

# Skill mix in healthcare: An international update for the management debate

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## Abstract

**Purpose:** The interest in health workforce redesign has been growing internationally and over one decade of practice and research resulted in a variety of literature on the impact of the different approaches to staffing on patient and services' outcomes. The purpose of this review is to produce an update on the knowledge developed on this topic of interest to the international healthcare management community and to policy makers involved in reforming healthcare systems and organizations.

**Methods:** A systematic review on healthcare skill-mix literature was conducted in a 4-month period through the Pubmed, BioMed Central, and Medline databases. Fourteen articles published between 1995 and 2011 were selected according to inclusion and exclusion criteria.

**Findings:** A total of 14 studies undertaken between 1998 and 2011 were selected for our discussion. The review identified a methodological weakness preventing the results of individual studies from being considered together to produce concrete findings and structured knowledge on the effectiveness of skill-mix experiments. Most studies describing the implementation of skill-mix models were undertaken in the USA and Australia in specific care settings and were mostly focused on doctors-nurses mixes. We found no evidence of a wider impact from a skill mix on health systems nor on the variables that determine its success. Most studies did not explain why a particular approach to skill mix was chosen, nor gave enough information about the context in which decisions were made. There were few appropriate evaluations of outcomes, quality, and costs that enable for effective skill-mix evaluation.

**Conclusion:** This review showed that despite the widely acknowledged interest on skill-mix initiatives there is a lack of evidence on skill-mix implications, constraints, outcomes, and quality impact that would allow policy makers to take sustained and

evidence-based decisions. There is a need to examine closely the methodological rigor of skill-mix reviews and to be aware of the motivation driving them. Being able to recognize differences between countries and contexts will also allow a better comprehension of the effectiveness of the initiatives and ways to implement them.

**Keywords:** Skill-mix, Health workforce, Workforce redesign, Healthcare integration, Healthcare innovation

## Background

As a result of ongoing health sector reforms, many health systems around the world have seen a number of changes as organizations restructure the delivery of patient care in an effort to provide the most cost effective and efficient services to patients. Also driven by productivity improvements, cost containment, and personal shortages, the interest in workforce reengineering has been growing since the past few years.

The World Health Report 2006 noted that preparing the health workforce to work toward attainment of its health objectives represents one of the most important challenges and opportunities for health systems. The report also stated that governments should go beyond the traditional notion of skill mix and explore what tasks the different levels of health workers are trained to do and are capable of performing.<sup>1</sup> Managers' interest in identifying the most effective mix of staff achievable within available resources has resulted in an increasing research on the impact of the different approaches to staffing on patient and services outcomes.

There is no common starting point for examining skill mix in different countries, healthcare settings, and related health systems.<sup>2</sup> However, maintaining

a reasonable balance in terms of numbers, diversity, and competencies of the health workforce requires a thorough understanding of the driving forces and challenges that shape health systems as well as labor markets.<sup>1</sup>

The purpose of this study is to produce and update on skills mix evidence through a systematic review of literature on this issue.

**Methods**

*A systematic review on skill-mix literature was conducted in a 4-month period*

The Pubmed, BioMed Central, and Medline databases were searched using skill mix, staff mix, changing staff mix, health workforce, and healthcare as key words, as well as the combination of those. Initially, a broad approach to searching was undertaken to ensure that any potentially relevant papers were not missed. The search included studies written in English and no limitations were placed to the date of publication. Where possible all search terms were explored and all subheadings were included. As our research scope was so vast we found about 200 references related to our subject.

