

FITNESS TO DRIVE AND HEART DISEASE*

M.C. Petch†

BACKGROUND

A pedestrian was killed outside Buckingham Palace 70 years ago by a motor car, in circumstances which suggested that the driver had lost control of his vehicle. In the subsequent police investigation bromide papers, then a popular treatment for epilepsy, were found on the back seat. Legal interest in this case shifted from a prosecution of the driver to the enactment of legislation to prevent a recurrence of such an accident. The law in the United Kingdom relating to the medical fitness of drivers, which was enacted in 1931, remains in force to this day.

The wording of the latest edition of the Road Traffic Act (1988) states, in part, that any driver must not suffer from (a) epilepsy, (b) severe mental handicap, (c) liability to sudden attacks of disabling giddiness or fainting. Additional disqualifying conditions were added later, for example poor eyesight, as well as additional permissive clauses, for example a person may resume driving one year after a single epileptic fit. Statement (c) above is the one which is obviously relevant to the driver who suffers from cardiovascular disease.

The UK has a long record of research into the causes of road traffic accidents. In the 1950s the Road Research Laboratory conclusively established that 95% of accidents were due to driver error. The immediate causes identified then are now notoriously familiar - fatigue, alcohol, inexperience, and inappropriate speed. Only about 4 per 1,000 serious accidents can be attributed to underlying medical incapacity, and the figure for minor accidents is even less. These findings by Grattan and Jeffcoate¹ culled from 9,390 police accident records have since been corroborated by other workers in other countries.^{2,3} These small numbers might lead to the conclusion that the problem is unimportant, were it not for the very large number of vehicular accidents that take place regularly. In 1997, 3,599 people were killed on the roads, 42,967 seriously injured, and 327,544 slightly injured, in Britain. The actual total number of accidents is probably much greater and indeed difficult to gauge because many go unreported. The economic burden incurred is immeasurable.

Any serious accident due to medical incapacity excites undue press and political interest. Memorable examples include the bus driver who suffered a syncopal episode whilst approaching a queue of potential passengers at a bus stop, and the road tanker whose driver suffered a blackout, crashed into a camp site and caught fire. It is important not to over-react to the political pressure that these tragedies

engender, however vociferous and intense they may be. But inevitably on each such occasion questions are asked of politicians, who in turn ask the appropriate Government Department i.e. Transport, who in their turn nowadays refer the question to their executive agency - The Driver and Vehicle Licensing Agency (DVLA).

MEDICAL ADVISORY PANELS

With due cognisance of the prevailing situation, the Medical Unit of DVLA has gradually evolved guidelines which supplement the basic law. Advice on specialist medical problems in relation to road accidents was originally obtained from certain distinguished physicians, but in 1985 the Secretary of State constituted five honorary medical advisory panels to formalise this process respectively for drivers suffering from diabetes, drug and alcohol misuse and dependency, neurological, cardiovascular, and latterly, visual disorders, and thereby to facilitate decisions. A 'visual' panel first met formally in early 1998. Prior to this, advice on eyesight-related matters was provided by the Visual Standards Sub-committee of the Royal College of Ophthalmologists. The 'cardiovascular' panel comprises the author as chairman, four other cardiologists with varied subspecialty interests including arrhythmias and grown-up congenital heart disease, and one cardiac surgeon. The panel meets every six months and engages in weekly correspondence, including advice to the DVLA on specific cases. Much of the work is concerned with the safety of vocational drivers i.e. those who depend on driving as an occupation.

Taylor⁴ showed that epilepsy was the commonest cause of medical incapacity at the wheel (Table 1). Heart disease accounts for only 8% but it is certain that many blackouts experienced while driving will have a cardiovascular cause. About 75% of accidents resulting from cardiovascular incapacity occur in drivers with previously diagnosed disease. Taylor also described the difference in case-fatality rates for accidents involving heavy goods vehicles (HGVs) and public service vehicles (PSVs) as compared with those involving private motor cars - three and four times larger, respectively. This difference is recognised internationally and all developed countries distinguish between the professional or vocational driver (Group 2), for whom the

TABLE 1
Medical causes of road vehicular accidents.

