

Key changes in the Healthcare workforce

Rapid review of international evidence
Report developed by The Evidence Centre for Skills for Health



Contents

Key Themes	3
Scope	3
Context	6
Approach	6
Workforce Changes Organised?	8
Multidisciplinary working	8
Examples	9
Changing skill mix	19
Examples	20
Examples	27
Role Enlargement	33
Examples	34
Substitution	40
Examples	42
Driving Factors	49
Contextual Framework	49
External Context	50
Organisational Context	57
Staff Context	63
Summary	70
References	73
 Figure 1: Framework for considering drivers of workforce changes	 49



Key Themes

Scope

In order to ensure that healthcare is of the highest quality, safety and value, a highly skilled and experienced workforce is needed. Changing population demographics, staff characteristics, the policy context, new technologies, regulations about staff working hours, and different management and funding approaches have all influenced how the workforce is organised and developed in recent years. This rapid review examines published evidence from around the world about the most common workforce changes in the fields of community mental health, health promotion, surgery and paediatrics.


To identify studies for inclusion in the review, one reviewer searched six bibliographic databases for empirical research available as of February 2011. More than 40,000 abstracts were screened and 818 studies were included.


The five most common workforce changes identified were similar across the specialities of interest:

- a focus on more integrated and multidisciplinary working
- testing different staff-patient ratios and mixing various levels of experience and qualifications in staff teams
- expanding roles through encouraging staff to undertake enhanced tasks or enlarging the number and type of tasks undertaken
- and substituting some types of staff for others

Multidisciplinary Teams

As healthcare moves away from a focus on episodic acute care towards more holistic, continuous care, there is an acknowledgement of the importance of integrating health services and ensuring smooth transitions between health, social, community and other agencies. This move towards integration means that staff from different disciplines have been encouraged to work together in multidisciplinary teams. There is also a move towards some interdisciplinary training during preregistration and as part of continuing professional development, though this is the exception rather than the norm.





Evidence suggests that it can be challenging to develop and maintain multidisciplinary teams because various disciplines conceive of and do things differently and there may be some issues about power and control. However, there are examples from around the world of how multidisciplinary teams can improve the quality and efficiency of care and, in some cases, improve patient outcomes.

Skill Mix

Skill mix involves changing who works together within teams. Changes include increasing the number of personnel, using higher ratios of qualified and including higher ratios of senior staff members.

In the fields of paediatrics and surgery in particular, research about skill mix tends to focus on the number of different types of workers available and the best ways of organising them to ensure efficiency and productivity.


Despite conflicting findings, a number of studies and systematic reviews suggest that a richer staff mix may be associated with better outcomes and fewer adverse events for patients. For instance, having a rich mix of qualified personnel with advanced degrees or specialty certifications is often associated with better clinical outcomes, including lower patient mortality rates.


The majority of work about skill mix comes from North America and may have limited applicability in the UK context. Although the concept of skill mix has been used as a managerial and policy tool to consider workforce changes, more recent work is moving away from simplistic notions, towards a more complex understanding of the drivers of workforce developments such as external policy factors, organisational factors and staff characteristics.

Role enhancement

Role enhancement involves expanding a group of workers' skills so they can assume a wider range of responsibilities through innovative and non traditional roles. For instance, in the US and the UK, GPs who hold additional qualifications or training and who focus on particular areas are sometimes known as 'GPs with special interests.' Such GPs can offer specialist care in the community or work as part of multidisciplinary hospital and primary care teams. Similar developments have occurred for pharmacists whose work has expanded far beyond the distribution of medications to include patient education, health promotion, counselling, medication management, health monitoring and even in some jurisdictions, prescribing.

There is relatively limited evidence about the impacts of role enhancement in general, though a number of studies of enhancing nurses' roles in health promotion, community mental health, paediatrics and surgery suggest that





this can work well to enhance patient outcomes and improve the retention and morale of the workforce.

Role enlargement

Role enlargement involves growing staff roles by encouraging members of the workforce to extend their activities and take on roles and functions at parallel or lower levels. Role enlargement has been part of efforts to shift service delivery from a task oriented approach towards integrated care carried out by workers who are able to meet patients' multiple and complex needs. This has been particularly important as healthcare strives to meet the needs of people with long term conditions and others who particularly require continuity of care.

Role enlargement has the potential to reduce fragmentation of services and improve continuity. It can also have a positive impact on staff members themselves by increasing job variety, autonomy and motivation. But role enlargement must be undertaken cautiously because unabated expansion can threaten professional identity, intensify workloads to the point of excess, and spark significant levels of demotivation and dissatisfaction.

Substitution


One of the most frequently debated workforce changes in recent years involves substituting or delegating one type of worker for another. For instance, healthcare assistants may take on roles previously undertaken by nurses or nurses may complete activities that were traditionally the realm of doctors.


In the field of health promotion for instance, nurse led clinics have gained popularity. Here, nurses undertake health and wellbeing checks, provide motivational counselling and raise awareness about healthy eating, lifestyles and smoking cessation – all of which may previously have been led by GPs.

There is evidence that, following appropriate training and with adequate supervision and support, substitution and delegation can be effective, efficient and worthwhile. This is not without challenges, including perceived threats to disciplinary boundaries and role autonomy, but the evidence suggests that overall this has been a positive workforce change.

Next steps

These top five workforce changes in community mental health, health promotion, surgery and paediatrics are the result of a number of interrelated drivers and competing priorities. Some of the changes are somewhat ad hoc or reactionary. Whilst there are many tools available for workforce planning and thousands of articles have been written hypothesising the best workforce developments, it could be argued that there is limited strategic vision about how the workforce should be changing to meet future demands. This rapid review outlines the most frequently researched workforce





changes in recent years, but leaves open the question of what additional changes are now needed.

Context

A healthcare system's ability to provide safe, high quality, effective and patient centred services depends on sufficient, well motivated and appropriately skilled personnel working in environments that optimise their performance.^{1,2}

In recent years there have been a number of significant changes in the healthcare workforce. This rapid review summarises these changes, focusing on the following key questions.

What are the most widespread workforce changes taking place in community mental health services, health promotion services, operating theatre / elective surgery services and paediatric services?

What is driving these workforce changes (including any models that underpin them)?


What impact are workforce changes having for service users, practitioner roles and management practices?


The review focuses most heavily on the first question; first summarising general workforce changes and then providing examples from each of the four key fields of interest. The impacts of these changes are discussed simultaneously. Following this, the key reasons for change are briefly described.

Approach

To identify studies for inclusion in the review, one reviewer searched six electronic databases (Medline, Embase, Ovid, Cinahl, the Cochrane Library and Controlled Trials Register, and the Health Management Information Consortium) for articles published between 1990 and February 2011. Search terms included combinations of words such as workforce, staffing, HR, personnel, adaptation, change, transformation, mental health, paediatrics, health promotion, surgery, theatre, role substitution, role enlargement, skill mix, multidisciplinary and so on.

As the aim was to provide a rapid review of key themes in readily accessible literature, studies of any design, in any language and from any country were






eligible for inclusion. Empirical research was prioritised, including systematic reviews, randomised controlled trials and large observational studies.

The search identified more than 40,000 potentially relevant studies, but after further review most were found not to address the core research questions empirically. 818 studies were included in the review.

All studies were checked for relevance by one reviewer, using the methodology of the NHS Centre for Reviews and Dissemination. Two reviewers independently extracted bibliographic data and information about key findings.

To synthesise material, the reviewers grouped studies according to topic areas and outcomes and provided a narrative summary of key trends. Meta analysis was not possible due to the heterogeneity of the study designs and topics covered.

The reviewers aimed to provide a mix of rapidity and rigour, but when interpreting the review, readers should bear in mind:

- The review focused on readily available literature and was completed within a short period. It is not an exhaustive appraisal of all material in this field.
 - There are many studies about the healthcare workforce but these do not usually consider key staff changes, impacts or drivers for change so these general studies were excluded from the review.
 - The quality of literature varied. Much of the material is descriptive or observational and not necessarily of high quality.
 - Omission of specific types of staff deployment does not indicate that these changes do have important impacts on workforce organisation, just that little has been published about some topics.
 - Many studies are from the US, Canada or other countries with very different health systems and staffing structures to the UK. This means that the findings may not be generalisable to the UK context.
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Workforce Changes Organised?

Multidisciplinary working

This section describes some of the key changes in the healthcare workforce over the past few decades. These include:

- multidisciplinary working
- changes in skill mix
- role enhancement
- role enlargement
- substitution of workers

This is not an exhaustive list of workforce changes, but provides an overview of the top five most frequently researched trends.


Each of these changes is examined in turn by providing a general description of the change and its impacts, followed by specific examples from the fields of community mental health, health promotion, surgery and paediatrics.

Overview

There is an increasing focus on gathering together individuals from different professions and specialties in order to provide well rounded care. This is known as multidisciplinary working.

Multidisciplinary teams are now commonly used in hospitals, outpatient services and primary care.^{3,4} Increased interest in a 'whole system' approach to care has also contributed to the inclusion of social services staff, community workers and volunteers on primary care teams.⁵ Involving service users as part of the care team is also gaining momentum in some areas.

Furthermore, interdisciplinary education is gaining popularity, with specialities coming together to be trained simultaneously in specific undergraduate courses and in continuing professional development. This includes training in clinical content as well as specific teamwork training.





Impact

There is an extensive literature about the potential benefits of multidisciplinary teams and, more broadly, of collaboration amongst professionals from different disciplines as a way to address fragmentation, discontinuity and lack of receptiveness.⁶

However, whilst this is a widely described and accepted workforce change, some of the evidence is inconsistent about the effectiveness of multidisciplinary teams compared to care provided by a single group of professionals. A review of 14 systematic reviews and 33 additional randomised trials found that the impact of multidisciplinary teams on quality of life and clinical outcomes varied considerably amongst the studies.⁷

Other research indicates that although multidisciplinary outpatient teams or teams of primary and secondary care personnel working together can improve patient outcomes, this result may vary according to the initiatives undertaken and patients' conditions. For instance, a systematic review about care for people with arthritis found that multidisciplinary outpatient teams may improve functional outcomes more than usual care.⁸ Other trials involving elderly people and those who had suffered strokes, however, found no impact on health outcomes ^{9,10}

Collaboration between doctors and nurses has been the subject of extensive research. Some studies suggest that a high degree of collaboration is associated with lower mortality and complication rates and increased patient satisfaction in adult intensive care units (ICUs).^{11,12} Findings about the value of GP and nurse collaboration in primary care are less clear. While some studies have found improved clinical outcomes and satisfaction,¹³ others have discovered no significant improvement over usual care approaches.^{14,15}


In addition to the conflicting findings, it is difficult to draw clear conclusions from these studies because most multidisciplinary interventions contain several other variables, such as increased follow up, new technologies and medication reviews. It is therefore unclear whether multidisciplinary team composition, additional contacts with staff members or other factors influence outcomes. Similarly, it is uncertain which specific staff members may be more or less useful within multidisciplinary teams.


The overall evidence though, is that working together in a multidisciplinary team, though challenging, can be beneficial for both staff and patients.

Examples

Community mental health

Multidisciplinary working is particularly important in mental health because the determinants of individual and community mental health and wellbeing





are diverse and many lie outside the sphere of the health sector.¹⁶ Developing the confidence and skills of those in other sectors to contribute to improved mental health is becoming a priority.¹⁷ As a result, there are numerous examples of how teams are being changed or expanded in community mental health.^{18,19,20,21}

For example, in Australia a two day course was developed to increase skills and knowledge among organisations from a range of sectors including health, local government, community arts, sport and recreation, justice and education. Over a two year period more than 1000 practitioners took part. The course was associated with improved knowledge, skills and practice and increased cross sector understanding and collaboration.²²

Mental health services have perhaps led the way in acknowledging service users and carers as important components of the care team. Service user and family involvement in the planning and provision of mental health services has been growing over the past two decades, especially where there is a move from institutional care towards care in the community.^{23,24,25}

There are examples from around the world of multidisciplinary teams with strong service user involvement. In Norway for example, researchers examining multi-professional community mental health centre teams found:


“The informants highlighted the complexity of community mental health work and the need to be flexible when working to support people with mental health problems in their everyday life situation. To see the service users as people and to facilitate social interaction was important.”²⁶


In the US, people with mental health issues were employed as part of the care team for homeless mentally ill adults. Employing these ‘consumer advocates’ created a more positive attitude toward people with mental illness among other team members. Having clear role definitions, boundaries and supervision was important.²⁷

Elsewhere in the US, a randomised trial found that a team of mental health service users working as case managers were as effective as professional case managers in maintaining the stability of severely mentally ill people over a two year period.²⁸

However, in some areas the hiring of current or former service users is seen as a ‘quick fix’ for issues rather than a reflection of more fundamental changes in attitudes and behaviours.²⁹

Another important trend in community mental health is using technology to widen the care team to include various professionals and service users.³⁰ For instance, electronic decision support systems that assist with service user and practitioner decision making have been tested to improve communication, especially as there are high rates of workforce turnover in this field. A randomised trial in the US found that using decision support





systems helped care managers and service users work together in a more integrated way and improved satisfaction with and recall of care plans.³¹

But multidisciplinary care or shared care is not always straightforward.³² In the US, collaborative interagency relationships have been tested to enhance mental health services, but environmental, situational, task and interagency barriers impacted on collaboration.³³


Other researchers in the US found real challenges when integrating mental health and primary care services due to high rates of co-morbidity, regulatory burdens and a lack of resources which created challenges for collaboration and coordination. The authors suggested that to improve collaboration, it is important to address key financing, workforce, information technology and performance assessment issues and engage multiple stakeholders including consumers, practitioners and policymakers and commissioners.³⁴

In the UK policies seek to engage primary care personnel in community mental health teams in order to improve services for children. A survey and focus groups with health, education and social services agencies in one area found that integration of primary care personnel was slow. Deficiencies in skills and knowledge among primary care personnel were suggested and staff wanted training and support to increase their involvement. The authors concluded that a lack of training and organisation is impeding multidisciplinary care for children with mental health issues.³⁵

In England, focus groups found that staff from a wide variety of agencies routinely encountered a range of issues when supporting people with mental health conditions. Whilst the training and development needs of specialist mental health staff and primary care staff have been examined, other community agency staff thought there was a need for more training and support. Joint working with mental health services was seen as problematic. The researchers concluded that whilst policy guidelines emphasise the importance of a holistic approach to care incorporating the expertise of many team members, in practice this may not be happening.³⁶

Multidisciplinary training has also been tested in mental health.^{37,38,39} For instance, in the US a distance learning training course was developed to support health administration, nursing, psychology, social work and special education students in rural areas. The course aimed to enhance interdisciplinary team skills, demonstrate how technology could be a useful tool for mental health practitioners, and enhance understanding of specific cultures and rural mental health.⁴⁰

A major source of job dissatisfaction in rural areas is professional isolation, including a lack of continuing education opportunities and an inadequate number of peers available for professional interaction. One rural US region implemented interdisciplinary educational programmes to improve the job satisfaction and potentially job retention of rural mental health providers. There was a significant improvement in job satisfaction and reduced professional isolation over a three year period.⁴¹



Health promotion

Health promotion services are wide ranging and can focus at local, regional or national level. What ties such services together is the aim to support people to keep well through exercise, healthy eating, reducing alcohol consumption, stopping smoking, breastfeeding and so on. Such services are also known as public health or health prevention initiatives.⁴²

There has been an increasing focus on health promotion in recent years, and therefore more priority placed on training the workforce to provide health promotion and prevention services.

“Understanding of health and its determinants is rapidly expanding and changing. The emergence of chronic diseases as the leading cause of global disease burden and improved understanding of social determinants of health has brought greater focus to the role of prevention in health.”⁴³


As well as general services targeting the population as a whole, health promotion also incorporates follow up care for people with specific conditions, such as those with heart conditions who are receiving secondary preventive support to reduce cholesterol and blood pressure. This field includes both direct services and awareness raising campaigns.^{44,45,46} Employer wellness programmes and workplace health promotion programmes are also gaining popularity and have been found to be a cost effective way to improve health and wellbeing – both within and outside the healthcare sector.^{47,48,49,50,51,52,53,54,55}

As with community mental health services, there has been a push towards integrated working and multidisciplinary care in the health promotion field.^{56,57,58}

“Public health professionals working across disciplines can have a greater impact on the health of the public than they can work independently.”⁵⁹

In Finland, health promotion activities were traditionally within the remit of community health teams made up of a physician, midwife and public health nurse. Multidisciplinary community health centres were located in small quarters called ‘health houses’ and care was also provided in village level sub-centres. Public health nurses were required to take part in continuing medical education on a regular basis to help them maintain their skills. Although services have been reconfigured, doctors, midwives and public health nurses still work closely together.⁶⁰

In England, researchers examined how teachers and school nurses can work together to keep school children healthy. The role of school nurses included safeguarding the health and welfare of children, health promotion, being a confidante for students, being a health advisor and providing family support. Nurses and teachers had shared or complementary activities in this respect so ensuring boundaries and shared understandings was important.⁶¹




In Australia, a health promotion programme aimed to prevent obesity in early childhood. The programme drew together stakeholders from a variety of organisations and developed knowledge, skills, commitment, structures, systems and leadership to enable effective health promotion. This joint capacity building was an important success factor, but there were challenges, including limited funding, high staff turnover, changing governance structures, lack of high level leadership and unclear communication strategies.⁶²


At regional and national level there are many examples of how a wide range of stakeholders have come together to promote joint working for health promotion.⁶³ For instance, in England teaching public health networks have been set up to enhance capacity and health promotion activity in the wider workforce.⁶⁴

In Australia a programme was developed which integrated health promotion and disease management. It took the form of a workplace education programme to reduce the onset and impact of a common chronic disease - osteoarthritis. Key stakeholders with experience of these interventions were drawn together into a multidisciplinary planning team. The team developed a programme framework drawing on practice based and research informed elements. To gain information at a national level, a structured concept mapping workshop was undertaken with health education providers, academics, clinicians and policymakers. This helped to develop guiding principles, possible service providers, services, training modes, programme elements and the causal processes by which participants might benefit.⁶⁵

There is growing evidence that the physical environment can have a direct and indirect impact on public health. However planners, who shape the built environment, and public health professionals, who protect the public's health, rarely interact. Most public health professionals have little experience with urban planners, zoning boards, city councils, and others who make decisions about the physical environment. And few planners understand the health implications of design, land use or transportation decisions. Multidisciplinary education courses have been proposed as a way to develop links.⁶⁶

In Scotland, a community public health programme aimed to tackle smoking in a low income area. Partnership working was an essential component across organisations and disciplines. An evaluation found that staff numbers from the multiagency partnership dwindled during the life of the programme and there was a lack of continuity. Technical components of public health programmes such as the importance of staff numbers, skill mix and continuity are widely recognised, but it is the more indeterminate aspects such as loss of the theory underpinning the programme, which most affect delivery. The evaluation concluded that community based programmes that rely strongly on partnership processes should consider the potential risks associated with expected and unexpected stakeholder change. Contingency plans need to be developed to sustain the theory and culture of the programme in the advent of staff changes.⁶⁷





Similar to community mental health services, health promotion at local and regional level has explored the benefits of involving service users, volunteers and members of the public as part of the service delivery team.^{68,69,70,71} For instance, in the US, community navigators support low income Southeast Asian women with breast cancer screening and care.⁷²

In Mexico, volunteer health promoters are part of community based tuberculosis (TB) control programmes. They volunteer 11 hours each week to participate in clinical and public health work in their communities, using both traditional and allopathic medicine.⁷³

In the Philippines, a three day training programme was developed to train 'village health workers' to build the health promotion capacity of community leaders. The programme was associated with significant increases in the total health promotion capacity of villages.⁷⁴

In the US, Latino people are at increased risk for HIV and sexually transmitted diseases. A lay health advisor programme was designed to increase condom use and HIV testing among Latino men. Lay health advisors from Latino soccer teams were trained and worked with their teammates for 18 months. Other teams served as a comparison group. Lay health advisors helped to increase consistent use of condoms and HIV testing.⁷⁵


Evaluations suggest that lay health workers or community workers of this kind are feasible, appropriate for ethnic minorities and can help target populations who might otherwise be difficult to reach.^{76,77,78,79,80,81,82,83,84,85}


“Lay health educators have three primary functions: to serve as mediators between [patients] and health agencies, to establish a social network, and to offer social support. When properly recruited and trained, these educators can bridge the gap between health professionals and the community as well as help health professionals to better understand community and individual concerns.”⁸⁶

Drawing on local community knowledge and integrating this with broader care services are key success factors.⁸⁷

But the effectiveness of lay people providing health promotion activities has been questioned. In a review of studies of lay health advisors supporting breast and cervical cancer screening among Latino people in the US, only two out of 14 studies found evidence of effectiveness. The quality of available evidence was poor.⁸⁸

Another systematic review with 37 studies of lay health advisors for Latino communities in the US found that the primary roles of lay health advisors included supporting participant recruitment and data collection, serving as health advisors and referral sources, distributing materials, being role models and advocating on behalf of community members. But only 14 out of 37 studies found evidence of effectiveness.⁸⁹





As well as questions about effectiveness, lay workers may not always be accepted by professionals. For instance, a survey of health workers in Rwanda suggested that they were somewhat reluctant to accept the involvement of lay people in the promotion and implementation of primary care programmes.⁹⁰

Another important change in the health promotion workforce involves the development of wellbeing programmes in workplaces. These employee health promotion initiatives are popular internationally, though there is little evidence about their impact in the UK. This is an important development because it means that health promotion teams need to be able to support local employers who make a commitment to addressing workforce health issues.⁹¹ The team may also expand to address the needs of private and public employers. For instance in the US, one such programme included 26 employers with approximately 4,700 employees. These organisations encouraged stairwell use, provided low or no cost healthy meals for employees and provided healthy foods at meetings. Developing partnerships between health services, commissioners and private and public employers was a critical success factor.⁹²

Surgery


In surgery, teams have traditionally been multidisciplinary, but there is a new focus on ensuring that multidisciplinary teams work together more effectively. For example checklist driven preoperative briefings and postoperative debriefings have been associated with improvements in patient safety.⁹³


In England, researchers examined the benefits of formalised briefing and debriefing sessions for cardiac surgery teams. Theatre teams thought the process improved communication and the quality of care.⁹⁴

In Canada, preoperative team communication checklists were also found to be feasible, acceptable to staff and useful for promoting information exchange and team cohesion.⁹⁵

Communication, cooperation and coordination are vital for effective care, especially in complex services such as surgery and elective care. Training in teamwork has been suggested as one method for optimising teamwork and increasing patient safety. A comparison of surgery teams that had and had not participated in teamwork training found that the trained group had significant increases in the quantity and quality of pre-surgical procedure briefings and the use of good quality teamwork behaviours. There were also improvements in perceptions of patient safety culture and teamwork attitudes.⁹⁶

In the field of surgery, studies have examined how staff contribute to teams and how teams work together. For instance, an audit of theatre traffic in a UK cardiac centre used an electronic door counter and theatre management software to calculate how often doors opened during operations and how teams could work more effectively to reduce this. The theatre door was open





for 10% of each hour of operating. Door opening disturbs theatre airflow and results in increased air and wound contamination. It may also contribute to surgical mistakes.⁹⁷

Clearly defined professional roles mean that team members know what they are expected to do and have clear expectations of other professional groups. In a typical operating theatre however, team members are not constantly involved and may work interchangeably. A survey of anaesthesia doctors and nurses, surgeons and operating room technicians and nurses in Switzerland found that surgeons and anaesthetists had the strongest influence. The influence of members of the nursing profession was less valued within surgery teams. All three professional groups rated themselves higher than in the perception of the other professional groups. The authors suggested that role definition may not be clear in multidisciplinary surgery teams and there is scope for improvement to reduce the potential for conflict and enhance productivity.⁹⁸


In large hospitals with many surgical staff, it may be difficult to keep up skill and knowledge levels in all areas. This may lead to staff dissatisfaction and a high turnover rate. One hospital in the US found that by allowing staff to choose their own clusters in a 'cluster staffing' model, staff satisfaction, clinical knowledge and efficiency increased and turnover reduced.⁹⁹


Working together on improvement projects can strengthen multidisciplinary teams in surgery. Retained objects after surgical procedures are an infrequent but potentially serious medical error. One clinic in the US undertook a multidisciplinary quality improvement programme to reduce the incidence of surgical retained objects. The initiative was led by surgical, nursing and managerial leaders. A review of previous incidents was undertaken alongside a revision of organisational policy. Education was then undertaken to raise awareness and communication among all theatre personnel including surgeons, residents, nursing and allied health staff. Education included staff meetings, team training, simulation videos and daily education reminders and room audits. Prior to the initiative the organisation had an average of one retained object every 16 days. After the intervention this improved to one every 69 days. This improvement was sustained long term.¹⁰⁰

Teams have also tested adding new members. For instance in the US, a dedicated orthopaedic traumatologist was added to a trauma system team. Adding this new team member was financially beneficial due to increased non trauma and elective referrals and uninterrupted elective theatre schedules.¹⁰¹

Paediatrics

The paediatric workforce is made up of hospital specialists (doctors and nurses), specialist dentists and dieticians, midwives, health visitors, community nurses, volunteers and community groups, amongst others. In addition, other practitioners also work with children and families as part of their day to day roles, although they may not specialise in caring for children.





The most commonly written about trend in teamwork in paediatrics is creating a strong interface between primary, secondary, social, mental health and community services and the variation in quality can result if transitions are not fully planned for.^{102,103,104,105,106} The need to have multidisciplinary teams available to care for children and families in the community or in their own homes is also a key theme.^{107,108,109,110,111,112} In England, Children's Centres are an example of this, whereby local authorities and health services work together to support young children and their families in an integrated manner.


As an example of building teams to foster transitions, researchers have examined how the healthcare workforce can support adolescents with attention deficit / hyperactivity disorder prepare to enter higher training and the workforce. Multidisciplinary primary care teams made up of paediatricians and nurses have provided preventive counselling and long term monitoring to good effect.¹¹³


In the US there has been a focus on developing special integrated care teams for young people with hydrocephalus. This is a long term condition that follows children into adulthood so ensuring that transition services are available is essential. Adults with hydrocephalus need continuous access to expert surgical and medical providers, but studies in the US suggest that existing care models fail to meet this need. Integrated teams of paediatric and adult medical and surgical specialists have been developed to provide continuous, coordinated care for people with hydrocephalus in a paediatric setting. Training doctors about optimal transition care is an important part of this.¹¹⁴

In the US some primary care practitioners specialise in caring for children. In fact paediatrics is largely thought of as 'primary care' in the US, though there are also hospital specialists in this area.¹¹⁵ Surveys suggest that these primary care paediatricians find it difficult to work in partnership with secondary care specialists due to shortages of specialists, especially in rural areas.¹¹⁶

But specialist teams for children tend to have benefits. In the US, interfacility transport by a paediatric critical care specialised team was compared with transport by non specialised teams. Unplanned events and death were more common when non specialised teams were used. It was concluded that transport of critically ill children to a paediatric tertiary care centre can be conducted more safely by a paediatric critical care specialised team with specific training and expertise.¹¹⁷ Other studies have similar findings.^{118,119,120,121}

In Africa, teams specialising in caring for children were put together to support HIV / AIDS care. Expertise in paediatrics is in particularly short supply throughout Africa so a 'Paediatric AIDS Corps' programme was developed to place paediatricians and other doctors in Africa on a long term basis to expand existing health professional capacity for paediatric and family HIV/AIDS care. Developing specific multidisciplinary teams focused on children's care increased the number of children receiving treatment.¹²²






Freestanding children's hospitals may lack resources such as surgical personnel. In the US, a multidisciplinary team was developed to address this at a tertiary care children's hospital. Attending trauma surgeons and anaesthetists took out-of-hospital calls and directed initial care for the most severely injured patients. Paediatric emergency doctors directed care for patients with less severe injuries. This team approach was found to be safe and effective.¹²³

A range of different staff members have been added to paediatric teams. For instance, one hospital in the US evaluated using a clinical pharmacist in a paediatric intensive care unit. The pharmacist did two ward rounds per week and reviewed medication lists daily. The pharmacist change drug doses where appropriate and provided drug information. On average the pharmacist spent 0.73 hours per day (or 0.02 full time equivalent) in the intensive care unit. Direct cost savings per year were estimated at US\$9,135 per year or 0.15 full time equivalent. Indirect savings were noted from educational activities, avoidance of medication errors and optimisation of medical therapies.¹²⁴

In the US there have been moves to include dental therapists as part of multidisciplinary teams caring for children.^{125,126,127,128} Oral health is an area of great disparity and the problem is particularly acute among children. It has been suggested that the current dental workforce in the US is inadequate to meet the oral healthcare needs of children due to the number of dentists and their geographic distribution, ethnicity, education and practice orientation. Dental therapists are paraprofessionals trained in a two academic-year programme. They could potentially care for children in dental offices, public health clinics, schools, GP clinics and the offices of paediatricians. Studies of their effectiveness are currently underway.¹²⁹

In the US paediatric palliative care is provided by a multidisciplinary team of medical staff, nursing, psychosocial staff, and other healthcare professionals. Also included are support staff such as financial counsellors, volunteers, secretaries and others not involved in the direct administration of medical services. Studies of support staff have found that being involved in palliative care for children can have adverse outcomes on their personal lives and few support staff felt they had sufficient knowledge or training in palliative care.¹³⁰ This emphasises the importance of providing high quality support and training for all members of the paediatric workforce.

In the US, multidisciplinary and multi institutional training has been tested for staff specialising in children's care. A simulation 'boot camp' was run as an orientation programme for hospital specialist trainees. The programme spanned nine institutions and was run at a large simulation centre. The two and a half day course covered common crises such as airway management, vascular access, resuscitation, sepsis, trauma and traumatic brain injury and delivering bad news. Follow up surveys found the training was effective for improving clinical performance and self confidence.¹³¹



Changing skill mix

Overview

Managing the workforce in healthcare involves organising groups of workers with different professional backgrounds, skills, grades, qualifications, expertise and experience in order to achieve optimal patient care. The concepts of staff mix and skill mix have been used as policy and management tools for developing the best combinations of skills across professions and organisations, as well as at the individual level.

Healthcare organisations have a range of options for ensuring a richer staff mix including increasing the number of personnel, higher ratios of qualified workers, higher ratios of senior staff members and multidisciplinary teams.

Workforce changes related to skill mix are a result of pressures arising from both the supply and demand sides of healthcare. On the supply side changing the mix of healthcare staff has often been used as a resourcing strategy to address staff shortage problems. On the demand side, changes have been implemented as means to enlarge the scope of services, fill previously unmet health needs and improve patient care.^{132,133}

Impact


Specialisation

Several observational studies have found that having a rich mix of qualified personnel with advanced degrees or specialty certifications is associated with better clinical outcomes including lower patient mortality rates.^{134,135,136,137,138} For instance, one study found that people cared for in the community by degree educated registered nurses required fewer home visits and had better knowledge and health behaviours than those cared for by nurses without such degrees.¹³⁹

A number of studies have examined the added value of specialty certification among doctors. Evidence suggests that doctors with specialty training have lower rates of adverse outcomes for certain procedures and medical conditions.^{140,141,142} For instance, patients suffering heart attacks tend to have higher survival rates when cared for by cardiologists rather than general hospital doctors.¹⁴³ However, there are divergent trends too. For example, studies comparing pharmacists to pharmacy technicians have found similar error rates between the two groups.^{144,145}

Experience

Although this may seem counterintuitive, research suggests that being more experienced does not necessarily mean that staff have better outcomes. For instance, several observational studies have concluded that more years of surgical experience are not associated with lower rates of post operative



complications.^{146,147} Similarly, studies suggest no relationship between years of experience as a registered nurse and patient mortality rates.¹⁴⁸

There are conflicting findings, with some studies finding a relationship between years of experience and outcomes.^{149,150}

The overall conclusion is that there is no straightforward relationship that can be applied to improve team dynamics based on experience.

Skill mix

Despite conflicting findings, a number of studies and systematic reviews suggest that a richer staff mix may be associated with better outcomes and fewer adverse events for patients. The evidence, however, is highly limited by practical limitations and methodological shortcomings. While many studies have reported positive impacts from enriching staff mix, they do not offer clear guidance about ideal thresholds in terms of personnel/patient ratios or the proportion of different categories of staff members on teams. More fundamentally, the staff-mix perspective that emphasises numbers and types of personnel gives less attention to the conditions that determine how staff members' skills are used.

Examples


Community mental health


In community mental health, a number of tools and approaches are available to measure staff workload and the amount of time community mental health teams spend on various tasks, with a view to adjusting staffing levels and ratios to enhance efficiency.^{151,152,153,154,155,156}

For instance, analysts in the US developed a method to help determine staffing levels for community mental health centres. A computer model was developed which included the number of hours staff have available for direct care, preferred intervals between a patient's return visits and the duration of appointments for an initial psychiatric assessment and for medication maintenance.¹⁵⁷

In the US, rural mental health teams often have a higher proportion of non professionally qualified or paraprofessional staff. This has not been found to affect outcomes adversely.¹⁵⁸

In England, a number of mental health teams have experimented with different skill mix ratios. For instance, in Essex a community mental health intensive care team employed a high ratio of unqualified to qualified staff. The use of healthcare assistants was initially viewed with suspicion and seen as a way of diluting the workforce. However, service users benefited greatly and were satisfied. The personality of healthcare assistants was important in facilitating treatment. The authors concluded that in community





mental health the personality and traits of practitioners are at least as important as having formal qualifications.¹⁵⁹

But adding new team members does not automatically improve outcomes. Researchers in England compared patterns of clinical activity amongst existing staff in two inner city community mental health teams before and after enhancement with extra staff resources. The amount of time spent in face to face contact with patients and carers showed no meaningful change following team enlargement. The authors suggested that adding staff resources to community mental teams without considering how to target the time released amongst existing staff may reduce their capacity to work more innovatively.¹⁶⁰

Health promotion

A number of researchers have profiled the public health and health promotion workforce in different countries or regions, aiming to assess capacity, skill mix and gaps.^{161,162,163} These studies tend to describe the extent to which different professionals provide health promotion services and the barriers and training required to increase such services.¹⁶⁴

Models to assess the most appropriate skill mix are also available.¹⁶⁵

For example, in England audits of the public health workforce have examined the roles of regional, district and organisational Directors of Public Health, public health doctors, consultants in dental public health, trainees in public health medicine, epidemiologists, research officers, nurses, medical advisers, pharmacists, health promotion staff and so on. Researchers concluded that the public health function is multidisciplinary, but the skill mix within health authority areas is variable.¹⁶⁶


Another study in England found that practice nurses were engaged in a wide range of activities for which many have had little formal training, including health promotion activities. The majority wanted to develop their role and undertake further training.¹⁶⁷


Similarly, a survey of occupational therapists in Australia found that these professionals spend minimal time on health promotion because of limited knowledge and because clinical work is seen as more of a priority. Barriers to practice include high demand for services, limited funding and time spent on administrative tasks.¹⁶⁸

Surgery

Data are available about the amount of time and cases covered by different types of theatre staff and the varying roles staff take
ON.^{169,170,171,172,173,174,175,176,177,178,179,180,181,182}

In surgery, rather than focusing on the best mix of staff to increase safety and quality, the majority of available studies focus on the best mix of surgeons and other staff to improve throughput and productivity and to reduce costs. ^{183,184,185,186,187,188,189,190,191,192,193,194,195,196}





The focus on the scheduling and organisation of surgery is important for both productivity and safety reasons. It also has a significant impact on workforce morale and satisfaction.¹⁹⁷

“The operating unit is one of the cost-intensive facilities in a surgical clinic... The power of performance of the operating unit is based on the cooperation of all disciplines and professions involved... To ensure successful operating room management, the internal structure of the operating room must fit the clinical tasks and the available quantity of personnel in each profession must be coordinated.”¹⁹⁸

There are many examples of the tools used to examine and modify skill mix in surgery. For instance, using theatre databases from two European hospitals, statistical models were developed to predict surgical and procedure times with various staff.¹⁹⁹ Another study examined how to best schedule holiday operating theatre rosters.²⁰⁰

In Germany, the time hospital doctors, including those in theatre, spent on direct patient contact and multitasking was observed. The authors concluded that surgeons had limited direct patient time compared to other activities and that it may be possible to consider other skill mix or task allocation strategies to improve efficiency.²⁰¹


Other researchers modelled the potential benefits of using additional lower level personnel in theatres to improve efficiency. Due to its resource intensive nature, the theatre environment is the most expensive part of the supply chain for surgical disciplines. A parallel production process with additional personnel and process adaptations may be more effective than a conventional serial layout.²⁰²

Emergency patients need to be operated on within a predefined safety window to improve their chances of recovery. In the Netherlands researchers have modelled the optimal size of emergency theatre teams on call at night in order to reduce staff costs and ensure the right mix of staff are available.²⁰³

In the US, certified registered nurse anaesthetists are the predominant anaesthesia providers in rural areas. Researchers developed a tool to examine practice, skills and time allocation for nurse anaesthetists.²⁰⁴

Elsewhere in the US, discharge data from 115 hospitals in a rural state were analysed to determine how much hospitals can increase elective inpatient surgical workload for different specialties.²⁰⁵

There has also been some work done about the value of full time versus part time staff when considering the skill mix of teams. In Japan, a small general hospital tested the value of hiring a full time anaesthetist instead of part time staff. Having a full time member of staff was beneficial in terms of explaining the nature of anaesthesia, possible risks, operating room and pre-postoperative procedures to patients. Anaesthetic management fees were reduced as was the length of stay in operating theatres.²⁰⁶



Paediatrics

In paediatrics, most studies of skill mix have examined the number and type of different staff providing care for children or the competencies that these staff could be expected to

have.^{207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267}

Most of this work comes from North America. For example, in Canada researchers assessed the regional variability of the paediatric subspecialty workforce and monitored growth over time.²⁶⁸


There have been studies about staff shortages in the fields of paediatric dermatology, radiology, oncology, neurology, surgery, ophthalmology, primary care, nursing, general paediatrics, dentistry, health education and so on.^{269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299} These studies tend to see each profession as 'stand alone' rather than examining skill mix implications.

