.

Aims of the rapid access blackouts triage clinic

The aims of the RABTC were to:

- provide a rapid clinical assessment and ECG within two weeks of referral
- assess, and where possible, diagnose the cause of blackouts
- triage patients into the high- and low-risk groups, and ensure rapid specialist assessment in high-risk patients where appropriate
- help decrease hospitalisation of low-risk patients by providing a very short wait for assessment
- use the clinical assessment to determine the cause of blackouts, then apply further tests and/or treat if appropriate, otherwise to direct patients to the most appropriate specialist care promptly.

Methods

A multidisciplinary planning group for the RABTC was held. Clinics were led by specialist nurses in arrhythmias, falls and epilepsy. Medical cover and ECG over reading were provided by an experienced cardiologist. Patients were encouraged to attend with an eyewitness and all had a 12-lead ECG performed. Those ⩾40 years of age underwent carotid sinus massage during the procedure.[4] Patients then underwent a detailed assessment by one of the three specialist nurses, using a customised, web-based computer questionnaire featuring 60 standard questions/data fields, with embedded video-clips, and generating an automated report (Fig 1). Previous resource-consumption was recorded, and source of referral, number of admissions for blackouts, dates, and the admitting hospitals confirmed by medical records. Lying and standing blood pressures were undertaken. Postural hypotension was defined per guideline.[4]

Risk stratification

High risk ('red flag') features were:

Cardiac:

- an abnormal 12-lead ECG
- the presence of sudden cardiac death (SCD) risk factors
- a family history of SCD <40 years
- a blackout occurring during exercise.

Neurological:

- a history of brain injury
- a history suggestive of epilepsy
- a new or evolving neurological deficit.

No red flags = green flag.

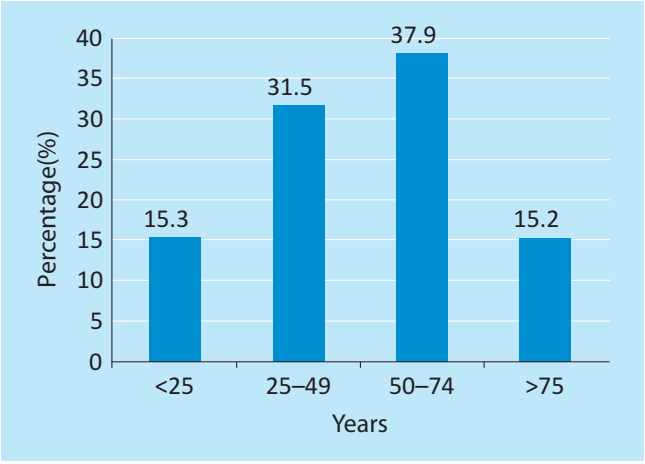

Fig 1. Age distribution of patients referred to the rapid access blackouts triage clinic.

Assessment outcomes:

- reassure, discharge to primary care
- schedule further investigations (frequently same day, eg echocardiograms, ambulatory ECG) with main outpatient review
- schedule treatment where diagnosis secure and treatment indicated (eg implantation of a permanent pacemaker)
- onward referral to appropriate specialty (eg falls, neurology, cardiology).

Readmissions (follow-up data) after RABTC triage for blackout were evaluated by review of medical records and postal questionnaire. If a 'fall' or 'collapse' occurred, this was assumed to have been a recurrent blackout. Continuous variables are mean±SD. Percentages have been used for categorical variables. Comparisons were made using two tailed Student's t-test. Comparisons were made between blackout patients at high risk and low risk and the Graph Pad Prism Statistical Package was used for analysis.

Results

In total, 327 patients participated in the study; 307 had suffered from blackout(s). A majority of patients had ⩾1 red flag, 183/307 (60%), versus 124 green flag patients (40%). Patients were 51±21 (16–96) years and 143 (43%) were males. Most were between 50 and 75 years (Fig 1).

Time from referral

Referral to assessment took 35±19 days (median: 31, 1–136 days). Most recent referrals took 30±14 days. Only 9% of patients were seen within 14 days of referral. The delays in assessment were for several reasons. Initially, nursing staff had to be inducted slowly. Clinic sizes could not be increased due to a lack of resources and quickly more referrals (Fig 2) were received each week than could be seen in a weekly clinic (nine patients).