Epilepsy	37%
Blackouts	23%
Diabetes (on insulin)	17%
Stroke	8%
Heart disease	8%
Other causes	7%

*Based on a lecture given at the Symposium on Cardiology held at the College on 4 June 1998
†Consultant Cardiologist, Papworth Hospital, Cambridge

guidelines are relatively strict, and the ordinary or private driver (Group 1) for whom minimal restrictions commensurate with community safety are imposed. In Europe, vehicles in the Group 2 category include large goods (LGV, formerly HGV) vehicles of over 3.5 metric tonnes, and passenger carrying (PCV, formerly PSV) vehicles exceeding eight seats (excluding the driver). Taxis fall into an intermediate category; the drivers spend longer at the wheel than ordinary drivers, and thus have more prolonged intra-occupational exposure, but the kinetic energies involved in any accident with such vehicles are low and hence there are few fatalities in such incidents. In the UK a local regulatory body, not the DVLA, is responsible for issuing the licence for taxi cabs, and the criteria adopted by individual bodies do vary; most do **not** apply Group 2 guidelines, some do, e.g. Northern Ireland.

Evolving guidelines

Traditionally the guidelines for vocational drivers were draconian. Virtually no such driver formerly regained his licence following the development of heart disease, and certainly not after undergoing expensive and mildly hazardous investigations such as coronary arteriography. At times guidelines have had an adverse influence on cardiological practice: for example, anticoagulation was a bar to continue driving; hence a vocational driver who needed valve replacement surgery might opt for a biological prosthesis to avoid anticoagulation so that he could regain his livelihood, at a time when it was beginning to be appreciated that such valves could fail suddenly and that a mechanical valve for which anticoagulation was necessary, would be more reliable in the long term. An important aspect of the panel's work therefore is to keep DVLA abreast of medical advances and recommend changes in the guidelines, after due consideration.

Changing practice prompts changes in the guidelines for three reasons. First, better treatments have transformed the outlook for patients with cardiovascular disease: Coronary Artery Bypass Grafting (CABG) is an obvious and dramatic example. Another is the use of drugs such as aspirin, statins, and angiotensin converting enzyme inhibitors which have had a quieter, but equally potent, beneficial effect.

The role of the DVLA advisory panel differs from that of occupational medicine specialists. The latter not only advise the employer but also are valuable to the employee in ensuring that he/she receives optimal medical care, including cardiac procedures and lifestyle changes, both of which may enjoy financial support from an enlightened employer. The former merely assesses and on occasion has the misfortune to witness the failings of our NHS, for example when treatments such as CABG cannot be delivered with the resultant loss of livelihood, or when guidelines which enjoy universal cardiological support cannot be implemented, or are misinterpreted, owing to lack of local expertise. This difference is a potential cause of misunderstanding for individual drivers. In general the gradual relaxation of the guidelines for Group 2 drivers has been largely due to the better treatments available for the relief of myocardial ischaemia.

New treatments, and new devices in particular, pose problems when they are first introduced. Any regulatory authority needs to be satisfied that the treatment or device is reliable, and that takes time. The implantable cardioverter

defibrillator (ICD) is a case in point: concerns about false triggering proved well-founded, and the discharges of early models could be incapacitating. Recent models appear to be less likely to cause such incapacity but many of the early ICDs are still implanted, their lead systems are ageing, raising the spectre of lead fracture and inappropriate disabling discharges in those who have been implanted with them. The recent models are also undergoing refinement with anti-tachycardia pacing capability. This raises a further possibility, namely that the device may cause a relatively benign arrhythmia to degenerate into ventricular fibrillation with ensuing disaster. Cardiological opinion is not unanimous on the safety of ICDs but a decision had to be made, and eventually in the UK, in May 1995, ordinary driving was permitted subject to certain criteria being met; currently these are as set out below (Appendix). So far no accidents have been caused by an ICD discharge, and the DVLA currently has knowledge of every one implanted in drivers. All drivers with ICDs have short-term licences which is annoying for them because it can result in insurance and car hire companies imposing financial penalties.

Better investigative tools are the second reason for changing guidelines. Echocardiography is a particularly good example. This technique can visualise the cardiac valves and chambers painlessly, harmlessly, and repeatedly. Hence decisions about the significance of valve lesions can be easily made. This investigation has however created other difficulties. One current example is the identification of potentially incapacitating disorders in relatives of patients suffering from disorders such as hypertrophic obstructive cardiomyopathy or Marfan's syndrome. Those vocational drivers who are identified as having one of these disorders on screening, and have a family history of sudden cardiac death present a formidable and unresolved dilemma.

Better understanding of prognosis is the third reason for changing guidelines. Decades of follow-up of patients with mechanical heart valves have confirmed the latter's reliability. The natural history of 'lone' atrial fibrillation is now well documented and clearly benign. The outlook for patients following a coronary event can be quantified. Unfortunately there is a discrepancy between the epidemiological data on coronary disease which record deaths, myocardial infarction, and other events; these are not necessarily the same as incapacity at the wheel. Anecdotal reports^{5,6} testify to the occurrence of coronary deaths with the driver 'slumped over the wheel of his car at the side of the road with the engine still running'; the inference is that the victim had sufficient warning to pull over to the side of the road. Death might have been sudden in epidemiological terms, but it was not instantaneous. In contrast an epileptic fit is the commonest medical cause of an accident yet rarely causes death. The commonest cardiovascular cause of an accident may be a syncopal attack.

