

# Workload capacity measures for estimating allied health staffing requirements

Adrian M Schoo, Rosalie A Boyce, Lee Ridoutt and Teresa Santos

## Abstract

Workforce planning methodologies for the allied health professions are acknowledged as rudimentary despite the increasing importance of these professions to health care across the spectrum of health services settings. The objectives of this study were to (i) identify workload capacity measures and methods for profiling allied health workforce requirements from a systematic review of the international literature; (ii) explore the use of these methods in planning workforce requirements; (iii) identify barriers to applying such methods; and (iv) recommend further action.

Future approaches to workforce planning were explored through a systematic review of the literature, interviews with key stakeholders and focus group discussions with representatives from the different professional bodies and health agencies in Victoria.

Results identified a range of methods used to calculate workload requirements or capacity. In order of increasing data demands and costliness to implement, workload capacity methods can be broadly classified into four groups: ratio-based, procedure-based, categories of care-based and diagnostic or casemix-based. Despite inherent limitations, the procedure-based measurement approach appears to be most widely accepted. Barriers to more rigorous workforce planning methods are discussed and future directions explored through an examination of the potential of casemix and mixed-method approaches.

**Aust Health Rev 2008; 32(3): 548–558**

ALLIED HEALTH has been recognised as an increasingly important discipline in health care management, particularly in the prevention and treatment of chronic diseases that affect ageing populations.<sup>1</sup> Providing allied health services outside major urban areas is becoming an increasing challenge to workforce planners and health serv-

## What is known about the topic?

The lack of definitional consistency about workload measurement has hampered workforce planning. In its simple form workload measurement can be seen as quantifying the relationship between service activity or demand, the required tasks to be performed, and the units of labour needed to perform the tasks. Expressed in reverse, the “labour required” becomes *workload capacity*, the amount of work or activity a unit of labour can deliver.

## What does this paper add?

This paper contributes to the research on workforce planning relevant to the allied health professions. Specific contributions include the generation of a typology of workload capacity methods categorised according to increasing data and resource intensity: (1) ratio-based methodologies; (2) procedure-based methodologies; (3) categories of care-based methodologies; and (4) diagnostic or casemix-based methodologies. A fifth approach which is a combination of all four methods was also identified.

## What are the implications?

Creating rigorous system-wide methodologies will require significant investment. A first step could be to build on sophisticated and valid frameworks developed from the work of the National Allied Health Casemix Committee. These data could be fed into the development of a broader platform approach able to be adjusted for the needs of specific settings from primary through to tertiary care.

---

**Adrian M Schoo**, PhysioD, Senior Lecturer  
Department of Rural Health, Greater Green Triangle  
University, Hamilton, VIC.

**Rosalie A Boyce**, PhD, MBus, Research Advisor  
School of Pharmacy, University of Queensland, Brisbane, QLD.

**Lee Ridoutt**, MEd  
**Teresa Santos**, MEd  
Human Capital Alliance, Sydney, NSW.

Correspondence: Dr Adrian M Schoo, Department of Rural Health, Greater Green Triangle University, PO Box 283, Hamilton, VIC 3300. [adrian.schoo@greaterhealth.org](mailto:adrian.schoo@greaterhealth.org)

ice managers.<sup>2</sup> Efficient deployment of available allied health labour though enhanced workload capacity measures could be an important contribution to a broader effort to meet this challenge. A national review of allied health workforce issues noted that without more rigorous data on allied health workforce requirements it would be “difficult to assess priorities for future action” (p. 15).<sup>3</sup>

The objectives of this study were to: (i) Identify current methods for quantifying workload capacity in selected allied health professions: physiotherapy, occupational therapy, speech pathology, clinical psychology and social work; (ii) Identify the use or potential use of these methods in planning Victorian allied health workforce requirements at a local or system level; and (iii) Identify barriers that may exist to applying such methods in the Victorian human services context, including an analysis of structural and attitudinal factors.

