Issue 2

Nursing workforce planning: mapping the policy trail

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The authors alone are responsible for the contents of the report and conclusions.

Executive Summary

Planning for the efficient and effective delivery of health care services to meet the health needs of the populations is a significant challenge. Globally policy makers, educators, health service researchers, leaders of unions and professional associations, and other key stakeholders struggle with the best way to plan for a workforce to fulfil the health needs of populations. To meet this challenge, achieving the appropriate balance between human and non-human resources is important and requires continuous monitoring, careful attention to the country specific context in which policy decisions are made, and evidence-based decision-making. This paper provides an overview of current evidence and policy initiatives pertinent to the nursing workforce including: health human resource (HHR) planning, service planning and modelling; nursing workforce imbalances and internal migration; and approaches to nursing deployment and utilisation. Policy implications and recommendations are offered.

Human resource planning needs to be placed within the broader system in which health care services are provided. The effect of social, political, geographical, technological and economic factors and their influence on the efficient and effective mix of human and non-human resources must be considered in planning for and managing the health care workforce. In addition, the issue of political will is an important one. Today's human resource challenges have evolved slowly over the past 50 years. Past mistakes cannot be overcome within the timeframe of a single or even a second political mandate. Although critical, sustained HHR planning efforts by policymakers and key stakeholders are very difficult given changing governments and political agendas. Policymakers and researchers must work in concert to keep the health policy issues relevant, easily understood, and practical.

HHR planning must promote and support models, practices and strategies, which are needs-based and outcome-directed and explicitly recognise the dynamic nature of the factors that impact HHR planning decisions and allocations. Furthermore, building relationships is critical to successful HHR planning. Effective and ongoing coordination of the interaction among government, research and administrative stakeholders through advisory, research, and communication infrastructures is essential.

Traditionally, HHR planning has been performed independently and in isolation of other aspects of planning in the health care sector (Lomas, Stoddar and Barer 1985; Birch et al. 1994; Denton, Gafni and Spencer 1995; Vujicic 2003). However, important principles of the HHR Conceptual Framework (O'Brien-Pallas et al. 2001a) are that human resources are key inputs in the production of health care services (Birch and Maynard 1985) and that the levels and methods of service production are determined by the prevailing social, economic and political contexts (O'Brien-Pallas et al. 2001a). In this way, the need for human resources is derived from the need for health care services and the methods used to produce those services.

The social, economic and political contexts determine the requirements for health care services. For example, the social and political contexts determine the means of access to health care services (e.g. willingness and ability to pay for care, ability to benefit) while the economic context influences the aggregate level of resources (or share of society's economic output) to be allocated to health care services (Lavis and Birch 1997). Clearly, planning to produce health care providers to meet all the health needs of the population would be wasteful if no mechanism were in place to fund the provision of these services.

Contextual considerations are not confined to these broad 'macro-level' influences on human resource requirements. Human resources do not provide health care services in isolation – instead, the production of health care services generally employs a mixture of human and non-human resources – i.e. a health care production function that uses a range of inputs to generate health care services (Gray 1982; Birch 2002). The health care sector is noted

for the high level of 'labour intensity' compared to other sectors. If some health care services could be delivered in ways that do not require human resources and that maintained the quality and quantity of outcomes but at a lower cost, there would be no need for human resources in the provision of such services. Since fully automated health care services are a distant future, human resources continue to be key inputs for health care production.

Simulation is a powerful tool for integrating knowledge of the components of complex systems, improving understanding of the dynamics of the system, and rehearsing strategies and policies to avoid hidden pitfalls (Kephart et al. 2004). Simulation modelling being carried out in some countries, particularly in Canada, has provided many insights that are practical for planning. Applied to human resource planning for nursing, dynamic simulation models can provide not only valuable insights on the reasons for the current crisis, but also alternatives for resolving the problem. Simulations allow planners to explore consequences of alternative policies, facilitate input and output sensitivity analysis, and make it easier to involve stakeholders throughout the planning and management process (Kephart, O'Brien-Pallas and Tomblin Murphy 2004). Simulations are a means, not an end, to assist planners in decision-making. The extent to which simulation provides useful scenarios for consideration is dependent upon the quality of the data used in the model and the extent to which the variables modelled reflect the system as a whole.

To be optimally effective, needs-based models of HHR planning require high quality data from a wide variety of sources. Although much of immediate relevance can be accomplished by careful analysis of existing data within a framework of a well-defined needs-based HHR planning model, there is little doubt that research, policy and planning initiatives continue to be significantly hampered by a lack of quality data, which are both comparable and comprehensive.

Nursing workforce imbalances, which have been reported worldwide across regions, health care sectors and clinical specialties (O'Brien-Pallas et al. 1997a) can be exacerbated by migration patterns. Internal migration does not remedy workforce over- or under-supply and compounds planning difficulties at a national level. Currently, the extent of internal migration in most countries is not easy to accurately determine due to inadequate data sources. Many argue that the development of a unique identifier for nurses could aid in tracking workforce imbalances and migration patterns (Tomblin Murphy and O'Brien-Pallas 2004; Baumann et al. 2004a). Planners need to be aware that, when creating new roles or developing incentives that redistribute the workforce, unintended shortages may emerge in other sectors or regions. To build nursing capacity in under-serviced areas and prevent the loss of nurses to large urban areas where educational programmes are often concentrated, access and delivery of nursing education should occur closer to home.

At the organisational level, deployment and utilisation of nursing human resources cannot be considered in isolation of the system in which nursing care is delivered. Provision of nursing services is now understood to result from a complex array of health care system inputs, throughputs, and intermediate and distal outputs (O'Brien-Pallas 1988; O'Brien-Pallas et al. 1997b; O'Brien-Pallas, Irvine Doran et al. 2001c, 2002). Nurse staffing, workload, nursing unit utilisation, and productivity are potential tools for managing the deployment and utilisation of nurses at the local or organisational level.

Nurse staffing measures often calculate the amount of nursing resources available relative to the number of occupied beds. However, simply counting beds provides little information about the care requirements of the patients in the beds. Conceptually, nurse:patient ratios assume an average nurse capacity or a standard time per occupied bed. Developed in the 1980s in North America, diagnostic groupings (e.g. Case Mix Groups in Canada or Diagnosis Related Groups in the United States of America) were used to manage nursing

resources, reflecting a return to the standard nursing hour determined by diagnostic grouping as opposed to standard hours per bed. Another aspect of nurse staffing is staff mix (i.e. the types and combinations of health care workers providing direct patient care).

Nursing workload measures focus on patients' requirements for nursing care. Workload and patient classification systems are primarily used for staffing decisions within organisations. When used with experience and judgment in the context of continuing validation and ongoing reliability, these systems can be used effectively to guide staffing decisions. However, when pushed beyond their original purposes (e.g. for case costing or inter-organisational comparisons), the non-equivalence of patient classification systems is problematic. Hospital workload data are necessary for local and national management of nursing resources, but alone, are insufficient to engage in HHR and service planning.

By combining measures of nurse staffing and workload to examine the demands for nursing service relative to the amount of nursing resources used to provide that service, nursing unit utilisation may provide a greater understanding of the effect of the amount of nursing resources on outcomes than either nurse staffing and workload alone. Calculated at the unit level as patient workload divided by nurse worked hours, nursing unit utilisation measures how well an organisation staffs to meet patient care standards and needs (O'Brien-Pallas et al. 2004c). The rate of services per provider is a measure of productivity and forms a major element of estimating the required number of human resources (Birch 2002). This definition of productivity is consistent with concepts of productivity in other sectors of the economy and focuses exclusively on the relationship between outputs and an individual input. However, this differs from traditional uses of productivity in the health care sector that describe the demands placed on a provider (i.e. what proportion of time is devoted to direct patient care) without any reference to the quantity of service outputs (O'Brien-Pallas et al. 2004c). This measure of demands on providers is more accurately described as an indicator of work intensity or utilisation and, although it is not a measure of the rate of output produced, it will have implications for that rate of output. Failure to incorporate considerations of productivity in HHR planning risks overestimating the number of providers required to meet population needs and hence results in an 'excessive' number of providers seeking ways of delivering services. It also overlooks an important policy instrument for dealing with imbalances between requirements and availability of HHR.

Internationally, nursing workforce planning is a priority for policy planners. Strategies to effectively plan for and manage nurses and other health care providers are of utmost importance. In addition, adequately resourced policies to deal with the ongoing issues of recruitment and retention need to be developed, implemented, and evaluated to determine their utility.

Introduction

The World Health Organization (WHO) emphasises that the integration and coordination of services and human resources must be based on a Primary Health Care model (WHO 1978). HHR should be broad in nature, incorporating the entire health workforce (Health Systems Improving Performance 2000). Furthermore, health providers, planners and government policy makers must be involved in the entire planning process to enhance HHR policy. Health system inputs must consider the appropriate balance between human and physical capital. Human capital decisions include the appropriate quantity, mix and distribution of health services. Achieving this balance requires continuous monitoring, attention to the contexts of the countries in which choices are being made, and the use of research evidence to ensure that population health needs are addressed effectively and efficiently. This paper provides an overview of current evidence and policy initiatives pertinent to the nursing workforce on national models of health workforce planning and service planning, as well as geographic maldistribution and intra-national migration. The paper appraises different approaches to determining staffing levels and assessing nursing workload at the local level.

Section One: Health Human Resource Planning

Overview

Planning and management of health human resource (HHR) are important issues for policy makers, health care administrators, professional associations, unions, and health services and policy researchers. Many of the most pressing health care policy issues at any point in time involve HHR in one way or another, a product of the fact that health care is a human resource-intensive activity. In the face of growing expectations and technological innovations in health care, and an aging population with different needs than previous generations, decision makers are increasingly challenged to improve efficiency in the use of health care resources. This is achieved in part by changing the level and mix of personnel delivering the services and by ensuring an adequate supply of human resources to meet the health needs of the population. Decisions about the level and deployment of HHR are often made in response to short-term financial pressures as opposed to evidence of the effectiveness of their use on health outcomes (Tomblin Murphy and O'Brien-Pallas 2002).

Health human resource planning is a priority issue for governments and planners globally. Recently in an international comparative review of planning human resources in health care in Australia, France, Germany, Sweden and the United States of America (USA), Bloor and Maynard (2003) concluded that countries ignore relationships between professions and that planning is inadequate. Although future demand for physicians is often considered, most planning is carried out in discipline specific silos using supply data with major gaps. They reinforce the need to conduct integrated planning across health professions with an emphasis on the impact of geography and skill mix. Similarly, in a review of international health workforce planning, Health Canada (2002) suggested that silo-specific planning persists in Germany, the Netherlands and Australia. A more integrated approach was apparent in the USA, New Zealand and the United Kingdom (UK). WHO and reports from the USA, the UK and Australia identify the need to collect certain data elements to influence HHR planning and management (WHO 2002a). However, prioritisation of information needs and indicators to guide the process is urgently required. In addition, the historical emphasis on the collection of supply-based variables must shift to include such factors as population health needs, demand factors and social, political, technological, and economic factors.