RISK ASSESSMENT

The discrepancy between driver incapacity and a cardiovascular event means that the epidemiological data have to be interpreted cautiously. This is one reason why risk quantification may not be appropriate. The concept does however merit consideration. In civil aviation, the death of a pilot is undoubtedly a threat to the safety of the aircraft, whereas a faint may not matter. It is therefore reasonable for medical opinion to quantify the risk in statistical terms and for the regulatory authority to decide

what level of risk is acceptable. This is the basis for the 1% rule.⁷ It is reasonable for society to accept a risk of incapacity in a pilot that is no greater than the average Northern European cardiovascular mortality. It so happens that this risk in males in the pilot's age range is of the order of 1% per annum, which is approximately equivalent to one death per million man hours. If a pilot's risk exceeds that then he is grounded. This approach also has the advantage that the regulatory authority shoulders the responsibility if 'a potentially adverse decision has to be made'. Despite the discordance between incapacity and death on the road, high- and low-risk groups of drivers can be identified, and if the epidemiological data from follow-up studies of heart attacks victims, etc. are combined with clinical judgement then a fair decision can be made.⁹ It is not however possible to claim that the guidelines are 'evidence based'. In fact precious little medical practice enjoys that status, because when evidence is examined critically, it rarely seems to apply to the patient or driver under consideration.

The physician's responsibility

The United Kingdom differs from most other countries in that guidelines concerning fitness to drive may be subject to the process of law. The ultimate responsibility for granting a driving licence rests with the Secretary of State for Transport. If a driver feels aggrieved that his licence has been revoked on medical grounds then he can appeal and, if so inclined can go to court, usually a magistrate's court (or in a Sheriff Court in Scotland) which is not the best place for making difficult medical decisions. This is fortunately a very rare experience nowadays.

A more common dilemma concerns the duty of the physician when faced with a driver who cannot meet the required standards and persists in driving. The duties are well defined and were reinforced by the GMC in 1995. First, the physician should attempt to persuade the patient to stop driving and remind the driver of his personal legally-imposed obligation to notify DVLA - there is no such statutory duty on the medical practitioners. Second, he should inform the medical unit at DVLA and tell the driver that he is doing so. DVLA will then take appropriate action. It has happened that the driver has then lodged a complaint against the physician, hitherto the ombudsman has always found in favour of the doctor. The vast majority of drivers are responsible citizens and accept the guidelines which are themselves the result of long and careful deliberation.

Cardiovascular disease guidelines

All guidelines are inevitably imperfect. Whilst the drivers' guidelines described here have been composed with great care, there are imperfections. For example, the guidelines relating to ICDs make no mention of anti-tachycardia pacing. Patients with paroxysmal tachycardia may be treated by catheter ablation of an accessory conduction pathway; following this, four weeks off driving were recommended. This guideline was introduced when the procedure was more traumatic, before the use of radiofrequency current ablation. One week is now deemed sufficient.

Where the guidelines are deficient, however, the Law remains in force: a person should be advised not to drive if he or she suffers from sudden attacks of disabling giddiness or faintness. The phraseology may be quaint but the intention is no less clear than our contemporary 'incapacity'.

The judgement may be difficult; in cases where there is genuine doubt the physician should seek advice from DVLA.

Minimal restrictions are required for Group 1 drivers. Certain drivers with heart disease should on occasion be advised not to drive. Following a cardiac event some should be subject to specialist evaluation. In general, periods off driving following a cardiac event have become shorter because times for recovery following myocardial infarction, coronary bypass surgery, etc. are quicker.

The requirements for Group 2 drivers are more stringent and specialist evaluation is generally necessary. For cardiovascular disorders, this often involves technical measurements. In all guidelines of this nature there is a dilemma concerning the use of measurements to define acceptable standards. Estimates of such parameters as aortic valve gradient, left ventricular ejection fraction, the degree of coronary arterial stenosis on angiography, and aortic root diameter will always be subject to some observer error. Minor adjustments of the measurement ('creep') to ensure acceptability is a temptation that is too difficult to resist. Furthermore an aggrieved driver who is advised not to resume driving would argue that he has been disadvantaged by a technical measurement which is only a few points adrift. It is therefore important to emphasise that these guidelines should reflect a combination of clinical judgement by an accredited specialist, in addition to some individual technical measurements such as left ventricular ejection fraction, or exercise time on the treadmill or bicycle.