There have also been debates about whether personnel trained to support adults should practice with children without qualifications and experience specific to children.³⁰⁰

In the US, physician assistants are licensed to practice with the supervision of doctors. Physician assistants do not specialise as part of their standard training and their license is not limited to a specific specialty. As such, physician assistants can and do change their practice settings at will. Researchers in the US examined the current distribution and status of physician assistants in paediatrics. Most states have fewer than 50 paediatric physician assistants and there is significant variation in their distribution across the US. Most work in primary care, often in private practice settings. The authors concluded that greater numbers of this role would be needed to have a major impact on workforce skill mix.³⁰¹

In the US, researchers examined patterns of work and retirement among paediatricians older than 50 years. About half planned to provide patient care after the age of 65. As professionals got older they were increasingly likely to engage in part time work, and this may represent a step toward retirement for many. The researchers suggested that making provisions for a gradual reduction in work hours or other forms of phasing out of the workforce could extend the career length of the most experienced paediatricians.³⁰²

In the UK, a survey of the specialist workforce in paediatric dentistry found that the majority of specialists were women and a significant proportion worked part time. Almost half planned to retire during the next ten years and most had had a break during their careers (for instance, for childrearing). The authors concluded that in order to ensure appropriate skill mix in future, workforce planners must be cognisant of the need to increase the number of specialists in training to take account of service lost through part time working and career breaks.³⁰³



In the US, the impact of staff numbers on clinical outcomes for children with diabetes was examined. An analysis of data from a paediatric diabetes outpatient clinic spanning several years found a linear relationship between higher staff numbers and greater glycaemic control. Greater staff numbers were also associated with reduced hospitalisations. The authors did not examine the best mix of staff to optimise outcomes.³⁰⁴

In Canada, a children's hospital found that the number of nurses was related to nosocomial viral gastrointestinal infections in a general paediatrics population. Nurse understaffing contributed to an increased infection rate.³⁰⁵


In the Netherlands a capacity management system was used to develop insight into staff and equipment resources for inpatient care for children. A capacity model was developed to calculate required nursing staff capacity based on historical bed use, nurse-patient ratios, contract hours and nursing staff needed per shift. Organisational improvement processes were initiated in three different groups of wards. For paediatric wards, the most important improvements were improving working processes so that the agreed nurse-patient ratios could be attained.³⁰⁶


Researchers in London analysed the impact of workload, skill mix and staff supervision on adverse events in a paediatric intensive care unit. Factors associated with increased adverse events included day shift, average patient dependency, number of occupied beds and the presence of multiple, simultaneous management related issues that compromised the supervisory ability of the nurse in charge. Factors associated with decreased adverse events included the presence of a senior nurse in charge, a high proportion of the shift filled by rostered permanent staff or senior nurses, the number of admissions and discharges and the presence of new junior doctors. The authors concluded that skill mix has an important impact on outcomes.³⁰⁷

Overview

Role enhancement involves expanding a group of workers' skills so they can assume a wider range of responsibilities through innovative and non traditional roles.³⁰⁸ Enhancing staff members' roles gives employees the opportunity to acquire new competencies and expand their tasks so that they can take on responsibilities traditionally carried out at higher levels.³⁰⁹ By altering the content of their work, staff are offered opportunities for individual achievement and recognition. There may also be greater work satisfaction because staff are involved in tasks that increase their control or responsibility.³¹⁰

Role enhancement or enrichment is considered a vertical and upward expansion of work because it alters authority, responsibility and the level of complexity.³¹¹ In the healthcare context, role enhancement maximises workers' use of knowledge and skills related to clinical practice, education, research, professional development and leadership.^{312,313}





Role enhancement does not entail adding functions from other professions. It occurs within a given profession's scope of practice.³¹⁴ It can also arise from innovative professional activity, new models of healthcare delivery and organisational changes that promote development of new knowledge, skills and practices. Through experience, continued professional growth and development and collaboration with colleagues from other disciplines, healthcare workers can develop new skills, abilities, and techniques.³¹⁵

In addition, as healthcare work expands into new settings, the situational factors that shape service provision in those environments create demands for new skills.³¹⁶

Role enhancement has been associated with the potential to increase longitudinal and personal continuity and improve patients' health outcomes by enabling one professional to cover a wider range of care needs or by enabling a patient to be cared for by fewer workers. As a result, many professionals such as nurses, pharmacists and GPs have recently expanded their responsibilities beyond their traditional scope of practice to include more innovative roles. In many cases, these role expansions were initiated in order to ensure that individual professionals would be able to oversee a greater proportion of their patients' care.


Primary care and prevention are the main areas in which nurses have taken the lead in delivering enhanced services, including health promotion, health screening and discharge follow up. For instance, since the 1990s, nurses in UK general practices have been responsible for carrying out 'well person' health checks and providing lifestyle counselling and other interventions in accordance with treatment guidelines.³¹⁷


Nurses have also expanded their roles by specialising in certain practice domains and by helping people with particular conditions. Such specialist nurses can be based in either primary or secondary care, and they are particularly active in nurse led clinics, where nurses assume responsibilities such as managing people with long term conditions, providing health promotion advice, monitoring and informing patients and undertaking cervical and cardiovascular screening.^{318,319,320,321}

Role enhancement is also evident in nurse led outpatient follow up, whereby hospital or community based nurses oversee discharge planning and post discharge outpatient follow up.³²² These examples illustrate the expansion of nursing to support needs that were often unmet or inadequately addressed.

While retaining their generalist background, some GPs have also enhanced their roles. In the US and the UK, GPs who hold additional qualifications or training and who focus on particular areas are sometimes known as 'GPs with special interests.' Such GPs can offer specialist care in the community or work as part of multidisciplinary hospital and primary care teams.^{323,324,325}

Similar developments have occurred for pharmacists whose work has expanded far beyond the distribution of medications to include patient





education, health promotion, counselling, medication management, health monitoring and even in some jurisdictions, prescribing.^{326,327,328,329}

Impact

Patient outcomes

Despite major interest in developing enhanced roles, evidence about the impact of these new roles is limited and has focused mostly on nursing.


Overall, the evidence suggests that health professionals can learn specific advanced skills that fall outside the scope of their routine practice and apply them in clinical settings. Some studies have found improvements associated with organisational innovations that draw on nurses with advanced skills, including nurse led clinics or specialist nurse led initiatives.^{330,331,332,333} Other studies have found fewer or no benefits.^{334,335,336,337}

However there are variations in the nursing interventions in these studies which may lead to inconsistencies in the findings and make it difficult to draw conclusions about the effects of enhanced nursing roles on patient outcomes. We cannot be certain whether any observed differences are due to the nurses' roles or to other factors such as increased follow up or access to a multidisciplinary team. Thus, although many studies have revealed connections between nurses' role enhancements and safe and effective care or improved patient outcomes, it remains uncertain whether the benefits are due to specific interventions or nurses' roles. Furthermore, the evidence regarding the opportunity costs of such service developments and marginal gains in terms of health outcomes is still scarce and often conflicting.

Workforce outcomes

In addition to patient outcomes, role enhancement also affects professional outcomes.^{338,339} Motivation may be a function of work factors such as responsibility, advancement, recognition and opportunity to acquire and use skills such as leadership and self regulation. It has been suggested that enhanced roles that include these factors lead to satisfaction and motivation because they provide workers with more control, responsibility and discretion over how they perform their jobs. Research on role enhancement in various sectors suggests that enriched jobs are more meaningful, less exhausting and associated with greater job satisfaction.^{340,341,342,343}

In the healthcare arena, role enhancement may also have a positive effect on workforce recruitment and retention, either by providing more advanced roles with increases in pay and status or through the creation of new clinical career pathways.^{344³⁴⁵}



Challenges

Despite the benefits associated with role enhancement, some caution is required. Firstly, as traditional roles and functions change, confusion and disagreements can challenge professionals' identities and create conflicts among practitioners and occupational groups. Such conflicts can in turn, lead to low morale and antagonistic working relationships.^{346,347}

Secondly, work expansion, even in a vertical direction, is not always synonymous with job enrichment.


Management strategies designed to expand practice scopes may undermine professionals' distinctive work domains because they blur role boundaries and make the work of one profession indistinguishable from that of others. Lack of clarity about professional practice means that, in fulfilling useful, flexible, and cost effective new roles, individuals may serve managerial, economic, and patient interests, but the new role may remain limited and lack any obvious benefits for the development of the profession. Some analysts have even suggested that adding new functions to professionals' roles is nothing more than a revamped version of rationalisation programmes in that this creates heavy workloads, significant role changes and pressures to develop a broader range of skills.^{348,349} These increased pressures to develop new skills and reach higher educational standards may be counterproductive if they demotivate workers who feel they must take on additional work without further support or reimbursement.³⁵⁰

Third, role enhancement may not go hand in hand with upskilling workers. Just because staff members must perform more tasks at higher levels does not mean they have been supported by further training. Several reports have voiced concerns that the broad range of initiatives being implemented to expand healthcare workers' roles is not always combined with efforts to establish supportive educational and training programmes.^{351,352} While some key stakeholders, including governments and employers, have argued for the expansion of scopes of practice in healthcare, the pace of service development has often outstripped the ability of training programmes to equip workers.

Examples

Community mental health

There are a number of examples of role enhancement from the field of mental health. The development of community mental health teams themselves could be seen as a form of role enhancement because these teams involve groups of professionals expanding their skills. The closure of institutions for those with mental illnesses coupled with government policies to reduce the number of hospital beds for people with severe mental illness in favour of providing care in non hospital settings, underpins the rationale behind the development of community mental health teams.³⁵³



More specific examples of enhancing the roles of particular professionals are also available. For instance, in the US community therapists have been trained to provide cognitive behavioural therapy in the wake of disasters such as hurricanes. Short two day training courses were found to be effective for helping practitioners expand their skills.³⁵⁴

In the UK, a new role of 'primary mental health worker' was established to support collaboration across the interface between care settings. A case study in six health authority areas in England interviewed primary mental health workers, GPs, health visitors, psychiatrists and service managers. There were issues with the integration and accommodation of the new workers into existing teams and there were tensions between the two different roles that primary mental health workers could undertake (direct clinical care versus consultation-liaison).³⁵⁵


A number of enhanced roles for nurses have emerged as more care is offered in the community.^{356,357} In England community psychiatric nurses were trained to deliver psychosocial support to people with schizophrenia living at home with relatives. The training package consisted of family assessment, health education and family stress management strategies. Comparing those who received support and those who did not over a 12 month period found that the enhanced nurse role was associated with improved symptoms, personal functioning and social adjustment. Relatives' satisfaction with services and wellbeing increased.³⁵⁸


Similarly, in the US clinicians and managers from 66 community mental health centres were trained to provide family psychoeducation services. Implementation success was more likely at sites where the treatment model was viewed more positively at the outset, where real and perceived resource limitations were addressed, where inducements to implementation were not prioritised and where attention was paid to the difference between new and existing treatment methods. This suggests that organisational contextual factors have an important effect on whether workforce developments succeed.³⁵⁹

Role enhancement may involve targeting care to specific groups. In England, a community development worker role for black and minority ethnic communities was created to enhance mental health services. Workers extended their skills and gained specific training to support minority groups.³⁶⁰

In Japan, occupational therapists have extended their reach to support people with mental health issues. Working in community facilities, they have become part of multidisciplinary teams supporting people in person and through telehealth networks.³⁶¹ This trend is also evident in the US.³⁶²

There is evidence that some practitioners welcome role enhancement and think that further expansion of their roles would be beneficial. For instance, in Australia community mental health nurses were surveyed about their attitudes towards role enhancement. Nurses were overwhelmingly positive





about expanded practice and believed that patients would benefit if nurses were legally able to undertake tasks such as prescribing medication.³⁶³

But expanding roles may impact negatively on staff. Previously in the UK, applications for involuntary admission to psychiatric units tended to be made by specially trained approved social workers. A study comparing these workers with other mental health social workers who did not carry statutory responsibilities found that the additional responsibilities were associated with longer work hours, less support at work, emotional exhaustion, greater burnout, more dissatisfaction and greater likelihood of wanting to leave their job.³⁶⁴

Health promotion

There are several examples of role enhancement in health promotion.

The role of oral healthcare professionals such as dentists and hygienists has expanded to include health promotion.^{365,366,367,368} Rather than merely treating caries and periodontal disease, oral healthcare professionals now provide counselling to facilitate risk reduction and individualised disease prevention planning.³⁶⁹ They also support other professionals to promote oral care.³⁷⁰


In England, dental practitioners enhanced their roles by explicitly providing general health promotion advice. However perceived barriers included lack of time and financial factors, workload and lack of personal skills and this resulted in relatively low involvement in general health promotion.³⁷¹


Elsewhere in England, hospital epidemiologists extended their roles to promote a public health perspective among hospital clinicians. Responsibilities included the promotion of clinical effectiveness and evidence based practice, epidemiological support for audit, research and clinical evaluation, liaison with primary care and public health colleagues in health authorities, and the development and implementation of clinical guidelines.³⁷²

In Canada, dieticians joined primary care teams. It was estimated that 1-2% of patients in primary care networks may require individual nutrition counselling in a year and the cost of adding a dietician to a primary care team would be around US\$80,000 per annum.³⁷³

Elsewhere in Canada, advanced practice nurses enhanced their roles as part of a programme to develop healthier communities. Examples of role developments for nurses included community leadership development, community assessment, nurse managed services, research and policy advocacy.³⁷⁴

In Australia, the Royal Flying Doctor Service provides health services for remote populations. To provide effective health promotion as well as acute clinical services, the service used 'field days,' an initiative based on a





capacity building approach to health promotion. Field days were conducted at large farms, national parks, remote tourist facilities, roadhouses and racecourses. They consisted of a morning interactive workshop based on locally identified health topics followed by an afternoon clinic. Participants found the events positive and staff believed that this approach helped expand their focus.³⁷⁵

In Poland, as in many other parts of the world, pharmacists have enhanced their roles to provide health promotion advice with a focus on smoking cessation. This may involve informal counselling or advice alongside routine services, or more specific programmes and targeting to support smokers who wish to quit.³⁷⁶

In Japan, training was provided to help public health professionals enhance their roles in providing diabetes support. The training included lectures with up to date knowledge about diabetes and practical aspects such as lifestyle assessment, coaching methods, nutrition sessions, experience walking and exercising with heart rate monitors and pedometers, and role plays about how to interview and provide health guidance. Training resulted in improved knowledge and skills amongst public health staff. After six months, participants had often set up diabetes prevention services and were cooperating with other facilities.³⁷⁷


Surgery


There are a number of examples of enhanced roles in surgery, especially with regards to nursing ^{378,379} physician assistants ³⁸⁰ and unlicensed assistive personnel.^{381,382,383} This may be a function of staff shortages, new technologies and the move toward more day and outpatient surgery.

“The present climate in health care, including a tendency toward more managed care and capitation systems, has caused hospital administrators and perioperative managers to reexamine traditional work systems and their associated costs. Some decisions around work redesign may be financially driven or based on the decreased availability of qualified professionals in the job market. The use of an increased number of unlicensed assistive personnel in hospital settings has become a common redesign strategy to address both issues.”³⁸⁴

In England and Wales, theatre practitioners have enhanced their skills so they can take on multiple roles. Research suggests that this has reduced cancellations in standalone day surgery units.³⁸⁵ Assistant practitioners have also been tested in theatre and critical care.³⁸⁶

In Scotland, nurse roles were enhanced to develop a self managing nurse team for day surgery. An 11 member nursing team was established at a district general hospital. Morale in the day surgery team was higher than





average for hospital staff and patient satisfaction was overwhelmingly positive.

Day case activity performance improved to within the top percentile for Scotland and financial performance targets were exceeded.³⁸⁷

In Canada, registered nurses have expanded their roles to undertake various theatre tasks, including theatre management.³⁸⁸

In the US, nurses took on team leader roles within operating theatres. Evaluators found that there were some difficulties in expanding roles in this way and that due to the highly technical nature of the operating theatre, team leaders defined their roles in relation to the organisational and technical needs of their surgical service.³⁸⁹

In one US hospital nurse practitioners began assisting with preoperative evaluations for children. The aim was to shift anaesthetists from the preanaesthesia clinic to the operating theatre while maintaining the quality of preoperative care. There was no difference in the incidence of respiratory complications, patient preoperative preparation time and levels of parental satisfaction between anaesthesiologist only and nurse practitioner aided assessments. Anaesthetist and preoperative clinic nurse satisfaction increased significantly. The evaluators concluded that enhancing the roles of nurse practitioners in this way maintained patient safety, timeliness, and a high level of parent satisfaction as well as increasing staff satisfaction. It also allowed two anaesthetists to be shifted to the operating theatre.³⁹⁰


Paediatrics


In paediatrics the most common examples of enhanced roles focus on nurses and physician assistants.

In the US, there is a maximum 80 hour work week for residents and trainees. This has led many teaching hospitals to find replacements for residents. At one organisation, A&E and hospital on call duties alternate between orthopaedic residents and orthopaedic nurse practitioners. Nurse practitioners taking on this enhanced role provided equal quality of care to residents.³⁹¹ However, in the field of paediatric surgery some studies have found that using support staff did not aid adherence to the working time guidelines.³⁹²

In the US, nurse practitioner roles have been enhanced to include supporting children in paediatric A&E departments. This includes running 'fast track' areas to support children and families. Half of all paediatric A&E departments in the US report using nurse practitioners. Freestanding children's hospitals were more likely to use nurse practitioners than children's hospitals within general hospitals.³⁹³

In Canada there are not enough paediatric neurologists to meet the needs of children. One hospital addressed this by enhancing the nursing role in the paediatric neurology outpatient clinic. A telephone nursing line was used in the hospital paediatric neurology clinic whereby parents were able to





telephone the nurses for assistance. Nurses managed more than half of all telephone calls without assistance from doctors.³⁹⁴

In the US, paediatric emergency medicine doctors enhanced their roles to provide a sedation service for children during imaging. There was a low risk of adverse events, minimal failures and no residual morbidity.³⁹⁵

One community hospital in the US enhanced the role of paediatric hospitalists by giving them responsibility for a combined paediatric A&E and inpatient facility. This role was associated with improved patient satisfaction and decreased A&E throughput times.³⁹⁶


In the US, the role of paramedics has been expanded for use in paediatric A&E departments. A survey of paediatric A&E departments found that around one quarter had paramedics who were employed as allied health personnel. Paramedic responsibilities in paediatric A&Es included patient transport, laboratory transport, IV access, medication administration, suturing, assisting and intubation. The average starting salary of paramedics was two thirds of that of a starting nurse salary.³⁹⁷


Dental caries are one of the most prevalent unmet health needs in US children.³⁹⁸ Access to care is particularly problematic for less advantaged children and is compounded by a shortage of dentists. Expanding the roles of paediatricians, family physicians and paediatric nurse practitioners who provide primary care services to children has been proposed as a solution to enhance oral healthcare.³⁹⁹

A number of new roles have developed to enhance professionals' scope of practice. For instance, in the US there are around 13,000 paediatric nurse practitioners. A survey of these professionals found that most are engaged in primary care but only one in ten practice independently (when allowed by law). Although it has been suggested that the role of paediatric nurse practitioners could be enhanced to be more specialised and to focus on children with long term conditions, this is not currently the case.⁴⁰⁰

Work hour restrictions for house staff in the US have led to the expansion of nursing roles in the form of paediatric trauma nurse practitioners. A randomised trial of nurse practitioners versus resident care found that the nursing group had a significantly shorter length of stay and greater patient satisfaction scores with regard to information on injuries, tests and treatment and frequency of visits provided to the patient and family. The researchers concluded that paediatric nurse practitioners provide equivalent trauma care for children with improved outcomes compared to residents.⁴⁰¹

In Canada and the US, 'paediatric hospitalists' have been tested.⁴⁰² This role involved enhancing a salaried doctor's role to focus on children's care. Clinical activities included attending on paediatric medicine inpatient units, consultation and co-management outside the unit and outpatient care of 'hospital intense' patients. There was also a high level of engagement in research, education and quality improvement activities. Perceived advantages of this role were working in a team, taking a generalist approach





to care, stability compared to community practice and intellectually stimulating and rewarding work. Perceived disadvantages included burnout, lack of recognition and respect and lack of long term relationships with patients.⁴⁰³

In the US the role of public health nurse-childcare health consultants has been developed. Interestingly, training of district nurse managers and other senior managers was essential to ensure that nurse consultants could apply their new skills and gain appropriate support.⁴⁰⁴

Role Enlargement

Overview

Role enlargement involves growing staff roles by encouraging members of the workforce to extend their activities and take on roles and functions at parallel levels (horizontal enlargement) or lower levels (downward enlargement).^{405,406,407}


In industry, role enlargement aims to change the scope of jobs in an attempt to motivate workers.^{408,409} This practice emerged as a response to excessive specialisation in the division of industrial labour, whereby work is typically divided into small units, each of which is performed repetitively by an individual worker. Concerns about extreme specialisation and its adverse effects on workers' morale led to calls to restore some of the skill, responsibility and variety that had been lost through work simplification.^{410,411}


In healthcare, role enlargement has been part of efforts to shift service delivery from a task oriented approach towards integrated care carried out by workers who are able to meet patients' multiple and complex needs.⁴¹² This has been particularly important as healthcare moves away from a focus on episodic acute care towards a more continual and holistic model of care to support people with longer term conditions.⁴¹³

In the field of long term conditions, population based approaches to care are moving the workforce away from caring for a single unit (one person seeking care) towards planning and delivering care to defined populations.

In addition to completing basic disciplinary training, professionals who care for people with long term conditions must develop a broad range of skills related to quality improvement, case management, systems design, care plans, supporting self management and working as members of teams.⁴¹⁴

As with role enhancement, role enlargement succeeds not by replacing one professional with another but by expanding the skill repertoire of workers. Such role enlargement has been present in many initiatives to upskill practitioners to provide certain routine, easily trainable and low risk procedures to support integrated care such as monitoring vital signs, measuring blood glucose level, measuring peak expiratory flow rate, examining for breast lumps and providing advice on health promotion.





Horizontal expansion can also be seen in increased interest in developing generic and non clinical skills such as patient education, technical writing, teamwork and communication.

The World Health Organisation suggests that there are five core generic attributes that transcend the boundaries of specific disciplines and that should be present in everyone who cares for people with long term conditions. These are patient centred care, partnering, quality improvement, information and communication technology and a public health perspective.⁴¹⁵

Impact

Beyond its potential to reduce service fragmentation, role enlargement can also have a positive impact on staff members themselves. Studies on the effects of job enlargement programmes suggest that focusing on role breadth tends to increase job variety, enhance task significance, increase autonomy and improve motivation.^{416,417,418} In one study, multiskilled healthcare workers with broad practice scopes reported having more interesting jobs, greater job security and more feelings of enhanced contribution to their hospital than did uni-skilled employees.⁴¹⁹


However some research suggests that role enlargement must be undertaken cautiously because unabated expansion can threaten professional identity, intensify workloads to the point of excess, and spark significant levels of demotivation and dissatisfaction. Nurses, for instance, have reported negative outcomes associated with role enlargement, primarily as a result of having to undertake more tasks. Coupled with staff shortages and often in the absence of reciprocal workload support from other occupations, these extra demands involve juggling additional functions on top of pre-existing clinical responsibilities and in more pressured environments.⁴²⁰ In such cases, staff members' resentment is fuelled by the perception that their specialist knowledge and skills are being devalued at the same time as they are being asked to take on a broader range of generic functions.


Examples

Community mental health

Community mental health nurses and other professionals undertake a wide variety of activities, and these vary in different countries.^{421,422,423,424}

In Ireland, mental health nurses are being asked to extend their skills to support people with diabetes. A survey of hospital and community mental health nurses found that such nurses are currently involved in a range of diabetes care activities, although their knowledge and skills may not be up to date. Mental health nurses reported a growing impact of diabetes care on their workload. Training needs identified were taking blood glucose readings, giving dietary advice, liaison with diabetes nurse specialists and weight management.⁴²⁵





In England, community mental health teams were trained in medication management. Antipsychotic treatment is important for reducing symptoms and relapse in schizophrenia and community mental health professionals have a significant role in this treatment but may not always be effective in medication management. A randomised trial found that training community teams in medication management improved symptoms and service user involvement in treatment compared to controls.⁴²⁶

A similar study in England examined brief medication management training to help community mental health nurses deliver compliance therapy for people with schizophrenia. Training was associated with improved knowledge about medication management and tangible improvements in skills.⁴²⁷

In the US, community mental health centre staff have enlarged their roles by providing basic general medical care.


“Although persons with chronic mental illness have a high incidence of physical health problems, they are often ill equipped to seek care within complex healthcare systems and tend to depend on community mental health centres as their only source of regular healthcare... [Nurse practitioners have] a role in assessing the medical needs of chronic mentally ill outpatients ... and in devising strategies to meet those needs. The nurse practitioner's activities include direct physical health screening and treatment, referral for specialised medical services, consultation, research, and staff and patient education.”⁴²⁸


However, there are difficulties with this, including reimbursement issues, workforce skills, lack of available space or equipment and lack of options for referrals to local community medical providers. Community mental health centres have the capacity to screen for common medical conditions, but organisational and skills deficits were barriers to providing general medical care.⁴²⁹

In the US, the role of psychiatrists within community mental health centres has also been enlarged. Psychiatrists are asked to be involved in a variety of activities in addition to prescribing medication, including policy development and training other staff members.⁴³⁰ In rural settings the degree of role diversification is even greater.⁴³¹

In Australia there have been moves to upskill GPs to provide more support for people with schizophrenia and other mental health conditions.⁴³²

As greater numbers of people with severe mental health issues are being accommodated in the community, mental health teams have expanded their skills to provide outreach services for these people. Social workers and community outreach mental health professionals have had to learn to deal





with threats of violence. To support the expanded roles, proactive prevention and post incident response procedures that create an organisational climate of safety awareness, training, and psychological support for traumatised workers are needed.⁴³³

Health promotion

There are a number of examples of enlarging the role of health promotion and public health staff to provide enhanced services or to use research and evidence based practice more effectively.⁴³⁴ There are also examples of how other staff have enlarged their skills to include health promotion activities.


In Australia, health promotion teams have been trained to enhance their role in undertaking evidence based practice. A train the trainer programme was implemented to build workforce capacity. Participants reported significant improvements in their evidence based practice knowledge and skills and said that this had altered their practice.⁴³⁵


Health visiting is a key profession in health promotion and public health. Starting Well is a national programme in Scotland to test the feasibility of enlarging health visitors' roles to improve child health by providing intensive home visiting to families. An evaluation found that greater contact with families allowed health visitors to develop their understanding of the life circumstances of those on their caseload, but there were questions about the feasibility of systematically changing practice and difficulties with implementing an approach that relied as much on individual values and organisational context as formal guidelines and standardised tools. The ability of the systems and structures within which practitioners were operating to facilitate a broad public health approach was limited. The evaluators concluded that in order to enhance health promotion, changes were needed not only at the level of workforce, but also at the level of organisations and policy.⁴³⁶

In Scotland the role of health visitors has also been enlarged to include oral health promotion. Health visitors undertook caries risk assessments in less advantaged communities. This was part of a broader programme where nursery schools and primary schools in the most deprived areas also undertook supervised tooth brushing and distributed oral health packs.⁴³⁷

There are also examples of enlarging the roles of general professionals to include health promotion activities. In the US, food service personnel in schools were educated to improve the use of whole grains. A continuing education programme was developed to address planning, purchasing, preparing and serving whole grain food in schools. The programme improved staff's knowledge and intention to find whole grain recipes for school menus. Follow up after three to six months found that more whole grain food items were offered in schools.⁴³⁸

In the US, child care centres are venues for overweight prevention efforts directed at young children. Child care health consultants who provide consultation to these centres receive little training about basic nutrition and






physical activity principles. In person training may have limited reach in disseminating health information to a geographically diverse population of health professionals so researchers tested the value of online training to help enlarge the skills of these consultants. A randomised trial with 50 child care centres found that training improved consultants' knowledge and that online training was as effective as in person training.⁴³⁹


In Australia, primary care teams took part in a five day course in health promotion. The aim was to improve adoption of health promotion. The course improved staff knowledge, skills, confidence and enthusiasm for undertaking health promotion work. 80% of participants said they had incorporated health promotion into their work frequently or all of the time since undertaking the course. Lack of understanding of health promotion from co-workers and managers, lack of organisational support and commitment, lack of resources, competing clinical priorities and lack of time were the main stated barriers.⁴⁴⁰

Elsewhere in Australia, five day courses were run to enhance the general healthcare workforce's knowledge and skills in health promotion. The course improved health promotion practice among individual staff and organisational capacity to conduct health promotion. There was also an improvement in the confidence and skills needed to engage in collaborative work. Participants emphasised the need for organisational change in order for health promotion practice to be embedded into organisations and for practitioners to be supported in their efforts to reorient services towards health promotion.⁴⁴¹

In Australia, staff at a mental health rehabilitation organisation enlarged their skills to include health promotion research and development. Staff were enthusiastic about embedding research practice into the organisation to help demonstrate programme outcomes. However, work demands took precedence over the tasks involved in research. The evaluators concluded that staff commitment, knowledge and skills are not sufficient if an organisation lacks the capacity to provide the resources or support for change. Workforce development to build the capacity for health promotion is more likely to be successful if it is embedded into organisational strategy and culture, has enough resources allocated (including staff time) and is supported by management.⁴⁴²

A survey in Finland examined which workers were involved in health promotion as part of role enlargement. 65% of staff working in primary care, 52% working in home care and 44% working in inpatient care were engaged in health promotion activities. Factors influencing engagement in health promotion were organisational values, perceived skill discretion and social support from co-workers, cooperation with external partners and staff competence and knowledge about the health and living conditions of the population. The researchers concluded that having the scope to practice skills and having collegial support enable teams to enlarge their roles to include health promotion.⁴⁴³





In the US, dental school staff were trained to undertake telephone triage in the event of an avian flu pandemic. 15 hours of training was provided and telephone triaging was practiced. The training enabled alternative healthcare professionals to become a source of additional resource if needed.⁴⁴⁴

Role enlargement is something that needs to be planned and developed systematically, rather than being left to chance. In the UK, researchers examined the extent to which primary care nurses are promoting physical activity for older people. The uptake of physical activity programmes amongst older people is highly variable and the optimal approach to promoting physical activity for this group is not well understood. Some believe that specialist exercise trainers are needed, but existing primary care practitioners such as nurses might fulfil this role equally well. A survey of district nurses and practice nurses found that nurses had the commitment and opportunity to promote physical activity to older patients but there were organisational and individual constraints on their ability to be involved in this aspect of health promotion or to refer older people to local activity promotion schemes. Nurses did not have a structured approach when promoting physical activity. The authors suggested that it would be useful to expand nurses' knowledge and skills in this area in order to more effectively target older people.⁴⁴⁵


In Spain, researchers found that GPs, primary care nurses, technicians, primary care managers and public health professionals believe there is a need for more training in generic public health skills such as communication skills, advice methodology and the use of clinical practice guidelines. The main barriers to health promotion and prevention in clinical practice were lack of time, lack of training and the attitudes of the professionals themselves towards prevention.⁴⁴⁶


Surgery

There are limited examples of role enlargement in the field of surgery. For instance, in Canada, the roles of orderlies and surgical aides were merged at one hospital, to provide a more generic support function.⁴⁴⁷

Paediatrics

Selected examples of role enlargement in paediatrics are available. For instance, in Canada, one hospital paediatric oncology nursing unit experienced a large influx of new staff nurses, only a few of whom had previous experience. To support these new nurses, a more experienced nurse took on the role of a 'resource nurse.' This was a temporary position to help new staff nurses with patient assignments, prioritising their day and dealing with complex procedures and treatments. The resource nurse also assisted all staff on the unit to deal with increased patient acuity, chemotherapy administration, family teaching and complicated family situations. This helped to orientate new nurses and make them feel more comfortable and confident in their roles.⁴⁴⁸





In Sweden, the role of child health nurses has been extended to include reducing children's exposure to tobacco smoke. Interventions led by nurses have been implemented at child healthcare centres. These have been found to be useful, but nurses have reported difficulties in reaching fathers, immigrant families and socially vulnerable families with tobacco prevention programmes.⁴⁴⁹

In the US, researchers found that doctors, nurses and respiratory therapists were equally effective at monitoring children and detecting wheeze in paediatric intensive care units. Staff could be used interchangeably for this activity.⁴⁵⁰


In the UK, nurses and other professionals are expected to enlarge their roles to safeguard particularly vulnerable children and young people including those in local authority care, those who have disabilities, those who are in custody and those who are affected by domestic violence.⁴⁵¹

Examples are also available from the UK of nurses taking leading roles in children's cancer care and other specialist care.⁴⁵²

In Australia, a programme was set up to help rural allied health professionals enlarge their skills in the field of paediatrics. Rural allied health professionals may experience professional isolation, lack of professional development opportunities and limited support systems. An exchange programme helped rural allied health professionals learn from those in metropolitan areas. Benefits included increased clinical skills in specialist paediatric areas, increased networking and access to resources.⁴⁵³

A lack of continuing primary care for asthma is associated with increased levels of morbidity in low income minority children. Effective preventive therapy is available, but many minority group children in the US receive episodic treatment for asthma that does not follow current guidelines for care. To alleviate this issue, staff at child health clinics serving low income children in New York were trained to provide preventive care for asthma. A controlled study found that child health clinic staff could be trained to provide ongoing asthma care, including screening to identify new cases and health education to improve family management.⁴⁵⁴

Primary care paediatric services in the US tested the value of enlarging roles to improve children's reading skills. Children from low income families are at risk of poor reading skills. A home environment that encourages learning and parents who are involved in their children's education are important factors in school achievement. A randomised trial compared usual primary care versus providing families with developmentally appropriate children's books and educational materials and advice about sharing books with children. The literacy programme helped to improve reading in families and increase children's vocabulary. It was particularly beneficial for older toddlers. The evaluators concluded that a simple and inexpensive intervention, delivered as part of usual primary care, changed parent attitudes toward the importance of reading with their infants and toddlers, and enhanced language development.⁴⁵⁵





Substitution

Overview

Role substitution

Role substitution involves extending practice scopes by encouraging the workforce to work across and beyond traditional professional divides.⁴⁵⁶

In recent decades role substitution has blurred traditional professional boundaries. In the US for example, physician assistants with a wide variety of backgrounds, including nursing and social care, have become an attractive option for expanding workforce capacity.⁴⁵⁷ Similarly, in many countries several types of non professionally qualified staff members have been used as substitutes for nurses or doctors. In fact, substitution of less expensive 'care assistants' for more expensive nurses and doctors has become increasingly apparent in response to cost containment initiatives and workforce shortages. Other role substitution examples include training respiratory therapists to perform EEGs and medical technologists to perform certain radiological procedures.⁴⁵⁸

Role delegation


Role delegation involves transferring certain responsibilities or tasks from one grade to another by breaking down traditional job demarcations. In practice, groups of professionals take on roles delegated to them by other groups of professionals. Interest in delegation has been driven by its potential to encourage highly qualified and high cost practitioners withdraw from activities that can be competently performed by less qualified and lower cost practitioners. As a result, the former group can devote more time to the interventions that only they can perform.


Although in theoretical terms role delegation is different from substitution, it is included in the same section in this review for simplification and because it can be difficult to differentiate between these two workforce developments.

Some research suggests that between 25% and 70% of general doctor's tasks could be delegated to other healthcare professionals.⁴⁵⁹ In the same vein, other studies have concluded that GP workload for specific patient groups can be reduced by up to 50% by delegating some activities to nurses, including managing requests for out of hours appointments,⁴⁶⁰ same day appointments ⁴⁶¹ and home visits.⁴⁶²

The Wanless report in the UK suggested that nurse practitioners could take on about 20% of work currently undertaken by GPs and junior doctors, whilst healthcare assistants could cover about 12.5% of nurses' current workload.⁴⁶³

According to other studies, task delegation would allow a significant proportion of nurses' workload to be taken up by healthcare assistants, auxiliary nurses, and other less qualified staff members.^{464,465}





One study found that over a 24 hour period in A&E, nursing staff spent 49% of their time on nursing tasks, 21% on communicating with patients, 17% on clerical work and 13% on housekeeping. These figures mean that a significant proportion of current nursing work could be delegated to untrained personnel such as healthcare assistants or support workers.

Impact

Substituting for doctors

Substitution of nurses for doctors has received a great deal of research attention. Overall, the evidence supports the view that, in many clinical areas, particularly primary care, there is substantial potential for nurse substitution to lower costs without decreasing quality. Nurses may even extend quality into areas of care not generally provided by doctors.⁴⁶⁶

Several studies have found that nurses achieve health outcomes that are as good as those achieved by doctors and generate higher patient satisfaction ratings – particularly with regard to interpersonal skills.^{467,468,469} Substituting midwives for doctors has also been well studied and again the findings suggest that health outcomes are comparable for both groups, but that midwives may use less technology and interventions.^{470,471}


Substituting for nurses


Substituting less qualified personnel for nurses is a more contentious practice. Although such role substitution offers a way to cope with staff shortages, many studies have suggested that it may adversely affect patient related outcomes such as satisfaction and quality of care. It may also impact on nurse related outcomes such as increased on call work, increased sick leave and overtime work, and increased workload for registered nurses.^{472,473,474}

Impact on costs

Over the last few decades, pressures such as rising costs, personnel shortages, and access limitations have raised interest in role substitution as a tool for fostering more cost effective use of a diversely skilled and flexible workforce.^{475,476} But it remains unclear whether role substitution lowers costs.

