Economic approaches to doctor/nurse skill mix: problems, pitfalls, and partial solutions

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SUMMARY
Against a background of government calls for a radical change in the way the medical workforce is planned and trained, the concept of skill mix seeks to match clinical presentation to an intervention based on an appropriate level of skill and training. Health economics is not the only framework within which these changes can be analysed. However, unless the economic issues are thought through clearly there is a danger that resources may be used inefficiently. The aims of this paper are to outline the economic issues in the area of doctor/nurse skill mix and the problems of obtaining correct solutions from the perspective of efficiency. It concludes by offering a pragmatic framework which can facilitate decisions in this area. Although this paper is written from the perspective of primary care, it is equally relevant to skill mix in the secondary care sector.
Keywords: *skill mix; economic evaluation.*

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Introduction

DESPITE the recognition of a paucity of evidence of effectiveness and cost-effectiveness,[1] a recent government document has called for further radical change in the way in which the medical workforce is a planned and trained.[2] The move to reconfigure the workforce has been driven by a number of factors:

- The workforce is a major expenditure of the NHS budget. Against a background of increasing demands on limited resources there is a need to ensure the efficient use of this workforce.
- A more educated nursing sector has resulted in pressure on existing professional boundaries and access to many areas that were previously the prerogative of doctors.
- An evidence base is developing which suggests that, in many clinical areas, roles undertaken by doctors can be successfully transferred to nurses. Nurse-led personal medical services pilots have demonstrated that nurses can also lead the delivery of primary care.[3]
- An emphasis on a more holistic approach to care and a focus on prevention and health promotion has been claimed to be better suited to the characteristics of nursing.

While recognising the validity of other analytical frameworks, the aims of this paper are to outline the economic issues surrounding doctor/nurse skill mix and the problems of obtaining correct solutions from the perspective of efficiency. We emphasise the importance of an understanding of basic economic principles and offer a pragmatic economic framework to facilitate decisions in this area. Although this paper is written from the perspective of primary care, it is equally relevant to skill mix considerations in other healthcare sectors.

Analysing changes in the healthcare workforce — where does health economics fit in?

Health economics and the rational model of organisational change

In standard economics, skill mix is viewed in the context of technical efficiency, i.e. achieving maximum output from a given set of inputs, or from minimising costs for a given output. Inputs comprise the resources an organisation employs which include labour, capital, and land. Skill mix issues focus on the extent to which different labour inputs are substituted and the effect that this has on output. This decision-making framework requires values to be made explicit, objectives to be set, and the health system engineered

towards those defined targets (Figure 1).

However, this simple and stylised theory does not easily apply to health care, where outputs are multi-dimensional and complex.

Reality of organisational change

In reality, organisations do not start from a clean slate from which ideal choices can be made. Systems only develop within the framework which they have inherited, building on what has gone before. Often, organisations are memorials to old problems, institutional residues that reflect the historical processes through which problems have been tackled.[4]

Perspectives that include power, status, and gender retain a considerable influence on skill mix changes and health professionals may be reluctant to relinquish their traditional roles. Developments take place against a background of limited room for manoeuvre and extended lead times, owing to the long training requirements of health professionals. There is also the danger that analysing skill mix from a limited economic perspective will overlook any intrinsic differences between the traditional roles of doctors and nurses. These might not be revealed in an economic evaluation, yet they may be important in practice.

It is clear that there is a gap between the rational approach to analysing skill mix and the pragmatic requirements of policy makers who operate in a complex environment against a background of limited room for manoeuvre. A number of alternatives to the rational model for analysing the development of skill mix have been described. For example, Pratt[4] emphasises the importance of exploring purpose and building relationships and argues that co-evolution of partners is the most relevant mode, building on the strengths of each partner. Nevertheless, if economic considerations are overlooked then there is a danger that resources may be used inefficiently.

Concept of skill mix

The concept of skill mix seeks to match clinical presentation to an intervention based on an appropriate level of skill and training.[5] Some advantages of working in teams are shown in Figure 2.

Over the past decade there has been a rapid expansion of the role of nurses, driven by a commitment to an NHS based on teamwork between health professionals. These changes have not been planned centrally; however, with increasing demands on limited resources, they offer an attractive option for policy makers.