Known powerful predictors of cardiovascular collapse include heart failure and poor left ventricular function, unstable angina due to coronary heart disease, and poor performance on exercise testing. Exercise testing on a treadmill using the Bruce protocol (Table 2) enables the fitness of a vocational driver to be assessed objectively. The choice of workload at the end of Stage 3 of the Bruce protocol was supported by a number of studies. Bruce and Fisher⁸ studied 2,373 men with clinically manifest coronary artery disease who had undergone exercise

TABLE 2
The Bruce Protocol⁸

Stage	Speed	Slope%	METs (Metabolic equivalent)
1	1.7	10	4.6
2	2.5	12	7.1
3	3.4	14	10.2
4	4.2	16	12.9
5	5.0	18	15.0
6	5.5	20	16.9

1 MET = rest. (Vo₂ = 3.5 ml/min/kg).

3-5 METs = slow walking, gentle swimming, golf, light gardening, DIY.

5-7 METs = tennis, cycling, hill climbing, skating.

7-9 METs = squash, jogging.

evaluation and follow up for a mean of 61 months. 300 sudden cardiac 'incapacitations' occurred; the annual incidence for such an event range from 0.084% per year in men aged under 38 years, increasing to 2.72% per year in men aged 64 years or older. The use of exercise electrocardiography enhanced the prediction to the extent that the highest risk group who could not achieve Stage 3 of the Bruce protocol and were aged more than 64 years, had an annual risk of 21% per annum. This report from the Seattle Heart Watch has been complemented by the Coronary Artery Surgical Study data. Wiener *et al* studied 4,083 medically treated patients with symptomatic coronary heart disease.⁹ They reviewed mortality at four years and found the ST segment response and duration of exercise proved most important. They identified an extremely low risk group (32%) with an annual mortality of 1% or less, who could exercise into Stage 3 of the Bruce protocol with less than 1 mm ST segment depression on ECG (10 METS) (Table 2). In contrast, a high risk group (12%) comprised those who could only exercise into Stage 1 of the Bruce protocol and who had ST segment depression of at least 1 mm. In this group the annual mortality was 5% or more. The authors also confirmed the over-riding prognostic importance of left ventricular function and the poor survival of patients with heart failure. These large studies reinforce earlier findings, for example by McNeer *et al*,¹⁰ who found that patients who could exercise into Stage 4 of the Bruce protocol with an adequate heart rate response had a one-year survival of 99%, and four-year of 93%. The exercise time is the major determinant of acceptability, but has to be coupled with relevant clinical observations, viz. absence of symptoms, ventricular tachyarrhythmias, hypotension, and ST segment shift. Undue reliance should not be placed on estimates of ST segment depression alone because of the incidence of false positive results, and because of the difficulties in interpretation in certain clinical situations, e.g. following coronary artery bypass grafting. If locomotor disability prevents the driver from achieving the required level of exercise, then the advice of DVLA should be sought.

The arrhythmias which have the greatest potential to cause cardiovascular incapacity, are generally ventricular tachycardia or fibrillation occurring in association with other cardiac disorders, especially coronary heart disease. But apparently benign arrhythmias still have the potential to cause incapacity, e.g. the onset of atrial fibrillation with a fast ventricular response may cause light-headedness, sufficient to distract a driver's attention.¹¹ The words used to describe this incapacity present some difficulty, as discussed above. Once again there is general agreement concerning the intention. True sudden incapacity as in epilepsy is unusual, but the phrases 'disabling symptoms', 'impairment of cerebral function', 'syncope' or 'near-syncope' are all in common use. This symptom, in which ever manner it is described, is the most useful and widely recognised predictor of incapacity, being superior to other parameters of an arrhythmia, including those found on ambulatory electrocardiography although this investigation is sometimes warranted in the follow up of Group 2 drivers.

Another area of concern which may prompt re-examination of the guidelines at a later date is the evaluation of the patient with unexplained syncope.¹¹ Most syncopal attacks are simple faints, occur in young people and do not require medical attention let alone further major