While workforce substitution is often initiated as a cost saving strategy, evidence about this is weak. Substitute workers may be able to provide equal quality care, yet the impact on costs depends on a number of factors, including whether substitutes answer previously unmet patient needs or, instead, generate new demands for care. It has been suggested that compared with doctors, nurses spend more time with patients, recall them at higher rates and carry out more investigations – all of which have cost implications.^{477,478} In addition, although it is generally less expensive to train nurses than doctors, savings may be eroded because nurses tend to have lower lifetime workforce participation rates than doctors.





Similarly, while there is no unanimity in this regard, current evidence suggests that substituting nurse aides or nurse assistants for more highly qualified and more expensive nurses may be no more cost effective because of the various hidden expenses associated with skill dilution: higher absence and turnover rates of less qualified staff, greater levels of unproductive time due to lack of autonomy and capacity to act independently, and higher rates of adverse events and risks for patients.^{479,480}

Impact on quality

Another danger with role substitution is that skills that are shared by a broad range of professionals may become a low priority for individual practitioners. Increasing the range of people capable of undertaking particular tasks might mean that those tasks are no longer specifically 'owned' by anyone. Reports have shown that practices intended to increase continuity have led, in reality, led to role and skills drift as well as to more fragmented care.⁴⁸¹ One example is the reduction of medical involvement in maternity care that has occurred in tandem with the extension of midwives' scopes of practice, leading to situations in which doctors no longer see certain tasks as belonging to them.

Impact of direct delegation

Evidence concerning the impact of role delegation on both patient and staff outcomes is limited and conflicting. The benefits of role delegation need to be balanced by the potential drawbacks. For instance, removing simple tasks from GPs and delegating them to other staff members may affect the sense of connection between patients and their doctors, thus compromising this important relationship.^{482,483,484}

Removing relatively simple tasks in order to allow doctors and nurses to manage more complex health problems may deprive professionals of valuable interludes in their work and be counterproductive if it leads to increased stress and job dissatisfaction.


Furthermore, unless there is a reciprocal helping relationship or additional resources and support, shifting work from higher to lower skilled groups can lead to excessive workloads for the latter and fuel the perception that one group is offloading tasks onto another.^{485,486}

Assessments of the scope for role delegation must also take account of workforce shortages. If 20% of GPs' and junior doctors' work was shifted to nurses, as suggested by the Wanless report,⁴⁸⁷ pressure on GPs would decrease. That move could, however, exacerbate nurses' dissatisfaction with their workloads and simply transfer the problem of workforce shortage from one professional group to another.

Examples

Community mental health





In the field of community mental health, nurse practitioners have extended their activities to many areas previously reserved for doctors, including treating depression and anxiety disorders as well as clinically assessing people who are receiving antipsychotic injections.^{488,489,490,491,492}

In England, support workers have been introduced in community mental health teams. These support workers are delegated activities that might otherwise be performed by nurses. A case study found that support workers boosted service provision, but there were disparities between the intended role and the assumptions of professional practitioners which caused confusion and dissatisfaction. The researchers suggested that managers need to ensure role clarity when non professional workers are introduced into multidisciplinary community teams.⁴⁹³


Elsewhere in England, community support workers have substituted for other staff supporting people with severe mental illness. Over a six month trial period, community support workers were associated with improved satisfaction with services, quality of life and social behaviour. However there was greater use of inpatient facilities.⁴⁹⁴


Also in England, paraprofessional mental health workers supported guided self help clinics in primary care. The workers had little mental health training and experience. Patients attending guided self help clinics received an average of around five hours support from these workers. Paraprofessional mental health workers were as effective as mental health nurses in providing support at the clinics, however they took more time to help people than nurses. Patients attending these self help clinics had reduced symptom severity.⁴⁹⁵

In the US, physician assistants have substituted for psychiatrists in community venues. The advantages include more effective and efficient use of the psychiatrist; reduced costs; increased primary medical screening capability in community mental health centres, and increased presence of ethnic minorities on the professional staff of community mental health services.⁴⁹⁶

Substitution or delegation of tasks can sometimes result in the creation of new roles. In the US people over the age of 55 were trained to work as case management aides for people with serious and persistent mental illness. The training included ten weeks of classroom instruction and four months of practical work in the field. The case management aides were found to provide high quality services and were able to take on roles previously completed by other professionals.⁴⁹⁷

In a remote area of the US, volunteers have provided in home counselling and support to elderly people who may feel isolated and depressed. After attending training, the volunteers committed to working at least eight hours a week for one year. Activities included counselling sessions, travel time, meetings with supervisors, group discussion and record keeping. Unlike professional counsellors, volunteer counsellors did not diagnose and treat complex mental health problems. Instead, they focused on listening,





providing informal support and making referrals for other help. Because they had smaller caseloads than professional counsellors, peer counsellors were able to spend more time with their clients.⁴⁹⁸

Sometimes staff substitute for other roles only when another professional is not available. For instance, in New York there is a shortage of child and adolescent psychiatry services. When psychiatrists are unavailable, nurse practitioners often prescribe or monitor psychotropic medication either in hospital or in the community. This is thought to enhance access to care.⁴⁹⁹

Health promotion


Pharmacists and nurses have been found to be able to substitute for GPs in providing health promotion services. A systematic review of 46 articles examined the effectiveness of task substitution between GPs and pharmacists and GPs and nurses for the care of older people with long term conditions. Task substitution between pharmacists and GPs and nurses and GPs improved processes of care and patient outcomes such as disease control. Health promotion and disease management interventions had most success. The reviewers concluded that pharmacists and nurses can effectively provide disease management and health promotion for older people with long term conditions in primary care. They suggested that when implementing task substitution it is important that the health professionals' roles are complementary otherwise they may simply duplicate the task performed by other health professionals.⁵⁰⁰


Other reviews have found that expanding the health promotion role of nurse practitioners is feasible, safe and acceptable to patients. While the quality of care is comparable to that offered by GPs, the cost is less due to lower costs of education and remuneration and the lower costs of pharmaceuticals and diagnostic tests generated. The health promotion and educative functions of nurses have been found to be more effective in enhancing people's self management, competence and awareness.⁵⁰¹

Primary care practice nurses may be able to substitute for GPs in providing health promotion advice and running wellbeing clinics. A survey in England examined patients' views about health promotion advice by GPs or practice nurses and the value of general practice health promotion clinics. Patients thought that receiving health promotion advice from practice nurses and GPs was equally acceptable. It was the ability of health professionals to respond to patients' health concerns rather than the type of health professional running the health promotion clinic that was important for patients.⁵⁰²

Similarly, a study in Spain found that practice nurses were just as effective as GPs for promoting smoking cessation.⁵⁰³

New roles have been developed in health promotion to substitute for nurses and doctors, or to undertake delegated tasks. For instance in the US Latino people with diabetes received self management education from a 'promotora' from their community. This non professional worker spanned the bounds of hospital and community based services and offered self





management courses in Spanish. This staff role was associated with increased satisfaction with services, increased ability to self manage diabetes and strengthened connections with other Latino diabetics.⁵⁰⁴

Similar findings are evident for promotoras supporting women with cervical cancer screening and care.⁵⁰⁵

Community health advisors are indigenous lay health advisors who, following training, disseminate health information and support behaviour change in their communities. An evaluation of community health advisors providing smoking cessation programmes in Latino communities in the US found that the advisors could be trained to provide effective services which impacted on health behaviours.⁵⁰⁶

Elsewhere in the US, lay health promoters provided occupational health and safety advice to Latino poultry processing workers. The service was associated with increased knowledge about safety and health prevention. Evaluators concluded that lay health promoters may be effective in promoting occupational health and prevention and reducing occupational health disparities among ethnic minorities in high risk occupations.⁵⁰⁷

In Canada, volunteers substituted for professionals in providing self management education.⁵⁰⁸

In England, community based food initiatives have developed to engage previously 'hard to reach' groups. Lay workers have taken on delegated roles within NHS community nutrition and dietetic services. A study of 15 programmes found that lay roles spanned three broad areas: nutrition education, health promotion and administration and personal development. The primary role for lay workers was to encourage dietary change by translating complex messages into credible and culturally appropriate advice. The activities undertaken by lay workers were strongly influenced by professionals and the NHS which were based on a narrow interpretation of health and a limited range of practice.⁵⁰⁹


In less developed countries, less qualified staff often substitute for doctors and nurses. For instance, in Micronesia indigenous people were trained as health assistants to service their local communities, with a focus on prevention and health promotion as well as curative aspects.⁵¹⁰

A number of similar examples are available, suggesting that it is feasible to work with paraprofessionals, lay workers or peers to promote health and wellbeing.

Surgery

In the field of surgery, new staff have taken on delegated roles from other professionals. For example:

“Assistant theatre practitioners are healthcare assistants with additional training, extending their practice to include limited, supervised roles in scrub



*and recovery support. They have the potential to increase the flexibility of the theatre team and aid retention of critical staff.*⁵¹¹

In Canada physician assistants have supported arthroplasty. Physician assistants saved their supervising physician about 204 hours per year which could be used for other clinical, administrative or research duties. Using a double operating room model facilitated by physician assistants increased the surgical throughput of hip and knee replacements by 42% and average wait times decreased from 44 weeks the previous year to 30 weeks.⁵¹²

In Scotland, physician assistants have also been piloted for use in perioperative roles.⁵¹³

In the US, there is a shortage of surgeons available to staff specialist trauma centres. One centre tested the value of physician assistants as surgery house staff. The physician assistants worked alongside surgeons. Transfer time to the operating theatre, intensive care unit and surgery floor decreased as did length of stay for admissions.⁵¹⁴

Elsewhere in the US, theatre nurses delegated activities to surgical technologists in low risk and high risk surgical procedures. Surgical technologists performed activities related to surgical counts, the sterile field and equipment and supplies. They tended not to undertake tasks related to patient transportation, teaching, medication administration, the theatre environment, patient monitoring or patients' rights.⁵¹⁵


In England, specialist nurses substituted for pre registration house officers in surgical preadmission clinics. Preadmission clinics aim to reduce non attendance rates for elective surgery and help in managing surgical waiting lists. A comparative study found that specialist nurses were as accurate or more accurate than pre registration house officers in taking a surgical history (with the exception of noting drug doses and frequencies) and taking a full social, alcohol and smoking history. Nurses also performed well with regard to limited physical examination and ordering investigations.⁵¹⁶

Both Europe and North America are experiencing shortages of anaesthesia personnel. Non physician anaesthesia providers have been substituted to cope with these shortages.⁵¹⁷

In Australia, alternative hospital workers and assistants have substituted for registered nurses in surgery, however this has led to concerns that there are now restricted opportunities for undergraduate exposure to the perioperative environment and fewer postgraduate opportunities for nurses.⁵¹⁸

In the US, there has been debate about whether or not a clinical neurophysiology doctor needs to be in the operating theatre throughout surgical monitoring. Surveys suggest that this task is now often delegated so that non physician staff monitor EEGs during carotid endarterectomy and undertake spinal cord monitoring during scoliosis procedures.⁵¹⁹

Paediatrics



There are examples of substitution and delegation of roles in paediatric care. For instance in England, healthcare assistants have been trialled in paediatric oncology units to undertake roles that might otherwise be completed by nurses.⁵²⁰

In London, a hospital based key worker service has been set up to support the families of children with disabilities. The 'community link team' provides information, emotional support and liaison among different agencies for children and families undergoing ophthalmology assessments. The key workers undertook some tasks previously completed by ophthalmologists including discussing the process and benefits of visual impairment certification, contacting an advisory teacher for the visually impaired and providing written reports to educational and social services. Parents and healthcare professionals believed the key workers provided important information and facilitated access to specific services.⁵²¹

In the US, nurses substituted for doctors when performing paediatric extubation. An evaluation found that nurses can safely perform endotracheal extubation in children.⁵²²


Similarly, the care offered by neonatal nurse practitioners and paediatric residents was compared for very low birth weight babies at a US neonatal intensive care unit. Neonatal nurse practitioners and paediatric residents provided comparable patient care, with similar outcomes and similar costs. Nurse practitioners could therefore substitute for residents when needed.⁵²³


In Israel, a study of paediatrician call outs to birth delivery rooms found that specialist medical skills were needed in only one of three cases, and then mostly in specific risk situations. The researchers suggested that other professionals could potential substitute in two thirds of call outs, leading to a more efficient use of medical resources without any increase in patient morbidity.⁵²⁴

In the US, paediatric anaesthetists specialise in sedating children. However staff shortages have led to sedation by other professionals such as nurse anaesthetists or appropriately credentialed non anaesthesia clinicians. Reviews suggest that in some circumstances the risk of adverse events is greater when sedation is provided by non anaesthetists. However, predictors of adverse outcomes have been identified and if sedation guidelines are adhered to, non anaesthetists can safely provide sedation for children.⁵²⁵

In India, non professional health workers were trained to provide developmental screening of infants and young children and their results were compared with trained medical practitioners. The non professional staff provided services of equal quality to professionals and could be used as a substitute.⁵²⁶

In the US some new roles have been clustered together using the heading of 'physician extenders.'⁵²⁷ These include hospitalists, physician assistants and nurse practitioners who may take on roles that were traditionally the realm of





hospital doctors.^{528,529,530} Societies such as the American Academy of Paediatrics have given their support to this type of substitution and research suggests positive outcomes within paediatric settings.^{531,532,533,534,535}

In New York, a neonatal intensive care unit replaced house staff with non physician providers such as neonatal nurse practitioners and physician assistants. Evaluators found that access to services and quality of care was preserved and in some cases enhanced with non physician providers.⁵³⁶

Elsewhere in New York, five years of data about physician assistants working in paediatric intensive care units found that, following extensive orientation, with supervision physician assistants can take on patient care roles similar to those of residents. Physician assistants performed similar tasks and activities as paediatric intensive care unit residents and integrated well with them to enhance bedside care. They supported nursing and respiratory therapy functions and improved the day to day functioning of the unit. However there were high job turnover rates and confusion between their role as shift workers or professional employees.⁵³⁷

One US hospital compared after hours paediatric intensive care unit coverage by residents versus hospitalists (salaried general doctors). Hospitalists were associated with improved survival and reduced length of stay. This suggests that the quality of care of critically ill children may be improved when more experienced doctors are providing bedside care, compared to residents. The authors concluded that hospitalists could substitute when an internal medicine specialist was not available.⁵³⁸

However it is acknowledged that implementing these roles is not without difficulties, not least of which is the challenge of raising awareness among other practitioners who may see these changes as an erosion in care, rather than as a new resource.^{539,540,541,542,543}

“Institutional and statutory boundaries continue to limit the practice of the nurse practitioners. Inconsistent education and practice standards and a lack of understanding and acceptance of the role also inhibit nurse practitioners from being used to the fullest potential in paediatric hospitals.”⁵⁴⁴

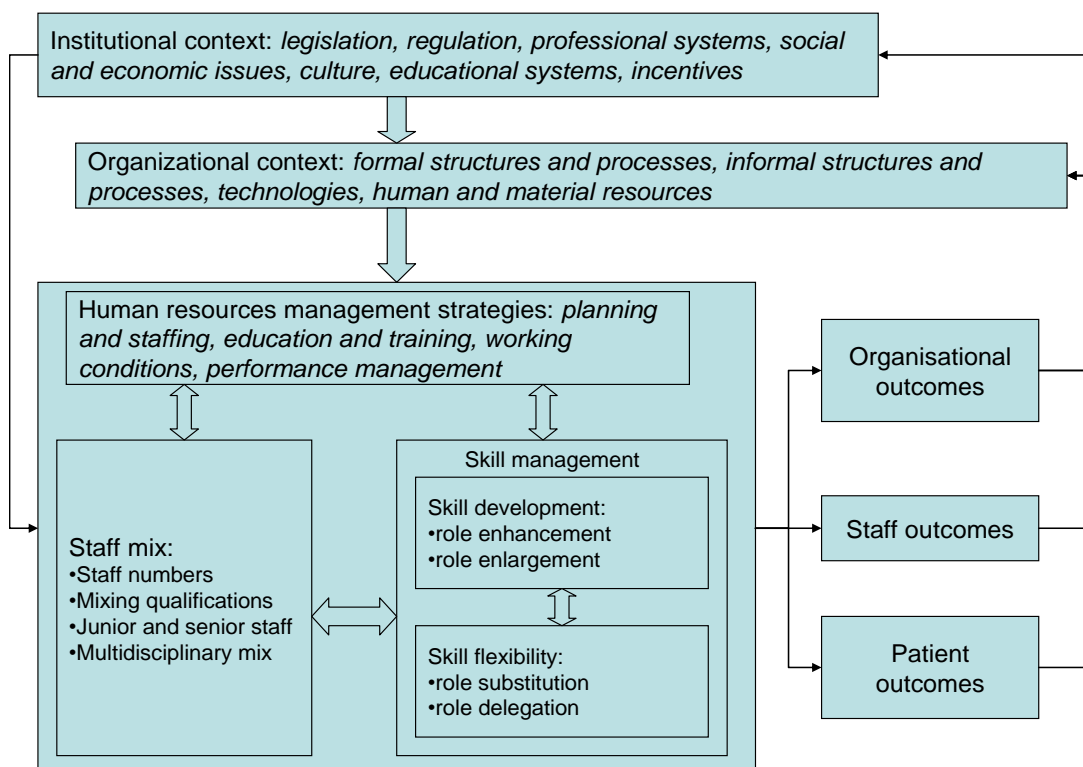
Driving Factors


Contextual Framework

One of the greatest challenges facing healthcare organisations in recent years has been how to adjust to the rapid pace of internal and external changes including environmental changes in consumers' tastes and demands, changes in legal requirements, socio demographic and epidemiologic changes, technological developments and economic fluctuations. All of these factors influence the healthcare workforce.

This section briefly describes some of the factors driving healthcare workforce changes. Examples are drawn from community mental health, health promotion, surgery and paediatrics but not in separate sections.

Figure 1: Framework for considering drivers of workforce changes





We identified no detailed theoretical models that are supported throughout the world as an explanation for workforce changes, though numerous individual research teams have developed their own hypotheses.

Drawing on several decades of empirical research and theoretical developments, a system wide framework to understand workforce changes has been developed (see Figure 1).⁵⁴⁵ This acknowledges that the drivers of workforce change include multiple integrated and interacting factors including staff mix, management of staff members' skills and the practice environments in which personnel apply their skills.^{546,547,548,549,550,551}

The framework suggests that attempts to optimise the healthcare workforce should aim to achieve a horizontal fit among human resources activities and a vertical fit with other organisational policies, goals and structures, as well externally with the wider environment.

The most commonly suggested drivers of staff change are:


- **external context** such as policy and environmental drivers, workforce regulation and education and legislation introduced to address research findings and promote best practice
- **organisational context** such as organisational climate, new technological developments and a desire to experiment with skill mix
- **staff context** such as workforce shortages and staff demographics

Although it is important to consider the different levels of determinants that affect the healthcare workforce, delineating between them is not clear cut. This section therefore provides examples of factors driving workforce changes but emphasises that this is not a simple relationship and that the factors listed are not exhaustive.

External Context

Changes in the healthcare workforce are influenced and driven by a number of external or high level factors.

The regulations that govern healthcare organisations and workers are dense and diverse. The institutions and agencies involved in these processes are also pluralistic, requiring the development of complex linkages among various bodies. Examples of the external environment that may impact on workforce developments include:

- **political structures** that define the distribution of responsibilities and power between various occupational groups
 - **rules, regulations and laws** that govern provider behaviour and working conditions
 - **regulatory bodies** that assume control of professional activities
- 

- **policies and legislation** that provide incentives to healthcare professionals to improve their practice

Together, these components create the broad social, cultural, economic, professional and political context in which key workforce decisions are made.

Policy context

Policy makers and planners have a direct impact on workforce changes. National or regional policies about health and social care set priorities and the workforce must be developed and adapted to meet these needs.⁵⁵² There are numerous examples of this from the fields of community mental health, health promotion, surgery and paediatrics.^{553,554,555,556,557,558}

“Government guidelines on mental health care in England have considerable implications for the level of competency required by the mental health workforce.”⁵⁵⁹


A major policy driver is a focus upon moving away from hospital care towards care in the community.

“Health reform is increasingly targeted towards strengthening and expansion of primary health systems as care is shifted from hospitals to communities. The renewed emphasis on prevention and health promotion is intended to curb the tide of chronic disease and sustain effective chronic disease management, as well as address health inequities and increase affordable access to services... The success of ... health system reforms are dependent on a nursing workforce that is appropriately educated and prepared for practice in community settings.”⁵⁶⁰

In the field of health promotion, the policy context focuses on the determinants of health and the cultural, social and environmental factors that the workforce could target to improve public health.

“As the basis and practice of health promotion progresses toward a socio-ecological approach, workforce training needs to keep pace with these developments to ensure an appropriately skilled health promotion workforce to meet emerging population health challenges.”⁵⁶¹

The broader policy context also influences the system of healthcare, the types of organisations involved and therefore staff development. In the UK there have been many changes in the structure of the health system, and this impacts on workforce roles.



“The constant structural changes to the NHS in England have created instability and lack of job security within the public health workforce in the UK. Since posts are linked to structures which keep changing, recent years have seen constant changes in titles, responsibilities and expectations. Effective public health practice involves teamwork across sectors and strong relationships with local communities, and this constant change has posed professional challenges.”⁵⁶²

The roles that make up the workforce are influenced by policy and historical factors.⁵⁶³ For example, community nurses make up the largest professional group in UK mental health services whereas in the US, social workers are the largest professional group in mental health services.⁵⁶⁴ Demand, supply and economic factors are important reasons for these differences.⁵⁶⁵

In the UK, separate registration has been an option for children's nursing since 1919, though this has been reviewed. There are polarised views about whether or not children's nursing should be a discrete branch of nursing rather than simply another postregistration speciality.⁵⁶⁶ This is different than in other countries, and shows how the regulatory framework and historical factors can impact on the types of personnel available.


In some countries, policies have been implemented to improve the training and development of the workforce to address the needs of specific groups. For instance, in Australia, a mental health policy and associated workforce training programme have been set up to enhance the wellbeing of Aboriginal people.⁵⁶⁷


Demographics and demand

Characteristics of the wider population impact on the healthcare workforce. For example, there has been considerable discussion about the impact of the aging population on the demand for healthcare services. This also has specific impacts on some services. For example, an increase in the elderly population results in increases in projected long term conditions and dementia and a corresponding need for staff skills and capacity in this area.⁵⁶⁸

The increasing ethnic diversity of the population means that health professionals also need to be culturally competent.^{569,570,571,572,573}

In health promotion, there is now an emphasis on long term conditions and the social, environmental, cultural and demographic causes. There is a move away from focusing solely on individual level needs towards a focus on population level needs.





“In the decades since chronic illnesses replaced infectious diseases as the leading causes of death, public health researchers, particularly those in the field of health promotion and chronic disease prevention, have shifted their focus from the individual to the community in recognition that community-level changes will foster and sustain individual behaviour change. The former emphasis on individual lifestyle change has been broadened to include social and environmental factors, often without increased resources.”⁵⁷⁴

Demand from service users can also influence how services are delivered and by whom. For instance, in England Sure Start programmes run by combined health and social care teams aim to support families with children under the age of five years, especially those in less advantaged areas. In London, Sure Start programmes found that parents wanted more oral health support and educations, so the local workforce was adapted to offer this service as part of the Sure Start programme.⁵⁷⁵

Legislation


Laws impact on the priorities of the healthcare workforce and can be important tools when considering staff roles.


“Law, which is a fundamental element of effective public health policy and practice, played a crucial role in many of public health’s greatest achievements of the 20th century... Development and implementation of legal frameworks could broaden the range of effective public health strategies and provide valuable tools for the public health workforce, especially for state and local health department programme managers and state and national policy makers.”⁵⁷⁶

Regulations about working hours have had a major impact on the workforce.^{577,578,579} For instance, the European Working Time Directive limits the amount of hours per week that employees can spend working or training. This has impacted on junior doctors’ hours in England and led to substituting advanced nurse practitioners and other roles.

In Switzerland, a 50 hour work week limitation for surgical residents has had a major effect on surgical training, resident quality of life and patient care. In a large scale survey, most residents and consultants reported that operative time and overall operating room experience were negatively affected by the work hour limitation. Whilst the limit was thought to improve residents’ quality of life it was not thought to be beneficial for training.⁵⁸⁰

Legislation has been implemented to address concerns about appropriate staffing. For instance, a number of studies have examined how staff numbers impact on patient care, particularly in nursing. It has been hypothesised that a lower nurse-to-patient ratio results in a greater workload and poorer quality of care due to time pressures that affect a nurse’s ability to implement best practice standards. Several empirical studies and





systematic reviews support this hypothesis and indicate that the numbers of nurses in a unit and the number of nurses per patient affect patient outcomes, including adverse events, readmissions and mortality.^{581,582,583,584,585,586,587}

In one study, hospitals in which nurses cared for an average of eight patients each had risk adjusted mortality rates following common inpatient surgical procedures that were 31% higher than hospitals in which nurses cared for four patients each.⁵⁸⁸

Some parts of the US and Australia have therefore created laws to mandate minimum staffing ratios. However, there is no clear evidence about the effectiveness of such legislated ratios, which may prevent managers from making local decisions about appropriate staffing and be insensitive to contextual factors.

Professional regulation


Issues related to the external context may both enable and constrain workforce development. For instance, on one hand more flexible use of workers may be an important tool for making healthcare more responsive to patients' needs. On the other hand, this has often been difficult to accomplish due to regulatory constraints.


It has been suggested that in some countries professional regulation has been diverted from its primary function of protecting the public from unqualified practitioners to the creation of barriers that hamper professionals' ability to practise to the full extent of their education, training, skills, knowledge, experience, competence and judgement.

Variations in how healthcare professionals work in different countries suggest that groupings of skills into professions are often arbitrary and owe more to custom, traditions, incentives, professional politics and power than to logic and providers' actual skills.^{589,590} A number of reports have highlighted that entrenchment of scope-of-practice rules and outdated legislation have resulted in inefficient use of scarce workforce resources in many areas.^{591,592} In some cases, rules prevent healthcare professionals from providing the full range of services they have been trained to deliver. In other cases, lack of a coherent regulatory framework creates obstacles to delivery. One often cited example is that of nurse practitioners, who in many countries remain constrained by the medical profession's scope of practice rules.

For instance, in Canada the lack of a national legislative framework for nurse practitioners and inconsistencies in legislation and regulations across jurisdictions have been identified as a barrier to nurse practitioners' full deployment.⁵⁹³

Some professional or regulatory restrictions generate adverse consequences, including occupational monopoly, barriers to entry and mobility, rigidity of occupational structures, restrictions to service access, personnel shortages, lack of accountability and stifling of





innovation.^{594,595,596} In general, when occupations are allowed to set restrictive entry-into-practice criteria and other conditions, service costs have tended to increase and service utilisation has tended to decrease.⁵⁹⁷

Educational context

The external context also includes training and education for professionals.

Over the last decade many governments have introduced healthcare reforms which aim to support interprofessional teamwork and integration. However educational systems to support integration and multiprofessional work may lag behind policy drivers.⁵⁹⁸ Although there are exceptions, for the most part healthcare workers continue to be trained in separate compartments, with little shared training and few opportunities to develop skills and competencies to enable them to function in teams.^{599,600,601}

The way that education and training programmes are set up influences staff attitudes and behaviours.^{602,603,604,605,606,607,608,609}

Pre registration education can also have a significant impact on the specialities in which professionals choose to work.

A number of programmes have been developed to enhance the roles of workers in particular fields such as mental health,⁶¹⁰ surgery,⁶¹¹ paediatrics^{612,613,614,615,616} and health promotion,^{617,618,619,620,621,622} and these specialised courses impact on the scope of practice workers expect to undertake in their day to day activities.^{623,624,625}


Education may take the form of classroom sessions, mentoring, information materials, supervision, fellowships, on the job learning, online courses and so on. There is a trend towards more education in community venues in some parts of the world.⁶²⁶ The most appropriate form of education depends on the topic and staff and organisational context.


For instance, although the need for continuing education and training is widely acknowledged, many professionals in the UK find it difficult to access further education due to increased workload, reduced budgets and personal commitments. There are also difficulties with staff being released from their practice setting.

Various new models of education have been set up to address these challenges. For example, a children's pain management module incorporating blended e-learning was developed in response to changing workforce needs. The course was well evaluated, although organisations allowed limited study time for participants.⁶²⁷

The way that education is delivered, monitored and quality assured may impact on workforce changes.^{628,629}

For instance, it is acknowledged that building a competent health promotion workforce with the necessary knowledge and skills to develop, implement and evaluate health promotion policies and practice is fundamental to





mainstreaming and sustaining health promotion action.^{630,631} There is a growing and diverse health promotion workforce in Europe but no organisation has responsibility for assuring the quality of training and professional practice at the European level. There are moves towards national level accreditation processes in the UK, Estonia and The Netherlands, but differences between countries in the formats, content and processes of developing accreditation, coupled with the different educational, practice, political and resource situations, reflect the complexity of developing a pan-European system.⁶³²

International meetings suggest that the core domains of competency in health promotion include catalysing change, leadership, assessment, planning, implementation, evaluation, advocacy and partnerships.

Similarly, in the US it has been suggested that the public health workforce needs advocacy, business management and finance, communication, community health planning and development, coalition building, leadership, computing and technology, cultural competency, evaluation and strategic planning skills.⁶³³

This has implications for the training of the workforce and the roles that staff are encouraged to take on.^{634,635}


Researchers in Australia found that agreed health promotion competencies have the potential to impact on recruitment, training, employment policy and health promotion practice.⁶³⁶


A number of other examples are also available to illustrate how developing competencies or ideal skill sets influences the expectations of staff roles.^{637,638,639,640,641} In Canada, health promotion competencies were developed as a means of strengthening the public health workforce. There were concerns about the potential marginalisation of health promotion. National health promotion competencies were shaped by cultural and political factors unique to specific jurisdictions.⁶⁴²

Also in Canada, the expansion of the public health nutrition workforce was integrally linked to developing robust methods of education and training.⁶⁴³

Financial incentives

Financial incentives play a major role in defining professionals' roles and in whether healthcare providers embrace or resist changes in their mix of skills and responsibilities. One often cited example is the comparison of scopes of practice of obstetrics and anaesthetics in the US and UK. Routine childbirth is managed by midwives in the UK. However in the US, midwifery by qualified nurses has been slow to develop and many babies are still delivered by obstetricians. In contrast, nurses in the US often administer routine anaesthesia, but in the UK that procedure is largely the preserve of doctors (with some exceptions).⁶⁴⁴





One suggested explanation for these variations between the US and the UK is the difference in the payment system of providers.⁶⁴⁵ In the US fee for service system, doctors have no incentive to share with midwives the ‘lucrative’ maternity market. However, when they are performing surgeries there is a stronger incentive for doctors to split their fees with nurse anaesthetists than with more expensive doctors. Such incentives are absent in the UK’s salaried approach to compensating doctors and nurses.

A number of studies have reinforced how the way healthcare is organised and financed in the UK influences workforce changes and the extent to which specific factors such as health promotion are prioritised.⁶⁴⁶

The funding mechanisms of health services have been consistently identified as either facilitating or blocking the optimal use of the workforce. When doctors rely primarily on fee for service compensation, expanding the role of other professionals in team based care may be seen as taking away a doctor’s income. In contrast, in practice settings in which teams rather than individuals are funded, teams would be more likely to look for ways to optimise the use of their different staff members and reduce costs overall.


The UK system of paying the practice (not individual providers), the Australian experience of promoting integrated healthcare teams, and the reimbursement models used in primary care in Canada illustrate how compensation reform can influence the roles of the workforce.^{647,648}

In the field of mental health, researchers in the US have found associations between the way services are funded and the attitudes, commitment and behaviours of staff. Direct, non profit capitation was positively linked to organisational commitment compared to traditional fee for service reimbursement. Perceptions about the organisation, including its culture and climate, were strongly linked to job attitudes and potentially workers’ willingness to take on new roles.⁶⁴⁹

Organisational Context

Issues of workforce development and change cannot be divorced from the organisational context in which staff work. The quality of a service depends on the personnel performing it, but also on the settings in which it develops and on the resources available to provide the service.

“The rapidly changing world of healthcare is faced with many challenges, not the least of which is a diminishing workforce. Healthcare organisations must develop multiple strategies, not only to attract and retain employees, but also to ensure that workers are prepared for continuous change in the workplace, are working at their full scope of practice and are committed to, and accountable for, the provision of high quality care.”⁶⁵⁰



An organisation is a complex system with formal and informal structures and processes, cultures and technologies (including procedures, practices, and guidelines). These organisational components provide the day to day contexts in which healthcare workers carry out their tasks. They shape internal structures that govern important workforce factors, including the number and mix of staff available, staff status, the extent of social contact in the workplace, working conditions and opportunities for self development and self realisation.

The 'internal structures' of healthcare organisations include reporting hierarchies, divisions of labour, coordination mechanisms, communication amongst providers, allocation of responsibility and authority.


Organisational processes include the arrangements, norms, standards, guidelines, protocols and procedures that form a diverse range of clinical, information, and management support systems that contribute to service delivery. All of these things influence workforce changes.


Workplace characteristics

There is no single, most appropriate organisational structure or process for optimising the healthcare workforce but several organisational characteristics appear to affect patient outcomes. For instance, organisational characteristics that create conditions for professionally based practice environments help to improve staff and patient outcomes.^{651,652} In the fields of community mental health, surgery, paediatrics and health promotion, these organisational elements include:^{653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668}

- relatively flat hierarchy
- worker autonomy
- role clarity
- participative management
- positive supervision
- professional development opportunities
- collaboration
- staff involvement in budgeting
- good working environment

Research into high performing workplaces suggests that organisation level factors that support teamwork such as organisational structures, management strategies and resources and tools strongly influence both the development of healthcare teams' collaborative practices as well as patient





outcomes.^{669,670,671,672,673} Such workplaces also tend to encourage partnership working and to be positively evaluated by peers and partners.⁶⁷⁴

More devolved forms of management have been successful in eliciting higher levels of worker involvement. Organisational characteristics that foster empowerment, decision ownership, job autonomy and participation boost workers' productivity by engaging them in a more responsible and a more responsive manner.^{675,676,677}

In the US, managed care, which aims to support integration of primary and secondary services, has influenced the roles of clinical social workers, clinical psychologists and psychiatrists, as well as many other staff roles in paediatrics and public health.⁶⁷⁸ For instance, organising services along managed care principles has been found to influence mental health practitioners' responsibilities, modes of treatment, the use of outcome measurement and management and the importance of case management.⁶⁷⁹


Managed care, with its focus on integration, may also impact on the most appropriate forms of training to prepare staff for this working environment.

“Appropriate training experiences in managed care organisations may be a valuable strategy to address the current disconnect between the traditional hospital based education of paediatricians and the expanded competencies necessary to practice in intensively managed, integrated and accountable health systems.”⁶⁸⁰

In England and Wales, surveys suggest that mental health professionals working in primary care tended to cluster together in practices that are larger and provide specific mental health clinics.⁶⁸¹ This in turn provides opportunities for new roles and activities. The openness of organisations to workforce innovation can have an important impact on development initiatives.

The location of organisations can also be an important influence on workforce development. For instance, remote and rural areas may utilise more non specialty providers in the provision of mental healthcare and other services, which in turn necessitates different types of training, recruitment and retention policies.⁶⁸²

Exactly where practitioners undertake their work can also influence staff characteristics and changes. For instance, in Canada changes in anaesthesia practice patterns have resulted in 40% of anaesthetists' work now occurring outside of the operating room. This is exacerbating shortages of anaesthetists and may lead to using other professionals and assistants.⁶⁸³



Organisational climate

Organisational culture is a shared set of norms and behavioural expectations characterising a corporate identity. This culture creates a pattern of beliefs, values and expectations about work organisation, role distribution, skills development and utilisation of different groups of workers. Managerial style, evaluation and reward systems, accountability, decision latitude, and opportunities for employee feedback all reflect an organisation's culture. Evidence suggests that these factors may influence an individual worker's level of commitment and motivation and therefore, levels of skills retention, skills utilisation and skills development across an entire workforce.^{684,685,686,687,688}

Organisational climate and culture has direct impacts on workforce performance. A number of tools measure organisational climate through surveying workers about their perceptions of leadership practices, decision making processes, working relationships among employees, role clarity and learning opportunities.^{689,690} Such surveys have also been developed specific to fields such as mental health⁶⁹¹ and in terms of organisational safety culture.⁶⁹²

The features of organisational social culture affect personal attitudes and behaviours and, as a result, organisational performance.^{693,694,695} For example, researchers have demonstrated that a climate high in autonomy and supportiveness is positively related to job performance.^{696,697}

Healthcare practitioners may also be more motivated to perform well if their organisations and managers provide a clear sense of vision and mission, increase staff members' participation in decision making, encourage teamwork, foster innovation, provide career structures and opportunities for promotion and use sanctions for poor performance in ways that are fair and consistent.^{698,699,700}

The links between organisational climate and workforce roles may be circular, with each influencing the other. As an example, researchers suggest that in order to be effective, health promotion needs to build in organisational change and be rolled out throughout the health sector and other sectors. This has implications for workforce roles.