A rational analysis of doctor/nurse skill mix is complicated by three factors :

1. *Limited evidence base*. Although it has been suggested that 30–70% of all tasks performed by doctors could be carried out satisfactorily by nurses,[6] most studies reviewed were undertaken in the United States and are unlikely to be relevant to the NHS. A recent review of 2500 primary care publications found that it was difficult to form a coherent overview of service provision in terms of the nature and cost-effectiveness of skill mix.[7] However, the evidence base is developing rapidly and is suggesting that, in many areas, nurses can give equal or better outcomes than doctors.
2. *Lack of clarity about strategic objectives.* Strategic options and their resource implications are complex and include combinations of doctor/nurse, investment/disinvestment, and substitution/complementation. Nurses can substitute for doctors, either releasing doctor time to enhance care in other areas or reducing medical manpower requirements. For example, nurses can manage minor illness in primary care with similar outcomes to GPs.[8] Nurses have also been shown to be capable of delivering a more extensive package of primary care from nurse-led primary care sites.[3] Alternatively, nurses can complement doctors, enhancing interventions in specific areas. For example, a dermatology nurse working alongside GPs can enhance the dermatology care of patients in general practice.[9] A third option is that increased nurse availability may lead to additional consultations through identifying unmet need. Patients who would not have previously consulted may now do so and there is some indirect evidence to support this. For example, a study on the impact of nurse practitioners in primary care showed no reduction in the rate of GP consultation.[10]
3. *Identifying the difference between nurses and doctors.* Effective teamwork is driven by the difference between members. Although some commentators see nursing as a discipline that is distinct from medicine,[11] we contend that, for the purposes of an economic analysis, doctor/nurse skill mix should be developed within a spectrum of care characterised by complexity and uncertainty of tasks and not by unique roles that infer that nurses are intrinsically different from doctors.[12] For example, Figure 3 shows the range of interventions that are delivered in primary care within a continuum of care, based on complexity of task and individual discretion. Nurses in primary care receive less training, accept less responsibility, and deal with less uncertainty. As a result they receive less remuneration. Using this model, an economic evaluation will seek to optimise health gain from the appropriate use of skills.

- specify the objective
- identify all relevant options for achieving the objective
- calculate the costs and consequences for each of these
- choose the option that will maximise the objectives, given the available resources

Figure 1. The rational decision-making framework.

- increased effectiveness
- increased efficiency
- increased staff motivation and satisfaction
- enhanced patient access
- facilitates innovation

Figure 2. Some advantages of working in teams.

Using economic evaluation to facilitate skill mix choices

The principles of economic evaluation

An economic evaluation facilitates choice between alternative interventions, by relating the health outputs (benefits) of

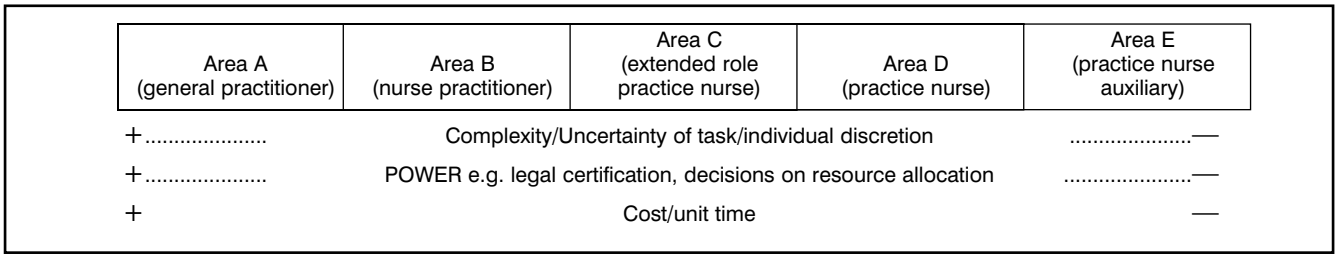

Figure 3. The spectrum of doctor/nurse tasks undertaken in primary care.

an intervention to the resources that are consumed[13] (Figure 4). This exercise seeks to facilitate the efficient use of resources, either by ensuring the maximum output for a given level of resource input or minimum cost to obtain a desired level of benefit (technical efficiency). It can also facilitate the most efficient mix of services provided (allocative efficiency). Skill mix issues are concerned with the most efficient mix of inputs (i.e. doctors or nurses) to achieve a specific output.