investigation. The precipitating events such as a hot environment, prolonged standing, pain, and fear, are well recognised, as are the sequence of symptoms and signs viz. nausea, light-headedness, pallor, bradycardia and hypotension, followed by rapid recovery on assuming a horizontal posture. This straightforward vasovagal syncope may be recurrent, but loss of consciousness is never abrupt and the victim does not present a hazard at the wheel. In contrast, neurally-mediated syncope in older patients may cause sudden loss of consciousness with incapacity. This neurocardiogenic syncope may be associated with carotid sinus hypersensitivity and may be reproduced by head-up tilt testing, which is now in widespread use in the investigation of this disorder. On tilt testing the immediate cause of the syncopal episode can be shown to be predominantly hypotension in some patients, bradycardia in others, or a combination of both in the majority. The problem from the regulatory point of view is that provocative testing in the investigation of syncope has poor predictive value, and its usefulness in guiding therapy remains controversial. In everyday practice many adults have experienced a single syncopal episode with no recurrence. A survey of 66 cardiac electrophysiological centres, who had treated more than 11,500 patients with syncope, indicated that 11% had treated at least one patient who had been involved in a motor vehicle accident. No respondent reported more than two such events.¹¹ An overlap exists between neurally-mediated syncope and epilepsy. Either may account for a single episode of unexplained loss of consciousness, though the former is probably much more common. In either event some restriction is necessary for Group 2 drivers, pending the results of clinical assessment and further investigation. The time-off driving is necessarily somewhat arbitrary but three months generally permits time for assessment, the introduction of effective treatment, e.g. pacemaking, and follow-up with repeat provocative testing. Most drivers will however never experience a recurrence and, as in other disorders which affect driver capability, reliance is best placed on clinical judgement by an experienced specialist.

The foregoing considerations illustrate the thinking behind some of the guidelines but are not of course a comprehensive account. The appendix contains the current version.

Operational considerations

The Group 2 guidelines affect approximately 1.47 million vocational drivers which means a huge caseload to be dealt with at Swansea. Disorders which require notification have been severely curtailed for the ordinary licence-holder. The Group 2 licence-holder however has an obligation in law to report any disorder which may affect driving ability. It is not generally appreciated that the granting of a licence confers this responsibility. The development of heart disease requires the licence-holder to notify DVLA. The driving of vehicles covered by that licence entitlement must cease until it is confirmed that he/she is able to meet the relevant criteria that will allow licensing to occur. An attending physician should advise a driver accordingly but it is the driver's inherent duty to inform DVLA. The hours and days following the onset of a 'heart attack' are, after all, the most dangerous. To revoke a licence at a later date, perhaps on renewal, is certainly shutting the stable door after the horse has bolted.

Ignorance of these regulations is no defence in law, but there is a difficulty in disseminating the advice contained in the guidelines. The decision to reduce the time-off driving for ordinary drivers following pacemaker implantation from one month to one week was taken at the panel meeting in May 1998 because of the wealth of experience that early failure, which was a complication with more primitive lead systems, was highly improbable with modern leads. (This conference represents the first opportunity to make this information public.)

DVLA publishes *At a Glance Medical Aspects of Fitness to Drive* every two years, most recently in March 1998. This is sent to every general practitioner, although not to every hospital doctor for whom different contractual arrangements exist. The fuller publication *Medical Aspects of Fitness to Drive (The Red Book)* contains useful accounts of the reasoning behind the guidelines, but as this is published by the Medical Commission on Accident Prevention, the latest edition came out in 1995 and is no longer accurate. The British Heart Foundation issues *Factfiles* which are widely distributed and appreciated. But there is no formal reliable method of communicating the decisions of all the advisory panels to the doctors to the DVLA. Hopefully this will change in future with the development of a DVLA website.

Wider issues which have an impact on driving and heart disease exist. One is the attitude of insurance companies. Their approach is broadly similar to that of DVLA and there are obvious regular interactions between the two establishments. An example is the driver who has a short-term licence whose premiums may be increased. But the goal, namely safety on the roads, means that there is seldom a conflict of interest between DVLA and driver insurers. Drivers do of course have to notify both DVLA and their insurance company if they develop a relevant disability.

Another issue is the driver from Europe, notably the LGV driver. The European Society of Cardiology recently appointed a Task Force to study the subject, which has just published its report.¹³ It is to be hoped that the recommendations, which are very like those in the UK, will be widely adopted. However, it has to be admitted that the minimal regulations that exist in certain countries mean that the drivers of some large vehicles from the European mainland who arrive on British shores at the moment may not have been medically scrutinised in a satisfactory manner. A further problem emanating from Brussels is the decision to downsize the LGV and PCV definitions, which means that the data from Taylor⁴ for example, can no longer be applied with such authority, although the principles remain correct.

The guidelines evolved by the cardiovascular panel at DVLA are being used by others as a basis for their own advice to other workers in 'safety critical' jobs, e.g. London Transport, Railtrack. There will however always be certain workforces for whom no increased risk is acceptable. Seafarers, at least in UK-registered vessels over 1,600 tons, are one such group for whom the development of heart disease means a shore-based job. Road tanker drivers in some companies are another.

