Is it possible to "achieve a balance" and meet the "safety net"?

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On behalf of the Paediatric Advisory Subcommittee to the North West Thames Regional Health Authority

Abstract

The government's document *Hospital Medical Staffing—Achieving a Balance—Plan for Action* introduced the concept of a "safety net"—that is, a minimum safe level of staffing—of junior doctors in the acute specialties. The North West Thames Paediatric Advisory Group has therefore reviewed the implications and consequences of implementing the safety net in respect of children's services. The group found that if a reasonable safety net was to be provided that enabled the services to stay within the projected junior staffing levels, maintain a balance, meet training needs, and reduce junior doctors' hours of work, then changes in the organisation of the services would be required. Examining the options available showed that to achieve a safety net within the projected numbers of junior staff at least six paediatric units in the region would have to close.

It is doubtful if there is the political will to support the very radical changes that would be needed in the distribution of services if the government's recommendations in *Achieving a Balance* were to be implemented. The profession, the Department of Health, and the public must be made aware that the proposed changes in medical staffing will cause a fundamental change in the traditional pattern of delivery of health care.

Introduction

The document *Hospital Medical Staffing—Achieving a Balance—Plan for Action* has been hailed as "the way forward" to achieve the twin goals of meeting the career aspirations of doctors in training and providing a consultant based medical service.[1] The document (p 29, par 56) makes recommendations about the need for a minimum safe level of staffing—the "safety net"—required to provide 24 hour hospital emergency cover in acute specialties. Other than "experience appropriate to the specialty," no advice is given about the type and number of staff who should constitute the safety net.

The work undertaken by junior doctors in paediatrics includes:

- Acute emergency work arising from obstetric and neonatal units, requiring the skilled resuscitation and ventilation of babies. This occurs wherever babies are born, both in district general hospitals and in specialised neonatal intensive care units
- Emergency care of infants and children, including those attending accident and emergency departments
- The care of children with chronic illnesses
- Helping in the care of children admitted to surgical specialties
- Using special diagnostic, technical, and therapeutic skills to care safely for children
- Participation in outpatient work and other types of ambulatory care.

The safety net needs to reflect the wide range of skills and experience required to undertake these tasks with safety. The British Paediatric Association has issued recommendations for minimum requirements of junior staff in acute paediatric units (policy statement, March 1988) and asks that priority should be given to implementing these when regions review the safety net.

We report the findings of a working party of the North West Thames Regional Paediatric Advisory Subcommittee set up to develop criteria for and review the consequences of implementing the safety net for children's services in its region.

Method

In order to assess the practical implications of implementing the safety net the following working definition was established: safety net doctors provide 24 hour cover and are resident "on call" staff who can provide immediate and skilled emergency care to children of different ages and who report directly to the responsible consultant. Once defined, the following guidelines were agreed:

(1) Separate safety nets are needed for (*a*) general acute paediatrics and (*b*) neonatal intensive care at the regional and subregional perinatal centres.

(2) Senior registrars, career registrars, associate specialists, staff grade doctors, and senior house officers with greater than 12 months' paediatric experience were considered to have gained sufficient clinical skill and practical knowledge to be safety net doctors in general paediatrics.

(3) Senior house officers would not be included in the safety net for neonatal intensive care units. These juniors were unlikely to have sufficient experience and skill to care for very sick neonates.

(4) Visiting registrars could be included only if they had appropriate experience. This must include knowledge of the full range of the social aspects of child care expected in the United Kingdom, especially the handling of child abuse.

(5) At least one additional junior doctor in training should be available immediately on call with a safety net doctor. This is needed because it is not uncommon for emergencies to occur simultaneously in the labour ward, the accident and emergency department, or the general ward.

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(6) The assumption was made that the region would recruit its full quota of visiting registrars.

(7) No on call rota should be more onerous than one in three.

(8) Cross cover between paediatrics and other specialties is not considered appropriate.

(9) Sufficient senior house officer posts should be available to give a minimum of one year's suitable training before a doctor could become part of the safety net.

These guidelines enabled the following calculations for the region's safety net to be made based on the assumption that the stated regional strategy to redevelop multiple sites on to two and single site acute units would be achieved and that the projected numbers of staff were available. The staff available to form the safety net would be nine senior registrar posts (the existing number); 28 registrar posts (14 career, and 14 visiting (that is, the indicative quotas issued to the region by the central joint planning advisory committees)); and 62 senior house officer posts (the existing number; the 16 general practitioner vocational trainees were excluded from the safety net). Staff were then allocated to the paediatric sites in the region. If the required staff exceeded the projected available staff, then sites were removed one at a time until the numbers of staff required and projected coincided. No allowance was made for subspecialty training needs.