Even though some countries like Australia (National Health Data Committee 2003) and Canada (Tomblin Murphy and O'Brien-Pallas 2004a) are identifying the necessary data elements for a National Minimum Data Set, easily accessed clinical, administrative and provider data bases are still needed to conduct HHR modelling activities (O'Brien Pallas et al. 2000a; Figure 1). Recently in Canada, the Canadian Institute for Health Information (CIHI) undertook a consultative approach to propose a supply-based national HHR Minimum Data Set (Tomblin Murphy and O'Brien-Pallas 2004a). Findings from this process have been outlined in the document, *The Development of a National Minimum Data Set for Health Human Resources in Canada: Beginning the Dialogue – Working Document, August 2004*. Through broad consultation, the information needs, indicators and data elements presented in this report will be refined and modified. Other countries, including the UK and Australia for instance, are also involved in similar processes.

A number of authors emphasise the need to integrate HHR planning and management into the broader strategic planning for health (Health Canada 2002; WHO 2002b). Diverse attempts to reform health care have been hampered by a lack of attention to human resource management (Buchan and DalPoz 2002). Health care reform creates dramatic changes to the health workforce. In Canada, the UK and the USA, health care reform

policies include the shift of hospital services to other sectors and the consolidation of health care services into larger organisations. These changes resulted in a significant increase in non-physician clinicians in primary health care (Atherton and Murray 2001). Given that health care is labour intensive with HHR consuming a large portion of health care budgets, broader approaches to health care planning surprisingly have not integrated HHR management (WHO 2002a).

Still in its infancy, integrated HHR planning has only recently emerged in the literature. Despite support in the literature for a policy shift to integrated planning, at the level of operations few completed examples are found (Biscoe 2001). One development is the creation of a central planning body at a national level to assume responsibility for HHR planning. In the past few years, this approach has been adopted by several countries including Australia, New Zealand and the Netherlands (Health Canada 2002). Until recently, however, Australia has focused only on physician resources. Other countries are changing their approaches to HHR management by expanding the planning process itself to include an array of variables including anticipated health system reform, population health and economic factors (O'Brien-Pallas et al. 2000b; Biscoe 2001; WHO 2002b; Buchan and DalPoz 2002).

WHO, which has been concerned about HHR for some time, has made significant contributions to educating governments on the importance of HHR management to strengthening health for all and to providing appropriate health services. WHO provides countries with tool kits for assessing HHR and is building a database of HHR policies (WHO 2002a, 2002b). Twice in the past decade the World Health Assembly has adopted resolutions to strengthen nursing and midwifery to address inequities in health. In 2001, Biscoe conducted an international review of the political and policy context of HHR for the WHO Global Health Workforce Strategy Group. The report addressed several issues, and includes identifying HHR best practices, successes and failures in implementing change in HHR policy and practice, the appropriate role of national level involvement in HHR in a decentralised system, trends in the implementation of new ideas and theories in HHR, and actions to better facilitate integration of HHR into health systems planning. The author concluded that health leaders do not well enough understand the strategic importance of human resources to strengthening health system capacity. Despite the availability of case histories of innovation and system change using HHR strategies, very little evidence exists to inform decision-makers on best practices (Biscoe 2001).

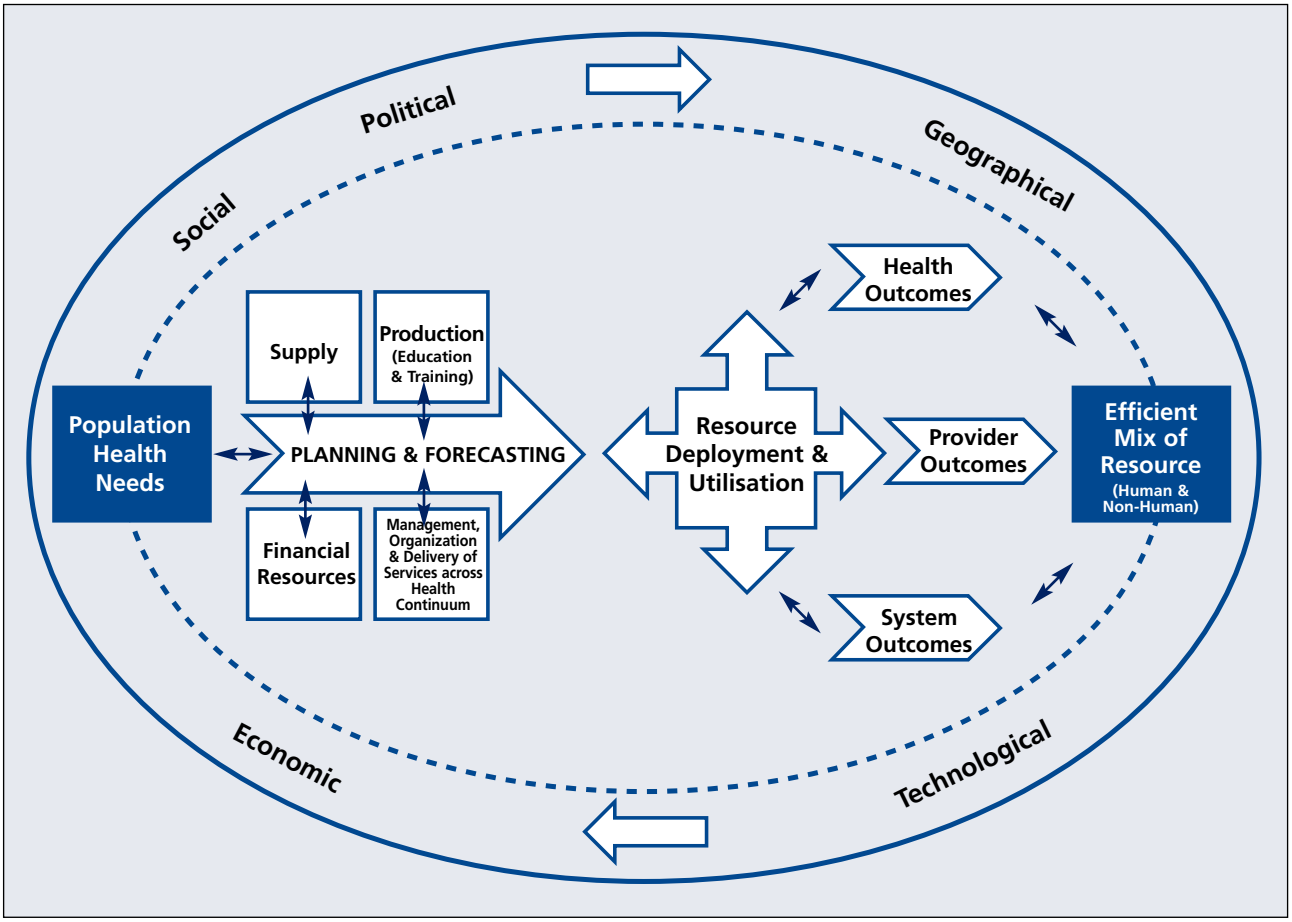
In conclusion, the international literature confirms a policy shift to an integrated approach to HHR planning as part of health system planning. Several countries have established organisations to engage in HHR planning and HHR research, signalling a commitment to the strategic importance of HHR and a plan to invest in long-term, stable HHR planning processes. This is a dramatic shift from the historical once-at-a-time and one-group-at-a-time analysis (Smith and Preker 2000; Health Canada 2002; WHO 2002b). Although inadequate data were frequently identified as a barrier to HHR management, the scope of information required was not delineated.

Health Human Resources Conceptual Framework

The HHR Conceptual Framework developed by O'Brien-Pallas, Tomblin Murphy, Birch and Baumann considers the key elements of the HHR planning process. It is helpful to policy makers and health services researchers and planners in planning a health care workforce to meet the health needs of the population (CIHI 2001; O'Brien-Pallas et al. 2001a, 2001b). The relationship between population health needs and outcomes has rarely been examined, except by members of the research team on this project. Three studies of this nature have been completed (Eyles, Birch and Newbold 1993; Tomblin Murphy et al. 2003, 2004b). Since no models or methods are universally accepted, this Framework can facilitate HHR planning and management, and has been selected by

the CIHI as the model for HHR planning in Canada. A detailed description of the model is available elsewhere (see O'Brien-Pallas 2002). Briefly, the Framework (Figure 1) provides researchers and planners with a guide to decision-making that considers current circumstances (e.g. supply of workers) as well as those factors that need to be accounted for in predicting future requirements (e.g. fiscal resources, changes in worker education and training). This open-systems approach incorporates factors that have not always been included in the planning process. Human resource planning needs to be placed within the broader system in which health care services are provided and must take into account the impact of several important related factors. These include: social, political, geographical, technological and economic factors, and how these influence the efficient and effective mix of both human and non-human resources. At the core of the Framework is the recognition that HHR must be matched as closely as possible to the health needs of the population (O'Brien-Pallas et al. 2001b). HHR planning must reflect the complex nature of the processes underlying the needs for services (population health) and the delivery of services (health care provision), as well as the effects of HHR planning on population, provider and system outcomes (Birch et al. 2003).

Figure 1: Health Human Resources Conceptual Framework



Source: O'Brien-Pallas et al. (2001); adapted from O'Brien-Pallas and Baumann (1997).

Approaches to health human resource planning

In Canada and other member countries of the Organization for Economic Co-operation and Development (OECD), shortages of nurses, physicians and other health professionals persist. Developing a long-term approach to HHR planning requires partnerships among policy makers, health care leaders and researchers (Sechrist, Lewis and Rutledge 1999). Due to the critical global shortages of all health care providers, there are numerous initiatives where governments (all levels), unions, professional associations, regulators, researchers, etc. sit at the same table to share perspectives not only on the related issues, but also on strategies to arrive at short, medium and long-term solutions. HHR planning models attempt to provide evidence to determine requirements for health care workers by approximating future planning requirements based on factors specific to the model being employed. The few methods available for predicting human resource requirements are plagued with methodological and conceptual difficulties (O'Brien-Pallas et al. 2001a).

