alteplase had a 30 day mortality of 19% (250/1297) and streptokinase treated patients a mortality of 21% (486/2358) compared with 4.4% (398/9039) and 5.5% (979/17 804) respectively for those aged 75 and under.[7] A recent French study showed a relative risk of 4.65 for five day mortality among those aged over 80 years (compared with those aged 50 and under).[8]

An overview of large trials showed no significant differences in the proportional mortality reductions achieved by thrombolytic therapy between different subgroups, so the absolute reduction in deaths is greater among those, such as elderly people, with a higher mortality.[9] In addition to reductions in hospital and short term mortality for elderly subjects, there is evidence of long term benefit: the four year follow up of ISIS-2 showed survival benefits of streptokinase treatment for at least four years, irrespective of age.[10] The benefits of thrombolytic therapy in the elderly are also cost effective.[11]

The increased incidence of adverse events with increasing age, particularly intracerebral haemorrhage, has inhibited widespread use of thrombolytic treatment among elderly patients. In the GUSTO-1 trial the incidence of intracerebral haemorrhage among patients aged over 75 was 2.08% in those treated with alteplase and 1.23% in those treated with streptokinase compared with 0.52% and 0.42% respectively among patients aged 75 and under.[7] In selecting elderly patients for thrombolytic therapy, clinicians need to take account of other factors that increase the risk of intracerebral haemorrhage: hypertension, low body weight, oral anticoagulants before admission, female sex (even after adjustment for worse baseline characteristics), and history of cerebrovascular disease.

Even in the absence of specific contraindications older patients still receive thrombolytic treatment less often than younger ones.[4] Although the incidence of stroke is higher in elderly people, the greater overall mortality reduction with thrombolytic treatment may result in greater net clinical benefits. The alternative strategy of primary angioplasty to avoid the increased bleeding risk of thrombolytic therapy cannot be recommended in view of the lack of data on primary angioplasty in patients over 75 years.

The lack of data on elderly patients is particularly pronounced in those over 85 years, who are increasingly encountered in clinical practice. The COBALT study population of 7169 patients included 96 over 85 years, who had a remarkably high 30 day mortality (31% *v* 7.4% for those ⩽ 85 years).[12]

Age is the most important predictor of survival after acute myocardial infarction. Most of the available data support the use of thrombolytic treatment in elderly patients with acute myocardial infarction. While a slightly higher rate of adverse events, particularly intracerebral haemorrhage, may be expected, overall more lives will be saved and mortality benefits maintained for several years. Despite this evidence, advanced age remains one of the strongest predictors for not receiving thrombolytic therapy. To enable clinicians to make informed decisions about the use of thrombolytic treatment in their elderly patients, particularly the very elderly, future trials of thrombolytic therapy should avoid age related exclusion criteria.

Stephen R McMechan *Specialist registrar in cardiology*
A A Jennifer Adgey *Professor of cardiology*