## Methods

### *Literature search*

The initial literature search utilised truncated words in the domains of the professions under investigation, workload capacity and tools. Papers were included when they were written in English, German or Dutch, and when abstracts or brief reviews were available. The databases that were interrogated were:

- Cochrane, MEDLINE, CINAHL, EMBASE, HealthSTAR, PubMed electronic databases;
- Internet search engines (Google, Scirus, Dogpile, UK Health Centre);
- Other internet sites of state and federal governments in Australia (eg, survey results), and Medical and Allied Health Associations in Australia, New Zealand, the United Kingdom, Canada and the United States; and
- Citation checking.

The initial search outcomes produced a large number of documents to potentially review. Merging the Medline (929 references) and CINAHL (566 references) yields and exclusion of duplicate entries resulted in a total of 1320

references. Citation checking and reports that were made available to us resulted in an additional 97 references, resulting in a grand total of 1417 references.

The majority of references did not meet the review inclusion criteria due to similar terminology (especially “workload”) used in physiology, exercise testing, ergonomics and measuring patients’ ability to work. Further exclusions were made because the focus was on measuring workload capacity of patients subsequent, for instance, to rehabilitation intervention. Much still of that which remained was deemed to be too focused on micro-level workload capacity measures and reflecting more the outcomes of poor workload capacity measurement (worker stress and burn-out) than measurement methods per se. Subsequently, the search process was broadened using the search terms “workload or staffing guidelines”, “workload measurement systems”, and “workforce planning or workload measurement systems”. The merged searches after further culling yielded only 78 references that fitted the inclusion criteria and the purpose of the study.

### *Interviews and focus group consultations*

The study included the objective of ascertaining the utilisation context of the methods identified from the literature review. Data were assembled to address this objective by individual interviews with key stakeholders and with focus groups to cross validate findings and explore possible future approaches. These targeted consultations occurred at various points of the study. In the earlier stages of the project, interviews were conducted with state government health service planners, managers and practitioners to gain a better understanding of current workload capacity measures employed in the Victorian context. Interview data were subjected to iterative thematic analysis techniques to assemble a taxonomy of workload assessment categories which were subsequently refined and analysed for their suitability to different professions and service contexts.<sup>4</sup> Findings from these analyses were then tested through four focus group discussions. The group participant populations consisted of:

## I Areas of investigation for the focus group discussions

Area of investigation	Questions
Workload capacity measures used and taxonomy of workload measure categories	What experience does each profession have in attempting to measure workload? Are there "live" cases of workload measurement that haven't been picked up in the literature? Can the identified taxonomy of workload assessment be checked and validated? Are there cases of workload measurement that are not covered by the taxonomy?
Suitability of different workload measures (considering specific professions and contexts)	What method approaches (types) will work in the settings of acute inpatient and ambulatory, sub-acute rehabilitation and assessment, mental health, disability, residential aged care, and primary and community care?
Use of "expert judgement" in different allied health professions	What types of approach have they used to make actual labour requirement calculations? We see in the literature that "expert judgement" appears to be most often employed. Is this the case?
Barriers to use of workload measurements	What are some of the "qualitative" issues with workload measurement? Are there any issues that could have a negative impact on the use of workload measurements?
Sub-classification of allied health labour	Would a sub-classification of allied health labour offer an acceptable compromise? For example: <ul style="list-style-type: none"> <li>■ Diagnostic specialities, such as diagnostic radiography, medical imaging technology;</li> <li>■ Procedural or therapeutic specialities, such as physiotherapy, speech pathology, audiology, optometry, podiatry;</li> <li>■ Consultative specialities, such as psychology, social work, occupational therapy, dietetics;</li> <li>■ Dispensing specialities, such as pharmacy, radiation therapy, prosthetics and orthotics; and</li> <li>■ Preventative specialities, such as nutrition, dental hygiene, environmental health, health promotion, public health.</li> </ul>

(i) health service planners, managers and policy analysts; (ii) a mix of different allied health practitioners as represented by members of relevant allied health associations (excluding physiotherapy and occupational therapy); (iii) physiotherapists; and (iv) occupational therapists. Box 1 shows areas of investigation for the focus group discussions. Focus group data were subjected to similar thematic analysis techniques as described above for the interview data.<sup>4</sup>

## Results

### Review of the literature

The review of the literature revealed a lack of definitional consistency related to the concept of workload measurement. This may be explained in

part by the different international contexts and their human resource management approaches from which the literature was drawn. Many different terms are used to cover a part or the whole of the concept, and these terms are used with little consistency in meaning. Adding to this confusion, different authors use the same terms to describe different phenomena,<sup>5</sup> and some authors even use different terms interchangeably.