"To maximise effectiveness, quality health promotion technologies and practices need to be adopted as core business by the health sector and by organisations in other sectors. It has proven difficult to develop the infrastructure, workforce and resource base needed to ensure the routine introduction of high quality health promotion into organisations... Health promotion specialists and practitioners, wherever they are located, should be building organisational change into both their practice and capacity building frameworks because without it, effectiveness and sustainability are at risk."⁷⁰¹

Technological advances

In Western societies, healthcare organisations operate in environments characterised by continual developments in the content of services and the technologies used to deliver them. Making the best use of healthcare practitioners therefore depends upon the availability of requisite technologies (including procedures, guidelines protocols, and medications) and their appropriate utilisation.

There is a growing amount of evidence that the automation of clinical, financial, and administrative transactions allowed by new information technologies can lead to gains in workforce productivity.^{702,703} These arise as a result of improving the ways staff members provide services and by reducing the cost of service provision and, hence, freeing up resources to provide care for other patients.

In the field of health promotion, a range of programmes are offered electronically, increasing access to a far greater range of people than might otherwise be possible and reducing costs compared to other health promotion strategies.⁷⁰⁴ In paediatrics, telephone calls are often used for triage and information provision, so even the most 'taken for granted' technologies can have a significant impact on the type of care available and who provides it.^{705,706}


In many sectors, technological advances have resulted in increased productivity and lower cost per unit. This result has been less obvious in healthcare, although examples of improved use of technology are becoming more frequent.

Highly educated and skilled health professionals continue to spend great amounts of time on matters that could possibly be handled by other staff members. Registered nurses, for instance, are often restricted from clinical care because they have to perform non nursing duties such as answering telephones, collecting meal trays and scrubbing bathtubs.⁷⁰⁷ This type of personnel deployment is costly and makes for less satisfying work for professionals. Technology is changing the way the workforce is deployed by allowing less qualified staff to take on more roles.⁷⁰⁸

For instance, a number of studies have found that technology allows lower grade staff to be used to good effect within the field of radiology.^{709,710} In the US, physician assistants now interpret x-rays, consult with referring specialists and perform less complicated interventional procedures.^{711,712,713}

Using new technologies may also cut down the number of staff needed to perform tasks, thus freeing up capacity to use skilled staff elsewhere. For instance, in Austria robotic camera holders were used to make laparoscopic cholecystectomy feasible and safe as a solo surgeon operation.⁷¹⁴

Similarly, in the US, robotic arm enhancement was used during surgery to minimise resource and personnel use during minimally invasive procedures such as laparoscopic hernia repairs, cholecystectomies, and nissen funduplications. The surgeon worked as a solo surgeon; the scrub nurse did



not participate in the procedures. The robotic technology reduced costs and minimised risk for patients.⁷¹⁵

Another example of how technology impacts on the workforce comes from Taiwan, where anaesthesiologists used portable computers to log information during ward rounds about patients who need acute pain management. Previously, this information was recorded on a sheet of paper by anaesthesiologists and subsequently entered into the hospital mainframe computer by a nurse. To reduce the number of staff needed for this task, a personal digital assistant (PDA) was introduced so anaesthesiologists could record information directly into the PDA device at the bedside. The data was loaded into the main hospital computer system at the end of the ward rounds. Not only did this save staff time and reduce the number of specialists that needed to be involved, the information compiled was also more extensive.⁷¹⁶

In operating theatres, the use of clinical information systems has been associated with reduced workload for clinicians by, for example, reducing documentation time for nurses or preparation time for anaesthetists.⁷¹⁷


New communication technology also means that team members can be drawn from different geographical locales.^{718,719,720} For instance, in Australia, distance management was tested to support nurses in remote and rural locations. Here the line management team was located in a different geographical region from the workplace they managed.⁷²¹

These are all examples of how technology is impacting upon workforce roles, organisation and development.

But technology also introduces new challenges. Researchers in the US illustrated how new technology could improve team communication and information flow in complex surgical environments. Introducing a robot assisted cholecystectomy procedure resulted in teamwork disruption and an increase in the complexity of information flow. Scripted speech tools were used to improve communication. The authors concluded that scripted speech can facilitate team communication and adaptation to new technology and that automatic information display interfaces are not useful if they are incompatible with operator expectations.⁷²²

In the US, robotic minimally invasive surgery technology was tested for decreasing surgeon workload and stress. The robotic system reduced the workload and stress levels for surgeons but somewhat degraded their performance.⁷²³

A survey of perioperative nurses in Australia found that medical technologies were perceived to have contributed to increased workloads and higher levels of stress.⁷²⁴



Centralising staff

Some workforce changes have come about due to the desire to improve the quality of care by centralising staff and standardising procedures.⁷²⁵

For instance, a number of systematic reviews and observational studies suggests that units with higher volumes are associated with lower error rates and lower patient mortality rates for doctors.^{726,727,728,729}

Such positive findings are, however, balanced by some contradictory evidence. After controlling for institutional factors, some studies have failed to find that doctors who perform high rates of technical procedures had lower rates of adverse outcomes, suggesting that the benefits reported in other studies may have been due to institutional characteristics rather than doctor specific factors.^{730,731,732,733}

Staff Context

Shortages and retention


Countries throughout the world are experiencing shortages in the healthcare workforce, with the global shortage estimated at more than four million workers.^{734,735} These shortages are a result of insufficient doctors, nurses, allied professionals, support workers, specialist workers, social workers and key managers.^{736,737,738,739,740,741} The literature suggests there are staff shortages and retention issues in all four fields of focus in the review: community mental health, health promotion, surgery and paediatrics.^{742,743,744,745,746,747,748}

“Concerns regarding the number of children’s nurses persist despite initiatives designed to reverse this trend. Recruiting and retaining a diverse nursing workforce is high on the policy agenda, particularly since the publication of the National Service Framework for Children, Young People and Maternity Services... There is considerable scope to increase diversity in the children’s nursing workforce... Continuing professional development is a high priority for many child health nurses at the outset of their careers.”⁷⁴⁹

Staff shortages are impacted by societal trends towards reduced work hours, workforce ageing and early retirement.⁷⁵⁰ Rural and remote areas have particular issues in recruiting and retaining staff.⁷⁵¹

As a result of staff shortages, healthcare organisations have explored innovative ways to deploy the workforce so staff shortages are a key driver of workforce changes.⁷⁵²

Organisational factors and staff factors jointly influence retention rates.^{753,754} Researchers in the US found that younger age, higher emotional exhaustion, lower job fulfilment, lack of perceived career path, higher qualifications and



working with clients with both physical and mental conditions predicted intention to leave community mental health services.⁷⁵⁵

Other researchers in the US found that staff turnover in mental health services is significant and can impact on the quality of care processes and outcomes. Stable teams were more likely to implement evidence based practices, whereas those with high turnover were less likely to provide consistently high quality care. The authors suggested that turnover rates needed to be considered during service and workforce redesign.⁷⁵⁶

In Australia, researchers examined the factors supporting improved recruitment and retention of mental health professionals in a rural area. Key success factors included building individual rapport with new workers at the time of their recruitment; an extensive and multifaceted orientation programme; taking into account cultural background; working to meet individual and family needs; provision of ongoing educational support; increased focus on cultural adaptation and professional supervision; and building strong links with professionals and services in other regions.⁷⁵⁷

Others have suggested that effective orientation and support is essential for staff working in paediatrics.


“As the number of specialty paediatric oncology units increases, many units are hiring increasing numbers of newly graduated registered nurses. Intense specialty training and an emotionally demanding work environment place new nurses at risk for job frustration and early job resignation... Practice implications include supporting new nurses beyond the acquisition of skills and knowledge and including opportunities for personal reflection as part of the orientation experience.”⁷⁵⁸


Professionals may elect to take a break from their careers, for instance when caring for children or elderly relatives and this needs to be factored in when undertaking workforce planning. Researchers have investigated the impacts of career breaks on staff competence and patient safety. For instance, a survey for the paediatrics workforce in the US found that around one in eight had had a career break for 12 months or more. Women were more likely than men to have had periods of clinical inactivity. The impact of clinical inactivity on patient care and patient safety is unknown, but researchers and clinicians suggest it may be beneficial for those who take a career break to undergo extra competency tests or training upon their return.⁷⁵⁹

Staff demographics and burnout can both impact on retention and recruitment.

Burnout

Whilst health promotion and wellness professionals tend to have relatively high rates of wellness and self esteem,⁷⁶⁰ in contrast, in the fields of mental health and paediatrics there are relatively high rates of burnout and turnover.^{761,762,763} This impacts on staff training, morale, costs and the quality of patient care.⁷⁶⁴





“There are enormous concerns regarding the recruitment, retention, training, and performance of the behavioural health workforce. Paramount among these concerns is turnover, which causes disruption in continuity of care, diminishes access to care while a position remains vacant, and poses financial hardship on the provider organisation through costs related to recruitment, orientation, and training of a new hire.”⁷⁶⁵


For instance, researchers in England examined burnout among staff working in community based services for people with personality disorder. The levels of burnout reported were lower than in other studies of mental health workers. Strong teamwork, clear leadership and opportunities for reflective practice were thought to protect staff from burnout. The authors concluded that organising services to share and contain work related anxiety can significantly reduce pressures on staff.⁷⁶⁶


In Wales, a large survey of community mental health nurses found that trying to maintain a good quality service in the midst of long waiting lists, poor resources and having too many interruptions while trying to work in the office were stressful.⁷⁶⁷ Forty percent of community mental health nurses tended to view themselves negatively, feeling that others did not hold much respect for them.⁷⁶⁸ These professionals tended to have high levels of long term emotional exhaustion, depersonalisation and burnout and were not relating well to clients.⁷⁶⁹ Predictors of high stress were having an unsupportive line manager, working with a specific client group and not having job security. The researchers concluded that there is a need to create more supportive environments both in terms of job security and management support, especially for those working in the fields of severe mental illness and rehabilitation.⁷⁷⁰

The NHS Plan required extensive changes in the configuration of mental health services in the UK, including introducing crisis resolution teams. Researchers in London examined the effects of these changes on mental health staff and their recruitment and retention. They focused on levels of burnout and sources of satisfaction and stress in crisis resolution teams compared with assertive outreach teams and community mental health teams. Feedback suggested that community mental health teams had low morale and sense of accomplishment compared to the more specialised crisis teams.⁷⁷¹

Researchers in Japan found that providing opportunities for skill development was one of the key factors for guarding against burnout in community mental health nurses, alongside modifying client-nurse relationships, ensuring safety and providing emotional support. The drive to mitigate against burnout by providing further education may in turn lead nurses to take on new roles.⁷⁷²

Examples are also available from other disciplines. In New Zealand, anaesthetic technicians play a key role in operating theatres and many have duties outside the operating room. A survey found that job satisfaction among anaesthetic technicians was related to teamwork, the practical nature





of work and patient contact. Dissatisfaction was related to lack of respect from nurses and a limited career pathway. High to moderate levels of emotional exhaustion, depersonalisation and low levels of personal accomplishment were indicators of burnout.⁷⁷³

Leadership can significantly influence job satisfaction, stress and staff turnover.

“High levels of stress and the challenges of meeting the complex needs of critically ill children and their families can threaten job satisfaction and cause turnover in nurses... Significant associations were found between job stress and group cohesion, professional job satisfaction, nurse-physician collaboration, nursing leadership behaviours, and organisational work satisfaction... Job stress and nursing leadership are the most influential variables in the explanation of job satisfaction.”⁷⁷⁴

A study in the US found that support systems may significantly affect work satisfaction and feelings of accomplishment for nurses supporting children and families with bone marrow transplants. The complexity of patients and the environment in which such nurses work can lead to stress, burnout and poor retention. Although most nurses perceived high levels of emotional exhaustion, they also had high levels of personal accomplishment, despite the critical illness or acuity of their patients, demanding patient families, rotating shifts, short staffing and caring for dying patients. Most nurses felt that support systems were in place and that support was accessible.⁷⁷⁵

Attitudes and morale


Morale and job perception of staff may influence retention and quality of care.^{776,777,778,779,780}


For instance, a study in the US found that there may be a mismatch between what motivates community mental health workers to stay in post and the assumptions of managers and commissioners. Staff were motivated by the intrinsic nature of the work and job burnout was a major reason for leaving. However managers thought that money was a major factor motivating workers to enter the field and perceived external opportunities as the main force pulling them away.⁷⁸¹

A similar study of social workers in US mental health services found that strategies which furthered professional enrichment, contribution to the profession and professional autonomy were most likely to support retention.⁷⁸²

Some research has suggested that staff in the community have low rates of morale.⁷⁸³ Comparative European research found that social workers working in London mental health services appear to have particularly low morale.⁷⁸⁴

Morale can be an important influence on how staff work and their desire to expand their roles and improve their practice.^{785,786} For instance,





professionals working in community mental health teams often do so for self actualisation. These professionals tend to perceive their work as more significant and meaningful compared to workers who see this type of work as 'merely a job.'⁷⁸⁷

A systematic review of studies about the morale of community mental health professionals in Austria, Germany, Italy and the UK found significant differences in morale between professional groups and study sites. Age was independently associated with morale. The authors concluded that staff in community mental health services have substantial differences in morale depending on the professional group and context.⁷⁸⁸ Attempts to enhance morale have sometimes included expanding workers' scope of practice or changing workforce dynamics in some way.

Role changes such as enhanced autonomy and increased managerial responsibility have been found to improve morale, reduce burnout and aid retention.⁷⁸⁹ This suggests that there is a circular relationship between staff morale and workforce developments, with morale driving workforce changes and those changes also impacting on morale and burnout.⁷⁹⁰

Staff demographics

The characteristics of staff can impact on workforce changes.^{791,792,793,794}


In the western world the healthcare workforce is aging and this has led to potential gaps in the junior workforce.⁷⁹⁵

Researchers in the US examined how demographic characteristics impacted on community mental health teams. For younger case managers, the relationship with the supervisor, perceived job pressure and lack of organisational support were significant predictors of plans to leave the job. Older case managers who reported lower satisfaction with financial rewards, the type of work they did and greater use of help seeking coping strategies were more likely to say they felt depressed and demotivated by their work.⁷⁹⁶

Other researchers in the US found racial differences in how workers cope with stress and burnout in mental health services. Compared to white people, African Americans reported significantly less emotional exhaustion and depersonalisation and these differences were not explained by geographic location or perceptions of the work environment. Age was also an important factor. This is an example of how demographic characteristics may influence staff perceptions, which may in turn impact on the roles and training undertaken.⁷⁹⁷

Researchers in Hungary found that demographic characteristics of public health workers such as age and smoking status influenced staff attitudes towards taking on tobacco cessation roles within their day to day work.⁷⁹⁸

Researchers in Australia examined the impact of demographic characteristics on nurses' resilience in clinical environments such as operating theatres. Age, nursing experience and education all predicted resilience but only to an extent. The conventional notion that an older



nursing workforce will have greater longevity and hence be more stable in theatre environments may not hold true.⁷⁹⁹

Gender differences also have important workforce impacts.⁸⁰⁰ For instance, a comparison of UK versus US paediatric surgeons found:

“Female representation in medicine is increasing. In contrast to the North American experience, very few UK female paediatric surgeons felt hampered by lack of mentorship or role models... For women in the United Kingdom, paediatric surgery challenges will also be met by ensuring healthy work-life balance, along with flexibility in training and established consultant practice.”⁸⁰¹


The proportion of women and men in the workforce may also influence availability in terms of career breaks and part time work. For instance, the paediatric workforce often seeks part time work⁸⁰² and women may be more likely to take breaks from their career to look after children or elderly relatives.⁸⁰³ Lifestyle issues have been found to be a particular issue for women in the paediatric workforce.^{804,805,806}

“Paediatrics has consistently attracted a large number of women. Although the majority of practicing paediatricians are male, female paediatricians will soon constitute the majority. The challenge to balance personal and professional life is of particular concern to women, and part-time positions may provide a potential solution... As a result, the total direct patient care hours available for children may be reduced. Paediatric practices will benefit by better accommodating the needs of paediatricians to balance work and family goals, and future workforce projections and training decisions must begin taking part-time employment rates into account.”⁸⁰⁷

Summarising drivers


This section has outlined some of the key factors influencing workforce changes, but it is important to emphasise that the relationship is complex. There is no single driver that is influencing workforce changes in community mental health, health promotion, surgery or paediatrics. Instead, external, organisational, staff and client related factors combine to drive workforce change. For instance, researchers in Australia examining the impact on mental health nurses' workload concluded:

“The workload of community mental health nurses is increased by the greater complexity of needs of community mental health clients. Service change has also resulted in poor integration between inpatient and community services and tension between generic case management and specialist roles resulting in nurses undertaking tasks for other case managers. These issues, along with difficulties in recruiting and retaining staff, have led to the intensification of community mental health work and a crisis response to care with less time for targeted interventions.”⁸⁰⁸



A survey of the public health workforce and educators in the US identified the following as key themes shaping workforce development: concerns about funding cuts and privatisation, increase in information technology, the need for policy advocacy skills, and the importance of a lifespan approach to health issues. Primary areas for training were organisational development, evaluation and management.⁸⁰⁹ This illustrates that the identified drivers of change spanned policy, organisational, epistemological, educational and technological factors.

Furthermore, the relationships are not simple 'cause and effect.' There are a range of complex and interrelated factors impacting upon and mediating the relationships. An example of the interrelated nature of key drivers comes from mental health services in the US. A nationwide study of mental health clinics found that organisations with the best organisational climates and social context had lower staff turnover rates and were more likely to sustain new treatment or service programmes. Staff retention was related to innovative service delivery, good organisational climates and strong organisational structures. All of these factors were found to be interlinked and to drive workforce changes.⁸¹⁰



Summary

This review has identified a number of important workforce changes in the fields of community mental health, health promotion, surgery and paediatrics. Although these clinical fields have many differences, the key workforce changes over the past decade or so have been relatively similar.

Changing skill mix, multidisciplinary working, role substitution, role enlargement and role enhancement are evident in each of these four fields and are the most frequently described workforce changes.


The changes are not simplistic and may have some paradoxes, with different priorities competing. For instance, in terms of paediatric services:

“there is a growing emphasis on prevention, yet a great demand for cure and palliation; public reliance upon professionalism within the workforce, yet greater lay assertiveness; a greater demand for technical competence and scientific rationality among nurses and midwives, yet a continuing need for traditional nursing qualities and the time to express them.”⁸¹¹

The drivers of workforce change include broad external factors such as regulation, policy and education; organisational factors such as work environment, organisational climate and technological advances; and staff variables such as workforce shortages and workforce demographics.

More specifically, factors that influence the healthcare workforce include:^{812,813,814,815}


- a growing elderly population
- increasingly culturally diverse populations
- rural and remote demographics
- long term conditions
- growing substance abuse, obesity and healthcare risk factors
- high infant morbidity and mortality
- policy changes and directives
- the way healthcare systems are organised
- commissioning and payment structures
- legislation
- professional regulation


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- changes in the way the workforce is educated
 - a focus on providing more care in the community
 - technological breakthroughs
 - heightened computer literacy
 - telecommunications
 - advances that help chronically ill people live at home
 - a focus on improved coordination of care
 - evidence based care
 - the feasibility of paraprofessionals and lay workers
 - changes in organisational structure
 - organisational climate
 - leadership
 - staff shortages
 - burnout
 - an aging staff profile
 - gender differences in career breaks

Such drivers are important because they show that organisational structures, processes and technologies offer many levers for optimising the healthcare workforce. Interventions designed to improve workers' performance should not be restricted to just one of these components. Rather, a combination of interventions cutting across components is more likely to form a reinforcing work environment.

Such an approach also moves workforce development activities from an operational and technical level to a more strategic one, where the focus is not only on developing a set of coherent workforce policies and practices but also on ensuring that employees' collective knowledge, skills and abilities contribute to achieving organisational objectives.^{816,817,818,819}

However, limitations in the current evidence about workforce changes have been well documented.⁸²⁰ Studies have been criticised for their methodological flaws, their descriptive focus and their reliance on statistical correlations that fail to account for many key variables.^{821,822,823} In addition, much research is based at single sites, draws small sample sizes and is






poorly designed – all factors that limit the validity of studies and the ability to draw conclusions that apply to other areas.⁸²⁴

This review highlights that there have been a range of workforce changes over the past few decades, but researchers suggest that further workforce change is needed to meet the demands of the population, to keep up with technology, to address staff shortages and demographics, to ensure evidence based care and to enhance value for money and efficiency.

In community mental health for instance, it has been argued that there remain significant gaps in the knowledge, skills and competencies of the workforce available to deliver effective interventions, the efficient and effective organisation of work and the development and replication of effective workforce training and support strategies to sustain services.⁸²⁵

The workforce is constantly adapting. Perhaps an important next step for those responsible for training, supporting and planning workforce needs is to analyse whether these changes are in the 'right direction' to meet population demands, workforce factors and efficiency goals. Many of the changes described in community mental health, paediatrics, health promotion and surgery have been somewhat ad hoc, and in response to wider organisational and policy influences.

A more structured analytical approach to planning how the workforce needs to change to meet future needs may be needed. The skills and training required to support workforce changes in these four fields is a gap in current knowledge.



References

- ¹ ACHDHR (2007). *A framework for collaborative Pan-Canadian health human resources planning*. Ottawa: Health Canada, Advisory Committee on Health Delivery and Human Resources, HHR Planning Subcommittee.
- ² Dussault G, Dubois CA (2003). Human resources for health policies: a critical component in health policies. *Human Resources for Health* 1: 1.
- ³ Singh D (2005). Which staff improve care for people with long term conditions. A rapid review of the literature. Birmingham: University of Birmingham, Health Services Management Centre.
- ⁴ Wagner EH (2000). The role of patient care teams in chronic disease management. *BMJ* 320(7234):569-72.
- ⁵ Sommers LS, Marton KI, Barbaccia JC, Randolph J (2000). Physician, nurse, and social worker collaboration in primary care for chronically ill seniors. *Arch Intern Med* 160: 1825-1833.
- ⁶ MacNeela P, Scott A, Treacy P, Hyde A (2010). In the know: cognitive and social factors in mental health nursing assessment. *J Clin Nurs* 19(9-10): 1298-306.
- ⁷ Singh D (2005). Which staff improve care for people with long term conditions. A rapid review of the literature. Birmingham: University of Birmingham, Health Services Management Centre.
- ⁸ Vliet Vlieland TP, Hazes JM (1997). Efficacy of multidisciplinary team care programs in rheumatoid arthritis. *Sem Arthritis Rheum* 27(2): 110-22.
- ⁹ Caplan GA, Williams AJ, Daly B, Abraham K (2004). A randomized, controlled trial of comprehensive geriatric assessment and multidisciplinary intervention after discharge of elderly from the emergency department - the DEED II study. *J Am Geriatr Soc* 52(9): 1417-23.
- ¹⁰ Donnelly M, Power M, Russell M, Fullerton K (2004). Randomized controlled trial of an early discharge rehabilitation service: the Belfast Community Stroke Trial. *Stroke* 35(1):127-33.
- ¹¹ Mitchell RH, Armstrong S, Simpson TE, Lentz M (1989). American association of critical-care nurses demonstration projects: Profile of excellence in critical care nursing. *Heart & Lung: The Journal of Critical Care* 18(3), 219-237.
- ¹² Knaus WA, Draper EA, Wagner DP, Zimmerman, JE (1986). An evaluation of outcome from intensive care in major medical centers. *Annals of Internal Medicine* 104(3), 410-418.
- ¹³ Lozano P, Finkelstein JA, Carey VJ, Wagner EH, Inui TS, Fuhlbrigge AL, Soumerai SB, Sullivan SD, Weiss ST, Weiss KB (2004). A multisite randomized trial of the effects of physician education and organizational change in chronic-asthma care: health outcomes of the Pediatric Asthma Care Patient Outcomes Research Team II Study. *Arch Pediatr Adolesc Med* 158(9): 875-83.
- ¹⁴ Taylor KI, Oberle KM, Crutcher RA, Norton PG (2005). Promoting health in type 2 diabetes: nurse-physician collaboration in primary care. *Biol Res Nurs* 6(3): 207-15.

-
- ¹⁵ Aigner MJ, Drew S, Phipps J (2004). A comparative study of nursing home resident outcomes between care provided by nurse practitioners / physicians versus physicians only. *J Am Med Dir Assoc* 5(1): 16-23.
- ¹⁶ Silver T, Goldstein H (1992). A collaborative model of a county crisis intervention team: the Lake County experience. *Community Ment Health J* 28(3): 249-56.
- ¹⁷ van Hoof F, van Weeghel J, Kroon H (2000). Community care: exploring the priorities of clients, mental health professionals and community providers. *Int J Soc Psychiatry* 46(3): 208-19.
- ¹⁸ Cuddeback G, Shattell M (2010). Nurses and assertive community treatment teams: a critical combination. *Issues Ment Health Nurs* 31(11): 751-2.
- ¹⁹ La Hee F (2001). The development of a community-based comprehensive mental health service delivery system for the Cayman Islands (1989-2001). *West Indian Med J* 50(Suppl 4): 34-9.
- ²⁰ Holmwood C (1998). Challenges facing primary care mental health in Australia. *Aust Fam Physician* 27(8): 716-9.
- ²¹ Beech B (1997). Studying the future: a Delphi survey of how multi-disciplinary clinical staff view the likely development of two community mental health centres over the course of the next two years. *J Adv Nurs* 25(2): 331-8.
- ²² Verins I, Marshall B, Keating C (2007). Strategies for bridging sectors and silos: a training model in mental health promotion. *Health Promot J Austr* 18(3): 260-5.
- ²³ Thornicroft G, Tansella M (2005). Growing recognition of the importance of service user involvement in mental health service planning and evaluation. *Epidemiol Psychiatr Soc* 14(1): 1-3.
- ²⁴ Crawford P, Brown B (2002). 'Like a friend going round': reducing the stigma attached to mental healthcare in rural communities. *Health Soc Care Community* 10(4): 229-38.
- ²⁵ Riebschleger J (2002). Community mental health professionals' theoretical assumptions about families: responses to a practice simulation vignette. *Psychiatr Rehabil J* 26(1): 91-6.
- ²⁶ Elstad TA, Hellzen O (2010). Community mental health centres: a qualitative study of professionals' experiences. *Int J Ment Health Nurs* 19(2): 110-8.
- ²⁷ Dixon L, Hackman A, Lehman A (1997). Consumers as staff in assertive community treatment programs. *Adm Policy Ment Health* 25(2): 199-208.
- ²⁸ Solomon P, Draine J (1995). The efficacy of a consumer case management team: 2-year outcomes of a randomized trial. *J Ment Health Adm* 22(2): 135-46.
- ²⁹ Stephens CL, Belisle KC (1993). The 'consumer-as-provider' initiative. *J Ment Health Adm* 20(2): 178-82.
- ³⁰ Ford J, Young D, Perez BC, Obermeyer RL, Rohner DG (1992). Needs assessment for persons with severe mental illness: what services are needed for successful community living? *Community Ment Health J* 28(6): 491-503.
- ³¹ Woltmann EM, Wilkniss SM, Teachout A, McHugo GJ, Drake RE (2011). Trial of an electronic decision support system to facilitate shared decision making in community mental health. *Psychiatr Serv* 62(1): 54-60.

-
- ³² Lankshear AJ (2003). Coping with conflict and confusing agendas in multidisciplinary community mental health teams. *J Psychiatr Ment Health Nurs* 10(4): 457-64.
- ³³ Chaudry RV, Polivka BJ, Kennedy CW (2000). Public health nursing directors' perceptions regarding interagency collaboration with community mental health agencies. *Public Health Nurs* 17(2): 75-84.
- ³⁴ Mauer BJ, Druss BG (2010). Mind and body reunited: improving care at the behavioral and primary healthcare interface. *J Behav Health Serv Res* 37(4): 529-42.
- ³⁵ Madge N, Foreman D, Baksh F (2008). Starving in the midst of plenty? A study of training needs for child and adolescent mental health service delivery in primary care. *Clin Child Psychol Psychiatry* 13(3): 463-78.
- ³⁶ Secker J, Hill K (2002). Mental health training and development needs of community agency staff. *Health Soc Care Community* 10(5): 323-30.
- ³⁷ Bugge C, Smith LN, Shanley E (1999). A descriptive survey to identify the perceived skills and community skill requirements of mental health staff. *J Adv Nurs* 29(1): 218-28.
- ³⁸ Kelley SD, Belgard W, Cooper D (1994). Vocational integration services in community mental health: professionals' perceptions of training needs. *Community Ment Health J* 30(2): 123-34.
- ³⁹ Chinnayya HP, Chandrashekar CR, Moily S, Puttamma, Raghuram A, Subramanya KR, Shanmugham V, Udaykumar GS (1990). Training primary care health workers in mental health care: evaluation of attitudes towards mental illness before and after training. *Int J Soc Psychiatry* 36(4): 300-7.
- ⁴⁰ Meyer D, Hamel-Lambert J, Tice C, Safran S, Bolon D, Rose-Grippa K (2005). Recruiting and retaining mental health professionals to rural communities: an interdisciplinary course in Appalachia. *J Rural Health* 21(1): 86-91.
- ⁴¹ Bhatara VS, Fuller WC, O'Connor-Davis L, Misra LK (1996). Improving job satisfaction of rural South Dakota mental health providers through education: a pilot study. *S D J Med* 49(3): 93-6.
- ⁴² Blacconiere MJ, Oleckno WA (1999). Health-promoting behaviours in public health: testing the health promotion model. *J R Soc Promot Health* 119(1): 11-6.
- ⁴³ Shilton T (2009). Health promotion competencies: providing a road map for health promotion to assume a prominent role in global health. *Glob Health Promot* 16(2): 42-6.
- ⁴⁴ Lam PP, Chambers LW, MacDougall DM, McCarthy AE (2010). Seasonal influenza vaccination campaigns for health care personnel: systematic review. *CMAJ* 182(12): E542-8.
- ⁴⁵ Griffiths J, Blair-Stevens C, Parish R (2009). The integration of health promotion and social marketing. *Perspect Public Health* 129(6): 268-71.
- ⁴⁶ Sheahan SL (2000). Documentation of health risks and health promotion counseling by emergency department nurse practitioners and physicians. *J Nurs Scholarsh* 32(3): 245-50.
- ⁴⁷ Tu HT, Boukus ER, Cohen GR (2010). Workplace clinics: a sign of growing employer interest in wellness. *Res Briefs* 17): 1-16.
- ⁴⁸ Murphy BM, Schoenman JA, Pirani H (2010). Health insurers promoting employee wellness: strategies, program components and results. *Am J Health Promot* 24(5): e1-10.

-
- ⁴⁹ Jorgensen MB, Rasmussen CD, Ekner D, Sogaard K (2010). Successful reach and adoption of a workplace health promotion RCT targeting a group of high-risk workers. *BMC Med Res Methodol* 10: 56.
- ⁵⁰ Rocha GM, Martínez AM, Hernández SA, Elizondo ME (2010). Integrated preventive care coverage effectiveness in high-risk worksites in Mexico. *Int Arch Occup Environ Health* 83(7): 813-21.
- ⁵¹ Chung M, Melnyk P, Blue D, Renaud D, Breton MC (2009). Worksite health promotion: the value of the Tune Up Your Heart program. *Popul Health Manag* 12(6): 297-304.
- ⁵² Perez AP, Phillips MM, Cornell CE, Mays G, Adams B (2009). Promoting dietary change among state health employees in Arkansas through a worksite wellness program: the Healthy Employee Lifestyle Program (HELP). *Prev Chronic Dis* 6(4): A123.
- ⁵³ Brunges M, Avigne G, Wasik M (2006). Health promotion in the operating room - a quality improvement project. *AORN J* 83(1): 171-2, 175-7.
- ⁵⁴ Chew L, Cheah C, Koh YH (2002). Health promotion programme in the private workplaces in Singapore: a prevalence survey. *Singapore Med J* 43(1): 18-24.
- ⁵⁵ Harper AS, Farrally MR, Emery AM, McGlew TJ, Lyon A, Docherty G, Russell M (1990). The Vale of Leven health promotion project. *Br J Gen Pract* 40(331): 64-6.
- ⁵⁶ O'Neill M, Cowman S (2008). Partners in care: investigating community nurses' understanding of an interdisciplinary team-based approach to primary care. *J Clin Nurs* 17(22): 3004-11.
- ⁵⁷ Shingo N, Takeo M (2002). The educational experiments of school health promotion for the youth in Japan: analysis of the 'sport test' over the past 34 years. *Health Promot Int* 17(2): 147-60.
- ⁵⁸ Shinkai RS, Del Bel Cury AA (2000). The role of dentistry in the interdisciplinary team: contributing to comprehensive health care for the elderly. *Cad Saude Publica* 16(4): 1099-109.
- ⁵⁹ Taub A (2003). Transdisciplinary approaches to building the capacity of the public health workforce. *Ethn Dis* 13(2 Suppl 2): S45-7.
- ⁶⁰ Siivola U, Martikainen T (1990). The public health nurse - the linchpin of primary health care. *World Health Forum* 11(1): 102-7.
- ⁶¹ Lightfoot J, Bines W (2000). Working to keep school children healthy: the complementary roles of school staff and school nurses. *J Public Health Med* 22(1): 74-80.
- ⁶² de Groot FP, Robertson NM, Swinburn BA, de Silva-Sanigorski AM (2010). Increasing community capacity to prevent childhood obesity: challenges, lessons learned and results from the Romp & Chomp intervention. *BMC Public Health* 10: 522.
- ⁶³ Powell S, Towers A, Milne P (2008). The public health view on closing the gap between public health and primary care. *Fam Pract* 25(Suppl 1): i17-19.
- ⁶⁴ Sim FM (2007). Teaching Public Health Networks: connecting with Shaping the Future. *J R Soc Promot Health* 127(5): 215-8.
- ⁶⁵ Reavley N, Livingston J, Buchbinder R, Bennell K, Stecki C, Osborne RH (2010). A systematic grounded approach to the development of complex interventions: the Australian WorkHealth Program - arthritis as a case study. *Soc Sci Med* 70(3): 342-50.

-
- ⁶⁶ Botchwey ND, Hobson SE, Dannenberg AL, Mumford KG, Contant CK, McMillan TE, Jackson RJ, Lopez R, Winkle C (2009). A model curriculum for a course on the built environment and public health: training for an interdisciplinary workforce. *Am J Prev Med* 36(2 Suppl): S63-71.
- ⁶⁷ Ritchie D, Gnich W, Parry O, Platt S (2008). 'People pull the rug from under your feet': barriers to successful public health programmes. *BMC Public Health* 8: 173.
- ⁶⁸ Winangnon S, Sriamporn S, Senarak W, Saranrittichai K, Vatanasapt P, Moore MA (2007). Use of lay health workers in a community-based chronic disease control program. *Asian Pac J Cancer Prev* 8(3): 457-61.
- ⁶⁹ Schneider EC, Altpeter M, Whitelaw N (2007). An innovative approach for building health promotion program capacity: a generic volunteer training curriculum. *Gerontologist* 47(3): 398-403.
- ⁷⁰ Andersen MR, Hager M, Su C, Urban N (2002). Analysis of the cost-effectiveness of mammography promotion by volunteers in rural communities. *Health Educ Behav* 29(6): 755-70.
- ⁷¹ Wells BL, DePue JD, Buehler CJ, Lasater TM, Carleton RA (1990). Characteristics of volunteers who deliver health education and promotion: a comparison with organization members and program participants. *Health Educ Q* 17(1): 23-35.
- ⁷² Nguyen TU, Tran JH, Kagawa-Singer M, Foo MA (2011). A qualitative assessment of community-based breast health navigation services for Southeast Asian women in Southern California: recommendations for developing a navigator training curriculum. *Am J Public Health* 101(1): 87-93.
- ⁷³ Herce ME, Chapman JA, Castro A, Garcia-Salyano G, Khoshnood K (2010). A role for community health promoters in tuberculosis control in the state of Chiapas, Mexico. *J Community Health* 35(2): 182-9.
- ⁷⁴ Kim JM, Koh KW, Oak CH, Jung WH, Kim SH, Park DH (2009). Assessment of village health worker training program in Tuguegarao, Philippine. *J Prev Med Public Health* 42(6): 377-85.
- ⁷⁵ Rhodes SD, Hergenrather KC, Bloom FR, Leichter JS, Montano J (2009). Outcomes from a community-based, participatory lay health adviser HIV/STD prevention intervention for recently arrived immigrant Latino men in rural North Carolina. *AIDS Educ Prev* 21(5 Suppl): 103-8.
- ⁷⁶ Vissman AT, Eng E, Aronson RE, Bloom FR, Leichter JS, Montano J, Rhodes SD (2009). What do men who serve as lay health advisers really do? Immigrant Latino men share their experiences as Navegantes to prevent HIV. *AIDS Educ Prev* 21(3): 220-32.
- ⁷⁷ Ngoc Nguyen TU, Tanjasiri SP, Kagawa-Singer M, Tran JH, Foo MA (2008). Community health navigators for breast- and cervical-cancer screening among Cambodian and Laotian women: intervention strategies and relationship-building processes. *Health Promot Pract* 9(4): 356-67.
- ⁷⁸ Perez M, Findley SE, Mejia M, Martinez J. The impact of community health worker training and programs in NYC. *J Health Care Poor Underserved* 17(1 Suppl): 26-43.
- ⁷⁹ Mack M, Uken R, Powers J (2006). People improving the community's health: community health workers as agents of change. *J Health Care Poor Underserved* 17(1 Suppl): 16-25.