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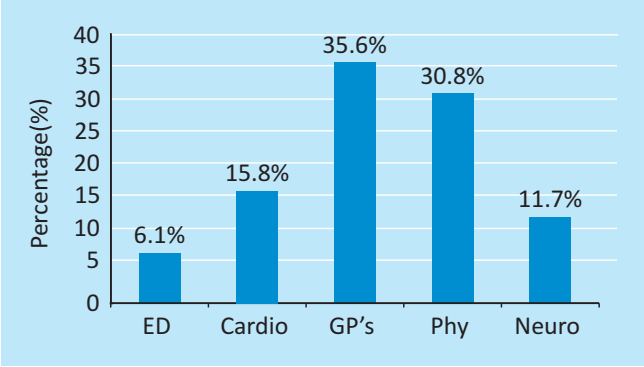

Fig 2. Referral source to the rapid access blackouts triage clinic. Cardio = cardiologist; ED = emergency department; Neuro = neurologist; Phy = general physician.

Duration of symptoms

The 307 patients with blackouts had suffered symptoms for 40±77 months (median: 12, range: 1–696 months).

Hospitalisation

Nearly half of the blackout patients (145, 44%) had been previously hospitalised. Average admissions were 1.6±1.4 days (1–11), and high risk cases had been hospitalised more often than low risk ones (52% *v* 38%, $p < 0.002$). Half of the previous admissions were to Manchester Royal Infirmary (49%), with 32% admitted elsewhere in Greater Manchester, and the remainder beyond.

Diagnosis after initial assessment

Most patients had syncope (78.5%), usually reflex syncope (38.1%). While syncope was diagnosed in a further 69 patients (22.5%) the type was uncertain. These patients had further tests, an implantable ECG loop recorder, and cardiology outpatient follow-up review. In these 69 cases, 35 had symptom/ECG correlation during follow-up, and eight had asystole or marked bradycardia and received a pacemaker via cardiology outpatients. In the remaining cases there was as yet no symptom/ECG correlation or no arrhythmia during symptoms. A further 61 (20%) patients had suffered blackout(s) but the cause was not clear from the triage in the RABTC. In these cases profiling risk was focused on and information was reported back to the general practitioner (GP), offering further care if needed.

Risk stratification

The majority of blackout patients fell into the high risk category because of an abnormal ECG with or without structural heart disease. Fifty patients, (27%), had an abnormal ECG and SCD risk factors.

Onward care

The management of onward care after assessment is summarised in Table 1. In 144/327 a diagnosis and treatment plan were provided within the RABTC. Thirty-nine low-risk patients (12%) were discharged to primary care with reassurance. Thirty one (10%) were referred on for detailed specialist evaluation, mostly neurological (26/31, 84%).

Type of treatment given

Information on treatment given after secure diagnosis in the RABTC is given in Table 2.

Follow-up and readmission

Follow-up was 230±153 (5–713) days (Table 3). There was no difference in follow-up time, symptoms, readmission, or discharge rates between high- and low-risk groups. There was a significant fall in readmission rates after evaluation, (46.2% to 6.8%, $p < 0.001$).

Deaths

Seven high-risk patients (2%) aged 80±12 years died during follow-up at 272±95 days from end-stage myelodysplasia, bronchopneumonia (2), liver failure, congestive heart failure (2) and myocardial infarction. One patients refused a pacemaker.

Carotid sinus massage and electrocardiogram

Carotid sinus massage was safe in 161 (49%) patients. Seven patients had carotid sinus syndrome (36). All 327 patients had an ECG, and 48% were abnormal (Table 4).

Echocardiography

An echocardiogram was performed in 202/327 (62%) patients, and 75 (37%) had an echocardiographic abnormality. In 54 (72%) of these patients there was also an abnormal ECG. In 21 patients an echocardiographic abnormality was found where the ECG was normal.

Table 1. Onward care of the 327 patients evaluated in the rapid access blackouts triage clinic.

	Whole cohort 327	Blackout 307	Blackout red flag 183	Blackout green flag 124	P value red flag *v* green flag
Diagnosis made, Rx given	144	135	65	70	<0.001*
Discharged to primary care	39	33	13	20	<0.012*
Specialist referral	31	28	21	7	0.057

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Discussion

This is the first study of a multidisciplinary, specialist nurse-led RABTC, following the publication of the 2005 NSF for Heart Disease guidelines and the 18-week commissioning pathway for blackouts. Patients with T-LOC/blackouts, not a subset with syncope, were triaged.

To provide capacity, specialist nurses from a number of disciplines, working with a structured electronic interview, were deployed. A SAS (staff and associate specialist) cardiologist supported the nurses, reviewed the ECG, determined diagnosis and advised on treatment, further tests or onward referral. Blackouts patients were brought into a single clinic but benefitted from the experience of specialist nurses from cardiac arrhythmias, epilepsy and falls services. The web-based questionnaire allowed questions to be asked systematically, preventing omissions and saving data. A profile of national activity and performance could result if the survey was distributed nationwide. The authors hope to make the tool accessible to the NHS via the Syncope Trust and Anoxic Reflex Syncope website: www.stars.org.uk. It is believed that this approach is robust and safe and patients with uncertain findings were sent back through specialist outpatients. 'Green flag' patients were usually reassured and returned to the GP with an automated letter, 'red flag' patients were referred for specialist care or seen for follow-up in a conventional clinic (cardiology clinic). Onward referral urgency was determined by the doctor covering the clinic.