In conclusion, three-quarters of road traffic accidents resulting from cardiovascular incapacity occur in drivers with previously diagnosed disease. Case-fatality rates for accidents involving LGVs and PCVs are higher, and hence vocational drivers are subject to more stringent guidelines

than ordinary drivers. The *modus operandi* of the medical unit at DVLA and the cardiovascular panel, the evolution of the current guidelines, and their application are described.

REFERENCES

- ¹ Grattan E, Jeffcoate GO. Medical factors and road accidents. *BMJ* 1968; **1**:75-9.
- ² Herner B, Smedby B, Ysander L. Sudden illness as a cause of motor vehicle accidents. *Br J Ind Med* 1966; **23**:37-41.
- ³ Halinen MO, Jaussi A. Fatal road accidents caused by sudden death of the driver in Finland and Vaud, Switzerland. *Eur Heart J* 1994; **15**:888-94.
- ⁴ Taylor J. In: *Medical aspects of fitness to drive* London: Medical Commission on Accident Prevention, 1995.
- ⁵ Christian MS. Incidence and implications of natural deaths of road users. *BMJ* 1988; **297**:1020-4.
- ⁶ Hossack DS. Death at the wheel: a consideration of cardiovascular disease as a contributory factor to road accidents. *Med J Aust* 1974; **1**:164-6.
- ⁷ Joy MD, Broustet J-P. Cardiovascular fitness to fly and to drive: the inter-face between cardiology and statutory fitness requirements. In: *Diseases of the heart* Julian DG, Camm AJ, Fox KM *et al* (eds). London: Balliere-Tindall; 1996.
- ⁸ Bruce RA, Fisher LD. Strategies for risk evaluation of sudden cardiac incapacitation in men in occupations affecting public safety. *J Occupat Med* 1989; **31**:126-33.
- ⁹ Weiner DA, Ryan TJ, McCabe CH *et al*. Prognostic importance of a clinical profile and exercise test in medically treated patients with coronary artery disease. *J Am Coll Cardiol* 1984; **3**:772-9.
- ¹⁰ McNeer *et al*. The role of the exercise test in the evaluation of patients for ischaemic heart disease. *Circulation* 1978; **57**:64-70.
- ¹¹ Miles WM. Driving issues related to arrhythmic syncope. *Cardiol Clin* 1997; **15**:327-39.
- ¹² Epstein AE, Miles WM, Berdott DIG *et al*. Personal and public safety issues related to arrhythmias that may affect consciousness: implications for regulation and physician recommendations.
- ¹³ Petch MC. Task force report: driving and heart disease. *Eur Heart J* 1998; **19**:1165-77.

APPENDIX
Cardiovascular fitness requirements (revised 1998)*

CARDIOVASCULAR DISORDERS	GROUP 1 ENTITLEMENT	GROUP 2 ENTITLEMENT
<p>ANGINA Stable/Unstable</p>	<p>Driving must cease when symptoms occur at rest or at the wheel. Driving may recommence when satisfactory symptom control is achieved. DVLA need not be notified.</p>	<p>Refusal or revocation with continuing symptoms (treated and/or untreated). Relicensing may be permitted when free from angina for at least 6 weeks, provided that the exercise test requirements can be met and there is no other disqualifying condition.</p>
<p>MYOCARDIAL INFARCTION CABG</p> <p>ANGIOPLASTY</p>	<p>Driving must cease for at least 4 weeks. Driving may recommence thereafter provided there is no other disqualifying condition. DVLA need not be notified.</p> <p>Driving must cease for at least 1/52. Driving may recommence provided no other disqualifying condition. DVLA need not be notified.</p>	<p>Disqualifies from driving for at least 6/52. Relicensing may be permitted thereafter provided that the exercise test requirements can be met and there is no other disqualifying condition.</p>
<p>PERIPHERAL VASCULAR DISEASE</p>	<p>Driving may continue unless other disqualifying condition.</p> <p>DVLA need not be notified.</p>	<p>Relicensing may be permitted provided that there is no symptomatic myocardial ischaemia, the exercise test requirements can be met and there is no other disqualifying condition. When exercise testing <u>cannot</u> be completed to the required level, specialist cardiological opinion may be required.</p>
<p>HYPERTENSION</p>	<p>Driving may continue <u>unless</u> treatment causes unacceptable side-effects.</p> <p>DVLA need not be notified.</p>	<p>Disqualifies from driving if resting BP consistently 180 mmHg systolic or more and/or 100 mmHg diastolic or more. Relicensing may be permitted when controlled and treatment does not cause side-effects which may interfere with driving.</p>
<p>AORTIC ANEURYSM including MARFANS SYNDROME</p>	<p>Driving may continue unless other disqualifying condition. DVLA need not be notified.</p>	<p>Disqualifies from driving if the aortic transverse diameter is >5.0 cms. Re(licensing) may be permitted following satisfactory repair unless there is other disqualifying condition.</p>

*The left hand column lists the conditions that should prompt consideration of driving entitlement. The middle- and right-hand columns list the precise requirements which prompt withdrawal of that entitlement in bold type and the requirements which enable the driver to regain entitlement in light type. Group 1 applies to ordinary driving licences and Group 2 to vocational licences.