We propose that workload measurement be conceived through a simple relationship between service activity (or service demand), the work or workload performance this activity would require, and the units of labour needed to bear this workload (Box 2).

In this relationship labour demand is shown to be clearly a "derived" demand, from the health services required. The amount of labour required

## 2 The simplified health service and staffing relationship



(units of labour) is derived from the level of service activity demanded and the effort or work required to deliver the activity (workload). If the arrows are reversed, then “labour required” would become “workload capacity”, the amount of work or activity a unit of labour can deliver.<sup>6</sup>

The above simple staffing relationship needs to be conceptualised within a broader set of relationships between the quantity of inputs used (including labour) and processes adopted and the quantity of *output* produced from those inputs, which will deliver certain health *outcomes*.<sup>7</sup> This conceptualisation demands an appropriate acceptance of the dynamic nature of workload measurement, the results of which can be influenced by many factors including the organisation of the work, models of care, skill mix, levels of illness of the population and the type of outcomes required.

The literature is replete with methods for calculating workload capacity (or workload requirements) and a list of methods and measures is included in the Appendix. The list of methods can be distilled into four broad categories of relatively common methodology practice (Box 3).

A fifth approach (“mixed”) purposefully combines elements of these four basic approaches. The approaches are shown in Box 3 in order of increasing data demands (and therefore costliness to implement).

Examples of workload capacity estimation for allied health labour using methods from each of the approach categories (Box 3) can be found in the literature. The vast majority of these examples relate to micro-level planning (that is “staffing” decisions within a work unit or organisation) as opposed to macro-level planning (say planning the mental health workforce for Victoria).

The literature analysis revealed three broad themes that account for the lack of progress with developing robust workload capacity approaches capable of informing workforce management and developing policy:

- (i) Claims that activity performance could not be adequately captured within a single profession, much less across the gamut of allied health;
- (ii) Concerns that approaches which focus on rigorously defining professional products and services will undermine professional authority about service levels; and

### 3 Methods for calculating workload capacity or workload requirements\*

Category	Description and examples from the literature
Ratio-based methodologies	Utilise a comparatively simple ratio of staff to activity <sup>8-10</sup>
Procedure-based methodologies	Take into account work performed in delivering health care services in terms of procedures, functions, broader areas of work or tasks <sup>11-17</sup>
Categories of care-based methodologies	Employ a ratio approach of staff to patients. Different patient conditions, basic care needs and/or therapeutic intervention requirements are taken into account <sup>18,19</sup>
Diagnostic or casemix-based methodologies	Workload estimates are linked to diagnostic sub-groups <sup>20-22</sup>
Mixed methodologies	Using components of two or more methodologies <sup>17</sup>

\* See also Appendix.

(iii) Differential approaches to the unit of analysis related to the service intervention or procedure classification across service settings, for example, acute care settings or community rehabilitation settings or private practice settings.

The extracts from the literature below illustrate the nature of each of the themes in turn more fully. Despite some claims extending over two decades, these factors were noted in the 2006 scoping investigation of the Australian allied health workforce as continuing barriers to progress.<sup>3</sup>

The argument by Williams<sup>5</sup> is illustrative of the approach that allied health staffing requirements focusing on the physiological instability of patients and their needs for teaching and emotional support is beset with practical methodological problems:

... there are serious problems in attempting to quantify the work of clinical professions like physiotherapy as there is no agreement on what the performance measures should be.

Others suggest the favouring of more intuitive approaches also reflects a deep-seated suspicion of management effort that could impact on the independence of clinical decision-making. Rappolt et al<sup>23</sup> describe this issue well:

... occupational therapists ... remain confident in their ability to provide care in the best interests of their clients, consistent with professional norms.

As well, workload measurement concerns in the allied health professions, vis a vis especially nursing and hospital-based medical practice, have reflected the predominance of their work in community and private consultation settings where the “unit of analysis” is generally a *case*. King et al<sup>24</sup> characterise “clinical case management” in the mental health setting as:

... individual psychotherapy/counselling, assessment, crisis intervention, monitoring daily living skills, monitoring medication, ... and ... regular and flexible contact with clients, contact with family or other carers, liaison with other service providers and

maintaining continuity of contact when the client is being treated in hospital.