The data from the Manchester clinic indicate that a RABTC can evaluate blackout patients fairly promptly, although limited resources necessarily cause delays. More resource allocation would allow more clinics and more rapid access. Referrals came from various services, with a limited proportion from casualty. The reasons for this are likely to be complex. One of the principle aims of this study was to reduce the admission rate in low-risk patients after a blackout. It was hoped that by providing rapid expert evaluation, there would be a reduced tendency to admit in borderline or low-risk cases. It seems that the clinic probably had a limited impact in this area. However, many patients could be diagnosed and treated within the RABTC itself, without the need for onward specialist referral, which was not the primary objective of the triage clinic, but a bonus. A good number of patients could immediately be assigned to the low-risk group and returned to primary care where the GP would have confidence that a thorough evaluation had taken place. In other cases, where doubt existed and the clinical features were of concern, it was possible to refer onward to specialist evaluation. Moreover, the collaborative links were already in place to make this process immediate, although the data show that relatively few patients needed neurological referral.

All deaths were seen in patients who had been assigned to the high-risk group. Many patients needing a pacemaker or other implanted device were detected and sent for treatment promptly. Syncope is probably the most important symptom in

Table 2. Treatment given after secure diagnosis in the rapid access blackouts triage clinic.

	Whole cohort 144	Blackout 135	Blackout red flag 65	Blackout green flag 70	P value red flag *v* green flag
Devices	20	20	20	0	<0.001*
Permanent pacemakers	18	18	18	0	<0.001*
BiVICD	2	2	2	0	0.13
EPS ± ablation	1	1	1	0	0.31
Lifestyle changes[a]	90	84	32	52	0.0027*
Drug withdrawal	8	6	3	3	0.37
Drug addition	26	21	12	9	0.37
Midodrine	10	10	2	8	0.072

[a]reassurance, increase salt and fluid intake, counter pressure manoeuvres, decrease alcohol intake. BiVICD = biventricular implantable cardioverter defibrillator; EPS = electrophysiological study.

Table 3. Follow-up (days).

	Whole cohort 327	Blackout 307	No blackout 20	P value red flag *v* green flag
Duration	230±153	231±153	200±138	ns
Range	5–713	5–713	28–516	–
Median	200	215	153	–
Symptomatic	77	72	5	0.84
Readmission	23	21	3	0.16
Discharged to primary care	27	23	4	0.045*

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patients with an indication for treatment due to bradycardia.[13] However, the UK is far behind other Western European countries in rates of pacemaker implantation. The average implantation rate on the Continent is over 900/million, and the UK rate is 460/million, with a target of 700/million.[14] Better response to typical symptoms of bradycardia and greater referral rates for pacing would improve matters. RABTCs can detect patients with intermittent bradycardia due to atrioventricular conduction block and sinoatrial disease rapidly, removing barriers to assessment and facilitating rapid onward progress for pacing, improving UK pacing performance.

While specialist nurses are essential staffing for this model for a RABTC an experienced doctor is also needed. This does not need to be a cardiologist, but experience, familiarity and confidence in ECG interpretation is essential. The primary objective of such RABTC is not to provide rapid access to the entire care pathway, but to provide a step which is between the 'first responder' and 'specialist care', as envisioned in the 18-week commissioning pathway for blackouts. However, a direction is needed for onward referral, and the more patients with obvious abnormalities who can be given a firm diagnosis and direction for treatment, the better. A SAS doctor in cardiology can provide ECG and echocardiographic analysis to clinch a diagnosis. However, the primary objective of this model is rapid triage to the right care pathway.

Table 4. Electrocardiographic findings.