For too long, HHR planners have only considered supply variables in planning (e.g. the age and sex characteristics of the health workforce). Birch first described a standard distinction among three approaches to HHR planning and their related assumptions, questions and methods (Lavis and Birch 1997; O'Brien-Pallas et al. 2000a). These approaches are utilisation-based (the number of health professionals required to serve the future population in the same way as the current population); needs-based (the number of health professionals required to meet the needs of the population); and effective demand-based (the number of health professionals required to support society's commitment to health care). Birch et al. (2003) emphasise that, traditionally, HHR planning has largely been an exercise in demography based on implicit assumptions that population structure alone determines the service needs of the population and that the age of providers determines the quantity of care provided. The main limitation of such approaches is the failure to reflect the complex nature of the processes underlying the needs for services (population health) and the delivery of services (health care provision), as well as the effects of HHR planning on population, provider, and system outcomes (Birch et al. 2003).

Health human resource planning has been supply-driven with very little attention paid to demand factors and health needs of the population. Although the concept of "demand" is critical in HHR planning, its meaning is inconsistent. Demand factors impact future resource requirements and drive the work patterns of health professionals and utilisation. Demand factors include population demographics, innovations and technology, availability of treatment and options, patient attributes, wait lists, access to services, service utilisation, and incidence of disease. A comprehensive HHR model addresses as many of these factors as possible.

Birch et al. (2003) argue that HHR requirements should be considered along with the relationships among the levels and mix of resources used to produce health care services and the quantity and quality of services produced. The efficient and effective mix of human resources is determined by the interaction of the many elements of the HHR Conceptual Framework (Figure 1). The Framework provides an evidence-base for exploring the implications of health care policies for planning future HHR.

Although critical, sustained HHR planning efforts by policy makers and key stakeholders are very difficult given changing governments and political agendas. The issue of political will is an important one. Today's human resource challenges have evolved slowly over the past 50 years. Past mistakes cannot be overcome within the timeframe of a single or even a second political mandate. Policy makers and researchers must work in concert to keep the health policy issues relevant, easily understood, and practical.

In addition to social, political, technological and economic factors, geographical factors must be considered in HHR planning. With appropriate and available data, the HHR Conceptual Framework can be applied to urban and rural areas. The approach begins by examining the dynamic nature of population health needs. Population characteristics related to health levels and risks reflect the varied characteristics of individuals in the population that create the demand for curative and preventative health services. Consideration must be given to people's responses to their environments, the economy, and the accessibility and quality of their health care systems. Outcomes must drive the HHR planning process. The outcomes of interest are related to the system (e.g. cost per case, number of preventable return visits); providers (e.g. health status, turnover); and the health of the populace (e.g. health status, preventable deaths) (O'Brien-Pallas 2002).

Nurse labour market indicators

How can labour market indicators be used in workforce planning? Globally, repetitive cycles of over- and under-supply of HHR reflect inadequate projection methods used to estimate future requirements for expanding health systems and the failure to consider the evidence supplied by ongoing labour market trends (Aiken and Salmon 1994; Buchan and Edwards 2000; O'Brien-Pallas et al. 1998; Pong 1997; Schroeder 1994; Sullivan et al. 1996; O'Brien-Pallas et al. 2000b). Although HHR planning must consider international migration of health care providers (Buchan and O'May 1999), the lack of international mobility data hinders the potential for modelling international nurse flow (Buchan and O'May 1999; Buchan, Parkin and Sochalski 2003). Globalisation and the migration of workforces signal a need to use labour market indicators in planning. The International Labour Office (ILO) has played a major role in establishing the Key Indicators of the Labour Market to monitor labour trends. As shown in Table 1, 20 indicators were selected according to conceptual relevance, data availability, and compatibility across regions (www.ilo.org/public/english/employment/strat/kilm/indicats.htm). These indicators can assist countries in examining the overall status of the health workforce in the broader labour market, nationally and internationally, through comparison with countries at similar levels of development or by WHO region (O'Brien-Pallas et al. 2000b).

For world comparison purposes, five indicators are the foci (labour force participation rates; employment to population ratio; employment by sector; unemployment; youth employment). The capacity of countries to collect these data varies widely. Countries that have regulatory bodies mandated to collect information about health professional workforces have better databases. In Canada and the WHO European Region, the availability of nursing and allied health data, population demographics, hospitals, number of beds and nurse to population ratios provide the necessary information in each of the five designated categories (www.cihi.ca; www.statscan.ca; www.who.dk). However, some countries lack data, organisational structures, technical staff, electronic infrastructure and the financial resources for information technology, as well as the training required to support the collection of information by region (O'Brien-Pallas et al. 2000b).

Data collection is a particular challenge for countries that struggle to provide even the most basic of health care services. However, some of the current human resource difficulties experienced in these countries may be due to the absence of such data and related planning. Sound data on the existing numbers and distribution of human resources, especially linked to data on health system performance, can contribute to the formulation of policies and plans to address health problems (Health Systems Improving Performance 2000).

Table 1: International Labour Office – key Indicators of the labour market

1. Labour force participation*
2. Employment:population ratio*
3. Status in employment
4. Employment by sector*
5. Part-time workers
6. Hours of work
7. Employment in the informal economy
8. Unemployment*
9. Youth employment*
10. Long-term employment
11. Unemployment by educational attainment
12. Time-related underemployment
13. Inactivity rate
14. Educational attainment and illiteracy
15. Manufacturing wage indices
16. Occupational wage indices
17. Hourly compensation costs
18. Labour productivity and unit labour costs
19. Labour market flows
20. Poverty and income distribution

*ILO - targetting 5 of 20 indicators for world and regional estimation

Careful analysis of labour market indicators could inform decision-making on these issues. In both developed and developing countries significant challenges remain in meeting the health needs of populations outside urban areas. Presently, comparisons among countries across any sector, including the health sector, are difficult.

For the most part, the labour market indicators represent the key variables needed to analyse the basic supply and distribution of different health providers in particular world regions and can be used to populate the supply component of the HHR Conceptual Framework (Figure 1). Unfortunately, analyses in some countries and regions are limited by inadequate data on workforce supply and characteristics, which are the most basic data elements. The supply component of the HHR model and the related analyses cannot be completed if these basic data are lacking. On the other hand, when good quality data exist about the supply and distribution of the workforce, attempts are often not made to examine the relationships among the needs of the population for health care services and the resulting population, provider and system outcomes. Instead, basic supply models, whose limitations were identified earlier, are frequently conducted within separate professional silos (i.e. planning is not integrated across health professions). A focus on supply alone provides insufficient information to plan for future population health needs and provider requirements.

Data challenges

Given the massive restructuring under health reform, other types of information are needed as well. For example, data regarding shifts from institutional to community-based care and the integration of community services, primary health care and institutional care must be monitored. It is essential to track changes in governance (e.g. devolution to regional health boards and mergers), methods of funding, reimbursement of professional

services, cost-shifting and burden sharing. And it is also critical to follow trends in the redefinition and reconfiguration of professional roles. Mapping the effects of these reforms, however, will require a significant shift away from historical database practices. A range of options for HHR planning and management are proposed in the literature. However, HHR planning, management, and research in most countries and jurisdictions is limited by data availability, quality, and timeliness. Data should be well-defined, reliable and comparable, and should comprehensively address information needs across health professions. An emphasis on supply variables in HHR planning has been apparent (Bloor and Maynard 2003; Health Canada 2002). Many reports speak to the limitations imposed as a result of gaps in the data (Bloor and Maynard 2003; Health Canada 2002). But even though policy makers consistently identify HHR as a major priority area for health services research, the data quality in most countries is poor. One of the key challenges is the immediate need for information and evidence to support HHR policy. There is a pressing need for the development of mechanisms, which enable meaningful and efficient partnerships to progress between researchers and data gathering/holding facilities. Governments, researchers and health services executives often presume that the data which form the basis of resource planning are currently available and of good quality. Regrettably, this assumption does not reflect reality (O'Brien-Pallas 2002; Tomblin Murphy and O'Brien-Pallas 2002). Needs-based approaches, in which resource requirements are based on the estimated health needs of populations, create greater data demands than those required for supply/utilisation-based planning. The requirement to link inputs to outcomes will initially create greater data challenges. Service planning and human resource modelling without high quality data will only lead to unreliable estimates of future human resource needs and erroneous service planning models (O'Brien-Pallas 2002).

Policy implications

1. HHR planning activities should be needs-based, responsive to a changing system, and outcome directed to foster the efficiency and effectiveness of the health care system (Tomblin Murphy and O'Brien-Pallas 2002).
2. HHR planning needs to be placed within the broader system in which health care services are provided. The impact of social, political, geographical, technological and economic factors as outlined in the HHR Conceptual Framework (O'Brien-Pallas 2002) and their influence on the efficient and effective mix of both human and non-human resources must be incorporated into HHR planning activities (Tomblin Murphy and O'Brien-Pallas 2002).
3. HHR planning should be broad in nature, rather than silo specific, incorporating the entire health workforce. Key stakeholders including health providers, planners and government policy makers, must be involved in the entire planning process to facilitate acceptance of the HHR planning recommendations (Tomblin Murphy and O'Brien-Pallas 2002).
4. HHR planning cannot be conducted effectively in isolation of broader health care policy processes (Tomblin Murphy and O'Brien-Pallas 2002). There is a need for strategies that promote and support models, practices and strategies for HHR planning which are needs-based, outcome directed, and which explicitly recognise and embrace the complex and dynamic nature of the factors that impact HHR planning decisions and allocations.
5. HHR planning must address the relative needs of communities rather than simply the demand for services expressed as a function of the utilisation of services (Tomblin Murphy and O'Brien-Pallas 2002).
6. The development of solid relationships and linkages between the research and policy arenas will advance policy-relevant HHR research and promote the use of findings in policy decision-making. The need for effective and ongoing coordination of the interaction among government, research and administrative stakeholders through advisory, research, and communication infrastructures is imperative (Tomblin Murphy and O'Brien-Pallas 2002).

7. The creation of a permanent virtual institute which links several standing HHR planning research/policy institutes, nationally and internationally, should be considered. Along with an enhanced commitment to ongoing HHR planning, research and policy infrastructure support, this virtual institute will help forge the links necessary to ensure optimal HHR planning for the future (Tomblin Murphy and O'Brien-Pallas 2002).
8. Policy makers should immediately address the underutilisation of nurses and other health care professionals and the resistance toward alternate forms of health care delivery known to positively influence population health. For example, nurse practitioners need to be more widely utilised in primary health care (Tomblin Murphy and O'Brien-Pallas 2002).
9. Educational programmes across health care disciplines and roles need to foster the skills, attributes and dispositions necessary for effective, multi-disciplinary teamwork. Meeting the needs of populations requires an integrated approach to educational programming for health professionals which emphasises teams. Population health needs and social, political, economic and technological advances must be considered in the planning, implementation and evaluation phases of educational programmes (Tomblin Murphy and O'Brien-Pallas 2002).

