

## **The causes and consequences of nursing shortages: a helicopter view of the research**

Christine Duffield and Linda O'Brien-Pallas

Christine Duffield is Professor of Nursing and Health Services Management, Centre for Health Services Management, University of Technology, Sydney. Linda O'Brien-Pallas is Adjunct Professor in the Centre for Health Services Management, University of Technology, Sydney and Co-Director of the Nursing Effectiveness, Utilization and Outcomes Research Unit, Faculty of Nursing, University of Toronto, Canada.

Email: Christine.Duffield@uts.edu.au

Fax for proofs: (02) 9514-5049

### **Abstract:**

In Australia, as in other industrialised countries, there is an acute shortage of registered nurses. There are numerous research reports emanating from North America (Canada and the United States) and Great Britain that provide insight into reasons for this shortage. Little comparable work or writing has been undertaken in Australia. This paper presents an overview of the complex interlinking set of factors explored overseas including lifestyle preferences, workforce composition, quality of work life and workload and the impact of organisational change and altered management practices. It is important that managers in Australian health care settings understand these issues in order to work towards developing sustainable human resource solutions for retention.

### **Background to the issue**

The worldwide nursing shortage is posing challenges not only for the nursing profession but also, workforce and facility planners. Significant changes to the ways in which health care is delivered together with the ever-changing needs of consumers are causing planners to rethink workforce estimates. Factors which will have a significant effect on the provision of nursing services include, epidemiological challenges such as more chronic lifestyle diseases and improved life expectancy (AIHW 2000); an increase in patient age and the number of severely ill patients (Jakob & Rothen 1995, Mion et al. 1988); shortened length of stay and an increased community burden with no compensatory transfer of resources (NSW Health 2001, Shamian et al. 1997, O'Brien-Pallas et al. 1997); and an increased acuity and complexity of hospitalised patients (O'Brien-Pallas et al. 2001, Aiken et al. 2001, Diers & Bozzo 1997). As many health facilities in New South Wales are close to reaching their targets of 80% day of surgery admissions (DOSA) and 60% day only surgery, drive through surgery is becoming all but a reality.

As if these challenges were of themselves not significant enough, the environment in which nurses must provide care is also much more complex (O'Brien-Pallas et al. 1997, O'Brien-Pallas et al. 2001a, 2001b) and the consumer is much better informed than ever before. The availability, or more frequently the lack of availability of beds in the public sector, provides immense challenges for and burdens on hospitals. 'Bed block' or 'system congestion' is constant during the 'winter months' with 'winter' frequently extending for up to eight months. Accident and emergency units are full waiting for a bed to become available and this situation exacerbates tensions between and within staff groups. As medical staff search for their patients, nursing staff are faced with: patient conditions unfamiliar to them; unknown medical staff and many more of them than usual given patient mix; medical treatment regimens that are new or unfamiliar; and a constantly fluctuating patient population as internal transfers occur when a bed in a more appropriate clinical unit becomes available. Given all of this, it is hardly surprising that reported incidents of verbal and emotional abuse between and amongst staff are on the increase.

Against this backdrop is an increasing shortage of skilled and qualified nursing staff to provide the care required (Duffield & O'Brien-Pallas 2002). Despite the lack of Australian data on the

reasons for and impact of nursing shortages, there are many indicators or 'flags' from research conducted overseas that might inform decision-makers in this country. This article will synthesise this body of work with some reference to Australian work and unique features.

### **Nursing Workforce Characteristics**

On the supply side, the profile of the nursing workforce is undergoing significant changes. Decreasing enrolments have been evident for some time (Tang et al. 1999, Tang et al. 1997, Tang et al. 1996, O'Brien-Pallas & Baumann 1999). However, enrolments for 2002 seem to be on the rise and time will tell whether this trend is sustained. With over 41% of the nursing workforce 40 years of age or older (AIHW 1999 Table 24) aging of the workforce is an issue here as it is overseas (AIHW 1999, O'Brien-Pallas et al. 1998, Buchan 1999). This is exacerbated by the increasing age profile of students entering nursing and nurses potentially are retiring faster than they can be replaced (O'Brien-Pallas 2002). The high recognition given to Australian nurses and their preparation (DETYA 2001), worldwide shortages and global migration (Duffield & O'Brien-Pallas 2002) ensure that in this country the supply side of the equation is uncertain. In addition, nurses here are increasingly better qualified with many clinicians and nurse managers now holding Master level qualifications (Duffield et al. 2002, DETYA 2001, Duffield & Franks 2001, Pelletier et al. 1999). Recent work indicates that nurse managers are at least as experienced and qualified as their health service counterparts (Duffield & Franks 2002) increasing their marketability to industries outside health. Multiple career options are also available which only serve to weaken the demand for entry to nursing programs. This is particularly evident amongst those from a non-English speaking background (NESB) where what constitutes 'nursing' overseas is vastly different from the image portrayed in this country. For example there is little understanding that nursing now requires study at the degree level (Tang et al. 1999).