TABLE I—*"Safety net" for paediatrics, showing staff needed for existing number of units*

Paediatric units	Senior registrars	Associate specialist or staff doctors	Registrars			Safety net senior house officers	Non-safety net senior house officers
			Visiting	Career	Academic		
1			1	1		2	3
2*	1	1	2	1		3	3
3*			4	1		4	3
4				1		3	3
5				1		3	3
6†						4	
7*	1		3	1		3	3
8*	1	1	2	1		3	3
9†						4	
10*	1	1	3	1		2	3
11*			4	1		3	3
12†						4	
13		1		2		1	3
14						4	3
15				1		3	3
16*	2			1	2	3	3
17						4	3
18*	3			1	3	1	3
19						4	3
Total	9	4	19	14	5	58	48
							106

*Neonatal intensive care. †Paediatrics without maternity care.

TABLE II—*"Safety net" for paediatrics based on using indicative quotas and reducing the number of paediatric units*

Paediatric units	Senior registrars	Associate specialist or staff doctors	Registrars			Safety net senior house officers	Non-safety net senior house officers
			Visiting	Career	Academic		
1				1		3	3
2*	1	1	2	1		3	3
3*			3	1		3	3
4				1		3	3
5				1		3	3
—							
7*	1		2	1		3	3
8*	1	1	2	1		3	3
—							
10*	1	1	2	1		3	3
11*			2	2		4	3
—							
13		1		1		2	3
—							
15				1		3	3
—							
17*	2		1	1	2	3	3
—							
19*	3			1	3	2	3
Total	9	4	14	14	5	38	39
							77

*Neonatal intensive care.

Results

There are currently 19 paediatric units in the North West Thames region (in 13 health districts), including two teaching districts. Not all are associated with neonatal intensive care or maternity units. Table I gives the numbers of posts required to achieve the safety net based on the existing number of paediatric units (but with site reductions as currently proposed). The table shows that it would be possible to achieve the safety net only if the numbers of registrars were increased by 10 (if the academic posts are excluded), the numbers of senior house officers were increased by 44, and 55% of the senior house officers in post (that is, 58/106) had at least 12 months' paediatric experience.

Table II shows how the safety net might be achieved by reducing the number of paediatric sites to 13, representing closure of six units, and then only if the visiting registrars were in every way comparable in experience with career registrars and 49% of the senior house officers (38/77) had at least 12 months' experience in paediatrics.

Discussion

The foreword of *Achieving a Balance* simplifies the intended reform of hospital staffing structure by stating that the needs are (*a*) to increase the numbers of consultants, (*b*) to plan the numbers of doctors in training grades to take account of career prospects, and (*c*) to maintain the necessary levels of junior staff support for consultants, especially in the acute specialties. No account, however, is taken of the different demands and needs of the various specialties.

The criteria for a safety net defined by our group are in line with the British Paediatric Association's recommendations and provide a basis on which to plan. It is important to realise that the criteria are currently not being met in most paediatric units in the region. At issue is whether the safety net can be achieved with the projected or even existing resources.

The starting point of *Achieving a Balance* seems to be an expansion of numbers of consultants with training grades to relate directly to these numbers rather than to service need. Paediatric workload is heavy and cannot easily be equated with that of other acute specialties; many planners, often with "adult" medical backgrounds, fail to appreciate the widely varied work of paediatricians. If consultants were expected to provide all this service and meet their existing day to day obligations, often at several sites, a massive increase in numbers would be required at prohibitive cost.

Research and academic posts at junior level fit uneasily into a career opportunity related medical manpower scheme, particularly one in which numbers are controlled and a safety net is to be provided. The existing proposals make no allowance for time out for research, which is an important component of the training of a consultant. In order to provide and maintain a safety net training opportunities are needed for inexperienced people to gain relevant experience. The requirement of a one in three on call rota, the demand for general practitioner vocational training schemes, and the need for a shift on call system in neonatal intensive care units all argue for increased training in paediatrics and not less. An expansion of the senior house officer grade would be needed to do this.