Other settings have adopted the notion of an episode of care as the unit of analysis, for example, from the work of Australia’s National Allied Health Casemix Committee (NAHCC) primarily in the acute care sector and more recently in relation to sub-acute and non-acute patients (AN-SNAP). The development of an agreed minimum dataset to underpin classification systems that describe clinical activity across a range of settings within a profession and across a number of professions within the allied health collective is a major advance on the data requirements to ultimately inform workforce planning, management and financing.<sup>14,21,22,25,26</sup> As we will discuss later, use of a procedure-based approach is appropriate to assessing the workload for case-based work.

### **Focus group analysis**

The research design included focus group methodology in order to ascertain the utilisation context of the range of approaches in the Victorian health system described in Box 1. Further, the focus groups sought to identify barriers to the implementation of what have been described as the more data-intensive methodologies.

The focus group discussions confirmed that a range of workload capacity systems have been adopted into practice in Victoria. Essentially, workload capacity measurement has only been used in isolated micro-level efforts. With the exception of professionals working in child support who employed a population-based measure and a small number of health care agencies using a set of linked performance indicators, micro-measurement systems in the guise of standard staffing guidelines (ratio-based approach) were most commonly reported. For example one focus group participant reported a staffing guideline of a maximum caseload of 30–40 clients for social work in one rural setting. These and similar guidelines were generally drawn from an unknown historic background of custom and practice.

Factors identified from the focus group data thematic analysis that affected workload capacity measurement include caseload management approach (particularly in mental health teams), proportion of non-clinical workload inherent in the role, for example supervisory and management responsibilities, caseload intensity, client factors (needs, complexity) and organisational factors/guidelines. Across organisations and within the same organisation, differences were noted between different sites due to case complexity (eg, ethnicity, stroke and mental disease could increase the workforce requirements of a case by up to 50%).

Some specific examples of workload capacity measurement were identified through the focus group discussions. In occupational therapy, the PI 4 measuring system, although it was felt to be antiquated, was still in use within hospitals. Modified versions were being used, particularly in the area of rehabilitation. Mental health and community health settings reported reasonable widespread use of case management models.

The private sector reported a system that consisted of a series of interlinked performance indicators used to determine: (i) staffing levels in the acute hospital setting (0.92 staff work hours per inpatient day) and outpatients (1.85 staff per 2 hours of therapy); (ii) desired client health outcomes (eg, functional independence measure changes); and (iii) skill mix measures (eg, Grades I, II and III and assistants, and the number of experts versus the number of novices). Also, it was reported that there is a limit to the number of staff needed to improve health outcomes. In other words, there is a “ceiling effect” beyond which no further improvement is expected.

Among factors that could influence workload capacity, triage processes were commonly identified through the focus group discussions. Triage systems are currently operating successfully in the public as well as private sector. They can range from intake officers in the mental health area to triage allied health professionals in non-emergency departments and orthopaedic patient management.<sup>27</sup> From the focus group results, triage appears to be an effective method to reduce

waiting lists, while improving health outcomes and reducing the need for procedures.

Trends that could have a negative impact on staff-to-patient ratios are bigger surgical procedures performed on older people. These procedures require risk management and higher staff-to-patient ratios. Early intervention was reported to demand a greater time investment at the beginning but less later on (eg, early psychosis intervention).

## Discussion

*Within* broad method categories (ie, ratio-based, procedure-based, categories of care-based, diagnostic or casemix-based) there can be surprisingly significant variation in calculated workload outcome,<sup>28</sup> although there is little empirical evidence to suggest which of the different outcomes are the more “accurate”. At the micro level of workload measurement, a particular almost individual approach to each choice of methodology can be assumed as “best practice”, based on each occasion on the available data context, the way work is performed and the capacity of primary data to be collected. The decision making may be quite (justifiably) idiosyncratic.