Regional Medical Cardiology Centre, Royal Victoria Hospital, Belfast BT12 6BA

1 Rask-Madsen C, Jensen G, Kober L, Melchior T, Torp-Pedersen C, Hildebrand P. Age-related mortality, clinical heart failure, and ventricular fibrillation in 4259 Danish patients after acute myocardial infarction. *Eur Heart J* 1997;18:1426-31.
2 Gurwitz JH, Col NF, Avorn J. The exclusion of the elderly and women from clinical trials in acute myocardial infarction. *JAMA* 1992;268:1417-22.
3 Brown N, Young T, Gray D, Skene AM, Hampton JR. Inpatient deaths from acute myocardial infarction, 1982-92: analysis of data in the Nottingham heart attack register. *BMJ* 1997;315:159-64.
4 European Secondary Prevention Study Group. Translation of clinical trials into practice: a European population-based study of the use of thrombolysis for acute myocardial infarction. *Lancet* 1996;347:1203-7.
5 White HD, Barbash GI, Califf RM, Simes RJ, Granger CB, Weaver WD, et al. Age and outcome with contemporary thrombolytic therapy. Results from the GUSTO-1 trial. *Circulation* 1996;94:1826-33.
6 Fibrinolytic Therapy Trialists' (FIT) Collaborative Group. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomised trials of more than 1000 patients. *Lancet* 1994;343:311-22.
7 The GUSTO Investigators. An international randomised trial comparing four thrombolytic strategies for acute myocardial infarction. *N Engl J Med* 1993;329:673-82.
8 Danchin N, Vaur L, Genes N, Renault M, Ferrieres J, Etienne S, et al. Management of acute myocardial infarction in intensive care units in 1995: a nationwide French survey of practice and early hospital results. *J Am Coll Cardiol* 1997;30:1598-605.
9 Reperfusion Therapy Consensus Group. Selection of reperfusion therapy for individual patients with evolving myocardial infarction. *Eur Heart J* 1997;18:1371-81.
10 Baigent C, Collins R. ISIS-2: 4-year mortality follow up of 17,187 patients after fibrinolytic and antiplatelet therapy in suspected acute myocardial infarction. *Circulation* 1993;88 (suppl):1-291.
11 Ramanathan K, Ellis CJ, White HD. Thrombolytic therapy in the elderly. Pharmacoeconomic considerations. *Drugs and Aging* 1996;8:237-44.
12 COBALT Investigators. A comparison of continuous infusion of alteplase with double-bolus administration for acute myocardial infarction. *N Engl J Med* 1997;337:1124-30.

Hours, sleep, teamwork, and stress

Sleep and teamwork matter as much as hours in reducing doctors' stress

> For every complex problem there is a simple solution … and it's wrong
>
> H L Mencken

Many studies show that the quality of patient care can be severely affected by the stress levels of clinical staff, particularly doctors.[1] We know too that doctors suffer high levels of stress and depression,[2] more so than other workers.[3] Strategies aimed at resolving the working difficulties of British doctors in training have been concerned primarily with the long, often excessive, hours worked. Following tough central directives and hard work by local task forces, many doctors now work fewer hours than five years ago. Has this reduced stress levels—or is there more to be done?

Hours of work are easy to measure and as a strategy of stress reduction reducing them has an attractive

BMJ 1998;317:1335–6

logic. However, very little evidence confirms a relation between the number of hours worked and the level of stress or depression experienced.[1] Moreover, other factors cause junior doctors greater stress than hours alone—for example, difficult relationships with senior doctors.[4] Not surprisingly therefore recent studies show stress levels to be still high,[3] training adversely affected, and satisfaction with new shift systems far from positive.[5]

The causes of stress are clearly more complex than this focus on hours implies. Research in other workers suggests that loss of sleep rather than long hours of work is the problem, causing decrements in mood and performance,[1] and this has also been confirmed in doctors.[6–7] The quality of sleep is also important, and evidence shows that this is inferior in those on call, expecting to be woken, who show greater sleepiness the following day.[8] Thus traditional approaches to the demands of patient care, relying on long periods of on call—and broken sleep—are no longer sustainable.

But the experience of stress is not only a reaction to harmful external influences: stressors are counteracted by positive aspects of work, such as support from colleagues and seniors. Senior doctors often underestimate the impact they have on the working lives of their juniors. For example, the more time consultants dedicate to supervision and training, including feedback and appraisal, the more satisfied junior doctors are with their posts.[9]

We also know that membership of a well functioning team—one with clear team and individual goals, that meets together often, and that values the diverse skills of its members—reduces stress levels and increases performance.[10] The ability to create such a team may not always come naturally, and the white papers' identification of team leadership skills as part of clinical governance is encouraging.

Thus coherent teamwork is crucial for the delivery of good quality patient care both directly in terms of efficient and effective services, and indirectly via its effects on reducing stress. Apart from their opportunities for support and supervision, teams are micro-organisations that are capable of innovative approaches to making on call commitments both practicable and bearable—perhaps even fulfilling.