-
- ⁸⁰ Frick KD, Carlson MC, Glass TA, McGill S, Rebok GW, Simpson C, Fried LP (2004). Modeled cost-effectiveness of the Experience Corps Baltimore based on a pilot randomized trial. *J Urban Health* 81(1): 106-17.
- ⁸¹ Glass TA, Freedman M, Carlson MC, Hill J, Frick KD, Ialongo N, McGill S, Rebok GW, Seeman T, Tielsch JM, Wasik BA, Zeger S, Fried LP (2004). Experience Corps: design of an intergenerational program to boost social capital and promote the health of an aging society. *J Urban Health* 81(1): 94-105.
- ⁸² Rebok GW, Carlson MC, Glass TA, McGill S, Hill J, Wasik BA, Ialongo N, Frick KD, Fried LP, Rasmussen MD (2004). Short-term impact of Experience Corps participation on children and schools: results from a pilot randomized trial. *J Urban Health* 81(1): 79-93.
- ⁸³ Fried LP, Carlson MC, Freedman M, Frick KD, Glass TA, Hill J, McGill S, Rebok GW, Seeman T, Tielsch J, Wasik BA, Zeger S (2004). A social model for health promotion for an aging population: initial evidence on the Experience Corps model. *J Urban Health* 81(1): 64-78.
- ⁸⁴ McQuiston C, Flakerud JH (2003). "If they don't ask about condoms, I just tell them": a descriptive case study of Latino lay health advisers' helping activities. *Health Educ Behav* 30(1): 79-96.
- ⁸⁵ Lacey L, Tukes S, Manfredi C, Warnecke RB (1991). Use of lay health educators for smoking cessation in a hard-to-reach urban community. *J Community Health* 16(5): 269-82.
- ⁸⁶ Brownstein JN, Cheal N, Ackermann SP, Bassford TL, Campos-Outcalt D (1992). Breast and cervical cancer screening in minority populations: a model for using lay health educators. *J Cancer Educ* 7(4): 321-6.
- ⁸⁷ Struthers R, Hodge FS, De Cora L, Geishirt-Cantrell B (2003). The experience of native peer facilitators in the campaign against type 2 diabetes. *J Rural Health* 19(2): 174-80.
- ⁸⁸ Martínez-Donate AP (2009). Using lay health advisors to promote breast and cervical cancer screening among Latinas: a review. *WMJ* 108(5): 259-62.
- ⁸⁹ Rhodes SD, Foley KL, Zometa CS, Bloom FR (2007). Lay health advisor interventions among Hispanics/Latinos: a qualitative systematic review. *Am J Prev Med* 33(5): 418-27.
- ⁹⁰ Freyens P, Mbakuiyemo N, Martin M (1993). How do health workers see community participation? *World Health Forum* 14(3): 253-7.
- ⁹¹ Emmons KM, Linnan LA, Shadel WG, Marcus B, Abrams DB (1999). The Working Healthy Project: a worksite health-promotion trial targeting physical activity, diet, and smoking. *J Occup Environ Med* 41(7): 545-55.
- ⁹² Hawkins C, O'Garro MA, Wimsett K (2009). Engaging employers to develop healthy workplaces: the WorkWell initiative of Steps to a Healthier Washington in Thurston County. *Prev Chronic Dis* 6(2): A61.
- ⁹³ Paull DE, Mazzia LM, Wood SD, Theis MS, Robinson LD, Carney B, Neily J, Mills PD, Bagian JP (2010). Briefing guide study: preoperative briefing and postoperative debriefing checklists in the Veterans Health Administration medical team training program. *Am J Surg* 200(5): 620-3.
- ⁹⁴ Papaspyros SC, Javangula KC, Adluri RK, O'Regan DJ (2010). Briefing and debriefing in the cardiac operating room. Analysis of impact on theatre team attitude and patient safety. *Interact Cardiovasc Thorac Surg* 10(1): 43-7.

-
- ⁹⁵ Lingard L, Espin S, Rubin B, Whyte S, Colmenares M, Baker GR, Doran D, Grober E, Orser B, Bohnen J, Reznick R (2005). Getting teams to talk: development and pilot implementation of a checklist to promote interprofessional communication in the OR. *Qual Saf Health Care* 14(5): 340-6.
- ⁹⁶ Weaver SJ, Rosen MA, DiazGranados D, Lazzara EH, Lyons R, Salas E, Knych SA, McKeever M, Adler L, Barker M, King HB. Does teamwork improve performance in the operating room? A multilevel evaluation. *Jt Comm J Qual Patient Saf* 36(3): 133-42.
- ⁹⁷ Young RS, O'Regan DJ (2010). Cardiac surgical theatre traffic: time for traffic calming measures? *Interact Cardiovasc Thorac Surg* 10(4): 526-9.
- ⁹⁸ Gfrorer R, Bernard U, Schaper C, Bauer M, Schupfer GK (2007). Role expectations of various professional groups in the operating theatre. *Anaesthetist* 56(11): 1163-9.
- ⁹⁹ Webber S (1993). Cluster staffing: cooperation, competence, and caring. *Today's OR Nurse* 15(2): 5-7.
- ¹⁰⁰ Cima RR, Kollengode A, Storsveen AS, Weisbrod CA, Deschamps C, Koch MB, Moore D, Pool SR (2009). A multidisciplinary team approach to retained foreign objects. *Jt Comm J Qual Patient Saf* 35(3): 123-32.
- ¹⁰¹ Althausen PL, Davis L, Boyden E, O'Mara TJ, Uppal R, Bray TJ (2010). Financial impact of a dedicated orthopaedic traumatologist on a private group practice. *J Orthop Trauma* 24(6): 350-4.
- ¹⁰² American Academy of Pediatrics Committee on Pediatric Emergency Medicine, American College of Emergency Physicians Pediatric Committee, Emergency Nurses Association Pediatric Committee (2009). Joint policy statement - guidelines for care of children in the emergency department. *Ann Emerg Med* 54(4): 543-52.
- ¹⁰³ Goodman DC (2009). Unwarranted variation in pediatric medical care. *Pediatr Clin North Am* 56(4): 745-55.
- ¹⁰⁴ Dugueperoux I, Tamalet A, Sermet-Gaudelus I, Le Bourgeois M, Gérardin M, Desmazes-Dufeu N, Hubert D (2008). Clinical changes of patients with cystic fibrosis during transition from pediatric to adult care. *J Adolesc Health* 43(5): 459-65.
- ¹⁰⁵ Baldwin L (2005). Multidisciplinary post-registered education in child and adolescent mental health services. *Nurse Educ Today* 25(1): 17-22.
- ¹⁰⁶ Di Giulio P, Cotta R, Bastianello D, Garaventa A, Jankovic M, Perilongo G, Salgarello MC, Tecchiato D (2004). Doctors-nurses integration in paediatric onco-hematology: a cornerstone for quality of care. Report on a three years experience. *Assist Inferm Ric* 23(3): 142-8.
- ¹⁰⁷ Hewitt-Taylor J (2005). Caring for children with complex needs: staff education and training. *J Child Health Care* 9(1): 72-86.
- ¹⁰⁸ Schor EL (2003). Family pediatrics: report of the Task Force on the Family. *Pediatrics* 111(6 Pt 2): 1541-71.
- ¹⁰⁹ Dobke J, Köhlen C, Beier J (2001). Home pediatric nursing care service in Germany - a quantitative study of the status of home pediatric nursing care providers in Germany. *Pflege* 14(3): 183-90.

-
- ¹¹⁰ Ostwald SK, Leonard B, Choi T, Keenan J, Hepburn K, Aroskar MA (1993). Caregivers of frail elderly and medically fragile children: perceptions of ability to continue to provide home health care. *Home Health Care Serv Q* 14(1): 55-80.
- ¹¹¹ Jessee PO, Cecil C, Jessee JE (1991). Pediatric family home visitors: effectiveness in problem solving. *Child Health Care* 20(3): 179-84.
- ¹¹² MacDonald V (1991). Home is where the heart is. Provision of home and day care for sick children. *Prof Nurse* 6(10): 606-8.
- ¹¹³ Gotlieb EM, Gotlieb JS (2009). Helping adolescents with attention-deficit/hyperactivity disorder transition toward adulthood. *Adolesc Med State Art Rev* 20(1): 203-22.
- ¹¹⁴ Simon TD, Lamb S, Murphy NA, Hom B, Walker ML, Clark EB (2009). Who will care for me next? Transitioning to adulthood with hydrocephalus. *Pediatrics* 124(5): 1431-7.
- ¹¹⁵ Freed GL, Dunham KM (2010). All primary care trainees are not the same: the role of economic factors and career choice. *Pediatrics* 125(3): 574-7.
- ¹¹⁶ Pletcher BA, Rimsza ME, Cull WL, Shipman SA, Shugerman RP, O'Connor KG (2010). Primary care pediatricians' satisfaction with subspecialty care, perceived supply, and barriers to care. *J Pediatr* 156(6): 1011-5, 1015.
- ¹¹⁷ Orr RA, Felmet KA, Han Y, McCloskey KA, Dragotta MA, Bills DM, Kuch BA, Watson RS (2009). Pediatric specialized transport teams are associated with improved outcomes. *Pediatrics* 124(1): 40-8.
- ¹¹⁸ Ajizian SJ, Nakagawa TA (2007). Interfacility transport of the critically ill pediatric patient. *Chest* 132(4): 1361-7.
- ¹¹⁹ Edge WE, Kanter RK, Weigle CG, Walsh RF (1994). Reduction of morbidity in interhospital transport by specialized pediatric staff. *Crit Care Med* 22(7): 1186-91.
- ¹²⁰ Rubenstein JS, Gomez MA, Rybicki L, Noah ZL (1992). Can the need for a physician as part of the pediatric transport team be predicted? A prospective study. *Crit Care Med* 20(12): 1657-61.
- ¹²¹ Reynolds M, Thomsen C, Black L, Moody R (1992). The nuts and bolts of organizing and initiating a pediatric transport team. The Sutter Memorial experience. *Crit Care Clin* 8(3): 465-80.
- ¹²² Kline MW, Ferris MG, Jones DC, Calles NR, Mizwa MB, Schwarzwald HL, Wanless RS, Schutze GE (2009). The Pediatric AIDS Corps: responding to the African HIV/AIDS health professional resource crisis. *Pediatrics* 123(1): 134-6.
- ¹²³ Vernon DD, Bolte RG, Scaife E, Hansen KW (2005). Alternative model for a pediatric trauma center: efficient use of physician manpower at a freestanding children's hospital. *Pediatr Emerg Care* 21(1): 18-22.
- ¹²⁴ Krupicka MI, Bratton SL, Sonnenthal K, Goldstein B (2002). Impact of a pediatric clinical pharmacist in the pediatric intensive care unit. *Crit Care Med* 30(4): 919-21.
- ¹²⁵ Nash DA (2009). Improving access to oral health care for children by expanding the dental workforce to include dental therapists. *Dent Clin North Am* 53(3): 469-83.
- ¹²⁶ Roberts MW, Vann WF Jr (2005). Access to dental care for young children in North Carolina: history and current status of workforce issues. *N C Med J* 66(6): 452-5.

-
- 127 Nash DA (2005). Developing and deploying a new member of the dental team: a pediatric oral health therapist. *J Public Health Dent* 65(1): 48-55.
- 128 Nash DA (2004). Developing a pediatric oral health therapist to help address oral health disparities among children. *J Dent Educ* 68(1): 8-22.
- 129 Nash DA (2009). Adding dental therapists to the health care team to improve access to oral health care for children. *Acad Pediatr* 9(6): 446-51.
- 130 Swinney R, Yin L, Lee A, Rubin D, Anderson C (2007). The role of support staff in pediatric palliative care: their perceptions, training, and available resources. *J Palliat Care* 23(1): 44-50.
- 131 Nishisaki A, Hales R, Biagas K, Cheifetz I, Corriveau C, Garber N, Hunt E, Jarrah R, McCloskey J, Morrison W, Nelson K, Niles D, Smith S, Thomas S, Tuttle S, Helfaer M, Nadkarni V (2009). A multi-institutional high-fidelity simulation "boot camp" orientation and training program for first year pediatric critical care fellows. *Pediatr Crit Care Med* 10(2): 157-62.
- 132 Bloor K, Maynard A (2003). *Planning human resources in health care: towards an economic approach*. Ottawa: Canadian Health Services Research Foundation.
- 133 Duffield C, Forbes J, Fallon A, Roche M, Wise W, Merrick ET (2005). Nursing skill mix and nursing time: the roles of registered nurses and clinical nurse specialists. *Aust J Adv Nurs* 23(2):14-21.
- 134 Blegen MA, Vaughn TE, Goode CJ (2001). Nurse experience and education: effect on quality of care. *J Nurs Adm* 31(1):33-9.
- 135 Aiken L, Clarke S, Cheung R, Sloane D, Silber J (2003). Educational levels of hospital nurses and surgical patient mortality. *JAMA* 290(12): 1617-1623.
- 136 Blegen M, Goode C, Reed L (1998). Nurse staffing and patient outcomes. *Nursing Research* 47: 43-50.
- 137 Cho SH, Ketefian S, Barkauskas VH, Smith DG (2003). The effects of nurse staffing on adverse events, morbidity, mortality and medical costs. *Nurs Res* 52(2):71-9
- 138 Needleman J, Buerhaus PI, Mattke S, Stewart M, Zelevinsky K (2001). *Nurse staffing and patient outcomes in hospitals. Final report*. Washington DC: U.S. Department of Health and Human Services.
- 139 O'Brien-Pallas L, Doran DI, Murray M, Cockerill R, Sidani S, Laurie-Shaw B, Lochhass-Gerlach J(2002): Evaluation of a client care delivery model, part 2: Variability in client outcomes in community home nursing. *Nursing Economics* 20(1) :13-21, 36.
- 140 Dorrance HR, Docherty GM, O'Dwyer PJ (2000). Effect of surgeon specialty interest on patient outcome after potentially curative colorectal cancer surgery. *Dis Colon Rectum* 43(4):492-8.
- 141 Fleischer AB, Jr., Feldman SR, Barlow JO, Zheng B, Hahn H, Chuang TY, Draft KS, Golitz LE, Wu E, Katz AS, Maize JC, Knapp T, Leshin B (2001). The specialty of the treating physician affects the likelihood of tumor-free resection margins for basal cell carcinoma: results from a multi-institutional retrospective study. *J Am Acad Dermatol* 44(2):224-30.
- 142 Gerbert B, Maurer T, Berger T, Pantilat S, McPhee SJ, Wolff M, Bronstone A, Caspers N (1996). Primary care physicians as gatekeepers in managed care. Primary care physicians' and dermatologists' skills at secondary prevention of skin cancer. *Arch Dermatol* 132(9):1030-8.

-
- ¹⁴³ Nash IS, Nash DB, Fuster V (1997). Do cardiologists do it better? *J Am Coll Cardiol* 29(3):475-8.
- ¹⁴⁴ Ness JE, Sullivan SD, Stergachis A (1994). Accuracy of technicians and pharmacists in identifying dispensing errors. *Am J Hosp Pharm* 51:354-357.
- ¹⁴⁵ McGhan WF, Smith WE, Adams DW (1983). A randomized trial comparing pharmacists and technicians as dispensers of prescriptions for ambulatory patients. *Med Care* 21(4):445-53.
- ¹⁴⁶ Goodwin AT, Birdi I, Ramesh TP, Taylor GJ, Nashef SA, Dunning JJ, Large SR (2001). Effect of surgical training on outcome and hospital costs in coronary surgery. *Heart* 85(4):454-7.
- ¹⁴⁷ Eldar S, Kunin J, Chouri H, Sabo E, Matter I, Nash E, Schein M (1996). Safety of laparoscopic cholecystectomy on a teaching service: a prospective trial. *Surg Laparosc Endosc Percut Tech* 6(3):218-20.
- ¹⁴⁸ Sasichay-Akkadechanunt T, Scalzi CC, Jawad AF (2003). The Relationship between nurse staffing and patient outcomes. *J Nursing Admin* 33(9):478-85.
- ¹⁴⁹ Tourangeau, AE, Giovanetti P, Tu JV, Wood M (2002). Nursing-related determinants of 30-day mortality for hospitalized patients. *Can J Nurs Res* 33(4): 71-88.
- ¹⁵⁰ Blegen MA, Vaughn TE, Goode CJ (2001). Nurse experience and education: effect on quality of care. *J Nurs Adm* 31(1):33-9.
- ¹⁵¹ Henderson J, Willis E, Walter B, Toffoli L (2008). Measuring the workload of community mental health nurses: a review of the literature. *Contemp Nurse* 29(1): 32-42.
- ¹⁵² Bhaskara SM (1999). Setting benchmarks and determining psychiatric workloads in community mental health programs. *Psychiatr Serv* 50(5): 695-7.
- ¹⁵³ Stevenson J, Caverly S, Srebnik D, Hendryx M (1999). Using work sampling to investigate staff time allocation in community mental health centers. *Adm Policy Ment Health* 26(4): 291-5.
- ¹⁵⁴ Goldman CR, Faulkner LR, Breeding KA (1994). A method for estimating psychiatrist staffing needs in community mental health programs. *Hosp Community Psychiatry* 45(4): 333-7.
- ¹⁵⁵ Redick RW, Witkin MJ, Atay JE, Manderscheid RW (1991). Staffing of mental health organizations, United States, 1986. *Ment Health Stat Note* (196): 1-14.
- ¹⁵⁶ Calsyn DA, Saxon AJ, Blaes P, Lee-Meyer S (1990). Staffing patterns of American methadone maintenance programs. *J Subst Abuse Treat* 7(4): 255-9.
- ¹⁵⁷ Baker JG (1997). A spreadsheet method for calculating maximum caseload and intake capacity for CMHC psychiatrists. *Psychiatr Serv* 48(12): 1578-81.
- ¹⁵⁸ Hollingsworth EJ, Pitts MK, McKee D (1993). Staffing patterns in rural community support programs. *Hosp Community Psychiatry* 44(11): 1076-81.
- ¹⁵⁹ Meek I (1998). Evaluation of the role of the health care assistant within a community mental health intensive care team. *J Nurs Manag* 6(1): 11-9.
- ¹⁶⁰ Kent A, Fiander M, Burns T (2003). Does extra staff change clinical practice? A prospective study of the impact of extra resources in mental health teams. *Acta Psychiatr Scand* 107(1): 50-3.

-
- ¹⁶¹ Russell ML, McIntyre L (2009). Boundaries and overlap: Community medicine or public health doctors and primary care physicians. *Can Fam Physician* 55(11): 1102-1103.e5.
- ¹⁶² Magana-Valladares L, Nigenda-Lopez G, Sosa-Delgado N, Ruiz-Larios JA (2009). Public health workforce in Latin America and the Caribbean: assessment of education and labor in 17 countries. *Salud Publica Mex* 51(1): 62-75.
- ¹⁶³ Vitiello JR, Levary RR (1997). Determining the optimal physician mix in health maintenance organizations. *J Med Syst* 21(4): 249-66.
- ¹⁶⁴ Dreyer JM (1989). A critical evaluation of the role and functions of community health nurses in the health service of local authorities in larger cities in the Republic of South Africa. *Curationis* 12(3-4): 17-29.
- ¹⁶⁵ Hatcher ME (1997). Uncertainty considerations in group decisions: staffing and ratesetting in a health promotion center. *J Soc Health Syst* 5(3): 31-42.
- ¹⁶⁶ Smith DC, Davies L (1997). Who contributes to the public health function? *J Public Health Med* 19(4): 451-6.
- ¹⁶⁷ Ross FM, Bower PJ, Sibbald BS (1994). Practice nurses: characteristics, workload and training needs. *Br J Gen Pract* 44(378): 15-8.
- ¹⁶⁸ Quick L, Harman S, Morgan S, Stagnitti K (2010). Scope of practice of occupational therapists working in Victorian community health settings. *Aust Occup Ther J* 57(2): 95-101.
- ¹⁶⁹ Dexter F, Epstein RH, Elgart RL, Ledolter J (2009). Forecasting and perception of average and latest hours worked by on-call anesthesiologists. *Anesth Analg* 109(4): 1246-52.
- ¹⁷⁰ Dexter F, Macario A, Cowen DS (2006). Staffing and case scheduling for anesthesia in geographically dispersed locations outside of operating rooms. *Curr Opin Anaesthesiol* 19(4): 453-8.
- ¹⁷¹ Schleipman AR, Healy CD (2005). Determining radiology staffing requirements in the operating room: a radiation protection compliance perspective. *Radiol Manage* 27(5): 42-7.
- ¹⁷² Saver C (2005). Staffing ratio trends - a survey of perioperative nurse managers. *AORN J* 81(5): 1041-4.
- ¹⁷³ Marco AP (2002). Game theoretic approaches to operating room management. *Am Surg* 68(5): 454-62.
- ¹⁷⁴ Tanner J, Bailey G (2001). Staff rostering in the operating department. *Br J Perioper Nurs* 11(5): 228-33, 235.
- ¹⁷⁵ Dexter F, Traub RD (2000). Determining staffing requirements for a second shift of anesthesiologists by graphical analysis of data from operating room information systems. *AANA J* 68(1): 31-6.
- ¹⁷⁶ Dexter F, Macario A, O'Neill L (1999). A strategy for deciding operating room assignments for second-shift anesthesiologists. *Anesth Analg* 89(4): 920-4.
- ¹⁷⁷ Hoffreumon P, Lescrenier N, Baele P (1998). Current anesthesia manpower in Belgium in relation to anesthesia work locations. *Acta Anaesthesiol Belg* 49(3): 185-91.
- ¹⁷⁸ Lee PP, Jackson CA, Relles DA (1998). Demand-based assessment of workforce requirements for orthopaedic services. *J Bone Joint Surg Am* 80(3): 313-26.

-
- 179 Barratt CC, Schultz MK (1997). Staffing the operating room. Time and space factors. *J Nurs Adm* 27(12): 27-31.
- 180 Blake JT, Carter MW (1997). Surgical process scheduling: a structured review. *J Soc Health Syst* 5(3): 17-30.
- 181 Barone JE, Ryan MC, Cayten CG, Murphy JG (1993). Is 24-hour operating room staff absolutely necessary for level II trauma center designation? *J Trauma* 34(6):878-83.
- 182 Miner D (1991). Staffing formulas determine correct levels. *OR Manager* 7(1): 15.
- 183 Sokal SM, Chang Y, Craft DL, Sandberg WS, Dunn PF, Berger DL (2007). Surgeon profiling: a key to optimum operating room use. *Arch Surg* 142(4): 365-70.
- 184 McIntosh C, Dexter F, Epstein RH (2006). The impact of service-specific staffing, case scheduling, turnovers, and first-case starts on anesthesia group and operating room productivity: a tutorial using data from an Australian hospital. *Anesth Analg* 103(6): 1499-516.
- 185 Plasters CL, Seagull FJ, Xiao Y (2003). Coordination challenges in operating-room management: an in-depth field study. *AMIA Annu Symp Proc* :524-8.
- 186 Dexter F, Abouleish AE, Epstein RH, Whitten CW, Lubarsky DA (2003). Use of operating room information system data to predict the impact of reducing turnover times on staffing costs. *Anesth Analg* 97(4): 1119-26.
- 187 Dexter F, Ledolter J (2003). Managing risk and expected financial return from selective expansion of operating room capacity: mean-variance analysis of a hospital's portfolio of surgeons. *Anesth Analg* 97(1): 190-5.
- 188 Dexter F, Epstein RH (2003). Optimizing second shift OR staffing. *AORN J* 77(4): 825-30.
- 189 Dexter F, Epstein RH, Marsh HM (2002). Costs and risks of weekend anesthesia staffing at 6 independently managed surgical suites. *AANA J* 70(5): 377-81.
- 190 Dexter F, O'Neill L (2001). Weekend operating room on call staffing requirements. *AORN J* 74(5): 664-5, 668-71.
- 191 Canet J, Moral V, Villalonga A, Pelegrí D, Gomar C, Montero A (2001). Model to predict staffing for anesthesiology and post-anesthesia intensive care units and pain clinics. *Rev Esp Anesthesiol Reanim* 48(6): 279-84.
- 192 Dexter F, Epstein RH, Marsh HM (2001). A statistical analysis of weekday operating room anesthesia group staffing costs at nine independently managed surgical suites. *Anesth Analg* 92(6): 1493-8.
- 193 Lucas CE, Buechter KJ, Coscia RL, Hurst JM, Meredith JW, Middleton JD, Rinker CR, Tuggle D, Vlahos AL, Wilberger J (2001). Mathematical modeling to define optimum operating room staffing needs for trauma centers. *J Am Coll Surg* 192(5): 559-65.
- 194 Sawyer RG, Tribble CG, Newberg DS, Pruett TL, Minasi JS (1999). Intern call schedules and their relationship to sleep, operating room participation, stress, and satisfaction. *Surgery* 126(2): 337-42.
- 195 Tucker JB, Barone JE, Cecere J, Blabey RG, Rha CK (1999). Using queueing theory to determine operating room staffing needs. *J Trauma* 46(1): 71-9.

-
- ¹⁹⁶ Vernon DD, Furnival RA, Hansen KW, Diller EM, Bolte RG, Johnson DG, Dean JM (1999). Effect of a pediatric trauma response team on emergency department treatment time and mortality of pediatric trauma victims. *Pediatrics* 103(1): 20-4.
- ¹⁹⁷ Drachman DA (1996). Benchmarking surgeon satisfaction at academic health centers: a nationwide comparative survey. *Best Pract Benchmarking Healthc* 1(5): 236-41.
- ¹⁹⁸ Riedl S (2003). Modern operating room management in the workflow of surgery. Spectrum of tasks and challenges of the future. *Anaesthesist* 52(10): 957-63.
- ¹⁹⁹ Stepaniak PS, Heij C, Mannaerts GH, de Quelerij M, de Vries G (2009). Modeling procedure and surgical times for current procedural terminology-anesthesia-surgeon combinations and evaluation in terms of case-duration prediction and operating room efficiency: a multicenter study. *Anesth Analg* 109(4): 1232-45.
- ²⁰⁰ Dexter F, Epstein RH (2006). Holiday and weekend operating room on-call staffing requirements. *Anesth Analg* 103(6): 1494-8.
- ²⁰¹ Weigl M, Müller A, Zupanc A, Angerer P (2009). Participant observation of time allocation, direct patient contact and simultaneous activities in hospital physicians. *BMC Health Serv Res* 9: 110.
- ²⁰² Hunziker S, Baumgart A, Denz C, Schupfer G (2009). Economic benefits of overlapping induction: investigation using a computer simulation model. *Anaesthesist* 58(6): 623-32.
- ²⁰³ van Oostrum JM, Van Houdenhoven M, Vrielink MM, Klein J, Hans EW, Klimek M, Wullink G, Steyerberg EW, Kazemier G (2008). A simulation model for determining the optimal size of emergency teams on call in the operating room at night. *Anesth Analg* 107(5): 1655-62.
- ²⁰⁴ Seibert EM, Alexander J, Lupien AE (2004). Rural nurse anesthesia practice: a pilot study. *AANA J* 72(3): 181-90.
- ²⁰⁵ Dexter F, O'Neill L (2004). Data envelopment analysis to determine by how much hospitals can increase elective inpatient surgical workload for each specialty. *Anesth Analg* 99(5): 1492-500.
- ²⁰⁶ Sekiguchi M, Nakamura T, Murayama T, Seo N (1999). Problems with employment of a staff anesthesiologist in a local hospital. *Masui* 48(6): 678-81.
- ²⁰⁷ Stucky ER, Ottolini MC, Maniscalco J (2010). Pediatric hospital medicine core competencies: development and methodology. *J Hosp Med* 5(6): 339-43.
- ²⁰⁸ Weinstein AR, Reidy K, Norwood VF, Mahan JD (2010). Factors influencing pediatric nephrology trainee entry into the workforce. *Clin J Am Soc Nephrol* 5(10): 1770-4.
- ²⁰⁹ Freed GL, Dunham KM, Loveland-Cherry CJ, Martyn KK (2010). Pediatric nurse practitioners in the United States: current distribution and recent trends in training. *J Pediatr* 157(4): 589-93, 593.e1.
- ²¹⁰ Stucky ER, Maniscalco J, Ottolini MC, Agrawal R, Alverson B, Ballantine A, Beauchamp-Walters J, Billman GF, Buchanan AO, Carlson DW, Chiang VW, Clemmens MR, Clute JL, Phillips SC, Dansky T, Daru J, Daud YN, DeWolfe C, Geskey JM, Hain PD, Herzog K, Hood M, Johnson KB, Johnson R, Kelly B, Kimmons HC, Li ST, Lye PS, Maniscalco J, Marcello DE 3rd, Melzer SM, Mikula MI, Mirkinson LJ, Miller CD, O'Hara C, Ottolini MC, Pate BM, Patrick

-
- D, Percelay JM, Pressel D, Rehm KP, Rhee KE, Riederer MF, Ruhlen M, Seidel HM, Sekaran A, Shadman KA, Singla V, Smith K, Sperring JL, Stryjewski G, Stucky ER, Thompson ED Jr, Turmelle M, Tynan MG, Williams RJ, Wolf H, Wu S, Zaoutis LB, Zempsky WT (2010). The Pediatric Hospital Medicine Core Competencies Supplement: a Framework for Curriculum Development by the Society of Hospital Medicine with acknowledgement to pediatric hospitalists from the American Academy of Pediatrics and the Academic Pediatric Association. *J Hosp Med* 5(Suppl 2): 1-114.
- ²¹¹ Ng KL, Yazer J, Abdolell M, Brown P (2010). National survey to identify subspecialties at risk for physician shortages in Canadian academic radiology departments. *Can Assoc Radiol J* 61(5): 252-7.
- ²¹² Schwend RM (2009). The pediatric orthopaedics workforce demands, needs, and resources. *J Pediatr Orthop* 29(7): 653-60.
- ²¹³ de Jesus LE, Aguiar AS, de Campos Mdo S, Baratella JR, Ketzer JC, Mastroti RA, Amarante AC (2009). Needs and specialization for pediatric surgeons in Brazil. *Rev Col Bras Cir* 36(4): 356-61.
- ²¹⁴ Tsai TC, Harasym PH (2006). Challenges of pediatric residency training in Taiwan. *Acta Paediatr Taiwan* 47(1): 3-6.
- ²¹⁵ Ferkol T, Zeitlin P, Abman S, Blaisdell CJ, O'Brodovich H (2010). NHLBI training workshop report: The vanishing pediatric pulmonary investigator and recommendations for recovery. *Pediatr Pulmonol* 45(1): 25-33.
- ²¹⁶ Hernon M, McKenna J, Busby G, Sanders C, Garden A (2010). The histology and management of ovarian cysts found in children and adolescents presenting to a children's hospital from 1991 to 2007: a call for more paediatric gynaecologists. *BJOG* 117(2): 181-4.
- ²¹⁷ Mayer ML, Skinner AC (2009). Influence of changes in supply on the distribution of pediatric subspecialty care. *Arch Pediatr Adolesc Med* 163(12): 1087-91.
- ²¹⁸ Nakayama DK, Burd RS, Newman KD (2009). Pediatric surgery workforce: supply and demand. *J Pediatr Surg* 44(9): 1677-82.
- ²¹⁹ Nakayama DK, Burd RS, Newman KD (2009). Clinical and financial characteristics of pediatric surgery practices. *J Pediatr Surg* 44(7): 1304-8.
- ²²⁰ Iwanaka T (2009). Postgraduate training and specialty certification systems in pediatric surgery in Japan. *Nippon Geka Gakkai Zasshi* 110(3): 128-32.
- ²²¹ McManus M, Fox H, Limb S, Arango P, Armstrong P, Azizkhan R, Behrman R, Chesney R, Grover A, Gupta VB, Jewett E, Jones MD Jr, Kim WJ, Lewy J, Lighter D, Mulvey H, Pan R, Schwartz R, Sia C, Stille C, Stockman J, Tait V, Tonniges T, Willson P (2009). New workforce, practice, and payment reforms essential for improving access to pediatric subspecialty care within the medical home. *Arch Pediatr Adolesc Med* 163(3): 200-2.

-
- 222 Massin MM, Masmoudi H, Dessy H, Goor M, Khaldi K, Viart P (2008). Spectrum and workload of consultation activities in a Belgian tertiary paediatric cardiac centre. *Acta Clin Belg* 63(6): 372-5.
- 223 Durham SR, Lane JR, Shipman SA (2009). The pediatric neurosurgical workforce: defining the current supply. Clinical article. *J Neurosurg Pediatr* 3(1): 1-10.
- 224 Quiñonez CR, Locker D (2008). On the pediatric oral health therapist: lessons from Canada. *J Public Health Dent* 68(1): 53-6.
- 225 Twycross A (2007). Modernising nursing careers: implications for children's nurses. *Paediatr Nurs* 19(9): 39-40.
- 226 Emil S, Laberge JM (2007). Canada-trained pediatric surgeons: a cross-border survey of satisfaction and preferences. *J Pediatr Surg* 42(5): 878-84.
- 227 Bartik W, Dixon A, Dart K (2007). Aboriginal child and adolescent mental health: a rural worker training model. *Australas Psychiatry* 15(2): 135-9.
- 228 Goodman DC (2006). The pediatric subspecialty workforce: time to test our assumptions. *Pediatrics* 118(6): 2545-7.
- 229 Estes R, Estes D, West C, Zobal-Ratner J, Droster P, Simon J (2007). The American Association for Pediatric Ophthalmology and Strabismus workforce distribution project. *J AAPOS* 11(4): 325-9.
- 230 Saewyc EM, Bearinger LH, McMahon G, Evans T (2006). A national needs assessment of nurses providing health care to adolescents. *J Prof Nurs* 22(5): 304-13.
- 231 Phillips RL Jr, Bazemore AW, Doodoo MS, Shipman SA, Green LA (2006). Family physicians in the child health care workforce: opportunities for collaboration in improving the health of children. *Pediatrics* 118(3): 1200-6.
- 232 Parshuram CS, Kirpalani H, Mehta S, Granton J, Cook D (2006). In-house, overnight physician staffing: a cross-sectional survey of Canadian adult and pediatric intensive care units. *Crit Care Med* 34(6): 1674-8.
- 233 Hixson ED, Davis S, Morris S, Harrison AM (2005). Do weekends or evenings matter in a pediatric intensive care unit? *Pediatr Crit Care Med* 6(5): 523-30.
- 234 American Academy of Pediatrics Committee on Pediatric Workforce (2005). Pediatrician workforce statement. *Pediatrics* 116(1): 263-9.
- 235 Odetola FO, Clark SJ, Freed GL, Bratton SL, Davis MM (2005). A national survey of pediatric critical care resources in the United States. *Pediatrics* 115(4): e382-6.
- 236 Werner RM, Polsky D (2005). Comparing the supply of pediatric subspecialists and child neurologists. *J Pediatr* 146(1): 20-5.
- 237 Mayer ML, Skinner AC (2004). Too many, too few, too concentrated? A review of the pediatric subspecialty workforce literature. *Arch Pediatr Adolesc Med* 158(12): 1158-65.
- 238 Santos de Soto J (2004). The Spanish registry of organization, resources and activities in pediatric cardiology. *An Pediatr* 61(1): 51-61.

-
- 239 Stromberg D (2004). Pediatric cardiac intensivists: are enough being trained? *Pediatr Crit Care Med* 5(4): 391-2.
- 240 Randolph AG, Gonzales CA, Cortellini L, Yeh TS (2004). Growth of pediatric intensive care units in the United States from 1995 to 2001. *J Pediatr* 144(6): 792-8.
- 241 Shipman SA, Lurie JD, Goodman DC (2004). The general pediatrician: projecting future workforce supply and requirements. *Pediatrics* 113(3 Pt 1): 435-42.
- 242 Freed GL, Nahra TA, Wheeler JR (2004). Which physicians are providing health care to America's children? Trends and changes during the past 20 years. *Arch Pediatr Adolesc Med* 158(1): 22-6.
- 243 Freed GL, Nahra TA, Wheeler JR (2003). Predicting the pediatric workforce: use of trend analysis. *J Pediatr* 143(5): 570-5.
- 244 Cull WL, Yudkowsky BK, Shipman SA, Pan RJ, American Academy of Pediatrics (2003). Pediatric training and job market trends: results from the American Academy of Pediatrics third-year resident survey, 1997-2002. *Pediatrics* 112(4): 787-92.
- 245 Nader PR, Broyles SL, Brennan J, Taras H (2003). Two national surveys on pediatric training and activities in school health: 1991 and 2001. *Pediatrics* 111(4 Pt 1): 730-4.
- 246 Spirito A, Brown RT, D'Angelo E, Delamater A, Rodrigue J, Siegel L (2003). Society of pediatric psychology task force report: recommendations for the training of pediatric psychologists. *J Pediatr Psychol* 28(2): 85-98.
- 247 Nipshagen MD, Polderman KH, DeVictor D, Gemke RJ (2002). Pediatric intensive care: result of a European survey. *Intensive Care Med* 28(12): 1797-803.
- 248 Winter AM, Teare J (2002). Workforce planning and community children's nurses: it's all in the advertisements. *J Child Health Care* 6(2): 84-95.
- 249 Srivastava R, Landrigan C, Gidwani P, Harary OH, Muret-Wagstaff S, Homer CJ (2001). Pediatric hospitalists in Canada and the United States: a survey of pediatric academic department chairs. *Ambul Pediatr* 1(6): 338-9.
- 250 Goh AY, Lum LC, Abdel-Latif ME (2001). Impact of 24 hour critical care physician staffing on case-mix adjusted mortality in paediatric intensive care. *Lancet* 357(9254): 445-6.
- 251 Saing H (2000). Training and delivery of pediatric surgery services in Asia. *J Pediatr Surg* 35(11): 1606-11.
- 252 Redding GJ, Cloutier MM, Dorkin HL, Brotherton SE, Mulvey HJ (2000). Practice of pediatric pulmonology: results of the Future of Pediatric Education Project (FOPE). *Pediatr Pulmonol* 30(3): 190-7.
- 253 Sekiguchi H, Machida Y (1999). The current status of dentistry, particularly pediatric dentistry, among the countries and territories of Asia. *J Clin Pediatr Dent* 23(2): 107-11.
- 254 (1998). Pediatric workforce statement. American Academy of Pediatrics. Committee on Pediatric Workforce. *Pediatrics* 102(2 Pt 1): 418-27.