For a given health condition, undertaking an economic analysis seeks to optimise skill mix accordingly. However, this task is not straightforward.

Measuring costs

Many studies provide misleading conclusions for decision makers, owing to inappropriate cost estimates.[14] For example, a recent review of studies that derived the cost of a general practitioner (GP) consultation found a range of between £3 and £11, depending on the method of costing used.[15] How costs are derived and combined will depend on the assumptions that have been made in their derivation and there are a number of costing rules that must be used when estimating cost data.[16,17]

The perspective of an exercise will determine which costs to count. For example, for long-term shifts in skill mix within the NHS, training costs must be identified and allocated to the unit costs of practitioners. The annuitised costs arising from professional training are rarely considered but will increase the cost of a GP consultation substantially (Figure 5).

Once the perspective has determined which costs to count, the concept of opportunity cost will determine how to value them. Opportunity cost is defined as the benefit foregone from using resources one way rather than another. The cost of a GP or nurse consultation may therefore vary, depending on the value of the foregone alternative and what the GP or nurse would have otherwise been doing. Different contexts of examining skill mix may therefore lead to different opportunity costs.

Although there still remain a number of deficiencies in cost data, estimates are becoming more accurate. A range of costs of health professionals updated annually can be found in Netten.[18]

Measuring the outcomes of skill mix options

Although health outcome measurement recognises the broader concepts of health, other sources of benefit that may be of particular relevance for nurse interventions can be overlooked.[19] For example, benefit may be obtained from the process of care arising from information reassurance or choice. The relationship between structural and process variables to final health outcomes may also be tenuous in this area. Outcomes are often multi-dimensional and assessment may be affected by timing and characterised by difficulties with attribution.[20,21]

Ideally, all outputs should be integrated into one overall index of benefit. This is important when comparing different interventions, but is rarely possible. In practice, what gets measured will depend on the context of the exercise and the agency that sets the evaluation agenda. One option, known as a cost consequence analysis,[22] is to present outcomes in a disaggregated form, allowing decision makers to make the necessary value judgements and trade-offs.

Relating costs to benefits

Ideally, an economic analysis should be carried out alongside a controlled trial. Where direct substitution takes place the methodology can be relatively straightforward. For example, one study randomised patients either to conventional care or to care exclusively from a nurse practitioner and found similar outcomes.[23] However, in most cases there will be elements of substitution, enhancement, and addition, and exact roles may be difficult to define.

In practice, most decisions will not be about whether services should be completely delegated or not, but about whether resources should be shifted between existing services. A marginal analysis[24] recognises the importance of how benefits and costs change as programmes expand or contract. For example, an asthma nurse rarely provides exclusive respiratory care but shares this role with the GP; however, the extent of this sharing may differ. In principle, this relationship should be determined by undertaking trials across a number of skill mix options to identify the optimum doctor/nurse mix; however, this will rarely be possible.

Owing to the wide variation in case mix, training, and organisation, there will inevitably be problems with generalisability and estimates of the potential for doctor/nurse delegation may be sensitive to the methods of data collection and type of practice. Trials themselves have an opportunity cost and multi-centre studies are difficult and expensive to manage, especially in primary care.

In summary, there will difficulties in obtaining rigorous, generalisable evidence, particularly where there are elements of both substitution and complementation.

A pragmatic framework that can facilitate skill mix decisions from an economic perspective