Findings	Number of patients (n=327)
PR interval ⩾200 msecs	39
Sinus bradycardia (heart rate ⩽60 bpm)	27
Intraventricular conduction defect	3
Left axis deviation (QRS axis ⩾−30°)	17
Right axis deviation (QRS axis ⩾+120°)	2
RBBB + LAD	6
RBBB + LPHB	0
Left bundle branch block	18
Ventricular ectopics	12
Atrial ectopics	4
Atrial fibrillation	9
Left ventricular hypertrophy	11
Right bundle branch block	19
Incomplete right bundle branch block	7
Abnormal Q waves (suggestive of old myocardial infarction)	10
Right ventricular hypertrophy	5
Non-progression of R wave across precordial leads	10
ST – T abnormalities	23
Suspected Brugada syndrome	3
Left atrial enlargement	1
QT prolonged (but <500 msecs)	7
Early transition of QRS in V3	2
Sinus tachycardia	11
Left atrial enlargement	1
Right atrial enlargement	1
Abnormal P wave morphology	3
Paced rhythm	1
Low voltage complexes	1

LAD = left axis; LPHB = left posterior hemi-block; RBBB = right bundle branch block

The RABTC was established in consultation with other medical specialties as, in practice, patients with blackouts/T-LOC are managed in diverse settings. Many cases of misdiagnosis of epilepsy, where blackouts are assumed to be due to a transient dysfunction of the brain, have been seen. This is usually because of convulsive features, even in the absence of red flag features, and irrespective of the detail of the clinical history. There is a tendency towards overreliance on more sophisticated investigations, which are known to have a low diagnostic yield, such as electroencephalography (EEG), rather than clinical detail and an ECG. Indeed, the EEG is of little use for patients over 35 years, and is not used by neurologists to make a diagnosis of epilepsy.[10] An EEG may be helpful in defining the precise epilepsy syndrome, after a clinical diagnosis of epilepsy has been made.[10] Whereas epilepsy is a clinical diagnosis, this study's cohort shows a high rate of ECG abnormalities, but there continues to be evidence that blackout patients do not routinely have an ECG. This may be due to a lack of resources, confidence and experience with ECG interpretation in primary care, and a lack of systematic inclusion of the ECG in neurological workup.

The misdiagnosis of epilepsy is a problem for the UK and is seen in up to 30% of adult patients and up to 40% in children diagnosed with epilepsy.[15] However, another very important factor is the failure to appreciate the features of convulsive syncope. Even 'benign' reflex syncope can present with a sudden blackout without warning, widespread dramatic twitching and jerking of the limbs, urinary and even faecal incontinence, involuntary biting within the mouth, and prolonged unconsciousness.[15] All the above factors play an important part in the very high rate of misdiagnosis of epilepsy in England, and elsewhere. The All-Party Working Group in Epilepsy in England indicated that at least 74,000 patients were misdiagnosed and mistreated for epilepsy and many more will have the worry of a label of 'probable' epilepsy, which is difficult to remove. This label has a profound effect on growing-up, education, employment, marital prospects and childbearing. The obvious cost to the NHS of misdiagnosis is about £200 million,[15] but there is likely to be a far higher cost when hidden social, employment and childbearing costs are included. There is also recognised to be a high risk of sudden death in epilepsy (SUDEP). In a few cases, blackouts may be due to syncope from life-threatening arrhythmias complicating such conditions as the congenital long QT syndrome, or the Brugada syndrome.[16] These may be disclosed by a routine 12-lead ECG. In some cases these patients are primarily diagnosed with epilepsy and secondly with cardiac disease.

Echocardiography was carried out in 62% of patients. In 54 patients with abnormalities (72%) it provided further

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refinement of a clinical and ECG diagnosis, or a further refinement of the assessment of risk. In 21 patients (10%), the echocardiographic findings were unexpected, and significantly changed the assessment of the patient. Echocardiography probably constitutes quite a useful complimentary investigation, but not an essential one in a RABTC.

The devised risk stratification methods were helpful in that they were closely compatible with the methods used to construct the 18-week commissioning pathway for blackouts.[17] The core red flag measures of risk were embedded in part of the web-based questionnaire, and could easily be abstracted and used for a quick risk-assessment, for example in primary care. Assessment of the accuracy of these red flags in identifying all high- and low-risk cases would require a much longer period of follow-up, or a different kind of trial. However, most of the important interventions, especially the pacemaker implantations, and all of the subsequent deaths, were in the high-risk group, indicating a degree of accurate prediction.

This study shows that a multidisciplinary, specialist nurse-led RABTC can effectively triage patients with blackouts when using a structured clinical assessment tool, and support by a SAS cardiologist. Ease of use of the assessment, and the guidance provided by it should make it possible for transfer to other settings and other staff. Limitations stemmed from resource allocation and it was not possible to increase the capacity of the clinic when the referral rate increased, thereby prolonging waiting times. It was anticipated that more referrals would come from accident and emergency so low-risk or borderline cases could be managed as outpatients, but referral rates remained low. A large number of patients had abnormal ECGs, and a low number of patients needed neurological assessment. It is possible that an assessment of patients with blackouts in RABTCs could result in more referrals for cardiac pacing, and could help to explain the traditionally low rates of pacemaker implantation in the UK.[18]

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