*Between* broad method categories there are more obvious differences contributing to the choice of approach. The main factors to consider are:

- simplicity to implement and operate — the chosen method should require minimum effort and time to maintain by individual staff and administrators. This normally implies using data which are already collected and available;
- technical acceptability — health practitioners feel that the method has face validity and captures well their work, and health service managers are prepared to use the results in their decisions;
- comprehensibility — results will be accepted by non-clinical managers (eg, finance, planning, personnel administration); and
- flexibility — the method chosen should be adaptable to changing policies, procedures, and different circumstances over time.

In the reviewed literature and the focus group discussions there is a strong bias in decision making towards practicality. In most cases this translates to lower cost implications, which in turn almost invariably means using existing (secondary) data sources and or collecting data through limited additional effort in association with normal operations.

At the micro level there seems merit in utilising simple, pragmatic approaches based on a series of interlinked performance indicators to determine staffing levels in a particular setting, desired client health outcomes and the required staff skill mix. Although a series of interlinked performance indicators appears to be a sensible mechanism to enhance staff utilisation and resources in the delivery of health services, it will be important to employ valid and reliable measures that have the required sensitivity and specificity.

Recent Victorian government efforts<sup>6,29,30</sup> to assess workload capacity in macro-level analysis have employed mostly simple ratio-based methodology. Arguably, aspects of the service activity and workload relationship could have been explored further in these studies to allow a more radical departure from the status quo, which itself is an inexorable consequence of the reliance on current utilisation and staffing data and assumptions of a stable staffing mix. In reality though, the methods chosen by these studies were arguably appropriate to the nature of the task, the level of accuracy demanded and the budget available. In the future, time and budget conditions could continue to conspire to strongly influence the choice of methodology and “force” sub-optimal methodology pathways. Without investment in the development of a systematic data-driven approach harmonised across service settings, the barriers to implementing a more rigorous methodology are likely to persist.<sup>3</sup>

### **Procedure-based workload measurement**

To enhance the predictive and perceptive capability of workforce planning the use of a procedures based approach to workload measurement could

be explored. This approach has three potential advantages:

- More than a decade of research in selected settings has shown that this technique is sensitive to workload measurement in the community-based setting that employs a significant proportion of the allied health workforce,<sup>13,15-17</sup>
- It appears to be more accepted by allied health professionals and managers, and considered to be less open to promoting work conditions of stress and burnout. Perhaps the method presents in ways that clinicians can more easily and intuitively grasp — it does after all start with their work; and
- It is more amenable to consideration of different skill mix inputs to the health production process. Work is disaggregated in a more transparent way; hence opportunities for labour exchange (or substitution) are more obvious.

The procedure-based approach is not without disadvantages. It is more, at least initially, resource intensive and therefore more costly and time consuming. Another common criticism is that procedure-based methods do not allow easy linkage with other data collections (eg, financial and management) to provide costing data, for example to budget for resources and cost to clients.<sup>13</sup> However, in community settings, especially where the traditional form of work allocation is the “case”, which covers much of the work of therapists and psychologists and social workers, the procedure-based approach appears to have most merit.

### **Casemix-based approaches and mixed methods — the way forward**

Fifteen years of development under the auspices of the National Allied Health Casemix Committee (NAHCC) has produced systematic, and increasingly generic, frameworks to measure the inputs of allied health professions in health care services.<sup>14,21,25</sup> As work has progressed from a focus on the acute care setting through to the sub-acute and non-acute the possibility of capturing allied health activity in nationally consistent frameworks has emerged. The NAHCC, drawing

together the efforts of eleven professions to develop the Australian Allied Health Activity Classification System (AAHACS), and more recently the Health Activity Hierarchy, has steadily shifted its focus from describing inputs to outputs and outcomes.

The standardised information frameworks produced by NAHCC and the coding structures that underpin them are capable of being the focus of a systematic workload measurement platform, particularly as the latest work on the Indicators for Interventions (IFI) project draws to a close in the next year.<sup>22</sup> The IFI project seeks to capture information on why the allied health professional is intervening rather than focusing on the medical diagnosis profile of the patient. Incorporating time dimensions with activity profiles in standardised systems will allow clinicians and managers to better understand the nature and characteristics of workloads both within and across allied health professions. Possible applications of an IFI-based framework include the potential for prospectively funding allied health services, allocating workloads and predicting resource requirements.<sup>25</sup>

Another approach which draws on a mixed-method framework could also be further explored for its utility in workload measurement and workforce planning and development related to clinical programs. The UK Department of Health released a comprehensive workforce planning resource in early 2008 which provides an example of how such an approach could be applied to the workforce supporting the National Stroke Strategy.<sup>31</sup> The framework brings together professions and organisations involved in the support of stroke to arrive at a consensus position informed by data-driven processes.