We have demonstrated some issues in undertaking an

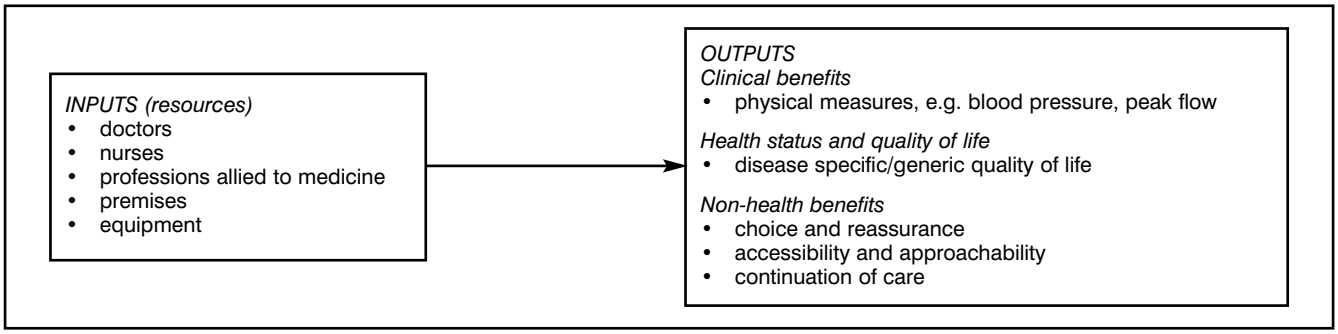

Figure 4. An economic analysis relates inputs (resources) to outputs (benefits and the values attached to them) of alternative interventions to facilitate decision making when resources are scarce.

What does a GP Cost?[18]

Perspective	*Cost*
GP practice	£21 per hour
Health Authority (includes central overheads)	£54 per hour
NHS (includes training costs)	£69 per hour

Figure 5. The importance of perspective. What does a GP cost? Different perspectives give different answers.

economic analysis in the area of doctor/nurse skill mix, particularly in primary care. Although the use of an economic framework can help clarify decision making, an exact solution to skill mix will rarely be accessible.

Here, we offer a pragmatic framework that incorporates a number of economic principles that can facilitate decision making in this area.

- Identify the strategic aims of skill mix. For example, is the aim to release resources by doctor substitution for use elsewhere or to maximise health gain from additional resources by complementing the intervention of doctors?
- Identify the perspective of the exercise (i.e., who is asking the question and why?). This will determine which costs to count. For example, for long-term changes in skill mix across the NHS, training costs will be relevant.
- What are doctors and nurses currently doing in specific clinical areas, and how can this be altered, either to reduce costs for the same outcome or enhance outcomes for the same costs? This should help generate a range of skill mix options. There may be a wide range of skill mix options across which testing may not be feasible. In practice, the option considered will have to be made based on the best available evidence and expert opinion.
- What is the scope for change? It will be of little benefit to consider large-scale doctor replacement if the required number of nurses are not available, or to reduce GPs in a practice if no-one is retiring. Often there will be limited room for manoeuvre in the short term. Change may only be possible over longer periods if suitable incentives and policies are in place.
- What are the likely changes in costs and benefits of each skill mix option, compared with the current allocation of tasks and time? The evidence base may be limited and not easy to generalise and often the opinions and experiences of local commissioners and providers of care will be relevant.

Conclusion

The development of skill mix is a complex area that can be approached using a number of different analytical frameworks. For example, Senge[25] sees teams as learning organisations, where team learning exceeds that of individual members and enables individuals to learn more rapidly. Svensson[26] offers a negotiated order framework, where structural constraints and local negotiation processes continually feedback and evolve. Economic evaluation adopts an approach that is rational and explicit by comparing resource implications and benefits of alternative ways of delivering health care.

Although historically the development of doctor/nurse skill mix has occurred ahead of evidence of effectiveness, there is a developing literature to suggest that, in some areas, substituting nurses for doctors gives equal or better health outcomes. However, there remains little evidence of cost-effectiveness at a time when skill mix changes are being introduced in an effort to increase health service efficiency. Unfortunately, the debate remains characterised by rhetoric and historical precedent and a recent edition of the *BMJ* that focused on this area concluded that it was 'a bit of a muddle.'

There are a number of problems in applying economic evaluation to the development of skill mix and we have argued that, in many cases, the evidence base will not be accessible to enable an exact optimisation of skills. A pragmatic approach will be needed, deriving solutions that are satisfactory rather than optimum, drawing on evidence where it is available but recognising its limitations, and living with uncertainty when evidence is lacking. Nevertheless, there are a number of fundamental economic principles that can facilitate decisions and guard against the introduction of changes that are thought to be efficient, when in fact they may not be so.

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