All references were reviewed by title and abstract to determine their potential relevance to the review. Letters, comments, and editorials were systematically excluded. Based on their strength of evidence only 100 studies were selected for further evaluation. Full-text articles could be obtained for

Table 1: Inclusion and exclusion criteria

<i>Inclusion criteria</i>
Article should:
(a) Contain abstract
(b) Be published and available in the public domain
(c) Address an issue related to skill mix in healthcare
(d) Make reference to the search strategy
(e) Discuss health policy-relevant results
(f) Review research studies into skill mix (e.g. drivers, dimensions, constraints, patient and services outcomes, and quality impact)
(g) Make reference to the strength of evidence of the analyzed studies
<i>Exclusion criteria</i>
(a) Letters, comments, and editorials
(b) Articles analyzing skill-mix processes in specific healthcare settings
(c) Projects with main purpose of financial improvement and/or changes that only concern administration
(d) Articles analyzing change in software and/or hardware and information technology
(e) Articles analyzing specific health professional groups' mix processes
(f) Articles containing a description of the intervention to implement skill mix

81 abstracts and the remaining were excluded. All articles were evaluated by two reviewers who selected 60 that met the inclusion criteria initially defined (Table 1).

Table 2: Categorization of skill-mix initiatives: purposes for skill-mix programs

2004	2009
<i>Changing roles</i>	
Enhancement: increasing the depth of a job by extending the role of a particular group of workers	Role delegation: transferring certain responsibilities or tasks from one grade to another by breaking down traditional job demarcations
Substitution: expanding the breadth of a job in particular by exchanging one type of worker for another	Role enhancement: expanding a group of workers skills so they can assume a wider and higher range of responsibilities through innovative roles
Delegation: moving a task up or down a traditional interdisciplinary ladder	Role enlargement: staff members should be able to extend their activities and take roles and functions at parallel or lower levels
Innovation: creating new jobs by introducing a new type of worker	Skills flexibility: using multi-skilled workers that can switch from one role to another while employing various skills as required
	Role substitution: to work across and beyond traditional divides in order to achieve more efficient workforce deployment
<i>Changing the interface between services</i>	
Transfer: moving the provision of a service from one healthcare setting to another	
Relocation: shifting the local where a service is provided from one healthcare setting to another, without changing the people who provide it (running a hospital in a primary care facility)	
Liaison: using specialists in one healthcare sector to educate and support staff working in another sector	

Although, because our goal was to critical review skill-mix concept through the evidence of the studies on that issue and not analyze skill-mix interventions, we decided to exclude studies analyzing exclusively specific health professional groups' mix as well as studies testing skill mix exclusively in specific healthcare settings. Fourteen studies undertaken between 1998 and 2011 were selected for our discussion. Ten studies were systematic literature reviews on skill-mix outcomes, constraints, patients and workers satisfaction, and quality of care. The other four were descriptive studies on skill-mix drivers and dimensions that were included for their relevance to the discussion.

## Findings

### *Skill-mix drivers and dimensions*

There are several common starting points for implementing skill mix in different countries, sectors, and health systems. Optimizing skill mix is highlighted as a policy solution for a range of health system-related problems and authors are unanimous when identifying the driving forces for skill-mix initiatives: respond to shortages of staff; cost containment; health workers distributional imbalances; improve quality of care and patient satisfaction; facilitate the interface between organizations, settings and workers.

However, while all of these drivers are valid premises that may lead to a review of the personnel mix, not all of them can be solved through skill-mix changes. Each of these issues is affected by a wide range of contextual factors, and the mix of personnel and skill is just one of them.<sup>3</sup>

Buchan (2001) was one of the first authors to discuss what is meant by skill mix and provide a typology of the different approaches to assessing skill mix.<sup>4</sup> However, skill-mix initiatives were initially categorized by Sibbald in 2004. In a systematic literature which included 24 studies focused on the skill mix of healthcare workforce, the author identified the dimensions through which skill-mix changes can be brought about (Table 2). Later, in 2008, the European Observatory on Health Systems and Policies issued a skill-mix policy brief subscribing the same dimensions and definitions.

From what we could investigate, the processes described in studies concerning skill-mix implementation seem to fit in one or more of these dimensions. For instance, some authors used 'task shifting' to describe both substitution and delegation initiatives. Fulton *et al.*<sup>5</sup> defined 'task' shifting as delegating tasks to existing or new cadres and Dovlo<sup>6</sup> defined it as shifting tasks from higher to lower-skilled

workers. Also Dubois & Singh (2009) in a wider review included 250 articles identified and recommended different skill-mix approaches that healthcare organizations should adopt to optimize its workforce, which are also summarized in Table 2. Despite the processes underpinning skill-mix implementation being similar because of the variety of concepts found, we could not consider that there is a consensus in the nomenclature used to classify skill-mix dimensions.

