sophisticated treatments have focused the attention of clinicians, managers, and politicians on the need to ensure that money is well spent. The public is becoming aware of the adverse effect of widespread use of antibiotics on bacterial resistance and of the small but not negligible risk of side effects of drugs used long term. The newly established National Institute of Clinical Excellence will examine new treatments, but it is unlikely that it will be able to examine established practice in retrospect. The use of systematic reviews to provide busy clinicians with a summary of previous studies has also aided critical evaluation of current practice.⁴³ The outcome of the systematic review of management of VUR is awaited with interest.

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Cardiac causes for syncope or sudden death in childhood

Sudden death of a child is every parent's worst nightmare. It is a rare occurrence, although individual cases or causes may receive disproportionate attention in the press. Syncope, on the other hand, is a common symptom in childhood and is almost always benign. In a very few cases syncope may be a clue to the presence of an underlying cardiovascular problem and may predict a risk of sudden death. Retrospective assessment of victims of sudden death sometimes reveals a preceding history of syncope to suggest that earlier recognition of the problem might have led to a different outcome. This review considers the causes of sudden death, the causes of syncope, and which children with syncope need further investigation.

Cardiac causes of sudden death in infancy

Sudden death in infancy is usually either sudden infant death syndrome or caused by infection. A few neonatal or

infant deaths are caused by congenital cardiovascular malformations, particularly duct dependent abnormalities or obstructive left heart malformations.¹ Sustained tachycardia usually presents with heart failure but may cause collapse or even death. Atrioventricular re-entry tachycardia, the most common type of supraventricular tachycardia, maybe difficult to recognise in the neonate. The history is often non-specific and there are few physical signs. Ventricular arrhythmias in infancy are rare but some types are dangerous. Complete atrioventricular block is usually recognised in utero or soon after birth but may cause death if unrecognised or untreated.

Sudden infant death syndrome implies absence of any identifiable cause of death. Extensive investigation has failed to demonstrate any cardiovascular contribution to sudden infant death syndrome² and, despite recent reports, there is no convincing evidence that QT prolongation is implicated.³

Sudden death in children with known heart disease

In previous generations sudden cardiac death most often occurred in children with end stage pulmonary vascular disease associated with unoperated congenital heart disease or in children with unoperated aortic valve stenosis.⁴ Over the years surgical repair has been performed earlier and more effectively so that those most at risk now are children with repaired heart disease. The risk seems to be highest (5–7 per 1000 patient years' follow up) after atrial repair of transposition of the great arteries.^{5,6} Death is probably caused by an arrhythmia and there is circumstantial evidence to implicate atrial flutter⁶ although ventricular tachycardia or ventricular fibrillation are also candidates.⁵ The risk of sudden death after repair of tetralogy of Fallot is lower (around 1.5 per 1000 patient years) and is declining.⁵ Death is probably caused by a ventricular arrhythmia, perhaps in combination with a residual haemodynamic abnormality, but late atrioventricular block is also a possible cause. Late sudden death after repair of other common cardiovascular malformations is rare, with an incidence of around 0.1 per 1000 patient years.⁵

The risk of sudden death in the presence of known hypertrophic cardiomyopathy is impossible to establish because of the lack of a denominator. The impression given by published reports from specialised referral units is that the risk is high, whereas evidence from the few population based studies does not support this. "Risk factors" have been identified but are absent in most children. "Risk stratification" is encouraged and may identify a few individuals at increased risk. However, for the large majority the risk of sudden death is low, especially in the absence of symptoms.

Syncope in children with known heart disease

Syncope or presyncope in any child after cardiac surgery or with unoperated heart disease is an obvious indication for urgent specialist evaluation. It is to be hoped that all such children are under review by a paediatric cardiologist.