Established patterns of working that did well enough when demands were less intense are not appropriate for current health care: new working practices need to respond to changes such as shorter patient stays, increased ambulatory care, and heightened patient expectations. Individual solutions will depend on local circumstances, but there are innovative examples of teamwork patterns that minimise sleep deprivation by looking at the whole context of patient care.[11] Most solutions require collaboration between managers, doctors, nurses, and other professions. For example, many of the tasks and questions about patient care at night can and should be done by staff other than doctors.[12] Rotas and on call commitments need to be organised in the context of the daily activity of the team. Outpatient clinics, endoscopy lists, and routine surgery need not be scheduled to coincide with a team's responsibilities for emergency care. And on call commitments for emergencies should be understood as a 48 hour commitment—the day of and the day after "take." Moreover, work patterns may need to respond to the experience—or inexperience—of team members: Do consultants, for example, reduce their or their registrars' clinic lists in order to support the new preregistration house officers in that first week in August?

These solutions are all a matter of good organisational practice. Hospitals have a duty to provide a culture and structure in which good teams can flourish, perhaps using protocols for their management and development in much the same way as they would apply protocols for the management of patient care. Consultants are crucial in this process; they need to appreciate their potential influence—both positive and negative—on stress experienced by doctors in training. But they also need the authority, the skills, and the time to work with other healthcare professionals, including senior nurses, to develop and nurture coherent and functioning multiprofessional clinical teams. Such teams need to be aware of all the responsibilities of a unit and, with knowledge of each other's work, develop ways of working together and supporting each other. The best ways will vary between hospitals and specialties, and the organisational changes will be more taxing than simply changing rotas to meet new limits on doctors' hours. But unless the work of doctors is understood in the context of supportive teams, future generations of doctors will be as stressed as their predecessors. The focus on hours has been an important first step, but now it is time to develop more innovative ways to improve the quality of work for doctors and other health professionals—and with it the quality of patient care.

Jenny Firth-Cozens *Director*

Centre for Clinical Psychology Research, University of Northumbria at Newcastle, Newcastle upon Tyne NE1 8ST
(j.firth-cozens@unn.ac.uk)

Fiona Moss *Associate dean of postgraduate medicine*

North Thames, Thames Postgraduate Medical and Dental Education, London WC1 N3J

1 Firth-Cozens J. Stress, psychological problems, and clinical performance. In Vincent C, Ennis M, Audley RMJ, eds. *Medical accidents*. Oxford: Oxford University Press, 1993.
2 Caplan RP. Stress, anxiety and depression in hospital consultants, general practitioners, and senior health service managers. *BMJ* 1994;309:1261-3.
3 Wall TD, Bolden RI, Borrill CS, Carter AJ, Golya DA, Hardy GE, et al. Minor psychiatric disorder in NHS trust staff: occupational and gender differences. *Br J Psych* 1997;171:519-23.
4 Firth-Cozens J. Sources of stress in junior doctors and general practitioners. *Yorkshire Medicine* 1995;7:10-3.
5 Baldwin PJ, Newton RW, Buckley G, Roberts MA, Dodd M. Senior house officers in medicine: postal survey of training and work experience. *BMJ* 1997;314:740-3.
6 Firth-Cozens J. Individual and organisational predictors of depression in general practitioners. *Br J Gen Pract* (in press).
7 Arnetz BB, Akerstedt T, Anderzen I. Sleepiness in physicians on night call duty. *Work and Stress* 1990;4:71-3.
8 Torsvall L, Akerstedt T. Disturbed sleep while being on-call: An EEG study of ships' engineers. *Sleep* 1988;11:35-8.
9 Paice E, Moss F, West G, Grant J. Association of use of a log book and experience as a preregistration house office: an interview survey. *BMJ* 1997;314:213-5.
10 Sonnetag S. Work group factors and individual well-being. In: West MA, ed. *Handbook of work group psychology*. Chichester: Wiley, 1996.
11 Read M, Draycott T, Beckwith J. Night vision. *Health Service Journal* 1988; 5 Jan:24-5.
12 McKee M, Black N. Junior doctors' work at night: What is done and how much is appropriate? *J Pub Health Med* 1993;15:16-24.