-
- 255 Pollack LD, Ratner IM, Lund GC (1998). United States neonatology practice survey: personnel, practice, hospital, and neonatal intensive care unit characteristics. *Pediatrics* 101(3 Pt 1): 398-405.
- 256 Colletti RB, Winter HS, Sokol RJ, Suchy FJ, Klish WJ, Durie PR (1998). A position paper of the North American Society for Pediatric Gastroenterology and Nutrition. Pediatric gastroenterology Workforce Survey and future supply and demand. *J Pediatr Gastroenterol Nutr* 26(1): 106-15.
- 257 Chang RK, Halfon N (1997). Geographic distribution of pediatricians in the United States: an analysis of the fifty states and Washington, DC. *Pediatrics* 100(2 Pt 1): 172-9.
- 258 Patel H, Macarthur C, Feldman W (1997). Where do children go? Comparing the after-hours availability of family physicians and primary care pediatricians in four Canadian cities. *Can Fam Physician* 43: 1235-9.
- 259 Bentley J (1996). Child-related services in general accident and emergency departments. *J Adv Nurs* 24(6): 1184-93.
- 260 Retik AB, King LR (1996). Pediatric urology manpower report 1995. Ellen Shapiro on behalf of the American Association of Pediatric Urologists. *J Urol* 156(2 Pt 1):488-91.
- 261 Needham J (1996). Balancing skill mix - future paediatric health care provision. *J Nurs Manag* 4(3): 127-31.
- 262 O'Neill JA Jr, Cnaan A, Altman RP, Donahoe PK, Holder TM, Neblett WW, Schwartz MZ, Smith CD (1995). Update on the analysis of the need for pediatric surgeons in the United States. *J Pediatr Surg* 30(2): 204-13.
- 263 Brotherton SE (1994). Pediatric subspecialty training, certification, and practice: who's doing what. *Pediatrics* 94(1): 83-9.
- 264 American Academy of Pediatrics Committee on Hospital Care (1994). Staffing patterns for patient care and support personnel in a general pediatric unit. *Pediatrics* 93(5): 850-4.
- 265 Shapiro E, Hatch DA (1993). Pediatric urological manpower report. Pediatric Urological Manpower Committee of the American Association of Pediatric Urology. *J Urol* 150(2 Pt 2): 675-9.
- 266 McCrindle BW, Starfield B, DeAngelis C (1992). Subspecialization within pediatric practice: a broader spectrum. *Pediatrics* 90(4): 573-81.
- 267 Piatt JP, Bergeson PS (1992). National trends in pediatric resident recruitment. *Am J Dis Child* 146(8): 979-82.
- 268 Filler G, Piedboeuf B, Paediatric Chairs of Canada (2010). Variability of the pediatric subspecialty workforce in Canada. *J Pediatr* 157(5): 844-7.e1.
- 269 Craiglow BG, Resneck JS Jr, Lucky AW, Sidbury R, Yan AC, Resnick SD, Antaya RJ (2008). Pediatric dermatology workforce shortage: perspectives from academia. *J Am Acad Dermatol* 59(6): 986-9.
- 270 Nakayama DK, Newman KD (2008). Pediatric surgery workforce: population and economic issues. *J Pediatr Surg* 43(8):1426-32.

-
- 271 Durham SR, Shipman SA (2008). A 15-year review of pediatric neurosurgical fellowships: implications for the pediatric neurosurgical workforce. *J Neurosurg Pediatr* 1(6): 429-32.
- 272 Leonard BJ, Fulkerson JA, Rose D, Christy A (2008). Pediatric nurse educator shortage: implications for the nursing care of children. *J Prof Nurs* 24(3): 184-91.
- 273 Lacey SR, Kilgore M, Yun H, Hughes R, Allison J, Cox KS (2008). Secondary analysis of merged American Hospital Association data and U.S. Census data: beginning to understand the supply-demand chain in pediatric inpatient care. *J Pediatr Nurs* 23(3): 161-8.
- 274 Shipman SA, Pan RJ (2008). Financing graduate medical education to meet the needs of children and the future pediatrician workforce. *Pediatrics* 121(4): 855-61.
- 275 Snyder CL (2008). Temporal geomapping of pediatric surgeons in the United States. *J Pediatr Surg* 43(3): 424-9.
- 276 Nainar SM (2007). Comparison of pediatric dental practitioner workforce in the midwestern United States: 1990 and 2000. *Pediatr Dent* 29(6): 488-92.
- 277 Morinville V, Drouin E, Lévesque D, Espinosa VM, Jacobson K (2007). Canadian pediatric gastroenterology workforce: current status, concerns and future projections. *Can J Gastroenterol* 21(10): 653-64.
- 278 Simon JW, Bradfield Y, Smith J, Ahn E, France TD (2007). Recruitment and manpower in pediatric ophthalmology and strabismus. *J AAPOS* 11(4): 336-40.
- 279 Dombrow M, Engel HM (2007). Rates of strabismus surgery in the United States: implications for manpower needs in pediatric ophthalmology. *J AAPOS* 11(4): 330-5.
- 280 Freed GL, Brzoznowski K, Neighbors K, Lakhani I (2007). Characteristics of the pediatric hospitalist workforce: its roles and work environment. *Pediatrics* 120(1): 33-9.
- 281 Keene DL, Humphreys P (2005). Inventory of pediatric neurology "manpower" in Canada. *Can J Neurol Sci* 32(3): 306-10.
- 282 North American Society for Pediatric Gastroenterology, Hepatology and Nutrition. (2005). Pediatric Gastroenterology Workforce Survey, 2003-2004. *J Pediatr Gastroenterol Nutr* 40(4): 397-405.
- 283 Casamassimo PS, Feigal R, Adair SM, Berg J, Stewart R (2004). A snapshot of the U.S. postdoctoral pediatric dentistry faculty workforce, 2002. *J Dent Educ* 68(8): 823-8.
- 284 Hester EJ, McNealy KM, Kelloff JN, Diaz PH, Weston WL, Morelli JG, Dellavalle RP (2004). Demand outstrips supply of US pediatric dermatologists: results from a national survey. *J Am Acad Dermatol* 50(3): 431-4.
- 285 Cox SJ, Robinson S, Murrells T (2003). Planning a career as a children's nurse: the availability of career guidance during the nurse diploma course. *J Child Health Care* 7(4): 258-76.
- 286 Ronen GM, Meaney BF (2003). Pediatric neurology services in Canada: demand versus supply. *J Child Neurol* 18(3): 180-4.

-
- 287 Price S (2003). Employing children's nurses? *Paediatr Nurs* 15(3): 24-7.
- 288 Geiger JD, Drongowski RA, Coran AG (2003). The market for pediatric surgeons: an updated survey of recent graduates. *J Pediatr Surg* 38(3): 397-405.
- 289 Ramritu P, Courtney M, Stanley T, Finlayson K (2002). Experiences of the generalist nurse caring for adolescents with mental health problems. *J Child Health Care* 6(4): 229-44.
- 290 Beazoglou T, Bailit H, Heffley D (2002). The dental work force in Wisconsin: ten-year projections. *J Am Dent Assoc* 133(8): 1097-104.
- 291 Goske MJ, Lebowitz RL, Lieber M, Ablin D, Royal S (2000). Pediatric radiologists: who we are and what we do. Results of a membership survey of the Society for Pediatric Radiology - 1999. *Pediatr Radiol* 30(9): 581-6.
- 292 O'Neill JA Jr, Gautam S, Geiger JD, Ein SH, Holder TM, Bloss RS, Krummel TM (2000). A longitudinal analysis of the pediatric surgeon workforce. *Ann Surg* 232(3): 442-53.
- 293 Davis MJ (2000). Pediatric dentistry workforce issues: a task force white paper. American Academy of Pediatric Dentistry Task Force on Work Force Issues. *Pediatr Dent* 22(4): 331-5.
- 294 Sanger RG, Reggiardo PA (1999). Workforce issues in pediatric dentistry: recommendations of a recent conference. *J Calif Dent Assoc* 27(11): 852-6.
- 295 Stoddard JJ, Cull WL, Jewett EA, Brotherton SE, Mulvey HJ, Alden ER (2000). Providing pediatric subspecialty care: A workforce analysis. AAP Committee on Pediatric Workforce Subcommittee on Subspecialty Workforce. *Pediatrics* 106(6): 1325-33.
- 296 Alberti PW (1999). Pediatric ear, nose and throat services' demands and resources: a global perspective. *Int J Pediatr Otorhinolaryngol* 49(Suppl 1): S1-9.
- 297 Parkerton PH, Geiger JD, Mick SS, O'Neill JA Jr (1999). The market for pediatric surgeons: a survey of recent graduates. *J Pediatr Surg* 34(6): 931-9.
- 298 Brotherton SE, Habal MB (1999). Analysis of workforce, distribution of care, and practice preference in pediatric plastic surgery. *J Craniofac Surg* 10(1): 3-10.
- 299 Thompson JW, Chesney RW, Stocks RM, Shmerling J, Herron P (1999). Pediatric hospitals' and physician strategies for the 21st century. *Clin Pediatr* 38(5): 259-63.
- 300 D'Amelio LF, Hammond JS, Thomasseau J, Sutyak JP (1995). "Adult" trauma surgeons with pediatric commitment: a logical solution to the pediatric trauma manpower problem. *Am Surg* 61(11): 968-74.
- 301 Freed GL, Dunham KM, Moote MJ, Lamarand KE (2010). Pediatric physician assistants: distribution and scope of practice. *Pediatrics* 126(5): 851-5.
- 302 Merline AC, Cull WL, Mulvey HJ, Katcher AL (2010). Patterns of work and retirement among pediatricians aged >or=50 years. *Pediatrics* 125(1): 158-64.
- 303 Hunter ML, Harray LE, Morgan MZ (2010). The United Kingdom's specialist workforce in paediatric dentistry: current and future trends. *Br Dent J* 208(12): 559-62.
- 304 Chalew SA, Harrison J, Berry S (2008). Achievement of glycemic outcome goals in pediatric diabetes: the impact of staff number. *J La State Med Soc* 160(6): 328-32.

-
- 305 Stegenga J, Bell E, Matlow A (2002). The role of nurse understaffing in nosocomial viral gastrointestinal infections on a general pediatrics ward. *Infect Control Hosp Epidemiol* 23(3): 133-6.
- 306 Elkhuizen SG, Bor G, Smeenk M, Klazinga NS, Bakker PJ (2007). Capacity management of nursing staff as a vehicle for organizational improvement. *BMC Health Serv Res* 7: 196.
- 307 Tibby SM, Correa-West J, Durward A, Ferguson L, Murdoch IA (2004). Adverse events in a paediatric intensive care unit: relationship to workload, skill mix and staff supervision. *Intensive Care Med* 30(6): 1160-6.
- 308 Sibbald B, Shen J, McBride A (2004). Changing the skill-mix of the health care workforce. *J Health Ser Res Pol* 9(suppl 1): 28-38.
- 309 Garg P, Rastogi R (2006). New model of job design: motivating employees' performance. *Journal of Management Development* 25(6):572-587.
- 310 Cook CW, Hunsaker PL, Coffey RE (1997). *Management and organizational behaviour*. Boston: Irvin McGraw-Hill.
- 311 Oztürk H, Bahcecik N, Baumann SL (2006). Nursing satisfaction and job enrichment in Turkey. *Nurs Sci Q* 2006, 19: 360-365.
- 312 Ackerman MH, Norsen L, Martin B, Wiedrich J, Kitzman HJ (1996). Development of a model of advanced practice. *Am J Crit Care* 5: 68-73.
- 313 Moloney-Harmon PA (1999). The synergy model in practice. *Critical Care Nurse* 19: 101-104.
- 314 Bryant-Lukosius D, Dicenso A, Browne G, Pinelli J (2004). Advanced practice nursing roles: development, implementation and evaluation. *J Ad Nurs* 48(5):519-529.
- 315 American Speech-Language-Hearing Association (1997). Position statement: Multiskilled personnel. *Asha* 39 (Suppl. 17): 13.
- 316 Vanier C, Hébert M (1995). An occupational therapy course on community practice. *Can J Occup Ther* 62(2):76-81.
- 317 Atkin K, Hirst M, Lunt N, Parker G (1994). The role and self-perceived training needs of nurses employed in general practice: observations from a national census of practice nurses in England and Wales. *J Adv Nurs* 20: 46-52.
- 318 Brown K, Williams EI, Groom L (1992). Health checks on patients 75 years and over in Nottinghamshire after the new GP contract. *BMJ* 305, 629-631.
- 319 Calnan M, Cant S, Williams S, Killoran A (1994). Involvement of the primary health care team in coronary heart disease prevention. *BMJ* 44: 224-228.
- 320 Muir J, Lancaster T, Jones L, Yudkin P (1995). Effectiveness of health checks conducted by nurses in primary care. Final results of the OXCHECK study. *BMJ* 310: 1099-104.
- 321 Tulloch A (1992). Screening elderly patients. *Practitioner* 1520: 1022-1026.
- 322 Singh D (2005). Transforming chronic care: evidence about improving care for people with long-term conditions. Birmingham: University of Birmingham Health Services Management Centre.

-
- ³²³ Royal College of General Practitioners (2004). *General Practitioners with Specialist Interests*. Information leaflet 11. London: RCGP,
- ³²⁴ Woodroffe E (2006). Nurse-led general practice: the changing face of general practice? *Br J Gen Pract* 56(529): 632–633.
- ³²⁵ Wright AF (1996). GP 2000: a general practitioner for the new millennium. *Br J Gen Pract* 46: 4–5.
- ³²⁶ Chapman JL, Zechel A, Carter YH, Abbott S (2004). Systematic review of recent innovations in service provision to improve access to primary care. *Br J Gen Pract* 54: 374–381.
- ³²⁷ Iversen L, Mollison J, MacLeod TN (2001). Attitudes of the general public to the expanding role of community pharmacists: a pilot study. *Fam Pract* 18(5):534–6.
- ³²⁸ Royal Pharmaceutical Society of Great Britain (1997). *Pharmacy in a new age: building the future*. London: Royal Pharmaceutical Society of Great Britain.
- ³²⁹ Department of Health (2004). Management of medicines - a resource to support implementation of the wider aspects of medicines management for the National Service Frameworks for diabetes renal services and long-term conditions. London: Department of Health.
- ³³⁰ New JP, Mason JM, Freemantle N, Teasdale S, Wong LM, Bruce NJ, Burns JA, Gibson JM (2003). Specialist nurse-led intervention to treat and control hypertension and hyperlipidemia in diabetes (SPLINT): a randomized controlled trial. *Diabetes Care* 26(8): 2250–5.
- ³³¹ Vrijhoef HJ, Diederiks JP, Spreeuwenberg C, Wolffenbuttel BH (2001). Substitution model with central role for nurse specialist is justified in the care for stable type 2 diabetic outpatients. *J Adv Nurs* 36: 546–55.
- ³³² Connor CA, Wright CC, Fegan CD (2002). The safety and effectiveness of a nurse-led anticoagulant service. *J Adv Nurs* 38: 407–15.
- ³³³ Ryden MB, Snyder M, Gross CR, Savik K, Pearson V, Krichbaum K, Mueller C (2000). Value-added outcomes: the use of advanced practice nurses in long-term care facilities. *Gerontologist* 40(6): 654–62.
- ³³⁴ Smith B, Appleton S, Adams R, Southcott A, Ruffin R (2001). Home care by outreach nursing for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 3: CD000994.
- ³³⁵ Salisbury C, Francis C, Rogers C, Parry K, Thomas H, Chadwick S, Turton P (2002). A randomised controlled trial of clinics in secondary schools for adolescents with asthma. *Br J Gen Pract* 52(485): 988–996.
- ³³⁶ Loveman E, Royle P, Waugh N (2003). Specialist nurses in diabetes mellitus. *Cochrane Database Syst Rev* 2: CD003286.
- ³³⁷ Gradwell C, Thomas KS, English JS, Williams HC (2002). A randomized controlled trial of nurse follow-up clinics: do they help patients and do they free up consultants' time? *Br J Dermatol* 147(3): 513–7.
- ³³⁸ Herzberg F, Mausner B, Snyderman B (1959). *The motivation to work*. New York: John Wiley.

-
- 339 Hackman J, Oldham G (1975). Development of the Job Diagnostic Survey. *J Applied Psych* 60(2): 159-170.
- 340 Newman GA, Edwards JE, Raju NS (1989) Organizational development interventions: A meta analysis of their effects on satisfaction and other attitudes. *Personnel Psych* 42:461-483.
- 341 Cherniss C (1980). Professional Burnout in Human Service Organizations. New York: Praeger.
- 342 Farber BA (1991). Crisis in Education: Stress and Burnout in the American Teachers. San Francisco: Jossey-Bass.
- 343 Kivimäki M, Voutilainen P, Koskinen P (1995). Job enrichment, work motivation, and job satisfaction in hospital wards: testing the job characteristics model. *J Nurs Manag* 3(2):87-91.
- 344 Collins K, Jones ML, McDonnell A, Read S, Jones R, Cameron A (2000). Do new roles contribute to job satisfaction and retention of staff in nursing and professions allied to medicine? *J Nurs Manag* 8(1):3-12
- 346 Dickson N, Pearson P, Emmerson P, Davison N, Griffith M (1996). Are nurse practitioners merely substitute doctors? *Prof Nurse* 11:325-328.
- 347 Wilson A, Pearson D, Hassey A (2002). Barriers to developing the nurse practitioner role in primary care – the GP perspective. *Fam Pract* 19:641-646.
- 348 Hanlon G (1998). Professionalism as enterprise: service class politics and the redefinition of professionalism. *Sociology* 32: 43–63.
- 349 Furlong S, Glover D (1998). *Confusion* surrounds piecemeal changes in nurses' roles. *Nurs Times* 94(37):54-55.
- 350 Buchan J, Edwards N (2000). Nursing numbers in Britain: the argument for workforce planning. *BMJ* 320(7241):1067-70.
- 351 World Health Organisation (2002). *Innovative care for chronic conditions: Building blocks for action*. Geneva: World Health Organisation.
- 352 World Health Organisation (2005). *Preparing a health care workforce for the 21st century: the challenge of chronic conditions*. Geneva: World Health Organisation.
- 353 Malone D, Marriott S, Newton-Howes G, Simmonds S, Tyrer P (2009). Community mental health teams for people with severe mental illnesses and disordered personality. *Schizophr Bull* 35(1): 13-4.
- 354 Hamblen JL, Norris FH, Gibson L, Lee L (2010). Training community therapists to deliver cognitive behavioral therapy in the aftermath of disaster. *Int J Emerg Ment Health* 12(1): 33-40.
- 355 Macdonald W, Bradley S, Bower P, Kramer T, Sibbald B, Garralda E, Harrington R (2004). Primary mental health workers in child and adolescent mental health services. *J Adv Nurs* 46(1): 78-87.
- 356 Savio M (1991). Psychiatric nursing in Italy: an extinguished profession or an emerging professionalism? *Int J Soc Psychiatry* 37(4): 293-9.

-
- 357 Tyrer P, Hawksworth J, Hobbs R, Jackson D (1990). The role of the community psychiatric nurse. *Br J Hosp Med* 43(6): 439-42.
- 358 Brooker C, Tarrier N, Barrowclough C, Butterworth A, Goldberg D (1992). Training community psychiatric nurses for psychosocial intervention. Report of a pilot study. *Br J Psychiatry* 160: 836-44.
- 359 McFarlane WR, McNary S, Dixon L, Hornby H, Cimett E (2001). Predictors of dissemination of family psychoeducation in community mental health centers in Maine and Illinois. *Psychiatr Serv* 52(7): 935-42.
- 360 Morris T (2006). A mental health worker for minority ethnic communities. *Nurs Times* 102(35): 23-4.
- 361 Tsuchisawa K, Ono K, Kanda T, Kelly G (2000). Japanese occupational therapy in community mental health and telehealth. *J Telemed Telecare* 6(Suppl 2): S79-80.
- 362 Trickey BA, Kennedy DB (1995). Use of occupational therapists in mental health settings in South Carolina. *Am J Occup Ther* 49(5): 452-5.
- 363 Elsom S, Happell B, Manias E (2009). Australian mental health nurses' attitudes to role expansion. *Perspect Psychiatr Care* 45(2): 100-7.
- 364 Evans S, Huxley P, Webber M, Katona C, Gately C, Mears A, Medina J, Pajak S, Kendall T (2005). The impact of 'statutory duties' on mental health social workers in the UK. *Health Soc Care Community* 13(2): 145-54.
- 365 Mitchell DA, Lassiter SL (2006). Addressing health care disparities and increasing workforce diversity: the next step for the dental, medical, and public health professions. *Am J Public Health* 96(12): 2093-7.
- 366 Rothfuss LG, Johnson SA, Larsen SD, Chaffin J, Finstuen K (2004). Staffing model for dental wellness and readiness. *Mil Med* 169(8): 604-8.
- 367 Chapman HR, Curran AL (2004). Bicycle helmets - does the dental profession have a role in promoting their use? *Br Dent J* 196(9): 539, 555-60.
- 368 Haden NK, Catalanotto FA, Alexander CJ, Bailit H, Battrell A, Broussard J Jr, Buchanan J, Douglass CW, Fox CE 3rd, Glassman P, Lugo RI, George M, Meyerowitz C, Scott ER 2nd, Yapple N, Bresch J, Gutman-Betts Z, Luke GG, Moss M, Sinkford JC, Weaver RG, Valachovic RW, ADEA (2003). Improving the oral health status of all Americans: roles and responsibilities of academic dental institutions: the report of the ADEA President's Commission. *J Dent Educ* 67(5): 563-83.
- 369 Dounis G, Ditmyer MM, McClain MA, Cappelli DP, Mobley CC (2010). Preparing the dental workforce for oral disease prevention in an aging population. *J Dent Educ* 74(10): 1086-94.
- 370 Reynolds MW (1997). Education for geriatric oral health promotion. *Spec Care Dentist* 17(1): 33-6.
- 371 Dyer TA, Robinson PG (2006). General health promotion in general dental practice - the involvement of the dental team Part 2: A qualitative and quantitative investigation of the views of practice principals in South Yorkshire. *Br Dent J* 201(1): 31, 45-51.

-
- 372 Wright J, Ayres P, Hill P (1997). Public health in hospitals: new steps in old directions. *J Public Health Med* 19(4): 408-12.
- 373 Witt J, Brauer P, Dietrich L, Davidson B (2006). Estimation of human resource needs and cost of adding registered dietitians to primary care networks. *Can J Diet Pract Res Suppl*: S30-8.
- 374 Flynn BC (1997). Partnerships in healthy cities and communities: a social commitment for advanced practice nurses. *Adv Pract Nurs Q* 2(4): 1-6.
- 375 Harvey DJ, Williams R, Hill K (2006). A flying start to health promotion in remote north Queensland, Australia: the development of Royal Flying Doctor Service field days. *Rural Remote Health* 6(1): 485.
- 376 Panas M, Brandys J (2004). Preparing pharmacists for participating in health promotion programs as exemplified by the smoking prevention program. *Przeegl Lek* 61(10): 1203-5.
- 377 Tsushita K, Hayase S, Matsumoto K, Kato M, Yamamoto M, Sato Y (2003). The effects of a practical diabetes prevention training course for public health care providers in Aichi Prefecture. *Nippon Koshu Eisei Zasshi* 50(4): 349-59.
- 378 Hodson DM (1998). The evolving role of advanced practice nurses in surgery. *AORN J* 67(5): 998-1009.
- 379 Miner DG (1990). Anesthesia: the perioperative nurse's role. *Today's OR Nurse* 12(8): 24-9.
- 380 Harris CM, Evarts CM (1990). The relationship of physician assistants to an orthopedic residency program. *Clin Orthop Relat Res* 252: 252-61.
- 381 Speers AT, Ziolkowski L (1998). Perioperative assistants are a new resource. *AORN J* 67(2): 420-7.
- 382 Messina J (1997). Development and implementation of a perioperative assistant training program. *AORN J* 66(5): 890, 893-4, 896.
- 383 Ince C (1995). The training of non-medical theatre personnel. *Health Trends* 27(3): 80-5.
- 384 Micheli AJ, Smith CE (1997). Unlicensed assistive personnel in the perioperative setting. *Nurs Clin North Am* 32(1): 201-13.
- 385 Lloyd H (2008). The impact of multi-skilled staff availability on day surgery cancellations. *J Perioper Pract* 18(1): 22-7.
- 386 Brown M, Mason C, McAleavy J (2006). A new assistant practitioner role in critical care and theatre. *Nurs Times* 102(27): 32-4.
- 387 MacDonald M, Bodzak W (1999). The performance of a self-managing day surgery nurse team. *J Adv Nurs* 29(4): 859-68.
- 388 Shewchuk M (2008). Why a registered nurse (RN) in the OR? The perioperative registered nurse role - a well kept secret. *Can Oper Room Nurs J* 25(4):38-9, 41, 45-6.
- 389 Graff C, Roberts K, Thornton K (1999). An ethnographic study of differentiated practice in an operating room. *J Prof Nurs* 15(6): 364-71.

-
- ³⁹⁰ Varughese AM, Byczkowski TL, Wittkugel EP, Kotagal U, Dean Kurth C (2006). Impact of a nurse practitioner-assisted preoperative assessment program on quality. *Paediatr Anaesth* 16(7): 723-33.
- ³⁹¹ Ho CA, Wilson PL (2010). A comparison of fracture reductions performed by physician extenders and orthopaedic residents in the acute pediatric orthopaedic practice. *J Orthop Trauma* 24(4): 244-9.
- ³⁹² Ladd AP (2006). Pediatric surgery fellowship compliance to the 80-hour work week. *J Pediatr Surg* 41(4): 687-92.
- ³⁹³ Wood C, Wettlaufer J, Shaha SH, Lillis K (2010). Nurse practitioner roles in pediatric emergency departments: a national survey. *Pediatr Emerg Care* 26(6): 406-7.
- ³⁹⁴ Letourneau MA, MacGregor DL, Dick PT, McCabe EJ, Allen AJ, Chan VW, MacMillan LJ, Golomb MR (2003). Use of a telephone nursing line in a pediatric neurology clinic: one approach to the shortage of subspecialists. *Pediatrics* 112(5): 1083-7.
- ³⁹⁵ Cutler KO, Bush AJ, Godambe SA, Gilmore B (2007). The use of a pediatric emergency medicine-staffed sedation service during imaging: a retrospective analysis. *Am J Emerg Med* 25(6): 654-61.
- ³⁹⁶ Krugman SD, Suggs A, Photowala HY, Beck A (2007). Redefining the community pediatric hospitalist: the combined pediatric ED/inpatient unit. *Pediatr Emerg Care* 23(1): 33-7.
- ³⁹⁷ Zempsky WT, Haskell G (1998). Paramedics as allied health care providers in the pediatric emergency department. *Pediatr Emerg Care* 14(5): 329-31.
- ³⁹⁸ Mertz E, Mouradian WE (2009). Addressing children's oral health in the new millennium: trends in the dental workforce. *Acad Pediatr* 9(6): 433-9.
- ³⁹⁹ Hallas D, Shelley D (2009). Role of pediatric nurse practitioners in oral health care. *Acad Pediatr* 9(6): 462-6.
- ⁴⁰⁰ Freed GL, Dunham KM, Lamarand KE, Loveland-Cherry C, Martyn KK (2010). Pediatric nurse practitioners: roles and scope of practice. *Pediatrics* 126(5): 846-50.
- ⁴⁰¹ Fanta K, Cook B, Falcone RA Jr, Rickets C, Schweer L, Brown RL, Garcia VF (2006). Pediatric trauma nurse practitioners provide excellent care with superior patient satisfaction for injured children. *J Pediatr Surg* 41(1): 277-81.
- ⁴⁰² Freed GL, Dunham KM (2009). Pediatric hospitalists: training, current practice, and career goals. *J Hosp Med* 4(3): 179-86.
- ⁴⁰³ Mahant S, Mekky M, Parkin P (2010). Integrating pediatric hospitalists in the academic health science center: practice and perceptions in a Canadian center. *J Hosp Med* 5(4): 228-33.
- ⁴⁰⁴ Wold JL, Gaines SK, Leary JM (2006). Use of public health nurse competencies to develop a childcare health consultant workforce. *Public Health Nurs* 23(2): 139-45.
- ⁴⁰⁵ Oztürk H, Bahcecik N, Baumann SL (2006). Nursing satisfaction and job enrichment in Turkey. *Nursing Science Q* 19: 360-365.
- ⁴⁰⁶ O'Reilly J (1992). Where do you draw the line? functional flexibility, training and skill in Britain and France. *Work, Employment & Society* 6(3):369-396.

-
- ⁴⁰⁷ Buhler PM (1990). Are you getting the most out of your employees? *Supervision* 1990, 51(10):14-16.
- ⁴⁰⁸ Walker CR (1950). The Problem of the repetitive job. *Harvard Business Review* 28(3):54-58.
- ⁴⁰⁹ Elliott JD (1953). Increasing office productivity through job enlargement. In: *The human side of the office manager's job*. New York: American Management Association.
- ⁴¹⁰ Guest RH (1957). Job enlargement - a revolution in job design. *Personnel Administration* 20(2):13-14.
- ⁴¹¹ Conant E, Kilbridge M (1965). An interdisciplinary analysis of job enlargement: technology, costs, and behavioural implications. *Industrial and Labour Relations Review* 18: 377-395.
- ⁴¹² Dubois CA, Singh D, Jiwani I (2008). The human resource challenge in chronic care. In Nolte E, McKee M (eds). *Caring for people with chronic conditions - a health system perspective*. New York: McGraw-Hill Education.
- ⁴¹³ Duckett SJ (2005). Interventions to facilitate health workforce restructure. *Aust New Zealand Health Policy* 29,2:14
- ⁴¹⁴ Pruitt SD, Epping-Jordan JE (2005). Preparing the 21st century global healthcare workforce. *BMJ* 330:637-639.
- ⁴¹⁵ World Health Organisation (2005). Preparing a health care workforce for the 21st century: the challenge of chronic conditions. Geneva: World Health Organisation.
- ⁴¹⁶ Jenkins, GD Jr, Gupta N (1985). The payoffs of paying for knowledge. *National Productivity Review* 4(2): 121-130.
- ⁴¹⁷ Knouse SB (1995). Variations on skill-based pay for total quality management. *SAM Ad Management J* 60(1): 34- 38.
- ⁴¹⁸ Wong CS, Campion MA (1991). Development and test of a task-level model of motivational job design. *J Applied Psych* 76:825-837.
- ⁴¹⁹ Vaughan DD, Fottler MD, Bamberg R, Blayney KD (1991). Utilization and management of multiskilled health practitioners in US hospitals. *Hospital and Health Services Administration* 36(3):397-419.
- ⁴²⁰ Adams A, Lugsden E, Chase J, Bond S (2000). Skill-mix changes and work intensification in nursing. *Work Employment and Society* 14(3): 541-55.
- ⁴²¹ Huang XY, Ma WF, Shih HH, Li HF (2008). Roles and functions of community mental health nurses caring for people with schizophrenia in Taiwan. *J Clin Nurs* 17(22): 3030-40.
- ⁴²² Hewitt AS, Larson SA, Lakin KC, Sauer J, O'Neil S, Sedlezky L (2004). Role and essential competencies of the frontline supervisors of direct support professionals in community services. *Ment Retard* 42(2): 122-35.
- ⁴²³ Rolim MA, Barros S, Stefanelli MC, Teixeira MB (1992). The nurse in mental health outpatient clinics. *Rev Esc Enferm USP* 26(3): 289-302.
- ⁴²⁴ Freeman M (1990). Decentralised responsibility--a way forward for 'homeland' mental health care? *S Afr Med J* 77(9): 478-80.

-
- 425 Nash M (2009). Mental health nurses' diabetes care skills - a training needs analysis. *Br J Nurs* 18(10): 626, 628-30.
- 426 Harris N, Lovell K, Day J, Roberts C (2009). An evaluation of a medication management training programme for community mental health professionals; service user level outcomes: a cluster randomised controlled trial. *Int J Nurs Stud* 46(5): 645-52.
- 427 Gray R, Wykes T, Gournay K (2003). The effect of medication management training on community mental health nurse's clinical skills. *Int J Nurs Stud* 40(2): 163-9.
- 428 McConnell SD, Inderbitzin LB, Pollard WE (1992). Primary health care in the CMHC: a role for the nurse practitioner. *Hosp Community Psychiatry* 43(7): 724-7.
- 429 Druss BG, Marcus SC, Campbell J, Cuffel B, Harnett J, Ingoglia C, Mauer B (2008). Medical services for clients in community mental health centers: results from a national survey. *Psychiatr Serv* 59(8): 917-20.
- 430 Diamond RJ, Goldfinger SM, Pollack D, Silver M (1995). The role of psychiatrists in community mental health centers: a survey of job descriptions. *Community Ment Health J* 31(6): 571-7.
- 431 Reed DA (1992). Adaptation: the key to community psychiatric practice in the rural setting. *Community Ment Health J* 28(2): 141-54.
- 432 Carr VJ, Lewin TJ, Barnard RE, Walton JM, Allen JL, Constable PM, Chapman JL (2004). Attitudes and roles of general practitioners in the treatment of schizophrenia compared with community mental health staff and patients. *Soc Psychiatry Psychiatr Epidemiol* 39(1): 78-84.
- 433 Spencer PC, Munch S (2003). Client violence toward social workers: the role of management in community mental health programs. *Soc Work* 48(4): 532-44.
- 434 James EL, Fraser C, Anderson K, Judd F (2007). Use of research by the Australian health promotion workforce. *Health Educ Res* 22(4): 576-87.
- 435 Lloyd B, Rychetnik L, Maxwell M, Nove T (2009). Building capacity for evidence-based practice in the health promotion workforce: evaluation of a train-the-trainer initiative in NSW. *Health Promot J Austr* 20(2): 151-4.
- 436 Mackenzie M (2008). 'Doing' public health and 'making' public health practitioners: putting policy into practice in 'Starting Well'. *Soc Sci Med* 67(6): 1028-37.
- 437 Turner S, Brewster L, Kidd J, Gnich W, Ball GE, Milburn K, Pitts NB, Goold S, Conway DI, Macpherson LM (2010). Childsmile: the national child oral health improvement programme in Scotland. Part 2: Monitoring and delivery. *Br Dent J* 209(2): 79-83.
- 438 Roth-Yousey L, Barno T, Caskey M, Asche K, Reicks M (2009). Whole-grain continuing education for school foodservice personnel: keeping kids from falling short. *J Nutr Educ Behav* 41(6): 429-35.
- 439 Benjamin SE, Tate DF, Bangdiwala SI, Neelon BH, Ammerman AS, Dodds JM, Ward DS (2008). Preparing Child Care Health Consultants to address childhood overweight: a randomized controlled trial comparing web to in-person training. *Matern Child Health J* 12(5): 662-9.
- 440 Devine SG, Llewellyn-Jones L, Lloyd J (2009). Impact of a five-day short course on integration of health promotion into practice in north Queensland. *Health Promot J Austr* 20(1): 69-71.

-
- 441 Keleher H, Round R, Marshall B, Murphy B (2005). Impact evaluation of a five-day short course in health promotion: workforce development in action. *Health Promot J Austr* 16(2): 110-5.
- 442 Joss N, Keleher H (2007). Workforce development to embed mental health promotion research and evaluation into organisational practice. *Health Promot J Austr* 18(3): 255-9.
- 443 Simonsen-Rehn N, Laamanen R, Sundell J, Brommels M, Suominen S (2009). Determinants of health promotion action in primary health care: comparative study of health and home care personnel in four municipalities in Finland. *Scand J Public Health* 37(1): 4-12.
- 444 Fernandez JB, Glotzer DL, Triola MM, Psoter WJ (2008). A unique role for dental school faculty: telephone triage training and integration into a health departments' emergency response planning. *Am J Disaster Med* 3(3): 141-6.
- 445 Goodman C, Davies SL, Dinan S, See Tai S, Iliffe S (2011). Activity promotion for community dwelling older people: a survey of the contribution of primary care nurses. *Br J Community Nurs* 16(1): 12-7.
- 446 Nebot M, Cabezas C, Marques F, Bimbela JL, Robledo T, Megido X, Prados JA, Munoz E (2007). Priorities in health promotion according to primary care health professionals: a Delphi study. *Aten Primaria* 39(6): 285-8.
- 447 Carver S (1997). Orderlies and aides merging into O.R. attendants. *Can Oper Room Nurs J* 15(3): 16-8.
- 448 MacKay LJ, Bellamy-Stack C (2010). The use of a clinical resource nurse for newly graduated nurses in a pediatric oncology setting. *J Pediatr Oncol Nurs* 27(6): 338-43.
- 449 Carlsson N, Johansson A, Hermansson G, Andersson-Gare B (2010). Child health nurses' roles and attitudes in reducing children's tobacco smoke exposure. *J Clin Nurs* 19(3-4): 507-16.
- 450 Proadhan P, Dela Rosa RS, Shubina M, Haver KE, Matthews BD, Buck S, Kacmarek RM, Noviski NN (2008). Wheeze detection in the pediatric intensive care unit: comparison among physician, nurses, respiratory therapists, and a computerized respiratory sound monitor. *Respir Care* 53(10): 1304-9.
- 451 McDougall T (2008). Safeguarding vulnerable children. *Paediatr Nurs* 20(3): 14-7.
- 452 Woodhouse S, Smith P (2001). A lead cancer nurse role at Birmingham Children's Hospital National Health Service Trust. *Eur J Cancer Care* 10(4): 275-9.
- 453 Parkin AE, McMahon S, Upfield N, Copley J, Hollands K (2001). Work experience program at a metropolitan paediatric hospital: assisting rural and metropolitan allied health professionals exchange clinical skills. *Aust J Rural Health* 9(6): 297-303.
- 454 Evans D, Mellins R, Lobach K, Ramos-Bonoan C, Pinkett-Heller M, Wiesemann S, Klein I, Donahue C, Burke D, Levison M, Levin B, Zimmerman B, Clark N (1997). Improving care for minority children with asthma: professional education in public health clinics. *Pediatrics* 99(2): 157-64.
- 455 High PC, LaGasse L, Becker S, Ahlgren I, Gardner A (2000). Literacy promotion in primary care pediatrics: can we make a difference? *Pediatrics* 105(4 Pt 2): 927-34.
- 456 Sibbald B, Shen J, McBride A, Zafar R, Grimshaw D (2002). Changing skill mix in the NHS: A review commissioned by the human resource directorate of the Department of Health to support the NHS Changing Workforce Programme. Manchester: UMIST.