### *Skill-mix strength of evidence*

We found 10 systematic literature reviews highlighting some of the practical problems in performing evaluations of skill-mix alterations since 1998.

Richardson *et al.* (1998) undertook a systematic literature review which included 17 articles, focused on skill-mix effectiveness and cost effectiveness to assess the potential for substituting or delegating of health professionals tasks. They found that most studies only addressed doctors and nurses' delegation of tasks and also that the few existent studies on those skill changes outcomes and costs were not sufficient to demonstrate the quality of the services provided. They considered that the measurement of patient outcomes and costs is essential before decision making on health professionals skill mix, and also recommend further research on this issue not only on what concerns doctors and nurses roles, but also on other non-physician personnel.<sup>7</sup>

One year later, the same author (Richardson, 1999) after a systematic review including 22 articles focused on cost implications of skill-mix changes, found once more that economic evaluation had been under-utilized in studies and that there was little evidence that substitution between health professionals can be cost effective. As most of the studies included in his research only addressed the costs of health professional's substitution, the author argued that economic evaluation is not only concerned with the costs, but also with the impact and economic consequences.<sup>8</sup>

In the discussion of results, Richardson identified some factors that could influence the cost-effectiveness of skill mix and should be taken into account when implementing it: the relative cost of employing health professionals; the relative effectiveness of health professionals; the evaluation of released time; demand-side factors; and supply-side factors. He also argued that if economic studies could demonstrate that skill mix can reduce costs and improve or maintain patient outcomes, then it should be implemented.<sup>8</sup>

For the purpose of this study we found there was no evidence on skill-mix cost-effectiveness, although

some literature reviewed argues that one of the main drivers to skill-mix implementation is the reduction of costs.

McGillis (1998) in a systematic literature review focused on staff mix models studies undertook between 1980 and 1997, identified policy implications related with skill-mix implementation. The author argued that the majority of examples in the literature of care delivery models which incorporate changes in staff mix use small samples which may unrepresentative and based on descriptive data only. Most studies were also undertaken in specific labor contexts and involved only doctors and nurses related skills mix. Despite the lack of empirical evidence in this area, the author retrieved some aspects which recommend to be taken into consideration when implementing skill-mix changes, such as: (a) involving the regulated providers in the staff mix development; (b) addressing the education requirements of the regulated providers to practice effectively within the new staff mix model; (c) addressing the education requirements of the unregulated workers; (d) clarifying and interpreting the meaning of delegation; and (e) continued evaluation of staff mix models.<sup>9</sup>

Also, Buchan (1999) through a literature review of 79 studies, focused in the main skill-mix approaches, has highlighted that most studies have methodological weaknesses that prevent the results of the individual studies from being considered together to produce general conclusions about the effectiveness of different mixes. As personnel mix exercises were based on the identification of care needs of a specific patient population and the match of these with the skills of the available staff, Buchan considered that results of each study only remain true for the time and place from which they were derived. The author also considered that there was a lack of appropriate evaluations of quality outcome and costs related to skill-mix implementation. In order to achieve more robust guidelines on how to determine skill mix, Buchan recommended the standardization of research and evaluation methodologies, to improve the network of study results.<sup>10</sup>

In a further research, through a systematic literature review of 36 articles examining skill mix in healthcare, Buchan & Poz (2002) identified significant limitations to the current evidence on skill mix in the health workforce. The authors considered that skill-mix determinants, such as skill shortages, cost containment, and the need for quality improvement, were well supported by the literature. However, there was a dearth of studies supporting the evidence of skill-mix success. They argued that many

published studies were merely descriptive accounts on different mixes of health professionals, which add little in terms of implementation methods or interpretative results. Moreover, they identified methodological weaknesses on those studies that moved beyond description. Because most of the rigorous studies the authors found were undertaken in the USA, they considered that those findings may not be relevant to other health systems. Another limitation pointed by the authors was the lack of studies on the effectiveness of skill mix in other health workers rather than nurses or doctors.<sup>11</sup>