This mixed-method approach consists of four discrete parts: (i) case studies of sub-sectors within the stroke continuum of care to describe the nature of roles, skills and best practice; (ii) consensus statements from the professions involved in stroke care outlining how their expertise contributes to improving stroke care; (iii) a staffing levels grid capturing the actual and aspirational levels of staffing on stroke units; and (iv) a table of stroke-related professions to provide a snapshot of the

current position of these professions from a training, regulatory and supply perspective. The framework is complemented by investigations of future models of care, for example commissioning work on how staffing requirements would be influenced by increasing reliance on multidisciplinary teams.

Finally, while the evidence is inconsistent, there is little doubt that a range of workplace and work practice factors can influence the outcome of workload measurement, leading to significant variation between theoretically similar settings in the staffing requirements that might be indicated. Models of care adopted, methods of allocating work (eg, triage systems), types of interventions practised, the characteristics and management of available human resources, and the level of illness and comorbidity of the client population can all impact on measurement outcome. The development of a systematic workforce measurement platform applicable across settings and drawing upon the strengths of procedure-based, casemix and mixed-method approaches outlined above suggests that more rigorous approaches are realisable within the short to medium term for allied health.

## Acknowledgements

The study was made possible through funding from the Victorian Department of Human Services. A full report is available.<sup>32</sup>

## Competing interests

The authors declare that they have no competing interests

## References

- 1 Segal L, Robertson I. Allied health services planning framework for chronic diseases. Working paper 148. Melbourne: Centre for Health Economics, Monash University, 2003.
- 2 VicHealth. Health in rural communities. VicHealth Letter. 1998: 3-19. Available at: <http://www.vichealth.vic.gov.au/vichealthletter/> (accessed Jun 2008).
- 3 Australian Health Workforce Advisory Committee. The Australian allied health workforce: an overview of workforce planning issues. (AHWAC Report 2006.1.) Sydney: AHWAC, 2004.