Sudden death in apparently normal children

The incidence of sudden death in apparently normal children is around 1–1.5 per 100 000 per year. Cardiovascular diagnoses first established after death include myocarditis, various types of cardiomyopathy, coronary artery abnormalities, and Marfan syndrome with aortic dissection. Sudden death associated with some types of structural heart disease, especially myocarditis or cardiomyopathy, may be related to an arrhythmia. In other children, death may remain unexplained after necropsy but the circumstances may lead to a presumptive diagnosis of a primary cardiac arrhythmia.

Sudden death from previously unsuspected hypertrophic cardiomyopathy often attracts publicity but is rare. The risk in apparently normal children or adolescents is less than 1 per 1 000 000 per year.⁷ Postmortem diagnosis should lead to screening of other family members but often no further cases are identified. Hypertrophic cardiomyopathy has an underlying genetic cause and it is likely that many cases presenting in this way are new mutations. Retrospective assessment will often reveal a prodromal history of syncope.^{8,9}

Unexpected sudden deaths that remain unexplained after necropsy are probably due to primary cardiac arrhythmias and are about 10 times as common as deaths from hypertrophic cardiomyopathy. Potentially fatal arrhythmias that would lead no trace after death include polymorphic ventricular tachycardia in congenital long QT syndrome,¹⁰ atrial fibrillation in Wolff-Parkinson-White syndrome,¹¹ primary ventricular arrhythmias such as those described by Brugada and colleagues¹² or Leenhardt *et al.*,¹³ and congenital complete atrioventricular block.¹⁴ Retrospective confirmation of an arrhythmia is not possible unless a familial

condition is recognised in a family member, but the circumstances surrounding death support a presumptive diagnosis in many cases. This group of arrhythmias also comprise most of the diagnoses made after resuscitation from out-of-hospital cardiac arrest.¹⁵ It is possible that some deaths attributed to "epilepsy" are in fact caused by a primary arrhythmia. Differentiation between syncope from a cardiac arrhythmia and epilepsy can be difficult.¹⁶

Syncope in apparently normal children

Syncope is a frequent problem in childhood. The common causes are benign whereas some rare causes are potentially dangerous. A simple faint or vasovagal syncope is said to occur in up to 15% of the normal population at some time during childhood. Other vascular but benign diagnoses include neurocardiogenic syncope in older children,¹⁷ and pallid syncope or reflex anoxic seizures in younger children.¹⁸ The mechanisms of these may be similar with inappropriate reflex bradycardia and hypotension. In the former syncope is often postural, and in the latter a frequent trigger is surprise, minor hurt or frustration.

Hyperventilation related to anxiety or behavioural disorders may produce syncope resulting from cerebral hypoperfusion, and the diagnosis will usually be apparent from the history.¹⁹ Psychogenic or hysterical syncope is rare—it usually occurs with an audience and does not result in injury.¹⁹

Studies that examine children presenting with syncope rarely identify any diagnoses with a significant risk of death because they are rare.²⁰ The spectrum of underlying abnormalities in children resuscitated from cardiac arrest is, not surprisingly, very different and more malignant. Diagnoses include various types of cardiomyopathy, particularly dilated cardiomyopathy or arrhythmogenic right ventricular cardiomyopathy, and substrates for primary arrhythmias including QT prolongation and ventricular pre-excitation.¹⁵

INVESTIGATION OF SYNCOPE

The history is of fundamental importance in the assessment of syncope. Common but benign causes such as vasovagal syncope or hyperventilation are usually easily recognised. A history of syncope on exertion, syncope preceded by palpitations, or syncope in the presence of a family history of sudden death, congenital long QT syndrome, or hypertrophic cardiomyopathy should lead to specialist evaluation. Detection of a cardiac murmur (or other abnormal signs on examination) should also lead to specialist referral as it may be a clue to the presence of aortic valve stenosis, coarctation of the aorta, or hypertrophic cardiomyopathy.