Buchan & Poz (2002) considered that it was not possible to prescribe in detail a universal ideal mix of healthcare workers. In order to adjust skill mix they recommended policy-makers to analyze the context, identify appropriate solutions, and manage sustained changes within the system.<sup>11</sup>

For the purpose of our study we would like to stress that due to the methodological weaknesses pointed out by both authors (McGillis, 1998 and Buchan, 1999) we agree that studies results on skill-mix implementation methods and outcomes cannot be generalized as their samples may be considered unrepresentative. There is no strength on the evidence of skill-mix implications and outcomes to allow policy makers to take sustained decisions.

In 2003, Branson *et al.* undertook a systematic literature review which included 52 studies focused on exploring patient satisfaction with skill mix in primary care. Primarily, the authors identified the key drivers for skill-mix implementation such as: the increasing demand and cost of care; the shift from hospital-based to community-based services; and the difficulties with the recruitment and retention of some health workers. Second they described the aspects of care that influence patient satisfaction with skill mix: healthcare access; professionals' skills and knowledge; professionals' communication skills; location of services; and availability. Despite those findings, the authors argued that their review highlighted areas where little research has been undertaken. The available research was scattered across the specialist literature of different professional groups and tended to focus on a single aspect of skill mix, rather than the complexity and diversification of skill-mix strategies. The authors recommended further research to consider patient views on a much wider range of services implementing skill mix.<sup>12</sup>

In order to achieve a wider perspective on how skill mix may affect the quality of care, Currie *et al.* (2004) undertook a systematic literature review of 85 articles on that issue. In the discussion of results the authors contended that skill-mix implementation

is 'highly contentious' which enhances the need of evidence to demonstrate its impact on quality of care. Although they have found some research on health professional's perception of skill-mix impact on quality of care, they could not find any systematic, rigorous research exploring patients' perceptions. The authors argued that traditional quality assessment tools have fallen out of use as they could not engage both patients and professionals' point of view. They considered that the professional voice alone is not enough to show whether skill mix can have impact on the quality of care, recommending further studies on patients' perceptions.<sup>13</sup>

Thus, for the purpose of our study we can retain three main ideas. First, there are few rigorous studies on patient perceptions of how skill-mix affects the quality of their care. Second, most studies with strength of evidence were undertaken in small and specific healthcare settings and professional groups, once again preventing generalization. Third, there is evidence on professional's perceptions, but that alone is not enough to evaluate skill-mix impact on health care.

In their 2004 review, Sibbald *et al.* not only identified the dimensions through which skill-mix change were brought about, but have also discussed its strength of evidence. In the discussion of results, the authors identified that there was a dearth of research for role change involving workers other than doctors or nurses. They found that cost-effectiveness was generally not evaluated nor the wider impact of skill mix on healthcare systems. Despite the lack of evidence on skill-mix constraints the authors argued that the following factors may influence the success or failure of skill-mix implementation: appropriate staff education and training; removal of unhelpful boundaries demarcations between staff or services sectors; appropriate pay and reward systems; and strategic planning and human resource management.<sup>14</sup>

Sibbald *et al.* (2004) recommended further studies on the consequences of skill-mix change, especially on what concerns quality of care, safety, costs, acceptability, and complexity of care pathways.<sup>14</sup>

For the purpose of our study it is important to note that the few discussions on skill-mix constraints are centered on specific health workers and settings, underestimating the wider context. There is no evidence on the wider impact of skill mix on health systems neither on the variables that determine its success.

More recently, Dubois & Singh (2009) performed a literature review which included 250 articles, focused on the main approaches to healthcare personnel deployment and skill management strategies. They

found that the healthcare staff-mix focus was both restrictive and static, and that it failed to account for staff member skills and their effective utilization. Authors also suggested that developing new roles and search for more flexibility in using staff members, requires an assessment of the environmental conditions that influence healthcare workers practices (institutional environment, the system of professional regulation, organizational incentives and also the workers' educational preparation).<sup>15</sup>

For the purpose of our study it is important to note that there is no evidence of previous evaluation of the context in which each skill-mix initiative should be implemented. Despite skill-mix initiatives having similar backgrounds, their implementation requires a structured analysis of the conditions that may influence it.