<p>ARRHYTHMIA Sinoatrial disease Significant atrio-ventricular conduction defect Atrial flutter/fibrillation Narrow or broad complex tachycardia See also Pacemaker and ICD Section NB: Transient Arrhythmias occurring during the acute phase only of a myocardial infarction or CABG do not require assessment under this Section.</p>	<p>Driving must cease following incapacity due to an arrhythmia. Driving may be permitted when underlying cause has been identified and controlled for at least 4/52.</p> <p>DVLA need not be notified unless there are distracting/disabling symptoms.</p>	<p>Disqualifies from driving if the arrhythmia has caused or is likely to cause incapacity (including systemic embolism)* Driving may be permitted when arrhythmia controlled for at least 3/12, provided that the LV ejection fraction is > 0.4, the exercise test requirements can be met and there is no other disqualifying condition.</p> <p>*See Valve Section</p>
<p>PACEMAKER IMPLANT</p> <p>SUCCESSFUL CATHETER ABLATION</p>	<p>Driving must cease for 1/52. Driving may be permitted thereafter provided no other disqualifying condition. Licence shall be subject to review at least every 3 years.</p> <p>Driving must cease for 1/52. Driving may be permitted thereafter provided no other disqualifying condition. DVLA need not be notified</p>	<p>Disqualifies from driving for 3/12. Re(licensing) may be permitted thereafter unless there is other disqualifying condition</p> <p>Disqualifies from driving for 6/52. Re(licensing) may be permitted thereafter unless there is other disqualifying condition</p>
<p>ICD IMPLANT</p>	<p>Driving may occur when the following criteria can be met:</p> <ol style="list-style-type: none"> (1) The device must have been implanted for at least 6 months and shall not have discharged during the past 6 months (except during formal clinical testing). (2) Any previous discharge must not have been accompanied by incapacity. (3) The device is subject to regular review with interrogation. (4) A period of 1 month off driving must elapse following any revision of the device (generator or electrode) or alteration of anti-arrhythmic drug treatment. (5) There is no other disqualifying condition. The licence shall be subject to annual review. 	<p>Permanently bars.</p>
<p>ATRIAL DEFIBRILLATOR (patient activated)</p>	<p>Driving may continue provided no other disqualifying condition.</p>	<p>Re/licensing may be permitted provided the arrhythmia section is met and there is no other disqualifying condition.</p>
<p>HYPERTROPHIC CARDIOMYOPATHY (HCM) (See also Pacemaker, Arrhythmia and ICD sections).</p>	<p>Driving may continue provided no other disqualifying condition.</p> <p>DVLA need not be notified.</p>	<p>Disqualifies from driving if symptomatic. Relicensing may be permitted provided that the following criteria can be met and there is no other disqualifying condition:</p> <ol style="list-style-type: none"> (1) He/she is asymptomatic. (2) There is no family history of sudden cardiomyopathic death. (3) The cardiologist can confirm that the HCM is anatomically mild. (4) No serious abnormality of heart rhythm disturbance has been demonstrated, i.e. ventricular tachyarrhythmia excluding isolated VPBs. (5) Hypotension does not occur during exercise testing.