With limits on numbers of staff, the legitimate demands of the service, and junior support for consul-

tants the requirements of training, research and academic medicine, and career balance can be met only by reductions in the numbers of units providing inpatient care. If paediatric services are contracted there would be a knock on effect on accident and emergency, obstetric, and other acute services. Fewer and larger units are needed if there is to be an economy of scale in terms of junior staff. These units also would need to be large enough to accommodate the workload for the whole population to be served. This is easy to say. Nevertheless, the difficulties associated with obtaining agreement to changes in the pattern of service or the closure of hospitals, even on grounds of quality and patient safety, must not be underestimated. The public and health authority members are concerned with the needs of local people who wish to keep their local units, not with the career aspirations of doctors.

It is very unlikely that there is the political will to change the service radically in order to meet the medical manpower needs. If this sort of change is to be achieved there must be much greater public understanding and discussion of the issues in the training of doctors and the provision of a safe service to patients throughout the 24 hours.

The alternative to reducing the number of sites is to follow through the suggestion in *Plan for Action* that a safety net would not be possible at all sites. This could lead to a two tier system with first and second class hospitals and first and second class consultants.

We believe that when other health authorities and districts undertake a similar exercise the conclusions and the options available to them will be similar to ours. Surely the time has come for the government, the profession, and health authorities to reassess the proposals in *Plan for Action*.

1 UK Health Departments, Joint Consultants Committee, Chairman of Regional Health Authorities. *Hospital medical staffing—achieving a balance—plan for action*. London: HMSO, 1987.

(Accepted 15 August 1989)

Scientific Tools in Medicine

Electrophoresis of proteins and nucleic acids: I—Theory

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Electrophoresis is used extensively in both routine clinical chemistry and biomedical research as a rapid method to separate macromolecules. The high resolution of proteins or nucleic acids that can be achieved by electrophoresis makes it an indispensable tool in the research laboratory. The separation of complex mixtures of either protein or nucleic acid polymers is most conveniently achieved with electrophoresis; indeed, often the separations obtained by electrophoresis cannot be achieved by any other method. By contrast, the separation of smaller molecules such as amino acids, nucleotides, sugars, or drugs is best achieved by high performance liquid chromatography. Hence electrophoresis and high performance liquid chromatography are generally considered to be complementary in their applications.

Electrophoretic techniques have revolutionised the study of pathophysiological processes at a molecular level for reasons that include the following:

- Methods of high resolving power have been developed
- Methods are easily manipulated and optimised for any application
- Many samples can be processed simultaneously, thereby allowing direct comparisons between standards, controls, and unknown samples
- Most methods are quick to perform
- Sensitive detection methods have been described
- Suitable equipment is available commercially and is inexpensive
- All methods can be used for analytical or preparative purposes.

In this article we discuss the theory of electrophoresis, and in our next article we will consider in detail the more powerful techniques available and their clinical applications.

Theory

Electrophoresis refers to the transport of ions or charged macromolecules through a solution by an electric field. Most biological macromolecules contain ionisable groups and under appropriate conditions (at the correct pH) will migrate in an electric field, but their movement is impeded by viscous drag. When a macromolecule migrates at a constant velocity during electrophoresis in free solution a balance exists between the electrical force and the viscous drag. The electrophoretic mobility of a charged particle under such circumstances in an insular medium can be described as:

$Eq = fv$, where E is electrical field, q is the charge on the particle, f is the frictional coefficient, and v is the constant velocity.[1] This equation can be rearranged as: $u = v/E = q/f$ to allow the mobility (u) of the macromolecule to be expressed as the velocity per unit field.

In practice, the situation is much more complicated because these equations assume that electrophoresis is performed in an inert medium that is not charged and is unaffected by the electric field.

The rate of migration of a macromolecule in an electric field, which depends on its size, shape, and charge, allows individual species to be distinguished and measured. The optimal separation of such macromolecules requires careful consideration of experimental conditions such as applied field, choice of buffer, and pore size of the support matrix as these variables can exert a considerable influence on the mobility of macromolecules during electrophoresis.

Choice of experimental approach

Figure 1 summarises the electrophoretic methods available. Some of the options available to the experimenter for selecting the most appropriate system for a particular application are outlined below.

NATURE OF SUPPORT MATRIX

Electrophoresis is carried out in a solution stabilised within a supporting gel matrix of polyacrylamide, agarose, cellulose acetate, or starch. Supporting matrices improve the resolution of proteins and nucleic acids by minimising the diffusion of the sample components that would occur in free solution and also

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Br Med J 1989;**299**:843-6