-
- 457 Hooker R, Cawley J (2003). *Physician assistants in American medicine* (2nd edition). New York: Churchill Livingstone.
- 458 McPherson K, Kersten P, George S, Lattimer V, Ellis B, Breton A, Kaur D, Frampton G (2004). *Extended roles for allied health professionals in the NHS*. UK: National Co-ordinating Centre for NHS Service Delivery and Organisation R & D (NCCSDO).
- 459 Richardson G, Maynard A (1995). Fewer doctors? More nurses? A review of the knowledge base of doctor/nurse substitution. Discussion Paper 135. York: University of York.
- 460 Dale J, Crouch R, Lloyd D (1998). Primary care: nurse-led telephone triage and advice out-of-hours. *Nurs Stand* 12(47):41-5.
- 461 Gallagher M, Huddart T, Henderson B (1998). Telephone triage of acute illness by a practice nurse in general practice: outcomes of care. *Br J Gen Pract* 48:1141-1145.
- 462 Jones K, Gilbert P, Little J, Wilkinson K (1998). Nurse triage for house call requests in a Tyneside general practice: patients' views and effect on doctor workload. *Br J Gen Pract* 48:1303-1306.
- 463 Wanless D (2002). *Securing our future health: taking a long-term view*. London: HM Treasury Public Enquiry Unit.
- 464 Poole J (1998). A role change for auxiliaries. *Nursing Times* 94(44):61.
- 465 Jeffrey L, Clarke A, Koperski M (1995). Practice Nurses' workload and consultations. *Br J Gen Pract* 45:415-418.
- 466 LeRoy L, Solkowitz S (1981). Case Study 16: *The Costs and Effectiveness of Nurse Practitioners*. Washington DC: Office of Technology Assessment.
- 467 Horrocks S, Anderson E, Salisbury C (2002). Systematic review of whether nurse practitioners working in primary care provide equivalent care to doctors. *BMJ* 324:819-823.
- 468 Hodson DM (1998). The evolving role of advanced practice nurses in surgery. *AORN Journal* 67:998-1009.
- 469 Brown J (1995). The handmaiden's tale ... practice nurses ... support workers. *Practice Nurse* 10(4): 257-260.
- 470 Brown SA, Grimes DE (1995). A meta-analysis of nurse practitioners and nurse midwives in primary care. *Nursing Research* 44:332-339.
- 471 Knedle-Murray ME, Oakley D, Wheeler JRC, Peterson B (1993). Production process substitution in maternity care: issues of cost, quality, and outcomes by nurse-midwives and physician providers. *Med Care Rev* 50(1):81-112.
- 472 Bostrom J, Zimmerman J (1993). Restructuring nursing for a competitive health care environment. *Nursing Economics* 11:35-41,54.
- 473 Powers P, Dickey C, Ford A (1990). Evaluating an RN/co-worker model. *J Nurs Adm* 20:11-15.
- 474 Garfink C, Kirby KK, Bachman SS (1991). The University Hospital nurse extender program: Part IV, What have we learned? *J Nurs Adm* 21(4):26-31.

475 Department of Health (2000). *The NHS Plan: a plan for investment, a plan for reform*. London: Department of Health.

476 Department of Health (2000). *Meeting the Challenge: A strategy for the allied health professions*. London: Department of Health.

477 Seale C, Anderson A, Kinnersley P (2005). Comparison of GP and nurse practitioner consultations: an observational study. *Br J Gen Pract* 55:938–943.

478 Venning P, Durie A, Roland M, Roberst C, Leese B (2000). Randomised control trial comparing cost effectiveness of general practitioners and nurse practitioners in primary care. *BMJ* 320:1048-53.

479 Edwards M (1997). The health care assistant: usurper of nursing? *Brit J Comm Health Nurs* 10:490-4.

480 Orne RM, Garland D, O'Hara M, Perfetto L, Stielau J (1998). Caught in the cross fire of change: nurses' experience with unlicensed assistive personnel. *Appl Nurs Res* 11:101-10.

481 Humphrey C, Ehrich K, Kelly B (2002). *Policies affecting human resource management in the NHS and their implications for continuity of care*. London: National Co-ordinating Centre for NHS Service Delivery and Organisation R & D.

482 Haggerty JL, Reid RJ, Freeman GK, Starfield BH, Adair CE, McKendry R (2003). Continuity of care: a multidisciplinary review. *BMJ* 327: 1219-1221.

483 Schers H, van de Ven C, van den Hoogen H, Grol R, van den Bosch W (2004). Family medicine trainees still value continuity of care. *Fam Med* 36: 51-54.

484 Laurant MG, Hermens RP, Braspenning JC, Sibbald B, Grol RP (2004). Impact of nurse practitioners on workload of general practitioners: randomised controlled trial. *BMJ* 328(7445):927.

485 Charles-Jones H, Latimer J, May C (2003). Transforming general practice: the redistribution of medical work in primary care. *Sociol Health Illn* 25:71-92.

486 Calpin-Davies PJ (1999). Doctor-nurse substitution: the workforce equation. *J Nurs Manag* 7:71-79.

487 Wanless D (2002). *Securing our future health: taking a long-term view*. London: HM Treasury Public Enquiry Unit.

488 Burns T, Millar E, Garland C, Kendrick T, Chisholm B, Ross F (1998). Randomized controlled trial of teaching practice nurses to carry out structured assessments of patients receiving depot anti-psychotic injections. *Br J Gen Pract* 48(437):1845-8.

489 Crosland A, Kai J (1998). "They think they can talk to nurses": practice nurses' views of their roles in caring for mental health problems. *Br J Gen Pract* 48(432):1383-6.

490 Kupshik GA, Fisher CR (1999). Assisted bibliotherapy: effective, efficient treatment for moderate anxiety problems. *Br J Gen Pract* 49(438):47-8.

491 Mann AH, Blizard R, Murray J, Smith JA, Botega N, MacDonald E, Wilkinson G (1998). An evaluation of practice nurses working with general practitioners to treat people with depression. *Br J Gen Pract* 48(426):875-9.

-
- ⁴⁹² Huang XY, Yen WJ, Liu SJ, Lin CJ (2008). The role of community mental health nurses caring for people with schizophrenia in Taiwan: a substantive grounded theory. *J Clin Nurs* 17(5): 654-66.
- ⁴⁹³ McCrae N, Banerjee S, Murray J, Prior S, Silverman AM (2008). An extra pair of hands? A case study of the introduction of support workers in community mental health teams for older adults. *J Nurs Manag* 16(6): 734-43.
- ⁴⁹⁴ Clarkson P, McCrone P, Sutherby K, Johnson C, Johnson S, Thornicroft G (1999). Outcomes and costs of a community support worker service for the severely mentally ill. *Acta Psychiatr Scand* 99(3): 196-206.
- ⁴⁹⁵ Farrand P, Confue P, Byng R, Shaw S (2009). Guided self-help supported by paraprofessional mental health workers: an uncontrolled before-after cohort study. *Health Soc Care Community* 17(1): 9-17.
- ⁴⁹⁶ Pollack DA, Ford SM (1998). Is there a role for physician assistants in community mental health? *Community Ment Health J* 34(2): 209-17.
- ⁴⁹⁷ Simon PM, Morse EV, Speier T, Osofsky HJ (1993). Training older adults to work as psychiatric case management aides. *Hosp Community Psychiatry* 44(12): 1162-5.
- ⁴⁹⁸ Hayes K, Baginski Y (1992). Bringing home mental healthcare. In-home peer counseling benefits the elderly. *Health Prog* 73(1): 66-8.
- ⁴⁹⁹ Kaye L, Warner LA, Lewandowski CA, Greene R, Acker JK, Chiarella N (2009). The role of nurse practitioners in meeting the need for child and adolescent psychiatric services: a statewide survey. *J Psychosoc Nurs Ment Health Serv* 47(3): 34-40.
- ⁵⁰⁰ Dennis S, May J, Perkins D, Zwar N, Sibbald B, Hasan I (2009). What evidence is there to support skill mix changes between GPs, pharmacists and practice nurses in the care of elderly people living in the community? *Aust New Zealand Health Policy* 6: 23.
- ⁵⁰¹ North N (1991). Primary care services. In search of alternative ways of providing services that are affordable, accessible and appropriate. A review of recent literature. *Nurs Pract NZ* 6(3): 11-8.
- ⁵⁰² Eggleston J, Gallagher J, Gallagher M, Hares T, Murray E, Naroz N, Owen T, Price P, Pym L, Reed L, et al (1995). Who should give lifestyle advice in general practice and what factors influence attendance at health promotion clinics? Survey of patients' views. *Br J Gen Pract* 45(401): 669-71.
- ⁵⁰³ Nebot M, Cabezas C, Oller M, Moreno F, Rodrigo J, Sarda T, Mestres J, Pitarch M (1990). Medical counseling, nursing counseling, and nicotine chewing gum for smoking cessation in primary care. *Med Clin* 95(2): 57-61.
- ⁵⁰⁴ Deitrick LM, Paxton HD, Rivera A, Gertner EJ, Biery N, Letcher AS, Lahoz LM, Maldonado E, Salas-Lopez D (2010). Understanding the role of the promotora in a Latino diabetes education program. *Qual Health Res* 20(3): 386-99.
- ⁵⁰⁵ Walton A, Calvo Y, Flores M, Navarrete L, Ruíz L (2009). Promotoras: observations and implications for increasing cervical cancer prevention and screening in the Hispanic community. *J S C Med Assoc* 105(7): 306-8.
- ⁵⁰⁶ Woodruff SI, Candelaria JI, Elder JP (2010). Recruitment, training outcomes, retention, and performance of community health advisors in two tobacco control interventions for Latinos. *J Community Health* 35(2): 124-34.

-
- 507 Grzywacz JG, Arcury TA, Marín A, Carrillo L, Coates ML, Quandt SA (2009). Using lay health promoters in occupational health: outcome evaluation in a sample of Latino poultry-processing workers. *New Solut* 19(4): 449-66.
- 508 Karwalajtys T, McDonough B, Hall H, Guirguis-Younger M, Chambers LW, Kaczorowski J, Lohfeld L, Hutchison B (2009). Development of the volunteer peer educator role in a community Cardiovascular Health Awareness Program (CHAP): a process evaluation in two communities. *J Community Health* 34(4): 336-45.
- 509 Kennedy LA, Milton B, Bundred P (2008). Lay food and health worker involvement in community nutrition and dietetics in England: roles, responsibilities and relationship with professionals. *J Hum Nutr Diet* 21(3): 210-24.
- 510 Keni BH (2006). Training competent and effective Primary Health Care Workers to fill a void in the outer islands health service delivery of the Marshall Islands of Micronesia. *Hum Resour Health* 4: 27.
- 511 Huddleston M, Scoins H (2006). Assistant theatre practitioners: 'must have' or 'needs must'? *J Perioper Pract* 16(10): 482-6.
- 512 Bohm ER, Dunbar M, Pitman D, Rhule C, Araneta J (2010). Experience with physician assistants in a Canadian arthroplasty program. *Can J Surg* 53(2): 103-8.
- 513 Reid J (2008). Evolving perioperative roles: nicety or necessity? *J Perioper Pract* 18(6): 228-31.
- 514 Miller W, Riehl E, Napier M, Barber K, Dabideen H (1998). Use of physician assistants as surgery/trauma house staff at an American College of Surgeons-verified Level II trauma center. *J Trauma* 44(2): 372-6.
- 515 Abbott CA (1994). Intraoperative nursing activities performed by surgical technologists. *AORN J* 60(3): 382-93.
- 516 Whiteley MS, Wilmott K, offland RB (1997). A specialist nurse can replace pre-registration house officers in the surgical pre-admission clinic. *Ann R Coll Surg Engl* 79(6 Suppl): 257-60.
- 517 Egger Halbeis CB, Schubert A (2008). Staffing the operating room suite: perspectives from Europe and North America on the role of different anesthesia personnel. *Anesthesiol Clin* 26(4): 637-63.
- 518 Bull RM, Fitzgerald M (2004). The invisible nurse - behind the scenes in an Australian OR. *AORN J* 79(4): 810, 813-8, 821-3.
- 519 Nuwer JM, Nuwer MR (1997). Neurophysiologic surgical monitoring staffing patterns in the USA. *Electroencephalogr Clin Neurophysiol* 103(6): 616-20.
- 520 Shelley H, Coyne R (2009). Employing healthcare assistants in paediatric oncology units. *Paediatr Nurs* 21(9): 32-4.
- 521 Rahi JS, Manaras I, Tuomainen H, Hundt GL (2004). Meeting the needs of parents around the time of diagnosis of disability among their children: evaluation of a novel program for information, support, and liaison by key workers. *Pediatrics* 114(4): e477-82.
- 522 Pop RS (2009). Extubation of pediatric patients: can nurses safely pull the tube? *J Perianesth Nurs* 24(5): 313-8.

-
- 523 Karlowicz MG, McMurray JL (2000). Comparison of neonatal nurse practitioners' and pediatric residents' care of extremely low-birth-weight infants. *Arch Pediatr Adolesc Med* 154(11): 1123-6.
- 524 Eidelman AI, Schimmel MS, Bromiker R, Hammerman C (1998). Pediatric coverage of the delivery room: an analysis of manpower utilization. *J Perinatol* 18(2): 131-4.
- 525 Smallman B (2002). Pediatric sedation: can it be safely performed by non-anesthesiologists? *Curr Opin Anaesthesiol* 15(4): 455-9.
- 526 Gupta R, Patel NV (1991). Training of non-professional health workers in a simple technique of developmental screening of infants and young children. *Indian Pediatr* 28(8): 851-8.
- 527 DeNicola L, Kleid D, Brink L, van Stralen D, Scott M, Gerbert D, Brennan L (1994). Use of pediatric physician extenders in pediatric and neonatal intensive care units. *Crit Care Med* 22(11): 1856-64.
- 528 Boyd J 3rd, Samaddar K, Parra-Roide L, Allen EP, White B (2006). Comparison of outcome measures for a traditional pediatric faculty service and nonfaculty hospitalist services in a community teaching hospital. *Pediatrics* 118(4): 1327-31.
- 529 Dwight P, MacArthur C, Friedman JN, Parkin PC (2004). Evaluation of a staff-only hospitalist system in a tertiary care, academic children's hospital. *Pediatrics* 114(6): 1545-9.
- 530 Brady MA, Neal JA (2000). Role delineation study of pediatric nurse practitioners: a national study of practice responsibilities and trends in role functions. *J Pediatr Health Care* 14(4): 149-59.
- 531 Cramer CL, Orłowski JP, DeNicola LK (2008). Pediatric intensivist extenders in the pediatric ICU. *Pediatr Clin North Am* 55(3): 687-708.
- 532 Wells RD, Dahl B, Wilson SD (2001). Pediatric hospitalists: quality care for the underserved? *Am J Med Qual* 16(5): 174-80.
- 533 (1999). Adding pediatric hospitalists speeds discharge process, improves continuity of care. *Health Care Cost Reengineering Rep* 4(4): 60-3.
- 534 Noblett KE, Meibalane R (1995). Respiratory care practitioners as primary providers of neonatal intubation in a community hospital: an analysis. *Respir Care* 40(10): 1063-7.
- 535 Nemes J, Barnaby K, Shamberger RC (1992). Experience with a nurse practitioner program in the surgical department of a children's hospital. *J Pediatr Surg* 27(8): 1038-42.
- 536 Schulman M, Lucchese KR, Sullivan AC (1995). Transition from housestaff to nonphysicians as neonatal intensive care providers: cost, impact on revenue, and quality of care. *Am J Perinatol* 12(6): 442-6.
- 537 Mathur M, Rampersad A, Howard K, Goldman GM (2005). Physician assistants as physician extenders in the pediatric intensive care unit setting - A 5-year experience. *Pediatr Crit Care Med* 6(1): 14-9.
- 538 Tenner PA, Dibrell H, Taylor RP (2003). Improved survival with hospitalists in a pediatric intensive care unit. *Crit Care Med* 31(3): 847-52.
- 539 Swift JD (2003). Integrating hospitalists into the pediatric intensive care unit. *Pediatr Ann* 32(12): 813-6.

-
- 540 Carlson DW, Fentzke KM, Dawson JG (2003). Pediatric hospitalists fill varied roles in the care of newborns. *Pediatr Ann* 32(12): 802-10.
- 541 Committee on Pediatric Workforce (2003). Scope of practice issues in the delivery of pediatric health care. *Pediatrics* 111(2): 426-35.
- 542 Ol'shanskii GG, Osadchii GM, Martynov KA, Ataev RA (1991). An economic experiment on the differentiated pay of medical workers in the pediatric and obstetrical care service in Murgab District, Mary Province, Turkmenia in relation to the end results. *Pediatrics* 8): 96-8.
- 543 Sabo K (1990). Protecting the professional role. A study to review non-nursing activities and recommendations for change. *Can J Nurs Adm* 3(4): 15-8.
- 544 Pitts J, Seimer B (1998). The use of nurse practitioners in pediatric institutions. *J Pediatr Health Care* 12(2): 67-72.
- 545 Dubois CA, Singh D (2009). From staff-mix to skill-mix and beyond: towards a systemic approach to health workforce management. *Hum Resour Health* 7: 87.
- 546 Martin-Alcazar F, Romero-Fernandes PM, Sanchez-Gardey G (2005). Strategic human resource management: integrating the universalistic, contingent, configurational and contextual perspectives. *Int J of human resource management* 16(5):633-659.
- 547 Lengnick-Hall CA, Lengnick-Hall ML (1988). Strategic human resource management: a review of the literature and a proposed typology. *Acad Man Rev* 13(3):454-70.
- 548 Schuler RS (1992). Strategic human resource management: linking people with the needs of the business. *Org Dynamics* 21:19-32.
- 549 Wright PM, McMahan GC: (1992) Theoretical perspectives for strategic human resource management. *J Manag* 18(2):295-320.
- 550 Wright PM, Snell SA (1991). Toward an integrative view of strategic human resource management. *Human Res Man Rev* 1: 203-25.
- 551 Jackson SE, Schuler RS (1995). Understanding Human Resource Management in the Context of Organizations and their Environments. *Ann Rev Psy* 46:237-64.
- 552 Renaud L, Sacks-Silver G (1996). Transition of the roles and mandates of public health professionals. *Promot Educ* 3(4): 29-32.
- 553 Hollingsworth EJ (1992). Falling through the cracks: care of the chronically mentally ill in the United States, Germany, and the United Kingdom. *J Health Polit Policy Law* 17(4): 899-928.
- 554 Belansky ES, Cutforth N, DeLong E, Litt J, Gilbert L, Scarbro S, Beatty B, Romaniello C, Brink L, Marshall JA (2010). Early effects of the federally mandated Local Wellness Policy on school nutrition environments appear modest in Colorado's rural, low-income elementary schools. *J Am Diet Assoc* 110(11): 1712-7.
- 555 Earls MF (2010), Committee on Psychosocial Aspects of Child and Family Health American Academy of Pediatrics. Incorporating recognition and management of perinatal and postpartum depression into pediatric practice. *Pediatrics* 126(5): 1032-9.

-
- 556 Shapiro CJ, Prinz RJ, Sanders MR (2010). Population-based provider engagement in delivery of evidence-based parenting interventions: challenges and solutions. *J Prim Prev* 31(4): 223-34.
- 557 Hector DJ, Hyde AN, Worgan RE, Macoun EL (2008). Research evidence can successfully inform policy and practice: insights from the development of the NSW Health Breastfeeding Policy. *N S W Public Health Bull* 19(7-8): 138-42.
- 558 Petersen PE, Yamamoto T (2005). Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 33(2): 81-92.
- 559 Gauntlett AN (2005). Evaluation of a postgraduate training programme for community mental health practitioners. *J Psychiatr Ment Health Nurs* 12(2): 223-30.
- 560 Keleher H, Parker R, Francis K (2010). Preparing nurses for primary health care futures: how well do Australian nursing courses perform? *Aust J Prim Health* 16(3): 211-6.
- 561 Harris N, McPhail-Bell K (2007). Evolving directions in health promotion workforce development. *Pac Health Dialog* 14(2): 63-5.
- 562 Griffiths S, Thorpe A (2007). Public health in transition: views of the specialist workforce. *J R Soc Promot Health* 127(5): 219-23.
- 563 Katz M, Rubino A, Collier J, Rosen J, Ehrich JH (2002). Demography of pediatric primary care in Europe: delivery of care and training. *Pediatrics* 109(5): 788-96.
- 564 Werrbach GB, DePoy E (1993). Working with persons with serious mental illness: implication for social work recruitment and retention. *Community Ment Health J* 29(4): 305-19.
- 565 Beinecke RH, Huxley PJ (2009). Mental health social work and nursing in the USA and the UK: divergent paths coming together? *Int J Soc Psychiatry* 55(3): 214-25.
- 566 Smith J, Long T (2002). Confusing rhetoric with reality: achieving a balanced skill mix of nurses working with children. *J Adv Nurs* 40(3): 258-66.
- 567 Jones C, Brideson T (2009). Using policy and workforce development to address Aboriginal mental health and wellbeing. *Australas Psychiatry* 17 (Suppl 1): S72-4.
- 568 Ryan R, Garlick R, Happell B (2006). Exploring the role of the mental health nurse in community mental health care for the aged. *Issues Ment Health Nurs* 27(1): 91-105.
- 569 Wells SA (1995). Creating a culturally competent workforce. *Caring* 14(12): 50-3.
- 570 American Academy of Pediatrics Committee on Pediatric Workforce, Friedman AL (2007). Enhancing the diversity of the pediatrician workforce. *Pediatrics* 119(4): 833-7.
- 571 Britton CV, American Academy of Pediatrics Committee on Pediatric Workforce (2004). Ensuring culturally effective pediatric care: implications for education and health policy. *Pediatrics* 114(6): 1677-85.
- 572 Flores G, Abreu M, Schwartz I, Hill M (2000). The importance of language and culture in pediatric care: case studies from the Latino community. *J Pediatr* 137(6): 842-8.
- 573 (1999). Culturally effective pediatric care: education and training issues. American Academy of Pediatrics Committee on Pediatric Workforce. *Pediatrics* 103(1): 167-70.

-
- 574 Navarro AM, Voetsch KP, Liburd LC, Giles HW, Collins JL (2007). Charting the future of community health promotion: recommendations from the National Expert Panel on Community Health Promotion. *Prev Chronic Dis* 4(3): A68.
- 575 Daly B, Clarke W, McEvoy W, Periam K, Zoitopoulos L (2010). Child oral health concerns amongst parents and primary care givers in a Sure Start local programme. *Community Dent Health* 27(3): 167-71.
- 576 Mensah GA, Goodman RA, Zaza S, Moulton AD, Kocher PL, Dietz WH, Pechacek TF, Marks JS (2004). Law as a tool for preventing chronic diseases: expanding the range of effective public health strategies. *Prev Chronic Dis* 1(1): A13.
- 577 Mercurio MR, Peterec SM (2009). Attending physician work hours: ethical considerations and the last doctor standing. *Pediatrics* 124(2): 758-62.
- 578 Henry MC, Silverman BL, Moss RL (2005). The impact of the 80-hour workweek on pediatric surgical training: an Association of Pediatric Surgery Program Directors-sponsored study. *J Pediatr Surg* 40(1):60-8.
- 579 Honigfeld L, Perloff J, Barzansky B (1990). Replacing the work of pediatric residents: strategies and issues. *Pediatrics* 85(6): 969-76.
- 580 Businger A, Guller U, Oertli D (2010). Effect of the 50-hour workweek limitation on training of surgical residents in Switzerland. *Arch Surg* 145(6): 558-63.
- 581 Carr-Hill R, Currie L, Dixon P (2003). *Skill mix in secondary care: SDO scoping exercise: Final report*. UK: University of York Centre for Health Economics,.
- 582 Tourangeau AE, Cranley LA, Jeffs L (2006). Impact of nursing on hospital patient mortality: a focused review and related policy implications. *Qual Saf Health Care* 15(1): 4-8.
- 583 Unruh L (2003). Licensed nurse staffing and adverse outcomes in hospitals. *Med Care* 41(1):142-52.
- 584 McGillis Hall L, Doran D, Baker G R, Pink GH, Sidani, S, O'Brien-Pallas L, Donner GJ (2003). Nurse staffing models as predictors of patient outcomes. *Med Care* 41(9) :1096-1109.
- 585 McGillis Hall L, Doran D, Pink GH (2004) Nursing staffing mix models, nursing hours and patient safety outcomes. *JONA* 34(1):41-45.
- 586 Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K (2002). Nurse staffing levels and the quality of care in hospitals. *N Engl J Med* 346(22):1715-22.
- 587 Person SD, Allison JJ, Kiefe CI, Weaver MT, Williams OD, Centor RM, Weissman NW (2004). Nurse staffing and mortality for medicare patients with acute myocardial infarction. *Med Care* 42(1) :4-12.
- 588 Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA* 288(16):1987-93.
- 589 Normand CEM (1993). Changing patterns of care - the challenges for health care professions and professionals. In Malek M, Vacani P, Rasquinha J et al (eds). *Managerial Issues in the Reformed NHS*. Chichester: John Wiley and Sons, 237-245.
- 590 Hunter DJ (1996). The changing roles of health care personnel in health and health care management. *Soc Sci Med* 43(5):799-808.

-
- 591 Kirby MJL, Keon W (2004). Why Competition Is Essential in the Delivery of Publicly Funded Health Care Services. *Policy Matters* 5(8):1-32.
- 592 Miniclier P (2000). *Regulatory realities and the nurse practitioner*. Medscape Portals, <http://www.medscape.com/viewarticle/425420>
- 593 Tarrant F et (2005). *Practice component literature review report; Supports, barriers and impediments to practice*. Ottawa: The Canadian Nurse Practitioner Initiative, Canadian Nurses Association.
- 594 Freidson E (1970). *Professional dominance: the social structure of medical care*. New York: Aldine Publishing Company.
- 595 Gaumer GL (1984). Regulating health professionals: a review of the empirical literature. *Milbank Mem Fund Q* 62: 380-416.
- 596 Muzondo TR, Pazderka B (1980). Occupational licensing and professional incomes in Canada. *Can J Economics* 13:659-667.
- 597 Pong RW, Saunders D, Church J, Wanke M, Cappon P (1995). *Health human resources in community-based health care: a review of the literature*. Ottawa: Health Canada, Health Promotion and Programs Branch.
- 598 Hall P, Weaver L (2001). Interdisciplinary education and teamwork: a long and winding road. *Med Educ* 35(9):867-75
- 599 Crozier K (2003). Interprofessional education in maternity care: shared. learning for women-centred care. *International Journal of Sociology and Social Policy* 23(4-5):123-138.
- 600 Driller C, Holschneider AM (2003). Training in pediatric surgery - a comparison of 24 countries in Europe and other countries around the world. *Eur J Pediatr Surg* 13(2): 73-80.
- 601 Gruskin A, Williams RG, McCabe ER, Stein F, Strickler J, Chesney RW, Mulvey HJ, Simon JL, Alden ER (2000). Final report of the FOPE II Pediatric Subspecialists of the Future Workgroup. *Pediatrics* 106(5): 1224-44.
- 602 Lakhani N (2006). Training for crisis resolution home treatment teams. *Nurs Times* 102(18): 19-20.
- 603 Melville L, Howat P, Shilton T, Weinstein R (2006). Health promotion competencies for the Israeli workforce. *Promot Educ* 13(3): 178-84.
- 604 Quinn G, Albrecht T, Marshall R Jr, Akintobi TH (2005). "Thinking like a marketer": training for a shift in the mindset of the public health workforce. *Health Promot Pract* 6(2): 157-63.
- 605 Swerissen H, Tilgner L (2000). A workforce survey of health promotion education and training needs in the state of Victoria. *Aust NZ J Public Health* 24(4): 407-12.
- 606 Tippetts E, Westpheling K (1996). The Health Promotion-Disease Prevention Project: effect on medical students' attitudes toward practice in medically underserved areas. *Fam Med* 28(7): 467-71.
- 607 Berman L, Rosenthal MS, Curry LA, Evans LV, Gusberg RJ (2008). Attracting surgical clerks to surgical careers: role models, mentoring, and engagement in the operating room. *J Am Coll Surg* 207(6): 793-800, 800. e1-2.

-
- ⁶⁰⁸ Sampson H (2006). Introducing student nurses to operating department nursing. *J Perioper Pract* 16(2): 87-8, 90-1, 93-4.
- ⁶⁰⁹ Graham RC, Heubi JE, Cohen MB, Li B (2009). Teaching and tomorrow: a novel recruitment program for a pediatric subspecialty. *J Pediatr Gastroenterol Nutr* 49(5): 594-8.
- ⁶¹⁰ Hannigan B (1999). Specialist practice in community mental health nursing. *Nurse Educ Today* 19(6): 509-16.
- ⁶¹¹ Smith CE (2001). Perioperative nursing education: the operating room as a learning climate. *Semin Perioper Nurs* 10(2): 70-3.
- ⁶¹² Rochlin JM, Simon HK (2011). Does fellowship pay: what is the long-term financial impact of subspecialty training in pediatrics? *Pediatrics* 127(2): 254-60.
- ⁶¹³ Earls MF (2010). Incorporating recognition and management of perinatal and postpartum depression into pediatric practice. *Pediatrics* 126(5): 1032-9.
- ⁶¹⁴ Fox HB, McManus MA, Klein JD, Diaz A, Elster AB, Felice ME, Kaplan DW, Wibbelsman CJ, Wilson JE (2010). Adolescent medicine training in pediatric residency programs. *Pediatrics* 125(1): 165-72.
- ⁶¹⁵ Knapp CA, Madden V, Wang H, Kassing K, Curtis C, Sloyer P, Shenkman EA (2009). Paediatric nurses' knowledge of palliative care in Florida: a quantitative study. *Int J Palliat Nurs* 15(9): 432-9.
- ⁶¹⁶ Emans SJ, Bravender T, Knight J, Frazer C, Luoni M, Berkowitz C, Armstrong E, Goodman E (1998). Adolescent medicine training in pediatric residency programs: are we doing a good job? *Pediatrics* 102(3 Pt 1): 588-95.
- ⁶¹⁷ Thorpe A, Griffiths S, Jewell T, Adshead F (2008). The three domains of public health: an internationally relevant basis for public health education? *Public Health* 122(2): 201-10.
- ⁶¹⁸ Talbot L, Graham M, James EL (2007). A role for workforce competencies in evidence-based health promotion education. *Promot Educ* 14(1): 28-33.
- ⁶¹⁹ Schulte PA, Stephenson CM, Okun AH, Palassis J, Biddle E (2005). Integrating occupational safety and health information into vocational and technical education and other workforce preparation programs. *Am J Public Health* 95(3): 404-11.
- ⁶²⁰ Mittelmark MB (2003). The role of professional education in building capacity for health promotion in the global South: a case study from Norway. *Ethn Dis* 13(2 Suppl 2): S35-9.
- ⁶²¹ Yamada S (1991). Educational courses for the teaching staffs of exercises for health promotion. *J UOEH* 13(1): 53-60.
- ⁶²² Mikiel-Kostyra K, Galecki A (1990). Preparation of health personnel for the promotion of breast feeding - a pilot study. (Part I - the level of knowledge). *Wiad Lek* 43(12): 572-7.
- ⁶²³ Woodhouse LD, Auld ME, Livingood WC, Mulligan LA (2006). Survey of accredited master of public health (MPH) programs with health education concentrations: a resource for strengthening the public health workforce. *Health Promot Pract* 7(2): 258-65.
- ⁶²⁴ Aksayan S (1994). Education of nurses for primary health care. *World Health Forum* 15(2): 150-2.
- ⁶²⁵ Chirdan LB, Ameh EA, Abantanga FA, Sidler D, Elhalaby EA (2010). Challenges of training and delivery of pediatric surgical services in Africa. *J Pediatr Surg* 45(3): 610-8.

-
- ⁶²⁶ Wilson M (1994). Pediatric generalist training: graduate medical education at a crossroads. *Curr Opin Pediatr* 6(5): 513-8.
- ⁶²⁷ Jonas D, Burns B (2010). The transition to blended e-learning. Changing the focus of educational delivery in children's pain management. *Nurse Educ Pract* 10(1): 1-7.
- ⁶²⁸ Kapelus G, Karim R, Pimento B, Ferrara G, Ross C (2009). Interprofessional health promotion field placement: applied learning through the collaborative practice of health promotion. *J Interprof Care* 23(4): 410-3.
- ⁶²⁹ Herrman J, Saunders A, Selekman J (1998). Beyond hospital walls: educating pediatric nurses for the next millennium. *Pediatr Nurs* 24(1): 96-9.
- ⁶³⁰ Battel-Kirk B, Barry MM, Taub A, Lysoby L (2009). A review of the international literature on health promotion competencies: identifying frameworks and core competencies. *Glob Health Promot* 16(2): 12-20.
- ⁶³¹ Kalb KB, Cherry NM, Kauzloric J, Brender A, Green K, Miyagawa L, Shinoda-Mettler A (2006). A competency-based approach to public health nursing performance appraisal. *Public Health Nurs* 23(2): 115-38.
- ⁶³² Santa-María Morales A, Battel-Kirk B, Barry MM, Bosker L, Kasmel A, Griffiths J (2009). Perspectives on health promotion competencies and accreditation in Europe. *Glob Health Promot* 16(2): 21-31.
- ⁶³³ Allegrante JP, Moon RW, Auld ME, Gebbie KM (2001). Continuing-education needs of the currently employed public health education workforce. *Am J Public Health* 91(8): 1230-4.
- ⁶³⁴ Barry MM, Allegrante JP, Lamarre MC, Auld ME, Taub A (2009). The Galway Consensus Conference: international collaboration on the development of core competencies for health promotion and health education. *Glob Health Promot* 16(2): 5-11.
- ⁶³⁵ Goetzel RZ, Ozminkowski RJ (2000). Health and productivity management: emerging opportunities for health promotion professionals for the 21st century. *Am J Health Promot* 14(4): 211-4.
- ⁶³⁶ Shilton T, Howat P, James R, Hutchins C, Burke L (2008). Potential uses of health promotion competencies. *Health Promot J Austr* 19(3): 184-8.
- ⁶³⁷ Songer T, Stephens-Stidham S, Peek-Asa C, Bou-Saada I, Hunter W, Lindemer K, Runyan C (2009). Core competencies for injury and violence prevention. *Am J Public Health* 99(4): 600-6.
- ⁶³⁸ Trent M, Cheng TL (2010). Meeting the needs of adolescents: pediatric medical education and workforce development. *Pediatrics* 125(1): 191-2.
- ⁶³⁹ Committee on Pediatric Workforce (2001). American Academy of Pediatrics: Financing graduate medical education to meet pediatric workforce needs. *Pediatrics* 107(4): 785-9.
- ⁶⁴⁰ Leslie L, Rappo P, Abelson H, Jenkins RR, Sewall SR, Chesney RW, Mulvey HJ, Simon JL, Alden ER (2000). Final report of the FOPE II Pediatric Generalists of the Future Workgroup. *Pediatrics* 106(5): 1199-223.
- ⁶⁴¹ Obladen M (1997). Neonatology in Europe. Training, accreditation, and research. *Eur J Obstet Gynecol Reprod Biol* 75(1): 75-80.