<p>DILATED CARDIOMYOPATHY</p> <p>(See also Pacemaker, ICD and arrhythmia sections)</p> <p>HEART FAILURE</p>	<p>Driving may continue provided no other disqualifying condition.</p> <p>DVLA need not be notified.</p> <p>Driving may continue provided there are no disqualifying symptoms and no other disqualifying condition.</p> <p>DVLA need not be notified.</p>	<p>Disqualifies from driving if symptomatic.</p> <p>Relicensing may be permitted provided that there is no other disqualifying condition.</p> <p>Disqualifies from driving if symptomatic.</p> <p>Relicensing may be permitted provided that the LV ejection fraction as measured by contrast angiography (or equivalent) is >0.4, the exercise test requirements can be met and there is no other disqualifying condition.</p>
<p>HEART AND/OR LUNG TRANSPLANT</p>	<p>Driving may continue provided no other disqualifying condition.</p> <p>DVLA need not be notified.</p>	<p>Disqualifies from driving if symptomatic.</p> <p>Relicensing may be permitted provided that there is no other disqualifying condition.</p>
<p>HEART VALVE DISEASE (to include surgery, i.e. replacement and/or repair)</p>	<p>Driving may continue provided no other disqualifying condition.</p> <p>DVLA need not be notified</p>	<p>Disqualifies from driving:</p> <p>(1) whilst symptomatic,</p> <p>(2) for 12 months after cerebral embolism <u>prior</u> to anticoagulant therapy,</p> <p>(3) <u>permanently</u> after systemic embolism whilst on anticoagulant therapy.</p> <p>Relicensing may be permitted provided that there is no other disqualifying condition.</p>
<p>CONGENITAL HEART DISEASE</p>	<p>Driving may continue provided there is no other disqualifying condition.</p> <p>DVLA need not be notified.</p> <p>NB: Arrhythmogenic right ventricular dysplasia and licensing fitness will be considered on an individual basis.</p>	<p>Disqualifies from driving when complex or severe disorder(s) is (are) present.*</p> <p>Those with minor disease and others who have had successful repair of defects or relief of valvular problems, fistulae etc. may be licensed provided that there is no other disqualifying condition.</p> <p>*Further details available from DVLA on request.</p>
<p>SYNCOPE</p> <p>(See also Neurological Section regarding unexplained loss of consciousness)</p>	<p>Driving must cease whilst symptoms persist.</p> <p>Driving may recommence once cause identified and symptoms controlled.</p>	<p>Disqualifies from driving following single or recurrent episodes.</p> <p>Unexplained syncope requires Specialist evaluation to include:</p> <p>(1) provocation testing.</p> <p>(2) investigation for arrhythmia.</p> <p>(3) neurological review if appropriate.</p> <p>Re(licensing) may be permitted 3/12 after the event provided that the results are satisfactory.</p>
<p>ECG ABNORMALITY</p> <p>Suspected myocardial infarction</p> <p>Left Bundle Branch Block</p> <p>PRE-EXCITATION</p>	<p>Driving may continue unless other disqualifying condition.</p>	<p>Re(licensing) may be permitted provided that there is no other disqualifying condition and the exercise test requirements can be met.</p> <p>May be ignored <u>unless</u> associated with an arrhythmia (see Arrhythmia Section) or other disqualifying condition.</p>

GROUP 1 AND 2 ENTITLEMENTS

- **Medication**

If drug treatment for any cardiovascular condition is required then any adverse effect which may affect driver performance will disqualify.

GROUP 2 ENTITLEMENT ONLY

- **Licence duration**

An applicant or driver who has, after cardiac assessment, been permitted to hold either LGV or PCV licence will usually be issued with a short term licence (maximum duration three years) renewable on receipt of satisfactory medical reports.

- **Exercise testing**

Exercise evaluation shall be performed on a bicycle or treadmill. Drivers should be able to complete three stages of the Bruce protocol or equivalent safely, without anti-anginal medication for 48 hours and should remain free from signs of cardiovascular dysfunction, viz. angina pectoris,

syncope, hypotension, sustained ventricular tachycardia, and/or electrocardiographic ST segment shift which accredited medical opinion interprets as being indicative of myocardial ischaemia (usually >2mm horizontal or down-sloping). In the presence of established coronary heart disease exercise evaluation shall be required at regular intervals not to exceed three years.

If the cause of the chest pain is in doubt an exercise test should be carried out as above. Those with a locomotor disorder who cannot comply will require specialist cardiologist opinion.

N.B. CORONARY ANGIOGRAPHY

In coronary heart disease angiography is not required for (re-)licensing purposes. If angiography has been undertaken (re-)licensing will not normally be permitted if the left ventricular ejection fraction is equal to or <0.40 on contrast angiography, or if there is significant proximal, unrelieved coronary arterial stenosis (left main and proximal left anterior descending equal to or >30% or proximal >50% elsewhere unless subtending a completed infarction).

Myre Sim Prize for Student Reports

Students are invited to submit a report for publication in *Proceedings* on the work they have undertaken during their elective period in this country or abroad. These should refer to work carried out by the student in either a clinical or laboratory setting. Each published paper will be judged by the Myre Sim Trustees, with advice from the Editor, and be eligible for a prize of up to £500. The decision of the Trustees will be final.

For further information, contact the Editorial staff at the Royal College of Physicians of Edinburgh:

Tel: 0131-225-7324

Fax: 0131-220-3939

email: editorial@rcpe.ac.uk