- 4 Miles MB, Huberman AM. Qualitative data analysis: an expanded sourcebook. Thousand Oaks, CA: Sage, 1994.
- 5 Williams JI. Caseload and workload — a model for physiotherapy services. *Hosp Health Serv Rev* 1986; 82: 120-3.
- 6 Service and Workforce Planning. Nurses in Victoria: a supply and demand analysis, 2003–04 to 2011–12. Melbourne: Department of Human Services, 2004.
- 7 Birch S, O'Brien-Pallas L, Alksnis C, et al. Beyond demographic change in human resources planning: an extended framework and application to nursing. *J Health Serv Res Pol* 2003; 8: 225-9.
- 8 Adams R. Progress in the development of recommended staffing levels for rural physiotherapy services. Services for Australian Rural and Remote Allied Health (SARRAH) National Conference "Walking together side by side"; 26-28 Aug 2004; Alice Springs.
- 9 Allied Health in Rehabilitation Consultative Committee. Guidelines for allied health: resources required for the provision of quality rehabilitation services. Version 9; 2005 October.
- 10 Boyce RA, Jackway PT. Dietetic staffing in Australian general hospitals. *Aust Health Rev* 1985; 8(3): 177-88.
- 11 Hurwitz H, Cresswell D. Workload measurement project report. *OACAS (Ontario Association of Children's Aid Societies) J* 2001 March — Special Edition; 45(1).
- 12 Wright M, Scott E, Cockerill R. Surviving the management game: workload measurement systems in a cost-conscious environment. *Can J Occup Ther* 1993; 60: 23-8.
- 13 Cockerill R, Scott E, Wright M. Responding to workload measurement needs. *Can J Occup Ther* 1994; 61: 219-21.
- 14 National Allied Health Casemix Committee. Health activity hierarchy: an Australian standard describing the range of activities provided by health professionals. Melbourne: Health Services Management Group, School of Management, RMIT University, 2001.
- 15 Somers JP, Mulrone RA. Workload measurement study to develop staffing guidelines for the clinical inpatient dietitian. *J Can Diet Assoc* 1983; 44: 246-50.
- 16 Towers D, Coskumer H, Kennedy M, et al. System of workload measurement for clinical dietitians. *J Can Diet Assoc* 1987; 48: 243-6.
- 17 Levin RH, Letcher KI, de Leon RF, McCart GM. Patient-care unit system for measuring clinical and distributive pharmacy workload. *Am J Hosp Pharm* 1980; 37: 45-61.
- 18 Hollis V, Kinsella J. Manpower measurement: a model. *Br J Occup Ther* 1994; 57: 59-63.
- 19 Fortune T, Ryan S. Applying clinical reasoning: a caseload management system for community occupational therapists. *Br J Occup Ther* 1996; 59: 207-11.
- 20 Gadiel D, Ridout L. Towards a rural allied health strategy: a workforce and economic analysis of allied health in New South Wales. Report to NSW Department of Health. Sydney: Strategic Human Capital Management, 1993.
- 21 National Allied Health Casemix Committee (I Woodruff). The Australian Allied Health Service Weights Study: final report. Melbourne: Health Services Management Group, School of Management, RMIT University, 2005.
- 22 Stokes D. Allied health indicators for intervention. Phase 2: Stage 2. Final interim report. National Allied Health Casemix Committee, 2007.
- 23 Rappolt S, Williams P, Lunn J, et al. Clinical autonomy in occupational therapy practices: results of a 2003 Ontario survey. *OT Now* 2004 (Nov–Dec): 9-12.
- 24 King R, Meadows G, Le Bas J. Compiling a caseload index for mental health case management. *Aust N Z J Psychiatry* 2004; 38: 455.
- 25 Cleak H. A model of social work classification in health care. *Aust Soc Work* 2002; 55: 38-49.
- 26 Green J, Gordon R. The development of Version 2 of the AN-SNAP casemix classification system. *Aust Health Rev* 2007; 31 Suppl 1: S68-78. Available at: [http://203.147.135.205/publications/articles/issues/ahr\\_31\\_1\\_0407/ahr\\_31\\_1\\_s068.asp](http://203.147.135.205/publications/articles/issues/ahr_31_1_0407/ahr_31_1_s068.asp) (accessed Jun 2008).
- 27 Oldmeadow LB, Bedi HS, Burch HT, et al. Experienced physiotherapists as gatekeepers to hospital orthopaedic outpatient care. *Med J Aust* 2007; 186: 625-8.
- 28 Carr-Hill RA, Jenkins-Clarke S. Measurement systems in principle and in practice: the example of nursing workload. *J Adv Nurs* 1995; 22: 221-5.
- 29 Victorian Department of Human Services. Disability Services Workforce Study. Melbourne: Victorian Government, 2005.
- 30 Service and Workforce Planning. Victoria's direct care mental health workers: the public mental health workforce study, 2003–04 to 2011–12. Melbourne: Department of Human Services, 2005.
- 31 UK Department of Health. National Stroke Strategy — Workforce Planning Resource. London: UK Department of Health, 2007.
- 32 Ridout L, Schoo AMM, Santos T. Workload capacity measures for allied health. Final report. Sydney: Human Capital Alliance, 2006.