In a more recent study Fulton *et al.* (2011) undertook a systematic literature review of 31 studies focused on health workforce skill-mix policies. They only explored the evidence of one skill-mix dimension – 'task shifting' – arguing that task shifting is an important policy option to help alleviate health workforce shortages and skill-mix imbalances in low-income countries. Despite the identification of promising 'task shifting' processes, the authors identified some constraints to its implementation, such as care quality and safety concerns, professional and institutional resistance, and the need to sustain professionals' motivation and performance. In the reviewed literature these authors could not identify any evidence on patient outcomes, quality of care or costs. As a research agenda Fulton *et al.* recommended that futures studies should examine the development and implementation of health workforce task shifting in country-specific labor markets.<sup>5</sup>

For the purpose of our study we must emphasize that despite the recommendations of previous studies, similar lack of evidence was identified. There is no strength of evidence on skill-mix policies constraints, outcomes, or quality impact.

## Discussion

We found 14 studies on skill mix that met our inclusion criteria. Despite the fact, this key healthcare management issue is being discussed in the USA and Australia since the 1990s, in Europe the skill-mix concept only became a relevant healthcare management research theme around 2000. Between 1995 and 2008 skill-mix initiatives were categorized and literature examined staff-mix models implementation and discussed potential areas for developing it.

Despite a basic consensus on skill-mix drivers and a general understanding of the concept, after 13

years of research on skill-mix initiatives the same lack of evidence is being identified as the same mistakes are being identified as undertaken. There are methodological weaknesses that have been preventing the results of individual studies from being considered complementary efforts to produce concrete conclusions on the effectiveness of skills mix.

It is important to note that there is no evidence of a structured analysis nature on the context in which each skills mix initiative should be implemented. Most studies describing skill-mix models implementation were undertaken in the USA and Australia in specific care settings and are mostly focused on doctors–nurses mixes. Non-European experiences should be cautiously analyzed once there are considerable differences between cultural backgrounds and health systems models.

Thus, in the European context it is not possible to generalize conclusions from the available research because the context in which studies were undertaken is different. Hence, there is no common strategy for health systems to evaluate skills mix effectiveness and the literature examples are unrepresentative and based on descriptive data.

Additionally, there are a few research papers on skill-mix constraints. Some of the existent literature is centered on specific health workers and settings undervaluing a wider context. There is no evidence on the wider impact of skill mix on health systems neither on the variables that determine its success. Most studies do not explain why a particular approach to skills mix was chosen, nor give enough information about the context in which decisions were made.

Furthermore, although the literature considers that one of the main drivers to skill-mix implementation is the reduction of costs, economic evaluation has been underused in skill-mix studies in spite of the finding that a few studies undertaken in small healthcare settings suggest that it can be cost-effective.

On what concerns quality perceptions, there are a few rigorous studies on patient perceptions of how skills mix affects the quality of their care and once again most studies with strength of evidence were undertaken in small and specific healthcare settings and professional groups, preventing generalization. There is evidence on professional's perceptions, but there is not enough evidence to evaluate skills mix impact on healthcare.

This review also allow the authors to argue that despite skill-mix initiatives being widely explored there is a lack of evidence on skills mix implications, constraints, outcomes, and quality impact that could allow policy makers to take sustained decisions.

There is a need to examine closely the methodological rigor of skill-mix reviews and to be aware of the motivation driving many of them. Being able to recognize differences between countries and contexts will allow a better comprehension of the effectiveness of the initiatives and diverse ways to implement them.

Reviewing, and perhaps adjusting skills mix, therefore, requires the capacity to analyze the context, identify appropriate solutions, and manage sustained changes within the system.<sup>4,16</sup> These are fundamental aspects that should guide Future research on the topic of skills mix in the healthcare management context.

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