Section Two: Integrating Workforce Planning and Service Planning

Health human resource planning also needs to be integrated with service planning. Integrated HHR planning involves determining the numbers, mix and distribution of health providers that will be required to meet population health needs at an identified future point in time (Tomblin Murphy and O'Brien-Pallas 2002, 2003). HHR planning should be aimed at ensuring that available resources for health care are allocated and managed in an efficient and effective manner. Short-term, medium-term and long-term planning are a reality and are necessary for planners to arrive at plans based on the changing needs of people and other factors. Service planning activities are concerned with how many and what type of health resources will be allocated among sectors and among human and physical capital, such as technology, drugs, human resources and creation or renewal of infrastructure (Tomblin Murphy and O'Brien-Pallas 2002, 2003). The same basic principles that underpin good HHR planning practices also underpin good service planning. If done properly, service planning and HHR planning activities should be mutually supportive. Both should be seen as part of a continuous quality improvement process which is updated at least bi-annually and where each activity informs the other. Both sets of activities should be based on evidence of best practice and current research (Tomblin Murphy and O'Brien-Pallas 2002, 2003). Where available, labour market analysis is a useful tool for understanding the shortfalls of previous planning decisions, gaining insight into the current HHR plans and planning context, and for providing clues for future corrective action to be taken along the planning horizons (O'Brien-Pallas 2002).

A vision of the health care system is needed to guide and frame planning, practice and research. This vision must be sensitive to the multiplicity of factors outlined in the HHR Conceptual Framework and provide simulation modelling opportunities to test new health care delivery strategies before implementation (e.g. to study the impact of programme management on health, system and provider outcomes prior to implementation). This includes a focus on outcomes and integrated planning in order to provide an efficient and effective health service for future generations (Tomblin Murphy and O'Brien-Pallas 2002, 2003).

Health human resource planning in the context of other service planning

Traditionally, human resource planning has been performed independently and in isolation of other aspects of planning in the health care sector (Lomas, Stoddart and Barer 1985; Birch et al. 1994; Denton, Gafni and Spencer 1995; Vujicic 2003). However, important principles of the HHR Conceptual Framework are that human resources are key inputs in the production of health care services (Birch and Maynard 1985) and that the levels and methods of service production are determined by the prevailing social, economic and political contexts (O'Brien-Pallas et al. 2001a). In this way, the need for human resources is derived from the need for health care services and the methods used to produce those services.

The social, economic and political contexts determine the requirements for health care services. For example, the social and political contexts determine the means of access to health care services (e.g. willingness and ability to pay for care, ability to benefit) while the economic context influences the aggregate level of resources (or share of society's economic output) to be allocated to health care services (Lavis and Birch 1997). Clearly, planning to produce health care providers to meet all the health needs of the population would be wasteful if no mechanism were in place to fund the provision of these services.

Contextual considerations are not confined to these broad 'macro-level' influences on human resource requirements. Human resources do not provide health care services in isolation – instead, the production of health care services generally employs a mixture of human and non-human resources – i.e. a health care production function that uses a range of inputs to generate health care services (Gray 1982; Birch 2002). Most aspects of health care services depend heavily on human resources and the health care sector is noted for the high level of 'labour intensity' compared to other sectors. If some health care services could be delivered in ways that do not require human resources (e.g. fully automated screening tests) and that maintained the quality and quantity of outcomes, but at a lower cost, there would be no need for human resources in the provision of such services. Since fully automated health care services are a distant future and, in fact, may leave the users of those services socially isolated, human resources continue to be key inputs for health care production.

The concept of the health care production function means that the quantity of human resources required to deliver a given level of health care services depends on the number and type of other human and non-human resources available. For example, a 'hospital restructuring' exercise was performed in Ontario, Canada in the mid-1990s (Ontario Health Services Restructuring Commission 2000). The main thrust of the recommendations concerned the reduction in the number of hospital beds and the relocation of some in-patient services to out-patient and community settings. In terms of the health care production function, this involved a substantial reduction in one input: hospital beds. However, because the care 'relocated' to other settings generally involved lower-severity patients, the average severity and hence the nursing needs of the remaining in-patients increased. Hospital beds do not improve patient health status; beds provide a setting for the delivery of care that generates health improvements.

In the absence of increases in nursing supply per in-patient day to cope with higher average patient severity, nursing workloads expand to meet the intensified needs of patients. In Ontario, nurse human resource planning did not accommodate the service planning consequences of the 'hospital restructuring' exercise. As a result, insufficient nurses were available to support the increased workload leading to unplanned increases in workload per nurse (Birch et al. 2003). In this example, the required number of hospital-based nurses depends, among other things, on the number of beds, other staff support and the operating theatre capacity of the hospital. To plan the number of hospital nurses simply on the basis of some measure of population need assumes implicitly that hospital nurses are the only resource required to serve population needs, or that all other resources are readily available without constraints. However, different levels of other inputs will give rise to different requirements for nurses even with the same level of population need. A reduction in hospital beds may mean that waiting time for admission is increased and patients on average have a greater level of severity on admission. Hence, the average intensity of care required for patients might be greater, thus increasing the number of nurses required to support the patient caseload.

Policy implications

1. Recognition of the concept of health care production implies that human resource needs are derived from the requirements for those health services dependent on HHR for service production and the availability of other inputs employed in production in order to achieve best outcomes for populations, providers and the system. As a result, effective human resource planning in the health care sector is informed by service planning.
2. In order to determine the appropriate number and type of human resources, information is required on the levels of services planned to be delivered using those resources and the anticipated levels of other non-human resources.

Section Three: Modelling to Support Assessment of Current and Future Planning Options

Simulation modelling

System dynamics simulations facilitate the exploration of system dynamics. Simulation is a powerful tool for integrating knowledge of the components of complex systems, improving understanding of the dynamics of the system, and rehearsing strategies and policies to avoid hidden pitfalls. These types of models can be found in fields, such as demography and population biology, where models of the dynamics of populations express the mathematical relationships between key determinants of population supply: age distribution, birth rates, death rates and growth rates (Kephart, O'Brien-Pallas and Tomblin Murphy 2004). More complex models explore the inter-relationships between regions or between two populations. These models have demonstrated that populations are characterised by complex relationships between variables (Keyfitz 1978). Moreover, simulating these relationships has provided many insights practical for planning. In addition to providing a basis for more accurate projections and forecasts for short-term predictions, simulations and models enable analysis of the longer-term implications of alternative policies (Kephart, O'Brien-Pallas and Tomblin Murphy 2004). Applied to human resource planning for nursing, dynamic simulation models can provide not only valuable insights on the reasons for the current crisis, but also alternatives for resolving the problem.

Simulations allow planners to explore consequences of alternative policies, facilitate input and output sensitivity analysis, and make it easier to involve stakeholders throughout the planning and management process. Simulations are a means, not an end, to assist planners in decision-making. The extent to which simulation provides useful scenarios for consideration is dependent upon the quality of the data used in the model and the extent to which the variables modelled reflect the system as a whole. In tracing key challenges to the use of WHO's simulation through the 1990s, Hall (2000) found the following: (1) planners want short-term estimates as longer-term projection models are too complex for some situations due to data requirements and planners are reluctant to make estimates; and (2) planners do not necessarily understand the concept of scenario testing, which they view as outcomes rather than information they can use to influence the training and deployment of health professionals to avoid or reduce the probability of shortfalls or surpluses in workforce planning. Simulation probably offers the most useful tools for assessing substitution across and within professions and for addressing issues such as the geographic distribution of health personnel.

O'Brien-Pallas et al. (2001a) report two commonly used approaches to assessing uncertainty in health projections: deterministic sensitivity analysis and stochastic simulation. A simulation model developed by Song and Rathwell (1994) estimated the demand for hospital beds and physicians in China between the years 1990-2010. The model was used to compare deterministic sensitivity analysis and stochastic simulation for assessing inherent uncertainty in health projections. The simulation model consists of three sub-models: population projections, estimation of demand for medical services and productivity of health resources. The outputs for the model include the number of hospital beds and the number of physicians required for the future. For each variable, three estimates, which comprise low and high limits and the most likely value, are produced. Even though these values are mostly intuitively based, Song and Rathwell (1994) argued that this approach represents an improvement compared to the use of a single value for input variables. Their findings indicate that the stochastic simulation method uses information more efficiently and produces more reasonable average estimates and a more meaningful range of projections than deterministic sensitivity analysis, but that a combination of methods should be considered. However, Hall (2000) cautions that detailed data requirements needed for stochastic modelling usually make these models difficult to use in developing countries.

Although techniques such as production functions, linear programming and Markov chains are attractive because the resulting models can be solved analytically, these techniques often require significant simplification of a problem to make it fit the required form. Simulation is flexible because it can model the evolution of a real-world system over time, based on mathematical or logical relations between objects and probability distributions. Rather than generating an exact mathematical solution, an iteration of a simulation generates one possible outcome. The model is run repeatedly to obtain an estimate of how the system will behave overall. Simulations are often used to analyse "what if" scenarios, a capability essential for use in health system planning. Although easier to apply than analytical methods and requiring fewer simplifying assumptions, simulations can be costly to implement because of their detailed data requirements.

Various predictive models have emerged to attempt to improve the precision and the flexibility of forecasting HHR supply and demand (Hughes, Tomblin Murphy and Pennock 1999; Pong 1997; Sullivan et al. 1996). Using some of these models, various "what if" scenarios to estimate the impact on HHR can be tested. Presently in Canada, an emphasis on HHR simulation modelling activities is seen as the opportunity to consider numerous policy options and their impact on planning, and can be considered in an interactive way involving key partners. For example, if a region increases home care by 20%, this option could be modelled to determine the subsequent human resource requirements. Unless assumptions are clear, different models used for prediction of HHR requirements will produce different results. This conclusion was previously reached by Birch et al. (1994) and O'Brien-Pallas et al. (1998, 1992). Whatever method used, O'Brien Pallas et al. (1998), Song and Rathwell (1994), and Eyles, Birch and Newbold (1993) suggest that estimates for requirements will not produce exact numbers, but rather a range of numbers. Until further model development occurs, sensitivity analysis will provide policy makers and planners with different estimates of required resources from which service need and HHR can be planned. The importance of continuously updating estimates cannot be overstated.