-
- ⁶⁴² Hyndman B (2009). Towards the development of skills-based health promotion competencies: the Canadian experience. *Glob Health Promot* 16(2): 51-5.
- ⁶⁴³ Fox A, Beyers J (2010). Planning a graduate programme in public health nutrition for experienced nutrition professionals. *Public Health Nutr* 17: 1-10.
- ⁶⁴⁴ Richardson G, Maynard A, Cullum N, Kindig D (1998). Skill mix changes: substitution or service development? *Health Policy* 45(2):119-32.
- ⁶⁴⁵ Dubois CA, McKee M (2006). Cross-national comparisons of human resources for health - What can we learn? *J Health Ec, Policy Law* 1: 59-78.
- ⁶⁴⁶ Jones KE, Brockway CR, Atkinson RE (1995). Survey of health promotion organisational arrangements and levels of service for health promotion. *Public Health* 109(1): 31-9.
- ⁶⁴⁷ Hollander MJ, Anderson M, Béland F, Havens B, Keefe J, Lawrence W, Parent K, Ritter R (2000). The identification and analysis of incentives and disincentives and cost-effectiveness of various funding approaches for continuing care: Final report. Victoria BC: Hollander Analytical Services.
- ⁶⁴⁸ Health Council of Canada (2005). Modernizing the Management of Health Human Resources in Canada: Identifying Areas for Accelerated Change. Report from a National Summit. Toronto: Health Council of Canada.
- ⁶⁴⁹ Morris A, Bloom JR (2002). Contextual factors affecting job satisfaction and organizational commitment in community mental health centers undergoing system changes in the financing of care. *Ment Health Serv Res* 4(2): 71-83.
- ⁶⁵⁰ Saxe-Braithwaite M, Carlton S, Bass B (2009). Aligning career development with organizational goals: working towards the development of a strong and sustainable workforce. *Nurs Leadersh* 22(1): 56-69.
- ⁶⁵¹ Institute of Medicine (1996). *Nursing staff in hospitals and nursing homes: is it adequate?* Washington DC: National Academy Press.
- ⁶⁵² Aiken LH, Smith HL, Lake ET (1994). Lower Medicare mortality among a set of hospitals known for good nursing care. *Med Care* 32(8):771-87.
- ⁶⁵³ Parsons MB, Reid DH, Crow RE (2003). Best and worst ways to motivate staff in community agencies: a brief survey of supervisors. *Ment Retard* 41(2): 96-102.
- ⁶⁵⁴ Brown B, Crawford P (2003). The clinical governance of the soul: 'deep management' and the self-regulating subject in integrated community mental health teams. *Soc Sci Med* 56(1): 67-81.
- ⁶⁵⁵ Webster L, Hackett RK (1999). Burnout and leadership in community mental health systems. *Adm Policy Ment Health* 26(6): 387-99.
- ⁶⁵⁶ Crocker T, Rissel C (1998). Knowledge of and attitudes to the health outcomes approach among community mental health professionals. *Aust Health Rev* 21(4): 111-26.
- ⁶⁵⁷ Blumenthal S, Lavender T, Hewson S (1998). Role clarity, perception of the organization and burnout amongst support workers in residential homes for people with intellectual disability: a comparison between a National Health Service trust and a charitable company. *J Intellect Disabil Res* 42 (Pt 5): 409-17.

-
- ⁶⁵⁸ Tang KC, Nutbeam D, Kong L, Wang R, Yan J (2005). Building capacity for health promotion - a case study from China. *Health Promot Int* 20(3): 285-95.
- ⁶⁵⁹ Marchal B, Kegels G, De Brouwere V (2004). Human resources in scaling up HIV/AIDS programmes: just a killer assumption or in need of new paradigms? *AIDS* 18(15): 2103-5.
- ⁶⁶⁰ Wachtel RE, Dexter F (2009). Reducing tardiness from scheduled start times by making adjustments to the operating room schedule. *Anesth Analg* 108(6): 1902-9.
- ⁶⁶¹ Marjamaa R, Vakkuri A, Kirvela O (2008). Operating room management: why, how and by whom? *Acta Anaesthesiol Scand* 52(5): 596-600.
- ⁶⁶² Bender HJ, Denz C, Schleppers A (2007). The optimization of a medicinal process and the organization of work in an operating-room. *Anesteziol Reanimatol* (4): 6-9.
- ⁶⁶³ Estryn-Behar M, Saurel-Cubizolles MJ, Maillard MF, Mugnier N, Saint-Maurice C (1993). Working conditions of operating room personnel. Different symptoms observed and pregnancy outcome. *Cah Anesthesiol* 41(5): 453-8.
- ⁶⁶⁴ Dorsey JH (1991). Operating room organization. Lasers and advanced operative laparoscopy. *Obstet Gynecol Clin North Am* 18(3): 569-74.
- ⁶⁶⁵ de Cássia Fogaça M, de Carvalho WB, de Albuquerque Cítero V, Nogueira-Martins LA (2010). Preliminary study about occupational stress of physicians and nurses in pediatric and neonatal intensive care units: the balance between effort and reward. *Rev Lat Am Enfermagem* 18(1): 67-72.
- ⁶⁶⁶ Lacey SR, Teasley SL, Cox KS (2009). Differences between pediatric registered nurses' perception of organizational support, intent to stay, workload, and overall satisfaction, and years employed as a nurse in magnet and non-magnet pediatric hospitals: implications for administrators. *Nurs Adm Q* 33(1): 6-13.
- ⁶⁶⁷ Schubnell T, Meuer L, Bengtson R (2008). Improving surgical services performance through changing work culture. *AORN J* 87(3): 575-83.
- ⁶⁶⁸ McCleary L, Brown GT (2002). Research utilization among pediatric health professionals. *Nurs Health Sci* 4(4): 163-71.
- ⁶⁶⁹ Mathieu JE, Marks MA, Zaccaro SJ (2001). Multiteam systems. In Anderson N, Ones DS, Sinangil HK, Viswesvaran C (eds). *Handbook of industrial, work and organizational psychology 2*. London: Sage, 289-313.
- ⁶⁷⁰ Hackman JR (2002). *Leading teams: Setting the stage for great performances*. Boston, MA: Harvard Business School Press.
- ⁶⁷¹ Hackman JR (1990). *Groups that work (and those that don't): Creating conditions for effective teamwork*. San Francisco: Jossey-Bass.
- ⁶⁷² Haward R, Amir Z, Borrill C, Dawson J, Scully J, West M, Sainsbury R (2003). Breast cancer teams: The impact of constitution, new cancer workload, and methods of operation on effectiveness. *Br J Cancer* 89(1):15-22.
- ⁶⁷³ Curley C, McEachern JE, Speroff T (1998). A firm trial of interdisciplinary rounds on the inpatient medical wards. *Med Care* 36(Suppl 8):AS4-12.
- ⁶⁷⁴ Bjertnaes OA, Garratt A, Ruud T (2008). Family physicians' experiences with community mental health centers: a multilevel analysis. *Psychiatr Serv* 59(8): 864-70.

-
- 675 Becker BE, Gerhart B (1996). The impact of human resource management on organizational performance: progress and prospects. *Aca Manage J* 39(4):779–801.
- 676 Whitfield K, Poole M (1997). Organising employment for high performance: theories, evidence and policy. *Organization Studies* 18(5):745–764.
- 677 Ramsay H, Scholarios D, Harley B (2000). Employees and high-performance work systems. *Brit J Ind Rel* 34(4):501–532.
- 678 DeAngelis C, Feigin R, DeWitt T, First LR, Jewett EA, Kelch R, Chesney RW, Mulvey HJ, Simon JL, Alden ER (2000). Final report of the FOPE II Pediatric Workforce Workgroup. *Pediatrics* 106(5): 1245-55.
- 679 Cohen JA (2003). Managed care and the evolving role of the clinical social worker in mental health. *Soc Work* 48(1): 34-43.
- 680 Bazell C, Salsberg E (1998). The impact of graduate medical education financing policies on pediatric residency training. *Pediatrics* 101(4 Pt 2): 785-94.
- 681 Kendrick T, Sibbald B, Addington-Hall J, Brenneman D, Freeling P (1993). Distribution of mental health professionals working on site in English and Welsh general practices. *BMJ* 307(6903): 544-6.
- 682 Merwin EI, Goldsmith HF, Manderscheid RW (1995). Human resource issues in rural mental health services. *Community Ment Health J* 31(6): 525-37.
- 683 Donen N, King F, Reid D, Blackstock D (1999). Canadian anesthesia physician resources: 1996 and beyond. *Can J Anaesth* 46(10): 962-9.
- 684 Michie S, West M (2004). Managing people and performance: An evidence based framework applied to health service organisations. *Int J Manage Rev* 5/6(2):91-111
- 685 Franco LM, Bennett S, Kanfer R (2002). Health sector reform and public sector health worker motivation: a conceptual framework. *Soc Sci Med* 54(8):1255-66
- 686 Ingersoll GL, Kirsch JC, Merk SE, Lightfoot J (2000). Relationship of organizational culture and readiness for change to employee commitment to the organization. *J Nurs Adm* 30(1):11-20
- 687 McClure ML, Hinshaw AS (2002). *Magnet hospitals revisited: attraction and retention of professional nurses*. Washington DC: American Nurses Association
- 688 Hern-Underwood MJ, Workman LL (1993). Group climate: a significant retention factor for pediatric nurse managers. *J Prof Nurs* 9(4): 233-8.
- 689 Brunet L, Savoie A (1999). *Le climat de travail*. Montréal: Éditions Logiques.
- 690 Parker CP, Baltus BB, Young SA, Huff JW, Altmann RA, Lacost HA, Roberts JE (2003). Relationship between psychological climate perceptions and work outcomes: a meta-analytic review. *J Org Behav* 24 (4) :389-416.
- 691 Bjertnaes OA, Nieland A, Damerell E, Garratt A (2010). General practitioners' evaluation of community psychiatric services: responsiveness to change of the General Practitioner Experiences Questionnaire (GPEQ). *BMC Health Serv Res* 10: 108.
- 692 Chan MF, Ho A, Day MC (2008). Investigating the knowledge, attitudes and practice patterns of operating room staff towards standard and transmission-based precautions: results of a cluster analysis. *J Clin Nurs* 17(8): 1051-62.

-
- ⁶⁹³ Bowen DE, Ostroff C (2004). Understanding HRM-firm performance linkages: the role of the "strength" of the HRM system. *Aca Manag Rev* 29(2): 203–221.
- ⁶⁹⁴ Collins CJ, Clark KD (2003). Strategic human resource practices, top management team social networks, and firm performance: the role of human resource practices in creating organizational competitive advantage. *Aca Manag Rev* 46(6):740–751.
- ⁶⁹⁵ Tsui AS, Pearce JL, Porter LW, Tripoli AM (1997). Alternative approaches to the employee -organization relationship: does investment in employees pay off. *Aca Manag J* 40(5):1089–1121.
- ⁶⁹⁶ Griffin MA, Mathieu JE (1997). Modeling organisational processes across hierarchical levels: climate, leadership and group processes in work groups. *J Org Beh* 18:731-744.
- ⁶⁹⁷ Pritchard RD, Karasek B (1973). The effects of organisational climate on managerial job performance and satisfaction. *Org Beh Human Perf* 9:126-146.
- ⁶⁹⁸ World Health Organisation (2006). Working together for health – the World Health Report 2006. Geneva: WHO.
- ⁶⁹⁹ Stordeur S, D'hoore W, Vandenberghe C (2001). Leadership, organizational stress and emotional exhaustion among nursing hospital staff. *J Adv Nurs* 35:533–542.
- ⁷⁰⁰ Beaulieu D, Horrigan DR (2005): Putting smart money to work for quality improvement. *Health Serv Res* 40:1318–1334.
- ⁷⁰¹ Heward S, Hutchins C, Keleher H (2007). Organizational change - key to capacity building and effective health promotion. *Health Promot Int* 22(2): 170-8.
- ⁷⁰² Brimberry (1988). Vaccination of high-risk patients for influenza: a comparison of telephone and mail reminder methods. *J Fam Pract* 26:397–400.
- ⁷⁰³ Friedman RH, Kazis LE, Jette A, Smith MB, Stollerman J, Torgerson J, Carey K (1996). A telecommunications system for monitoring and counseling patients with hypertension: impact on medication adherence and blood pressure control. *Am J Hypertens* 4:285–292.
- ⁷⁰⁴ Hodgins M, Battel-Kirk B, Asgeirsdottir AG (2010). Building capacity in workplace health promotion: the case of the Healthy Together e-learning project. *Glob Health Promot* 17(1): 60-8.
- ⁷⁰⁵ Chatterjee A, Lackey SJ (2001). Prospective study of telephone consultation and communication in pediatric infectious diseases. *Pediatr Infect Dis J* 20(10): 968-72.
- ⁷⁰⁶ Benjamin JT (1997). Pediatric residents' telephone triage experience. Relevant to general pediatric practice? *Arch Pediatr Adolesc Med* 151(12): 1254-7.
- ⁷⁰⁷ Priest A (2006). What's ailing our nurses? A discussion of the major issues affecting nursing human resources in Canada. Ottawa: Canadian Health Services Research Foundation.
- ⁷⁰⁸ Coile RC Jr (2002). Physician executives explore "new science" frontier. Bridging the communications gap between medical staff and administration. *Physician Exec* 28(1): 81-3.
- ⁷⁰⁹ Jarvis L, Stanberry B (2005). Teleradiology: threat or opportunity? *Clin Radiol* 60(8): 840-5.
- ⁷¹⁰ Sferrella SM, Story CP (2004). The impact of tech aides in radiology. *Radiol Manage* 26(2): 22-30.

-
- ⁷¹¹ Blackmore CC, Hoffer EK, Albrecht E, Mann FA (2004). Physician assistants in academic radiology: the Harborview experience. *J Am Coll Radiol* 1(6): 410-4.
- ⁷¹² Stockman T (2006). A case study in developing a radiology information technology (RIT) specialist position for supporting digital imaging. *Radiol Manage* 28(4): 46-9.
- ⁷¹³ Bude RO, Fatchett JP, Lechtanski TA (2006). The use of additionally trained sonographers as ultrasound practitioners: our first-year experience. *J Ultrasound Med* 25(3):321-30.
- ⁷¹⁴ Kalteis M, Pistrich R, Schimetta W, Polz W (2007). Laparoscopic cholecystectomy as solo surgery with the aid of a robotic camera holder: a case-control study. *Surg Laparosc Endosc Percutan Tech* 17(4): 277-82.
- ⁷¹⁵ Geis WP, Kim HC, Brennan EJ Jr, McAfee PC, Wang Y (1996). Robotic arm enhancement to accommodate improved efficiency and decreased resource utilization in complex minimally invasive surgical procedures. *Stud Health Technol Inform* 29: 471-81.
- ⁷¹⁶ Lee YL, Wu JL, Wu HS, Yang SF, Hsu SC, Tsai CC, Ku TH (2007). The use of portable computer for information acquirement during anesthesiologist's ward round in acute pain service. *Acta Anaesthesiol Taiwan* 45(2): 79-87.
- ⁷¹⁷ Bosman RJ (2009). Impact of computerized information systems on workload in operating room and intensive care unit. *Best Pract Res Clin Anaesthesiol* 23(1): 15-26.
- ⁷¹⁸ Mishra SK, Kapoor L, Singh IP (2009). Telemedicine in India: current scenario and the future. *Telemed J E Health* 15(6): 568-75.
- ⁷¹⁹ Abbott PA, Coenen A (2008). Globalization and advances in information and communication technologies: the impact on nursing and health. *Nurs Outlook* 56(5): 238-246.e2.
- ⁷²⁰ Pak HS, Brown-Connolly NE, Bloch C, Clarke M, Clyburn C, Doarn CR, Llewellyn C, Merrell RC, Montgomery K, Rasche J, Sullivan B (2008). Global forum on telemedicine: connecting the world through partnerships. *Telemed J E Health* 14(4): 389-95.
- ⁷²¹ Weymouth S, Davey C, Wright JI, Nieuwoudt LA, Barclay L, Belton S, Svenson S, Bowell L (2007). What are the effects of distance management on the retention of remote area nurses in Australia? *Rural Remote Health* 7(3): 652.
- ⁷²² Webster JL, Cao CG (2006). Lowering communication barriers in operating room technology. *Hum Factors* 48(4): 747-58.
- ⁷²³ Smith WD, Berguer R, Rosser JC Jr (2003). Wireless virtual instrument measurement of surgeons' physical and mental workloads for robotic versus manual minimally invasive surgery. *Stud Health Technol Inform* 94: 318-24.
- ⁷²⁴ Johnstone PL (1999). Occupational stress in the operating theatre suite: should employers be concerned? *Aust Health Rev* 22(1): 60-80.
- ⁷²⁵ Abiodun OA (1990). Mental health and primary care in Africa. *East Afr Med J* 67(4): 273-8.
- ⁷²⁶ Nash IS, Corrato RR, Dlutowski MJ, O'Connor JP, Nash DB (1999). Generalist versus specialist care for acute myocardial infarction. *Am J Cardio* 83(5):650-654.

-
- ⁷²⁷ Ellis SG, Weintraub W, Holmes D, Shaw R, Block PC, King III SB (1997). Relation of operator volume and experience to procedural outcome of percutaneous coronary revascularization at hospitals with high interventional volumes. *Circulation* 95(11): 2479-84.
- ⁷²⁸ Hartz AJ, Kuhn EM, Pulido J (1999). Prestige of training programs and experience of bypass surgeons as factors in adjusted patient mortality rates. *Medical Care* 37(1):93-103.
- ⁷²⁹ Halm EA, Lee C, Chassin M (2000). How is volume related to quality in health care? A systematic review of the literature. Washington DC: Institute of Medicine.
- ⁷³⁰ Malenka DJ, McGrath PD, Wennberg DE, Ryan TJ Jr, Kellett MA Jr, Shubrooks SJ Jr, Bradley WA, Hettleman BD, Robb JF et al (1999). The relationship between operator volume and outcomes after percutaneous coronary interventions in high volume hospitals in 1994-1996: the northern New England experience. *J Am Coll Cardiol* 34(5):1471-80.
- ⁷³¹ Klein LW, Schaer GL, Calvin JE, Palvas B, Allen J, Loew J, Uretz E, Parrillo JE (1997). Does low individual operator coronary interventional procedural volume correlate with worse institutional procedural outcome? *J Am Coll Cardiol* 30(4):870-7.
- ⁷³² Khuri SF, Daley J, Henderson W, Hur K, Hossain M, Soybel D, Kizer KW, Aust JB, Bell RH Jr, Chong V, Demakis J, Fabri PJ, Gibbs JO, Grover F et al (1999). Relation of surgical volume to outcome in eight common operations. Results from the VA National Surgical Quality Improvement Program. *Ann Surg* 230:414-432.
- ⁷³³ Hannan EL, Siu AL, Kumar D, Kilburn H Jr, Chassin MR (1995). The decline in coronary artery bypass graft surgery mortality in New York State. The role of surgeon volume. *JAMA* 273(3):209-13.
- ⁷³⁴ Joint Learning Initiative (2004). Human resources for health: overcoming the crisis. Cambridge: Harvard University Press.
- ⁷³⁵ World Health Organisation (2006). *Working together for health – the World Health Report 2006*. Geneva: World Health Organisation.
- ⁷³⁶ Buerhaus P, Staiger D, Auerbach D (2008). *The future of the nursing workforce in the United States. Data, trends, and implications*. Sudbury, MA: Jones and Bartlett Publishers.
- ⁷³⁷ Cooper RA, Getzen TE, McKee HJ, Laud P (2002). Economic and demographic trends signal an impending physician shortage. *Health Affairs* 21(1):140-154.
- ⁷³⁸ Hewitt A, Larson S (2007). The direct support workforce in community supports to individuals with developmental disabilities: issues, implications, and promising practices. *Ment Retard Dev Disabil Res Rev* 13(2): 178-87.
- ⁷³⁹ Huxley P, Evans S, Webber M, Gately C (2005). Staff shortages in the mental health workforce: the case of the disappearing approved social worker. *Health Soc Care Community* 13(6): 504-13.
- ⁷⁴⁰ Howard KI, Cornille TA, Lyons JS, Vessey JT, Lueger RJ, Saunders SM (1996). Patterns of mental health service utilization. *Arch Gen Psychiatry* 53(8): 696-703.
- ⁷⁴¹ Page-Cuttrara K (2007). Perioperative nursing education in Canada: current and future perspectives. *Can Oper Room Nurs J* 25(1): 10-2, 14-5, 18-9.
- ⁷⁴² Ainsworth D (2003). Recruitment and retention. The Derby Theatre Project experience. *Br J Perioper Nurs* 13(10): 416-8.

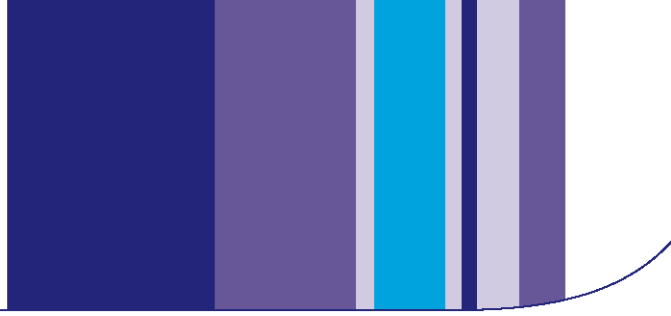
-
- 743 Tanner J (2002). Recruiting students to your theatres. *Br J Perioper Nurs* 12(5): 184-8, 190.
- 744 Chow EY, Searles GE (2010). The amazing vanishing Canadian dermatologist: results from the 2006 Canadian Dermatology Association member survey. *J Cutan Med Surg* 14(2): 71-9.
- 745 Nakayama DK, Burd RS, Newman KD (2009). Pediatric surgery workforce: supply and demand. *J Pediatr Surg* 44(9): 1677-82.
- 746 Arnold RW, Goske MJ, Bulas DI, Benya EC, Ying J, Sunshine JH (2009). Factors influencing subspecialty choice among radiology residents: a case study of pediatric radiology. *J Am Coll Radiol* 6(9): 635-42.
- 747 Nomura K, Inoue S, Yano E (2009). The shortage of pediatrician workforce in rural areas of Japan. *Tohoku J Exp Med* 217(4): 299-305.
- 748 Bale JF Jr, Currey M, Firth S, Larson R (2009). The Child Neurology Workforce Study: pediatrician access and satisfaction. *J Pediatr* 154(4): 602-606.
- 749 Robinson S, Cox S, Murrells T (2006). Developing the children's nursing workforce: profile, first jobs and future plans of newly qualified diplomates. *J Child Health Care* 10(1): 55-68.
- 750 Larson SA, Hewitt AS, Lakin KC (2004). Multiperspective analysis of workforce challenges and their effects on consumer and family quality of life. *Am J Ment Retard* 109(6): 481-500.
- 751 Wolfenden K, Blanchard P, Probst S (1996). Recruitment and retention: perceptions of rural mental health workers. *Aust J Rural Health* 4(2): 89-95.
- 752 Friedman J, Laxer RM (2000). Providing after-hours on-call clinical coverage in academic health sciences centres: the Hospital for Sick Children experience. *CMAJ* 163(3): 298-9.
- 753 Khan FA, Hamdani GA (2007). Factors influencing the choice of anesthesia as a career in a developing country. *Middle East J Anesthesiol* 19(1): 149-57.
- 754 Shermont H, Krepcio D (2006). The impact of culture change on nurse retention. *J Nurs Adm* 36(9): 407-15.
- 755 Blankertz LE, Robinson SE (1997). Turnover intentions of community mental health workers in psychosocial rehabilitation services. *Community Ment Health J* 33(6): 517-29.
- 756 Woltmann EM, Whitley R, McHugo GJ, Brunette M, Torrey WC, Coots L, Lynde D, Drake RE (2008). The role of staff turnover in the implementation of evidence-based practices in mental health care. *Psychiatr Serv* 59(7): 732-7.
- 757 Wilks CM, Oakley Browne M, Jenner BL (2008). Attracting psychiatrists to a rural area - 10 years on. *Rural Remote Health* 8(1): 824.
- 758 Linder L (2009). Experiences of pediatric oncology nurses: the first year of hire. *J Pediatr Oncol Nurs* 26(1):29-40.
- 759 Freed GL, Dunham KM, Switalski KE (2009). Clinical inactivity among pediatricians: prevalence and perspectives. *Pediatrics* 123(2): 605-10.

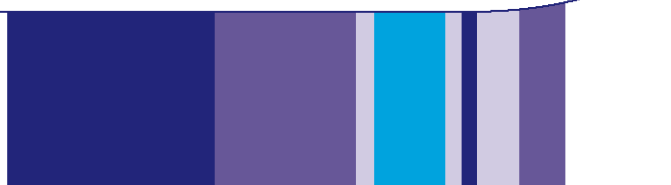
-
- ⁷⁶⁰ Jones JP, Frazier SE (1994). Assessment of self-esteem and wellness in health promotion professionals. *Psychol Rep* 75(2): 833-4.
- ⁷⁶¹ Jimenez Alvarez C, Morales Torres JL, Martínez Martínez C (2003). Study of "burnout" syndrome in Spanish pediatric surgeons. *Cir Pediatr* 15(2): 73-8.
- ⁷⁶² Fields AI, Cuerdon TT, Brasseux CO, Getson PR, Thompson AE, Orłowski JP, Youngner SJ (1995). Physician burnout in pediatric critical care medicine. *Crit Care Med* 23(8): 1425-9.
- ⁷⁶³ Jellinek MS, Todres ID, Catlin EA, Cassem EH, Salzman A (1993). Pediatric intensive care training: confronting the dark side. *Crit Care Med* 21(5): 775-9.
- ⁷⁶⁴ Losek JD (1994). Characteristics, workload, and job satisfaction of attending physicians from pediatric emergency medicine fellowship programs. Pediatric Emergency Medicine Collaborative Research Committee. *Pediatr Emerg Care* 10(5): 256-9.
- ⁷⁶⁵ Paris M Jr, Hoge MA (2010). Burnout in the mental health workforce: a review. *J Behav Health Serv Res* 37(4): 519-28.
- ⁷⁶⁶ Crawford MJ, Adedeji T, Price K, Rutter D (2010). Job satisfaction and burnout among staff working in community-based personality disorder services. *Int J Soc Psychiatry* 56(2): 196-206.
- ⁷⁶⁷ Burnard P, Edwards D, Fothergill A, Hannigan B, Coyle D (2000). Community mental health nurses in Wales: self-reported stressors and coping strategies. *J Psychiatr Ment Health Nurs* 7(6): 523-8.
- ⁷⁶⁸ Fothergill A, Edwards D, Hannigan B, Burnard P, Coyle D (2000). Self-esteem in community mental health nurses: findings from the all-Wales stress study. *J Psychiatr Ment Health Nurs* 7(4): 315-21.
- ⁷⁶⁹ Edwards D, Burnard P, Coyle D, Fothergill A, Hannigan B (2000). Stressors, moderators and stress outcomes: findings from the All-Wales Community Mental Health Nurse Study. *J Psychiatr Ment Health Nurs* 7(6): 529-37.
- ⁷⁷⁰ Edwards D, Burnard P, Coyle D, Fothergill A, Hannigan B (2001). A stepwise multivariate analysis of factors that contribute to stress for mental health nurses working in the community. *J Adv Nurs* 36(6): 805-13.
- ⁷⁷¹ Nelson T, Johnson S, Bebbington P (2009). Satisfaction and burnout among staff of crisis resolution, assertive outreach and community mental health teams. A multicentre cross sectional survey. *Soc Psychiatry Psychiatr Epidemiol* 44(7): 541-9.
- ⁷⁷² Funakoshi A, Miyamoto Y, Kayama M (2007). Managerial support of community mental health nurses. *J Adv Nurs* 58(3): 227-35.
- ⁷⁷³ Kluger MT, Bryant J (2008). Job satisfaction, stress and burnout in anaesthetic technicians in New Zealand. *Anaesth Intensive Care* 36(2): 214-21.
- ⁷⁷⁴ Bratt MM, Broome M, Kelber S, Lostocco L (2000). Influence of stress and nursing leadership on job satisfaction of pediatric intensive care unit nurses. *Am J Crit Care* 9(5): 307-17.
- ⁷⁷⁵ Gallagher R, Gormley DK (2009). Perceptions of stress, burnout, and support systems in pediatric bone marrow transplantation nursing. *Clin J Oncol Nurs* 13(6): 681-5.

-
- ⁷⁷⁶ Baker JG, Baker DF (1999). Perceived ideological differences, job satisfaction and organizational commitment among psychiatrists in a community mental health center. *Community Ment Health J* 35(1): 85-95.
- ⁷⁷⁷ Ben-Dror R (1994). Employee turnover in community mental health organization: a developmental stages study. *Community Ment Health J* 30(3): 243-57.
- ⁷⁷⁸ Vessey JA, Demarco RF, Gaffney DA, Budin WC (2009). Bullying of staff registered nurses in the workplace: a preliminary study for developing personal and organizational strategies for the transformation of hostile to healthy workplace environments. *J Prof Nurs* 25(5): 299-306.
- ⁷⁷⁹ Sexton KA, Teasley SL, Cox KS, Carroll CA (2007). United States operating room nurses: work environment perceptions. *J Perioper Pract* 17(3): 108, 110-4, 116-7.
- ⁷⁸⁰ Rheingans JI (2008). Relationship between pediatric oncology nurses' management of patients' symptoms and job satisfaction. *J Pediatr Oncol Nurs* 25(6): 312-22.
- ⁷⁸¹ Blankertz LE, Robinson SE (1997). Recruitment and retention of psychosocial rehabilitation workers. *Adm Policy Ment Health* 24(3): 221-34.
- ⁷⁸² Henry S (1990). Non-salary retention incentives for social workers in public mental health. *Adm Soc Work* 14(3): 1-15.
- ⁷⁸³ Vanier C, Fortin D (1996). Exploratory study of the sources of stress and of social support in community and mental health workers. *Sante Ment Que* 21(2): 200-23.
- ⁷⁸⁴ Priebe S, Fakhoury WK, Hoffmann K, Powell RA (2005). Morale and job perception of community mental health professionals in Berlin and London. *Soc Psychiatry Psychiatr Epidemiol* 40(3): 223-32.
- ⁷⁸⁵ Galeazzi GM, Delmonte S, Fakhoury W, Priebe S (2004). Morale of mental health professionals in Community Mental Health Services of a Northern Italian Province. *Epidemiol Psichiatr Soc* 13(3): 191-7.
- ⁷⁸⁶ Powell RA, Lloyd KR (2001). A national survey of violence experienced by community mental health researchers. *Soc Psychiatry Psychiatr Epidemiol* 36(3): 158-63.
- ⁷⁸⁷ Spear J (2006). Why do health professionals work in a community mental health service? *Australas Psychiatry* 14(2): 175-9.
- ⁷⁸⁸ Reininghaus U, Priebe S (2007). Assessing morale in community mental health professionals: a pooled analysis of data from four European countries. *Soc Psychiatry Psychiatr Epidemiol* 42(3): 237-43.
- ⁷⁸⁹ Prosser D, Johnson S, Kuipers E, Szmukler G, Bebbington P, Thornicroft G (1997). Perceived sources of work stress and satisfaction among hospital and community mental health staff, and their relation to mental health, burnout and job satisfaction. *J Psychosom Res* 43(1): 51-9.
- ⁷⁹⁰ Leary J, Gallagher T, Carson J, Fagin L, Bartlett H, Brown D (1995). Stress and coping strategies in community psychiatric nurses: a Q-methodological study. *J Adv Nurs* 21(2): 230-7.
- ⁷⁹¹ Hagglund KM, Helsing C, Sandmark H (2010). Assistant nurses working in care of older people: associations with sustainable work ability. *Scand J Caring Sci* (Published online August 2010).

-
- ⁷⁹² Annang L, Richter DL, Fletcher FE, Weis MA, Fernandes PR, Clary LA (2010). Diversifying the academic public health workforce: strategies to extend the discourse about limited racial and ethnic diversity in the public health academy. *ABNF J* 21(2): 39-43.
- ⁷⁹³ Fowler K, Celebuski C, Edgar T, Kroger F, Ratzan SC (1999). An assessment of the health communication job market across multiple types of organizations. *J Health Commun* 4(4): 327-42.
- ⁷⁹⁴ Minkovitz CS, Chandra A, Solomon BS, McDonnell KA, Silver GB, Tonniges TF (2006). Community pediatrics: gender differences in perspectives of residents. *Ambul Pediatr* 6(6): 326-31.
- ⁷⁹⁵ Sexton KA, Teasley SL, Cox KS, Carroll CA (2007). United States operating room nurses: work environment perceptions. *J Perioper Pract* 17(3): 108, 110-4, 116-7.
- ⁷⁹⁶ Gellis ZD, Kim JC (2004). Predictors of depressive mood, occupational stress, and propensity to leave in older and younger mental health case managers. *Community Ment Health J* 40(5): 407-21.
- ⁷⁹⁷ Salyers MP, Bond GR (2001). An exploratory analysis of racial factors in staff burnout among assertive community treatment workers. *Community Ment Health J* 37(5): 393-404.
- ⁷⁹⁸ Foley KL, Balazs P (2010). Social will for tobacco control among the Hungarian public health workforce. *Cent Eur J Public Health* 18(1): 25-30.
- ⁷⁹⁹ Gillespie BM, Chaboyer W, Wallis M (2009). The influence of personal characteristics on the resilience of operating room nurses: a predictor study. *Int J Nurs Stud* 46(7): 968-76.
- ⁸⁰⁰ Mayer ML, Preisser JS (2005). The changing composition of the pediatric medical subspecialty workforce. *Pediatrics* 116(4): 833-40.
- ⁸⁰¹ Smith NP, Dykes EH, Youngson GS, Losty PD (2006). Is the grass greener? A survey of female pediatric surgeons in the United Kingdom. *J Pediatr Surg* 41(11): 1879-81.
- ⁸⁰² Valentine JP, Martin CJ (1996). Job sharing at a children's hospital: evaluation by medical staff. *BMJ* 312(7023): 115-6.
- ⁸⁰³ Cull WL, Caspary GL, Olson LM (2008). Many pediatric residents seek and obtain part-time positions. *Pediatrics* 121(2): 276-81.
- ⁸⁰⁴ Harris MC, Marx J, Gallagher PR, Ludwig S (2005). General vs subspecialty pediatrics: factors leading to residents' career decisions over a 12-year period. *Arch Pediatr Adolesc Med* 159(3): 212-6.
- ⁸⁰⁵ Kahn JA, Parsons SK, Pizzo PA, Newburger JW, Homer CJ (2001). Work-family issues and perceptions of stress among pediatric faculty and house staff. *Ambul Pediatr* 1(3): 141-9.
- ⁸⁰⁶ Pan RJ, Cull WL, Brotherton SE (2002). Pediatric residents' career intentions: data from the leading edge of the pediatrician workforce. *Pediatrics* 109(2): 182-8.
- ⁸⁰⁷ Cull WL, Mulvey HJ, O'Connor KG, Sowell DR, Berkowitz CD, Britton CV (2002). Pediatricians working part-time: past, present, and future. *Pediatrics* 109(6): 1015-20.
- ⁸⁰⁸ Henderson J, Willis E, Walter B, Toffoli L (2008). Community mental health nursing: keeping pace with care delivery? *Int J Ment Health Nurs* 17(3): 162-70.

-
- ⁸⁰⁹ Demers AR, Mamary E (2008). Assessing the professional development needs of public health educators in light of changing competencies. *Prev Chronic Dis* 5(4): A129.
- ⁸¹⁰ Glisson C, Schoenwald SK, Kelleher K, Landsverk J, Hoagwood KE, Mayberg S, Green P (2008). Therapist turnover and new program sustainability in mental health clinics as a function of organizational culture, climate, and service structure. *Adm Policy Ment Health* 35(1-2): 124-33.
- ⁸¹¹ Corkin D, Clarke S (2007). Children's nursing education: 'the future characterised by paradoxes'. *Paediatr Nurs* 19(8): 27-30.
- ⁸¹² Hanson CM (1991). The 1990s and beyond: determining the need for community health and primary care nurses for rural populations. *J Rural Health* 7(4 Suppl): 413-26.
- ⁸¹³ Casey MM, Wholey D, Moscovice IS (2008). Rural emergency department staffing and participation in emergency certification and training programs. *J Rural Health* 24(3): 253-62.
- ⁸¹⁴ Jewett EA, Anderson MR, Gilchrist GS (2005). The pediatric subspecialty workforce: public policy and forces for change. *Pediatrics* 116(5): 1192-202.
- ⁸¹⁵ Goodman DC (2005). The pediatrician workforce: current status and future prospects. *Pediatrics* 116(1): e156-73.
- ⁸¹⁶ Rousseau DM (1995). Psychological contracts in organizations: understanding written and unwritten agreements. Thousand Oaks, CA: Sage.
- ⁸¹⁷ Huselid M (1995). The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance. *Acad Manage J* 38(3):972-991.
- ⁸¹⁸ Ichniowski C, Shaw K, Prenushi G (1997). The effects of human resource practices on productivity: a study of steel finishing lines. *Am Economic Rev* 87(3):291-313.
- ⁸¹⁹ MacDuffie JP (1995). Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the world auto industry. *Industrial and Labor Relations Review* 48(2):197-221.
- ⁸²⁰ Buchan J, Calman (2005). Skill-mix and policy change in the health workforce: Nurses in advanced roles. Paris: OECD.
- ⁸²¹ Richardson G (1999). Identifying, evaluating and implementing cost-effective skill mix. *J Nurs Manag* 7(5):265-70.
- ⁸²² Spilsbury K, Meyer J (2004). Use, misuse and non-use of health care assistants: understanding the work of health care assistants in a hospital setting. *J Nurs Manag* 12, 411-418.
- ⁸²³ Savitz LA, Jones CB, Bernard S (2005). Quality indicators sensitive to nurse staffing in acute care settings. *Advances in Patient Safety: from Research to Implementation* 4:375-385.
- ⁸²⁴ Ayre TC, Gerdtz MF, Parker J, Nelson S (2007). Nursing skill mix and outcomes: a Singapore perspective. *Int Nurs Rev* 54(1):56-62.
- ⁸²⁵ Schoenwald SK, Hoagwood KE, Atkins MS, Evans ME, Ringeisen H (2010). Workforce development and the organization of work: the science we need. *Adm Policy Ment Health* 37(1-2): 71-80.





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