Electrocardiography is a valuable screening test in children with syncope, and may identify QT prolongation, ventricular pre-excitation, or atrioventricular block or it may be a clue to the presence of underlying ventricular arrhythmia or cardiomyopathy. Other investigations might include echocardiography, ambulatory or exercise electrocardiography, tilt testing,²¹ or invasive electrophysiology, but the investigative strategy depends fundamentally on the history.⁹

Tilt testing may be valuable in assessment of neurally mediated syncope with reasonable sensitivity and specificity.²¹ Treatment strategies include β blockade, vasoconstrictors, fludrocortisone, and even pacemaker implantation, but their efficacy can be difficult to evaluate and support from convincing controlled trials is lacking.¹⁷

Sudden death in young athletes

A small but significant proportion of sudden deaths occur during exercise. Deaths during sports attract publicity and focus attention on the possibility of an underlying cardiac abnormality. The common structural abnormalities

identified at necropsy are hypertrophic cardiomyopathy, coronary artery abnormalities, right ventricular cardiomyopathy, and aortic valve stenosis.^{9–22} Unexplained cases may result from ventricular arrhythmia or atrial fibrillation in Wolff-Parkinson-White syndrome. Health screening programmes are in place for some young athletes but their efficacy has not been evaluated.

Death during sports is a rare event: estimates from the USA suggest that 5 per 100 000 young athletes (including children, teenagers, and young adults) have a predisposing condition, and that only 10–25 such deaths per year occur among the total USA population of 260 000 000.⁹

Population screening for unsuspected heart disease

The infrequency of prodromal symptoms and the absence of physical signs in children who die suddenly and are found to have a cardiac problem may lead to calls for screening of the general population. There is no evidence that screening for hypertrophic cardiomyopathy is either feasible or appropriate, and no evidence that either early detection or treatment in the absence of symptoms has any effect on outcome.^{23–24} To my knowledge the only prospective screening programme of normal children has been in place in Tokyo, Japan: the prevalence of hypertrophic cardiomyopathy is around 1 in 15 000,²⁵ and children identified seemed to be at particularly low risk.²⁶ The programme does also detect children with long QT syndrome, atrioventricular block, and Wolff-Parkinson-White syndrome by routine electrocardiography but these problems are rare. So far it has not been possible to show that screening prevents sudden death.²⁷

Conclusions

Sudden death in children is rare. About 10% of all deaths are sudden but most occur in children with previously recognised disease. Syncope is very common but is only rarely a clue to the presence of a significant cardiovascular abnormality. A detailed history is of paramount importance and the ECG is a useful screening test. There is no evidence at present to support screening of all children for unsuspected cardiac problems.

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Covert video surveillance: an important investigative tool or a breach of trust?

There has been controversy among professionals and the public surrounding the use of covert video surveillance (CVS) in cases of suspected child abuse. Opinion is divided as to whether it is necessary to make a “diagnosis” of child abuse and whether it is ethical and legal. CVS for documentation of apnoea by smothering was first used in 1983,¹ and since then more than 20 reports have appeared.^{2–7} Its primary use is to detect imposed upper airways obstruction, which normally presents in small babies under the age of 1 year with an apparent life threatening event. It is a well recognised entity requiring immediate and urgent assessment. It is a dangerous form of abuse with high mortality and morbidity.⁸ It can be difficult to differentiate a “normal” apparent life threatening event from an imposed upper airways obstruction purely on clinical grounds. It may require multichannel monitoring of physio-

logical function with concurrent CVS in an environment where prompt action can be taken to protect the child.

What is covert video surveillance?

Covert video surveillance is the video and audio recording of interactions between a child and his or her carer, usually the mother. It is conducted without the knowledge of the carer under strictly controlled conditions within a hospital based paediatric department. It is normally undertaken in a designated cubicle where two cameras (smaller than an electric light switch) are installed to provide coverage of the area from opposing positions. Two cameras reduce the possibility of a single camera angle being inadvertently obscured and abusive behaviour being undetected or misinterpreted. A typical CVS monitoring of a potentially life threatening situation would involve a child under 2 years of