While previous modelling efforts in Canada have focused on forecasting future supply, as well as demand, the goal has been to predict future requirements (Ryten 1997, 2002). In contrast, simulation analysis was used recently in a Canadian Nursing Labour Market Sector Study (Kephart, O'Brien-Pallas and Tomblin Murphy 2004) to understand the relative impact of factors affecting future supply. The simulation model was implemented using Vensim (2002), a modelling programme that allows planners to conceptualise, build and run dynamic simulation models. Vensim (2002) can be extended in the future to incorporate additional system components such as productivity, work environment, and population health needs. The effective use of simulation models requires a team of people with varying perspectives and expertise to interpret the findings and to develop the policy messages from the findings. Researchers, planners, and others need to work together on simulation activities.

Retirement and retention scenarios

While reliable supply data on nurse demographics are inadequate to complete full HHR modelling, these data can be useful for examining potential workforce losses by age cohort. These analyses can inform management decisions to address aging workforces, which are a major threat to nursing workforce stability in many countries. For example, O'Brien-Pallas et al. (2003b) utilised five years of data collected by the CIHI on ages and losses of Registered Nurses (RNs) in all Canadian jurisdictions to calculate average yearly loss rates. Applying adjustments for female mortality rates from Statistics Canada and average yearly loss rates, nurses over age 50 in 2001 were aged over five years to determine losses by the year 2006. The results indicate that if nurses retire by age 65, 13% of Canadian nurses will be lost to retirement or death by the year 2006. However, if nurses retire by age 55, Canada will lose almost 28% of the workforce by 2006 (O'Brien-Pallas et al. 2003b). At this rate, Canada would simply not have enough nurses to deliver services in the same way as in 2001. The potential utility of

retaining RNs who would otherwise retire was also examined by projecting the retention of 100% of nurses aged 50-54, 75% of those aged 55-59, and 50% of those aged 60-64. The results indicated that if retention strategies were successful with these aging cohorts, almost half of the projected losses could be avoided depending on the region being considered. A similar analysis completed in the state of New South Wales in Australia indicated that significant losses of nurses were predicted between 1998 and 2004 (O'Brien-Pallas, Duffield and Alksnis 2004a). These simple retirement and retention scenarios allow policy makers to plan strategies to maintain nurses in the workforce until their maximum working age.

Policy implications

1. Key stakeholders must join together to identify common research needs, existing resources for meeting those needs, available opportunities and obstacles to overcome in building truly effective modelling approaches.
2. Until further development of models occurs, sensitivity analysis will allow policy makers and planners to have different estimates of required resources from which to plan their service need and HHR planning. The importance of continuously updating estimates cannot be overstated.
3. There needs to be a significant investment in creating and maintaining readily accessible databases that allow us to compare differences between and across jurisdictions, to understand the needs, and to determine whether the system is working in effective and efficient ways to meet the needs (Tomblin Murphy and O'Brien-Pallas 2002).
4. Modelling of retirement and retention scenarios can indicate the relative utility of policies targeting older cohorts and assist in monitoring and managing an aging nursing workforce.
5. Potential policy initiatives include the expansion of educational programmes to replenish the workforce or the modification of work environments to retain older nurses in the workforce (e.g. workload measures which accommodate activities for more experienced, older nurses who may be involved in mentoring).
6. Modelling of retirement scenarios in isolation of the broader HHR framework is inadequate for a complete HHR planning process. Although retirement scenarios can offer one source of planning data, ideally workforce planning should consider the vast array of human and non-human inputs required to address population health needs and generate a variety of policy strategies to prevent recurrent cycles of shortage and surplus of health care providers.

Section Four: Workforce Imbalances and Internal Migration

Within the HHR Conceptual Framework (Figure 1), geographical factors are a significant consideration in the HHR planning process. Several dimensions of workforce imbalance, which have been identified, include imbalances across professions and specialties, geography, institutions and services, public and private sectors and gender (WHO 2002b). According to WHO (2002b:7), "imbalances in human resources for health exist in health systems when the composition, level and use of health workers, conditioned on total resources in human resources, do not lead to maximum health system goals". Imbalances in the deployment of nursing human resources have been reported across regions, health care sectors and clinical specialties worldwide (O'Brien-Pallas et al. 1997a). Regional variations in the surplus and shortage of nurses are frequently observed between urban, rural and remote areas. Under-serviced areas typically experience a shortage of health care providers in relation to the health needs of the population. To address nursing workforce imbalances, several countries have engaged in policy initiatives with limited success (O'Brien-Pallas et al. 1997a). For example, although the Republic of Benin in Africa deployed nurses to work in under-serviced rural areas, this did not remain a viable long-term strategy as these nurses soon migrated to urban cities (O'Brien-Pallas et al. 1997a). Some countries have reported inadequate funding for services (despite the need for these) and the availability of nurses to provide those services, resulting in artificial surpluses of nurses (O'Brien-Pallas et al. 1997a).

Workforce imbalances related to human resources are necessarily dependent on migration patterns. Although a great deal of attention has been paid to the migration of nurses between countries, far less has been devoted to internal migration which can just as significantly impact workforce numbers. Internal migration refers to the "movements of health professionals within national borders, across subnational administrative units, or between rural and urban areas" (Diallo 2004:602). In fact, given that internal migration frequently does not involve issues such as citizenship, recognition of qualifications, or the significant financial and social disruption associated with moving between countries, the effects could be more profound. More importantly, internal migration does not remedy workforce over- or under-supply and compounds planning difficulties at a national level.

Unfortunately, the extent of internal migration is not easy to accurately determine. Frequently, change of residence over a period of time is used as a proxy; however, this measure fails to identify multiple and return moves, or migrants who die during the measurement period (Bell et al. 2002; Baumann et al. 2004). In an overview of international and internal migration data sources, Diallo (2004) identified the comparability, completeness and timeliness of migration data as significant challenges to policy development.

Canadian data are collected on location of residence (i.e. urban, rural and remote), place of employment, and place of graduation through the Canadian Institute of Health Information (2004). Baumann et al. (2004) cite the lack of a unique identifier (nursing registration number) as a significant obstacle to accurate trend measurement. However, comparisons of Canadian data on province of graduation and province of employment can serve as a crude indicator of internal migration. For example, in 2001/2002, 87% of Registered Nurses (RNs), 92% of Licensed Practical Nurses (LPNs), and more than 80% of Registered Psychiatric Nurses (RPNs) were employed in their province of graduation (Baumann et al. 2004).

Many reasons cited for international migration also apply to the internal migration of nurses. Nurses may relocate to accompany their partners, be close to family, or because the cost or quality of life is better (Marr, McCready and Millerd 1981; Bagchi 2001; Bell et al. 2002; O'Brien-Pallas et al. 1997a). Nurses may also move from a rural to an urban setting to practice skills not available in their place of residence or to search for

professional development opportunities (Kingma 2001). An Australian example illustrates this point. When the first nurse practitioner positions were established in the State of New South Wales, interested nurses throughout the country were quick to seek these positions, which may have resulted in shortages for the original employers given tight labour market conditions.

Additionally, nurses might relocate to access better wages or improved working conditions (e.g. the introduction of 1:4 nurse:patient ratios in Victoria, Australia). In countries such as Australia, Canada and the USA, where employment conditions and wages vary between jurisdictions, nurses may alter their place of employment, especially when their residence is close to state/provincial boundaries and, more importantly, in countries such as Australia, where qualifications are mutually recognised across jurisdictions. The European Union also has nursing directives for nurses responsible for general care to facilitate the free flow of nurses across member states (Wallace 2001).

Another consideration in internal migration is relative distance. In their early work, Marr, McCready and Millerd (1981) commented that the opportunity cost of migrating one more mile is important in the decision of whether to move 30 versus 29 miles, but insignificant in the decision to move 2000 versus 2001 miles. In addition, in countries such as Britain, an individual may move only a very short distance but, because of the shape of the country (e.g. highly indented coastline), the real travel distance may be more significant than it first appears (Bell et al. 2002). Baumann et al. (2004) indicate that internal migration may follow well-established migratory patterns such as from East to West in Canada. In contrast, migration to coastal areas would be common in Australia. Several factors influencing the internal migration of medical personnel in Canada could equally apply to nurses. These included prior exposure to an area (personal familiarity is most important in this decision), cultural and social opportunities and economic factors (McFarland, cited in Marr, McCready and Millerd 1981). In addition, migration of self-employed people is common during early career (Long, cited in Marr, McCready and Millerd 1981).

Migration related to self-employment has implications for the nursing workforce, particularly among young entrants who, by virtue of increasing casual or agency employment, are essentially self-employed. In countries, such as Canada, where two languages are officially recognised, migration between English and French speaking provinces or communities may be restricted if the nurse speaks only one language. Bell et al. (2002) also note that, whereas Australians are more likely to migrate internally than are Britons (twice the number of moves), they are less likely to do so during their peak labour force ages, a factor which could be relevant in nurse migration. Baumann et al. (2004) cite other factors such as the number and availability of nursing programmes, the location of schools, availability of better employment and careers, greater income (although higher salaries was not a major reason for migration), retirement and other family-related reasons. In Canada, the Northern Territories depend on the provinces for their workforce and, in this context, internal migration is common and accepted (Baumann et al. 2004).

Internal migration has also been interpreted as movement between clinical specialties or locations and may relate to personal safety. Migration between countries is usually interpreted as concern for high rates of infectious disease or war (Kingma 2001; Kline 2003). However, as violence toward nurses increases in areas which are increasingly multi-cultural or where racial disharmony is prevalent, nurses are choosing to work in other institutions. In addition, as a result of the increasing prevalence of patients with acute psychiatric disorders of a violent nature, nurses may elect to change their specialty to a medical-surgical field. Again, movement across specialties is more seamless in countries such as Canada and Australia where comprehensive preparation of nurses enables them to practice in most types of nursing specialties. Yet, in some countries, specialty certification is required for some employment settings, such as intensive care units.

The consequences of internal migration are similar to those for international migration, such as loss of experienced staff and economic losses resulting from the training of health professionals in one jurisdiction, who subsequently practice in another (Kline 2003). Lack of integration between jurisdictional and national educational and workforce planning processes can be problematic, as training of health professionals can be lengthy. HHR policy and planning must allow sufficient lead time to integrate the planning and production of new health professionals and must address the subsequent deployment of graduates. Local jurisdictions may enter into 'bidding wars' to entice practitioners to work in their province or state, leading to a 'churning' of workforce numbers. This happens, for example, in Australia, where aged care is a national responsibility and salaries usually are not as high as their state-based acute care counterparts, resulting in movement of staff between these sectors and jurisdictions. In Canada, hospital nurses are generally higher paid than nurses in long-term care or community settings because of different bargaining unions, resulting in challenges for employers to attract well-trained professionals to these other sectors.