(Received 5/02/07, revised 5/05/08, accepted 11/06/08) □

**Appendix: Workload measures**

Author or measure	Description, notes	Service setting/ discipline	Strengths and limitations
Adams (2004) & Albert and King (1996)	Recommended staffing levels	Physiotherapy	Based on previous surveys (PTs to population ratio, inpatient drivers, facility service level and rurality). Mechanism based on population measures could eliminate negative effects of increased workload
Allied Health in Rehabilitation Consultative Committee (2005)	Staffing standards	Rehabilitation	The approach could be argued to be based on broad rehabilitation "diagnostic" categories. However the diagnostic groups are not related directly to normally used diagnostic classification systems and the "weights" established are simple staff ratios rather than more empirically constructed measures of allied health input as normally associated with case-mix studies
Bajcar et al (1995)	A workload documentation system	Pharmacy	The system takes into account clinical activities, and the pharmacists impact on drug therapy outcomes and costs
Ball et al (1984)	Care for Care measures patient dependency and timing of tasks	Nursing	Does not differentiate between different types of care. Higher correlation with SENS (dependency driven)
Christie (1999)	Recommended physiotherapy staffing levels	Physiotherapy	Based on previous surveys (PTs to population ratio, inpatient drivers, facility service level)
Denton et al (1995)	SHARP assists planning hospital health care services	Medical Nursing Other	Appears useful provided gender and age specific utilisation of allied health services remain the same
Duberley and Norman (1990)	FIP was designed for monitoring nursing costs	Nursing	Includes activity/tasks and manpower. Data requirements include patient individual requirements, ADL and technical care
Excel Care	Units of care per patient. Data collected on work/ tasks completed and outstanding	Nursing	Produces significant fluctuations in results
Fortune and Ryan (1996)	A caseload management system	Occupational therapy	Based on clinical reasoning. Subjective due to differences in experience, knowledge and skills
Gathercole and DeMello, (2001) Workload Analysis Scale (WAS)	Treatment factors, demographics, psychosocial complexity, planned interventions and variable staff factors	Social workers in assessment and rehabilitation setting	Designed to predict the likely workload. Equitable case allocation, flagging of difficult cases, work prioritisation, training of new staff and tracking changes over time
Hollis and Kinsella (1994)	Recommended staffing levels	Occupational therapy	A series of measurement formulae charts based on time and skill
Jeang and Falkenberg (1991)	A stochastic model	Generic, but suitable for hospitals	Results are independent of job mix, variation of in-service time for jobs, stationary or non-stationary job arrival rate
King et al (2004)	A caseload index for mental health case management	Mental health case managers	

**Appendix: Workload measures (continued)**

<b>Author or measure</b>	<b>Description, notes</b>	<b>Service setting/ discipline</b>	<b>Strengths and limitations</b>
Levin et al (1980)	A time-weighted measurement of workload for distributive and clinical pharmaceutical services	Pharmacy	American professionals do not cover the breadth of the profession such as in Australia. Consequently, more staff is needed to render services. Toohey, Herrick, and Trautman (1982) modified the PCU system to enhance precision of weighting factors that can be adapted by others
Meldrum & Yellowlees (2000)	The Clinical Load Monitoring Tool (CLM) has four domains	Mental health	The CLM measures frequency of contact, length of contact, clinical factors and community liaison
National Hospital Productivity Improvement Program		Occupational therapy	A 1993 survey found that most departments used the method (Scott et al, 1993)
Ojima et al (1997)	Recommended staffing levels	Public health, visiting nurses, oral hygienists, dieticians, physiotherapists, occupational therapists	Aged home care only
Ontario Association of Children's Aid Societies	Identified tasks, measured task completion time, and developed components for a workload measurement tool	Child care, Social work	Population-based measures may prevent increased caseloads due to incorrect predictions of previous caseloads
Ozcan and Hornby (1995)	WISN determines hospital workforce requirements	Any	A case study. Limited generalisation
Queensland Health 1995	Recommended staffing levels	Allied health, medical, nursing, administration	Different types of health services
Ridoutt et al, (2004)	Workload estimation in a population health organisation through units of competence	Population health	A proposed approach
Segal and Robinson (2004)	Human resource planning model	Allied health	
SENS	Day to day individual case monitoring	Nursing	Higher correlation with Care of Care (dependency driven)
Slade et al (2000)	Threshold Assessment Grid (TAG) has three main areas of inquiry: safety, risk, needs, disabilities.	Mental health	Measures the severity of mental illness. Assessment of complexity with a TAG score being generated. Clinicians use a five-point scale (none, mild, moderate, severe and very severe)
Somers and Mulroney (1983)	Number of consults and time per consult, and the indicators of workload, performance and productivity	Dietetics	Identify key activities and time to complete
Wright et al (1993)	A procedure-based workload measuring system	Occupational therapy	Takes into account past and present trends in accountability, and the relationship between therapy and administration