Policy implications

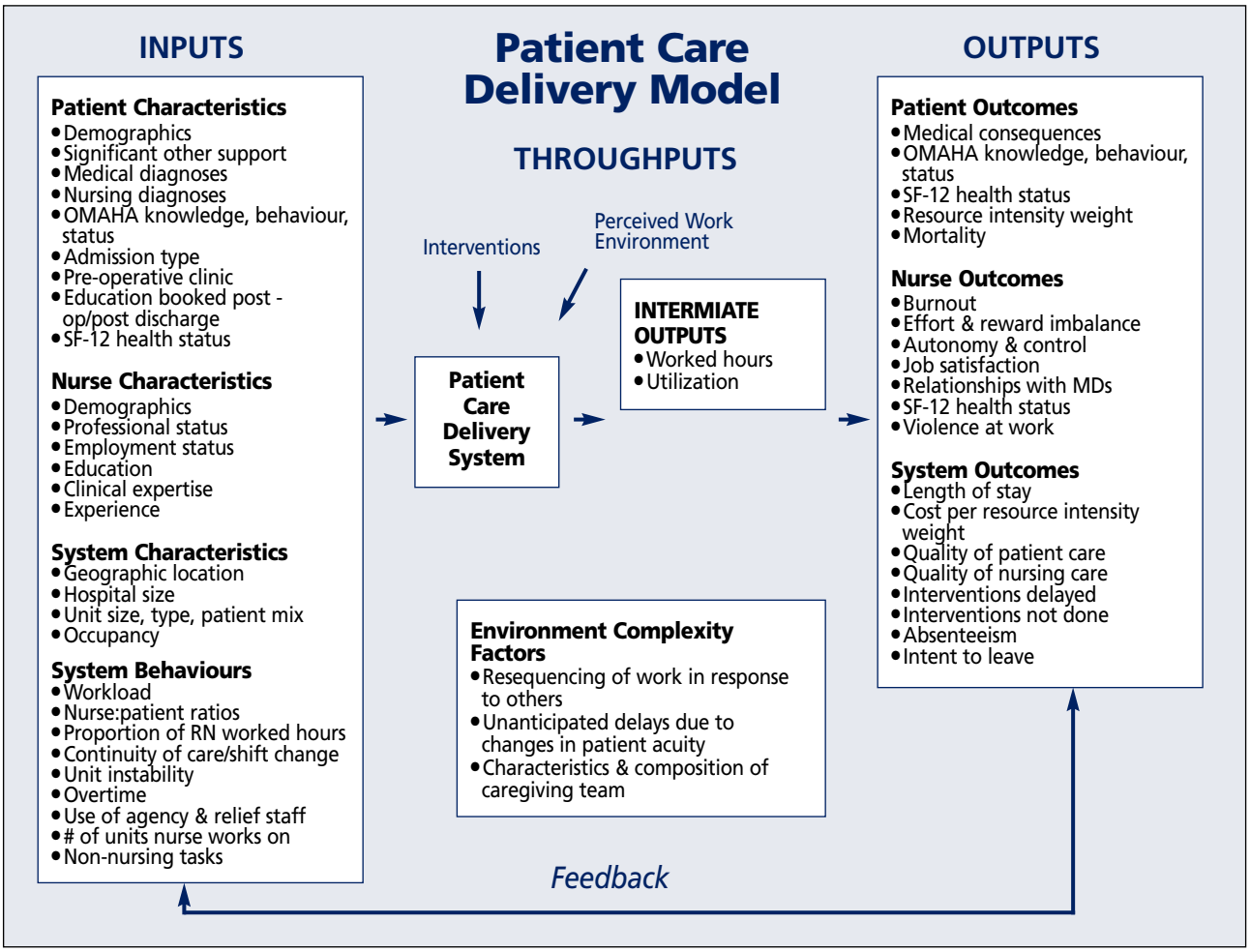
1. Development of a unique identifier for nurses can aid in tracking workforce imbalances and migration patterns (Tomblin Murphy and O'Brien-Pallas 2004).
2. Planners need to be aware that, when creating new roles or developing incentives that redistribute the workforce, unintended shortages may emerge in other sectors or regions.
3. Equality of salaries and benefit packages in all sectors where nurses work may help balance the workforce distribution.
4. Access and delivery of nursing education should occur closer to home in order to build nursing capacity in under-serviced areas and prevent the loss of nurses to large urban areas where educational programmes are often concentrated.

Section Five: Deployment and Utilisation of Nursing Services

Excessive workload remains a key labour issue in many countries (Baumann et al. 2001; Canadian Nursing Advisory Committee 2002; Aiken et al. 2001) and, in Australia, it is a documented reason for why nurses leave the profession altogether (Duffield, O'Brien-Pallas and Aitken 2004b). At the organisational level, deployment and utilisation of nursing human resources cannot be considered in isolation of the system in which nursing care is delivered.

Significant advances have been made in measuring the work of nurses. The science of workload measurement has moved beyond a focus on nursing tasks and diagnostic groupings. As illustrated by the Patient Care Delivery Model (Figure 2), provision of nursing services is now understood to result from a complex array of health care system inputs (i.e. characteristics of patients, nurses and organisations), throughputs (i.e. work environment, nurse deployment by type, workload), intermediate outputs (i.e. utilisation and patient care hours), and outputs (i.e. patient, nurse and organisational outcomes) (O'Brien-Pallas 1988, O'Brien-Pallas et al. 1997b, 2001, 2002). Nurse staffing, workload, productivity and utilisation are potential tools for managing the deployment and utilisation of nurses at the local or organisational level.

Figure 2: Patient Care Delivery Model



Source: O'Brien-Pallas et al. (2004c).

Approaches to nurse staffing

Nurse staffing ratios

Management of nursing human resources can be guided by nurse staffing ratios which use a descriptive methodology relying primarily on experience and judgment and supported by a limited theoretical and empirical evidence base (O'Brien-Pallas 1988). Measures of nurse staffing calculate the amount of nursing resources available relative to the number of occupied beds. Generally expressed as nurse staffing ratios, nursing resources have been measured by headcount, employment status (i.e. full-time, part-time and casual), full-time equivalents (FTE), filled positions and nursing hours worked per day (McGillis Hall 2004). Occupied beds, which serve as a proxy for patient demand, have been measured as number of patients, patient census, patient days in hospitals and medical diagnostic case mix indices (McGillis Hall 2004), as well as number of patient visits and time spent per visit in the community sector (O'Brien-Pallas et al. 1997b). However, simply counting beds provides little information about the care requirements of the patients in the beds. Frequently nurse staffing measures are adjusted for patient complexity and case mix, or studies also control for nurse staff mix (McGillis Hall 2004; Lang et al. 2004; O'Brien-Pallas et al. 2001c, 2002, 2004c). Although nurse staffing ratios can be calculated at both the nursing unit and hospital levels, hospital level ratios are often confounded by the inclusion of nursing staff that do not provide direct patient care (McGillis Hall 2004).

Average Nurse Capacity: Recent resurgence of mandated staffing ratios or minimum staffing standards in the USA and Australia has regenerated interest in nurse:patient ratios. In a review of studies, Lang et al. (2004) reported no research to support specific, minimum nurse:patient ratios for acute care hospitals. However, findings of one study indicated that lower nurse:patient ratios were associated with lower failure-to-rescue rates and lower mortality rates (Aiken et al. 2002). In the American state of California, specific minimum nurse:patient ratios for acute care, acute psychiatric care and specialty hospitals have been legislated with stipulations to increase nursing staff based on patient acuity and the complexity of the care environment, and with limitations on the use of unlicensed personnel and the practice of floating of nursing staff between clinical areas (Nurse Alliance of California 2005). In Victoria, Australia, the introduction of 1:4 nurse:patient ratios brought nurses back to the workplace in large numbers. The ratio is now being adjusted from 1:4 to 5:20 to reflect an emphasis on teamwork, rather than individual assignments.

Standard Time per Occupied Bed: Prior to 1960, nursing care within North American hospitals was allocated in terms of hours per patient day. In a survey of the average amount of nursing care for medical/surgical patients in 12 "best" American hospitals, Pfefferkorn and Rovetta (1940) determined a median value of 3.2 hours. This value was subsequently adopted as a national standard for medical/surgical patients (O'Brien-Pallas 1988). The notion of fixed hours per patient day is based on the assumption that all patients are equal in terms of nursing care requirements. Despite the widespread knowledge that "average" patients do not exist, the use of standard times per bed remained the norm in many hospitals throughout North America until the 1980s. The concept of global average nursing hours per patient day is still entrenched in both the USA and Canada. Despite mounting evidence, hospital administration and financial officers continue to employ the concept in relation to budget development.

Staff mix: The terms 'nursing staff mix' and 'skill mix' are often used interchangeably in the literature. The term 'skill mix' can refer to "the mix of posts in the establishment; the mix of employees in a post; the combination of skills available at a specific time; or alternatively, it may refer to the combinations of activities that comprise each role, rather than the combination of different job titles" (Buchan, Ball and O'May 2000:3). In an international review on the use of skill mix in health care, Buchan, Ball and O'May (2000) found that most studies that examined nursing skill mix or skill substitution between nurses and physicians were conducted in the USA, were methodologically weak, and neglected to evaluate the impact of skill mix changes.

Staff mix is "the combination of different categories of health care workers that are employed for the provision of direct patient care to patients" (McGillis Hall 2004:30). In a review of nurse staffing and staff mix studies, McGillis Hall (2004) reported that adverse events occurred when overall staffing levels included care providers other than RNs and that patient outcomes improved, to some extent, when staffing levels comprised higher levels of professional nursing staff. In a review of studies conducted in acute care, rehabilitation, and psychiatric hospitals, Lang et al. (2004) concluded that lower failure-to-rescue rates, lower in-patient mortality rates, and decreased length of stay were associated with increases in total nursing hours and richer skill mix. Moderate to high correlations between measures of nurse staffing and staff mix complicate the interpretation of outcomes, and studies have produced conflicting results (McGillis Hall 2004). Analyses of staff mix at the nursing unit level, rather than the hospital level, may also be more sensitive to patient outcomes (Mark et al. 2003). Moreover, given the complexity of care in delivery settings, partialling out the effects of only certain care providers in research studies is difficult (Buchan, Ball and O'May, 2000). During the 1990s in Canada and the USA, substitution of nurses by unregulated health workers to relieve nurses' workload as a cost-saving measure resulted in a failed experiment. The studies cited above demonstrate that superior outcomes are achieved with regulated nursing professionals.

Pros and cons

Even though staffing and skill mix variables are frequently adjusted for case mix and patient complexity, if these measures focus on the occupied bed or the capacity of the average nurse as opposed to the unique characteristics of patients and nurses, the outcomes of care and the nursing work environment, the empirical research base for planning of nursing resources will be limited. Most studies to date are cross sectional descriptive studies that do not test staffing interventions within the context of pre- and post-measurement. Studies of this nature are needed to provide answers to these complex questions.

Approaches to nursing workload

In contrast to the descriptive approaches used to determine nurse-staffing levels, nursing workload redirects the focus from the occupied bed and capacity of the average nurse to a focus on patients' requirements for nursing care. Nursing workload or nursing intensity is the daily amount and type (direct and indirect) of nursing resources required to care for an individual patient (O'Brien-Pallas and Giovannetti 1993). The hours of nursing resources used by a patient can be summed at the individual or unit (programme) level to determine how much nursing resource was used over the entire episode of care (O'Brien-Pallas and Giovannetti 1993). Depending on which workload or patient classification system is used, direct care comprises some or many of the tasks that nurses complete on behalf of patients or that require the presence of the patient or family. All other activities that nurses carry out for patients, unit maintenance and information exchange and training are labelled indirect care (O'Brien-Pallas, Meyer and Thomson 2004b).

Workload measurement systems and patient classification tools

Standard and average time per task: Pioneering studies by Connor (1960, 1961) demonstrated that some patients received more care than others and highlighted the fact that patients' requirements for nursing care are variable. Subsequently, nursing time was calculated by determining the average time associated with each nursing task. Replication of industrial engineering studies analysing the tasks performed and measuring the work and distribution of work by nurses resulted in standard or average times per task (see e.g. Dudeck and Gailani 1960).

This approach assumed that nursing tasks completed for patients adequately and accurately reflect patients' needs for nursing care (O'Brien-Pallas 1988). Different measurement methods proliferated. For example,

Meyers (1978) developed GRASP© based on the hypothesis that 85% of nurses' time is occupied by 15% of nursing activities. In contrast, PRN© measures all nursing care tasks performed (Tilquin 1976). These approaches assume that nursing comprises a set of well-defined tasks. However, neither the scope of nursing practice (Halloran 1980) nor the complexities of the care delivery environment (O'Brien-Pallas et al. 1997b) are factored into these standard and average time approaches.

Standard patient – categories of care: In contrast to traditional time studies, workload has also been measured by assessing patients' relative dependence on nursing care. Standard and average times per task were used to create patient classification systems in nursing, whereby the summation of nursing tasks required by the patient reflected the amount of care needed and served as a proxy of 'patient need' for nursing care (O'Brien-Pallas 1988). Medicus© (Jelinek and Denis 1976) is an example of a patient classification tool that categorises patients into levels of care by assessing their relative dependency on nursing in three areas: patient condition, basic care needs and therapeutic interventions (Thibault et al. 1990). Each level of care is assigned target hours that are determined specifically for each unit (Thibault et al. 1990). Reliability and validity of category of care approaches need to be strictly monitored because inaccurate patient classification can result in large differences (hours versus minutes) in the amount of nursing resources required.

In Canada during the 1980s, Management Information System guidelines were developed as a standardised framework to guide the collection and reporting of financial and statistical data about daily health service organisation operations (CIHI 1999). According to the guidelines, nursing workload data may be reported either prospectively (i.e. amount of care needed for the next 24 hours) or retrospectively (i.e. amount of care consumed in the past 24 hours). Although both approaches can be used for trending, retrospective workload data only reflect the care provided, not necessarily all the care required by patients which could lead to underestimation of the true need for nursing services.

Standard patient – diagnostic groupings: During the 1980s, dramatic restructuring of the American health care system resulted in increased competition under the prospective payment system. Medical case mix patient classification systems (i.e. Diagnosis Related Groups in the USA and Case Mix Groups in Canada) were introduced to predict patient resource use and facilitate fiscal management of hospitals. Medical case mix systems, which grouped patients on the basis of medical diagnosis and clinical management patterns, heralded the return of the standard nursing hour determined by diagnostic grouping as opposed to standard hours per bed. Canadian studies, examining workload for specific case mix groups, revealed huge variation in the amount of nursing care required by different patients with similar diagnoses (Cockerill et al. 1993; O'Brien-Pallas, Tritchler and Till 1989b). Severity of illness systems were subsequently developed as an overlay to medical case mix systems to improve sensitivity in relation to patient classification, clinical management, costs and outcomes. According to Horn and Sharkey (1983), utilising both medical case mix and severity of illness systems to classify patients created more homogeneous groups in terms of total nursing resource demand.

Nursing intensity: In the early 1980s, Prescott (1986) observed that workload systems generally did not consider the physiological instability of patients and their needs for teaching and emotional support. Prescott and Phillips (1988) subsequently developed the Patient Intensity for Nursing (PINI) as a measure of nursing intensity to cost nursing care (Prescott et al. 1991). PINI considers the amount and complexity of nursing care required and the clinical judgment required of the nurse to provide care. Medical severity of illness, dependency, complexity, and time are the four constructs that underpin the PINI.

Pros and cons

Workload and patient classification systems are primarily used for staffing decisions within organisations. When used with experience and judgment in the context of continuing validation and ongoing reliability, these

systems can be used effectively to guide staffing decisions. However, when pushed beyond their original purposes, the non-equivalence of patient classification systems is problematic. When used for case costing of nursing services or for comparison of nursing costs and hours across organisations, significant differences in the absolute estimates of hours of care were reported when GRASP©, PRN©, and Medicus© were applied to the same patient population (O'Brien-Pallas et al.1989a,1989b 1992). These estimates also varied by patient and by nursing unit type (O'Brien-Pallas et al. 1989a, 1992). Hence, sorting workload data by diagnostic grouping for case costing purposes or comparing nursing resource consumption across organisations pushes these systems beyond their intended purpose.

In fact, the use of nursing diagnoses instead of, or in conjunction with, medical diagnostic groupings may be a more sensitive measure of patient requirements for nursing services. Halloran (1980) determined that when both nursing diagnoses and Diagnosis Related Groups were used, significantly more variation in nursing workload was explained than by Diagnosis Related Groups alone. Nursing diagnoses were also a strong predictor of patient care needs and workload in hospital (O'Brien-Pallas et al. 1997b). However, this finding was not replicated in the home visiting nurse population (O'Brien-Pallas et al. 2001c, 2002).

Relationship between nurse staffing, workload and health human resource planning

Within the HHR Conceptual Framework (Figure 1), staffing and workload data inform the component entitled Management, Organisation and Delivery of Services across the Health Continuum. Measures of nurse staffing and workload inform management decisions about care delivery at the meso (organisational) level and along with data on supply, production and financial resources, can inform the Planning and Forecasting functions of the broader HHR Conceptual Framework (Figure 1). However, O'Brien-Pallas et al. (1999) found that many countries rely on workload measurement tools alone to determine HHR needs for nursing and midwifery services (i.e. service planning) without considering the breadth of factors and data necessary for comprehensive HHR planning. If HHR models are to be based on the health needs of the population served, then hospital workload data are not the only information needed to develop HHR planning models. Although hospital workload data can be aggregated when the entire population of hospital systems is available, in situations where this is not possible, the current hospital-serviced needs of the population would not be reflected. However, as stated earlier in this paper, it is imperative that other inputs (e.g. patient acuity and health needs) are considered in HHR planning. Workload should be captured across all sectors and, ideally, planning should broadly address population health needs, not necessarily just those currently serviced by current hospital system capacity as reflected by hospital workload data.

Nursing utilisation

Significant advances have been made in articulating and measuring the work of nurses. Although the relationships between inputs, throughputs and outputs in the Patient Care Delivery Model (Figure 2) can be examined relative to nursing workload or nurse staffing ratios, nursing utilisation may provide a greater understanding of the effect of nursing resources on outcomes. Nursing unit utilisation combines measures of nurse staffing and workload to examine the demands for nursing service relative to the amount of nursing resources used to provide that service. Calculated at the unit level as patient workload divided by nurse worked hours, nursing unit utilisation measures how well an organisation staffs to meet patient care standards and needs (O'Brien-Pallas et al. 2004c). Although this formula is used as a measure of "productivity" by the CIHI, it is more accurately termed a measure of utilisation. The higher the utilisation level, the less the nurse worked hours relative to the patient workload and vice versa. In other words, the more a unit is understaffed (reflected by high utilisation

levels), the lower the amount of actual nursing time available for each patient (O'Brien-Pallas et al. 2004c). For those countries that collect these data, the potential exists for them to monitor and adjust management of services and utilisation patterns.

To determine the maximum utilisation of a nursing unit, the contribution of paid mandatory breaks to worked hours needs to be considered. In Canada, 93% is the maximum work capacity of any nursing unit, because 7% of the shift consists of paid mandatory breaks during which time no work is contractually expected. At a utilisation level of 93%, nurses have no flexibility to meet unanticipated demands or rapidly changing patient acuity. A recent Canadian study by O'Brien-Pallas et al. (2004c) found that as utilisation began to exceed 80% on cardiac and cardiovascular care units, the number of negative outcomes increased for patients, nurses and the hospital. These outcomes included: less improvement in patient health status at discharge and in patient health behaviours; higher nurse autonomy; deteriorated nurse relationships with physicians; higher intention to leave amongst nurses; more nurse absenteeism; less nurse job satisfaction; and longer length of stay and higher costs per Resource Intensity Weight (O'Brien-Pallas et al. 2004c). A Resource Intensity Weight is a measure used in Canada that represents the relative value of each case compared to the 'average' case. Resource Intensity Weights do not indicate a monetary value but rather the expected relationships of total hospital costs for different patient types and are used to compare weighted cases across hospitals.

Relationship between utilisation, productivity and health human resource planning

The requirements for HHR are derived from the requirements for health care services to meet the needs of the population (Birch 2002). This linkage between providers and services is important for two reasons. First, the amount of time devoted to service provision differs between providers. For example, some providers may not be practising due to professional or personal circumstances. Physicians and nurses may be employed in management or government positions that do not involve any delivery of services, or may be unable to provide services due to sickness, disability, or maternity or paternity leaves. In some cases, providers may be devoting less than normal full-time hours to service delivery while in others, providers may be working more than full-time (e.g. overtime). As a result, the number of providers required to meet a particular service requirement will depend on the average level of hours per provider devoted to service delivery. This is incorporated in planning exercises through use of activity-standardised or full-time equivalent (FTE) measures of provider supply.

Second, the FTE measure simply adjusts 'crude' provider numbers for variations in the time spent in the delivery of care (i.e. the level of inputs to the production of health care services). Human resource requirements also depend on the rate at which services are provided by these inputs. For example, the number of FTE providers required to satisfy the needs of a population will fall as the rate of services per FTE provider increases. The rate of services per provider is a measure of productivity and forms a major element of estimating the required number of human resources (Birch 2002).

This definition of productivity is consistent with concepts of productivity in other sectors of the economy and focuses exclusively on the relationship between outputs and an individual input. However, this differs from traditional uses of productivity in the health care sector that describe the demands placed on a provider (i.e. what proportion of time is devoted to direct patient care) without any reference to the quantity of service outputs (O'Brien-Pallas et al. 2004c). This measure of demands on providers is more accurately described as an indicator of work intensity or utilisation and, although it is not a measure of the rate of output produced, it will have implications for that rate of output. For example, O'Brien-Pallas et al. (2004c) found that above a

particular threshold of nursing unit utilisation (i.e. the proportion of nurse worked hours relative to patient workload), lower levels of patient outcomes (e.g. declines in patient health status and health behaviours) and system outcomes (e.g. longer than expected length of stay) were observed. In other words, utilisation, although not a measure of productivity, may influence productivity and hence be an important instrument in managing human resources and estimating the future requirements for those resources. In this way, utilisation (which is derived from workload and staffing measures) or the intensity of demands on providers is an input to the production of health care services.

As discussed above, the production of services depends not only on the level of a particular human resource (such as nurses) but also on the other human and non-human resources available to these providers (Birch 2002). In other words, these other inputs will also affect the rate of service delivery per provider. Relative shortages in other inputs (e.g. the number of in-patient beds) may be the cause of increases in workload (e.g. a higher average level of patient acuity for the same number of nurse hours) leading to a reduction in the rate of output or productivity (acuity adjusted in-patient cases), because insufficient nurse hours are allocated to provide appropriate levels of care to all in-patients. One approach to addressing an anticipated shortage of HHR is to consider whether the productivity of existing human resources can be increased through improvements in technology or the methods of delivery of services.

The production functions for health care services help to identify the relationships between health care inputs, both human and non-human, and the output of health care services for the population. In this way, HHR can be planned in the context of different methods of deploying those resources and the implications for productivity that these different deployments involve. Major advances in health care technology lead to substantial increases in productivity in the health care sector and, hence, reductions in the number of providers required to produce a given level of service.

Policy implications

1. Developing standards of reporting at the macro level will ensure that all system users construct their systems and report using a common framework.
2. These standards should be audited by a third party on a regular basis to ensure validity, reliability and comparability of information submitted and compliance.
3. When used with experience and judgment in the context of continuing validation and ongoing reliability, workload and patient classification systems can effectively serve to guide staffing decisions within organisations.
4. When these systems are pushed beyond their intended purposes, the non-equivalence of patient classification systems is problematic.
5. Hospital workload data are necessary for local and national management of nursing resources but, alone, are insufficient to engage in HHR and service planning.
6. Failure to incorporate considerations of productivity in HHR planning risks overestimating the number of providers required to meet population needs. This results in an 'excessive' number of providers seeking ways of delivering services and overlooks an important policy instrument for dealing with imbalances between requirements and availability of HHR.

Section Six: Conclusion

This paper provided an overview of current evidence and policy initiatives pertinent to the nursing workforce, including HHR and service planning and modelling; nursing workforce imbalances and internal migration; and approaches to nursing deployment and utilisation. Based on the evidence, policy initiatives were described, and policy implications were delineated. Although advances in HHR planning and management have been achieved in both the political and scientific arenas, numerous challenges remain. Key HHR-related themes which emerged in this analysis of the policy trail include:

1. Efficient, effective and integrated delivery of health care services must be planned for and implemented based on the health needs of the population.
2. The influence of social, political, geographical, technological and economic factors on balancing an efficient and effective mix of human and non-human resources must be considered in planning, deploying and managing the health care workforce.
3. Administrative and health survey data must be enhanced through sustainable resources, particularly in developing countries, as data are essential to effective HHR planning and management. Enhanced data will assist planners in avoiding cyclical shortages of over- and under-supply perpetuated by inadequate planning methods and poor data sources.
4. Successful HHR planning is dependent on the effective and ongoing coordination of the interaction among government, research and administrative stakeholders through advisory, research and communication infrastructures.
5. Simulation modelling, which allows planners to explore consequences of alternative policies, facilitates input and output sensitivity analysis, and involves stakeholders in the HHR planning process, is dependent upon the quality of the data used in the model and the extent to which the variables modelled reflect the system as a whole.
6. Nursing workforce imbalances and migration patterns across regions, health care sectors, and clinical specialties are further compounded by inadequate data sources.
7. Deployment and utilisation of nursing human resources cannot be considered in isolation of the system in which nursing care is delivered.
8. Workload and staffing data can be combined to identify the rate of services per provider (i.e. a measure of utilisation) and form a major element of estimating the required number of human resources.

Internationally, nursing workforce planning is a priority for policy planners. Strategies based on sound theoretical frameworks and methodologies are necessary to effectively plan for and manage the nursing workforce and other health care providers. To support the achievement of "health for all" (WHO 1998), HHR planning must be driven by evidence and the effects of different HHR models and strategies must be examined to determine the impact on system, health and provider outcomes. HHR planning, research and policy must be based on the health needs of the population, be responsive to a changing system, and outcome directed.

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Abbreviations

3 x 5	Global Initiative Strategic and Operational Framework
AC	Audit Commission
ACETERA	Argentinean Civil Association of Non-University Schools of Nursing in Argentina
ACHIEEN	Chilenean Association of Nursing Education
ACOFAEN	Colombian Association of Schools of Nursing
ADHA	Additional Duty Hour Allowances
AEUERA	Argentinean Association of University Schools of Nursing
AFRO	AFRICA Regional Office
AHRQ	American Health Research and Quality
AHSN	Africa Honour Society for Nurses
ALADEFE	Latin American Association of Faculties and Nursing Schools
ANA	American Nurses Association
APE	Paraguayan Association of Nursing
ARVs	Anti Retroviral drugs
ASEDEFE	Ecuatorian Association of Schools of Nursing
ASOVESE	Association of Schools of Nursing of Venezuela
ASPEFEN	Peruvian Association of Schools of Nursing
AU	Africa Union
AWG	Africa Working Group
CEDU	Uruguay College of Nurses
CHI	Commission for Health Improvement
CHN	Community Health Nurse
CHSRF	Canadian Health Services Research Foundation
CIPD	Chartered Institute of Personnel and Development
CM	Community Midwifery
CN	Community Nursing
CNO	Caribbean Nurses Organization
COFEN	Federal Council of Nursing, Brazil
CREM	Mercosur Regional Council of Nursing
CRHCS	Commonwealth Regional Health Community Secretariat
DENOSA	Democratic Nursing Organization of South Africa
DFID	Department for International Development
DH	Department of Health
DJCC	Directors Joint Consultative Committee
DOT	Directly Observed Treatment
ECN	Enrolled Community Nurse
ECSA	East, Central and Southern Africa
ECSACON	East, Central and Southern Africa College of Nursing
ECSA-HC	East, Central and Southern Africa Health Community
EN	Enrolled Nurse
EPI	Expanded Programme on Immunisation
EU	European Union
FAE	Argentinean Federation of Nursing
FEMAFEN	Mexican Federation of Associations of Schools of Nursing
FEPPEN	Pan American Federation of Nursing Professionals
FIM	Functional Independence Measure
FNHP	Federation of Nurses and Health Professionals (USA)
FP	Family Planning
FTE	Full-Time Equivalents
FUDEN	Nursing Development Foundation (Spain)
GATS	General Agreement on Trade in Services
GAVI	Global Alliance for Vaccines and Immunizations
GDP	Gross Domestic Product
GNP	Gross National Product
GP	General Practitioner
GRNA	Ghana Registered Nurses Association
HC	Healthcare Commission
HIPC	Highly Indebted Poor Countries
HPCA	Health Professionals' Competency Asssurance Act
HPPD	Hours per Patient Day
HR	Human Resource
HHR	Health Human Resource
HRM	Human Resource Management
HSR	Health Sector Reform
ICN	International Council of Nurses
ICNP®	International Classification of Nursing Practice
ICU	Intensive Care Units

IDB	Inter-American Development Bank
IES	Institute for Employment Studies
ILO	International Labour Office
IMR	Infant Mortality Rate
IOM	International Organization for Migration
IOM	Institute of Medicine (USA)
IPC	Infection, Prevention and Control
IUCD	Intra Uterine Contraceptive Device
IWL	'Improving Working Lives'
JLI	Joint Learning Initiative
LPNs	Licensed Practical Nurses
MCH	Maternal and Child Health
MDGs	Millennium Development Goals
MMR	Maternal Mortality Rate
MoH	Ministry of Health
MSF	Médecins Sans Frontières
MTEF	Medium Term Expenditure Framework
NAFTA	North Atlantic Free Trade Agreement
NCDs	Non Communicable Diseases
NDNQI	National Database of Nursing Quality Indicators
NEPAD	New Partnership for Africa's Development
NGOs	Non-governmental Organisations
NHA	National Health Accounts
NHS	National Health Service
NNAs	National Nurses Associations
OAS	Organization of American States
OCB	Organisational Citizenship Behaviour
OECD	Organization for Economic Co-Operation and Development
OPSNs	Outcomes Potentially Sensitive to Nursing
OWWA	Office of Workers Welfare Administration
PAHO	Pan American Health Organization
PBN	Post Basic Nursing
PDP	Performance Development Plan
PEPFAR	President's Emergency Program for AIDs Relief
PHC	Primary Health Care
POEA	Philippine Overseas Employment Authority
PPP	Purchase Parity Pay
PRODEC	Nursing Development Programme in Central America and the Caribbean
PRSCs	Poverty Reduction Support Credits
PRSP	Poverty Reduction Strategy Papers
QA	Quality Assurance
RBM	Roll Back Malaria
RC	Regional Committee
RCHN	Registered Community Health Nurse
REAL	Latin American Nursing Network
RHMC	Regional Health Ministers Conference
RM	Registered Midwife
RN	Registered Nurse
RPN	Registered Psychiatry Nurse
RSA	Republic of South Africa
SADC	Southern Africa Development Community
SANC	South African Nursing Council
S&T	Science and Technology
SARA-AED	Support for Analysis and Research in Africa - Academy for Educational Development
SEW	Socio-economic Welfare
SSA	Sub-Saharan Africa
TB	Tuberculosis
UAP	Unlicensed Assistive Personnel
UK	United Kingdom
UNAM	Autonomous National University of Mexico
UNESCO	United Nations for Education, Science and Culture Organization
USA	United States of America
UWI	University of West Indies
VCT	Voluntary Counselling and Testing
VF	The Vaccine Fund
WHO	World Health Organization

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