On the demand side, overseas evidence indicates that the number of nurses employed is increasing, reflecting increased demands for nurses' skills and expertise (Buchan 1999). While similar data does not exist in Australia, there are indications that more nurses will be required given the introduction of new roles such as practice nurses and nurse practitioners. Life style choices, which see more nurses wishing to work part-time will translate into a need for more nurses to fill available shifts (Creegan et al. *in press*). In addition, there is recognition amongst employers that nursing qualifications and experience are valuable assets and transportable to a range of other industries (Duffield & Franks 2001, DETYA 2001). In the United States and Canada, trust and loyalty to an employer, both of which are earned, have been lost through processes of restructuring (Beyers 2001, Baumann et al. 2001). All too frequently this loss translates into not only a loss for particular institutions, but more frequently, a loss to the profession as these nurses find alternative employment (Beyers 2001).

### **Workload and work environment**

Workload and work environment are two of the most important factors contributing to the nursing shortage as they mitigate against retention. These include unacceptable and unsafe work environments (O'Brien-Pallas & Baumann 2000, Duffield & O'Brien-Pallas 2002) characterised by safety issues (bullying and harassment). Nurses report job demands/workload exceed their capacity to take on work (Baumann et al. 2001, Fagin 2001). In this country the National Review of Nursing Education (DETYA 2001) reported anecdotally that nurses complained of excessive workload and burnout, lack of recognition for work done, lack of autonomy, low morale, job dissatisfaction and safety issues (to name but a few).

Overseas, a baccalaureate education is associated with improved utilisation of staff and better patient and nurse outcomes (O'Brien-Pallas et al. 2001a, 2001b, Duffield & O'Brien-Pallas 2002, Doran et al. 2001). Dissatisfaction and burnout increase as nurses' ability to provide basic nursing care required by patients declines and job dissatisfaction becomes a significant factor in their decision to leave (Aiken et al. 2001, Gray et al. 1996). While in Australia we have a population of very well qualified nurses, research indicates that they are prevented from making

patient care decisions an integral part of the nursing role (Hoffman et al. 2002). Autonomy in practice is critical in staff retention and one of the most important aspects to this is the capacity of nurses to make decisions about their work and how it is done (Aiken et al. 1996). In terms of the work performed by nurses, once completed much of the 'evidence' of nursing interventions disappears (Lawlor 1991). The 'invisible nature' of nursing is one of its features, as is the vulnerability of patients who often expose their innermost fears and anxieties to nurses and then on recovery, do not wish to face this memory.

While patients may respect the work of nurses this is often not enough. The lack of respect for the work of nurses by institutional administrators, coupled with the lack of influence over how work is to be undertaken translating into a lesser quality of patient care received, are significant factors in nurses' decisions to remain in the workforce (Duffield & O'Brien-Pallas 2002, Aiken et al. 2001, Fagin 2001, O'Brien-Pallas 2002). The 'one size fits all' nurse which translates into language in this country of 'a nurse is a nurse is a nurse' devalues expertise built up through education and experience. Health facilities would not expect or even ask a cardiothoracic surgeon to perform neurosurgical procedures, yet these same facilities think nothing of 'floating' a cardiothoracic nurse specialist to the neurosurgical ward. While doing so may be unavoidable, the expectation that this nurse will perform at the same level is unrealistic and will almost certainly result in additional anxiety and stress not only for the individual nurse, but also amongst the neurosurgical nursing staff. Unfortunately, even within the profession, at times of peak activity there is often less understanding and consideration provided to colleagues in these circumstances than is desirable.

Once staff shortages occur, there is an increase in workload (often work overload) for those who remain (Baumann et al. 2001). 'Working short' inevitably increases workload before overtime, double shifts and the employment of agency or casual staff are added. The degree of elasticity (spare capacity) within the health care system is unmeasured but anecdotal evidence certainly suggests that nurses are feeling the stress of this situation (DEST 2001). In addition, as the workforce becomes increasingly casualised, rostering staff becomes more difficult with full-time members often faced with working around those on fixed part-time shifts (Creegan et al. *in press*). The loss of control over one's work life becomes yet another stressor. Control over practice is seen internationally as a key work environment issue for nurses (Aiken et al. 2001, Bauman et al. 2001).

Fagin (2001) indicates that adjustments to skillmix resulted in more hours being required to deliver care. While the individual salary levels may be lower (compare an assistant in nursing with a registered nurse), if additional hours are required to maintain *status quo* in terms of patient care, then there is unlikely to be any salary savings at the end of the day. In addition, the quality of care may also be compromised (Needleman et al. 2002, Tourangeau et al. *in press*). Tourangeau et al. (*in press*) also found that a richer mix of registered nurses led to a decrease in 30-day mortality rates. Needleman et al. (2002) confirm these findings. They found that a higher proportion of hours of nursing care provided by registered nurses was associated with better care for hospitalised patients. In addition, a greater number of hours of care provided by registered nurses was associated with better patient outcomes. It should also be noted that the mean number of hours of nursing care per patient day in this study was 11.4 of which 7.8 hours were provided by registered nurses (Needleman et al. 2002), far in excess of the number of hours of care provided to Australian patients by nurses.

It is unlikely that anyone would become a nurse for the financial rewards. Nevertheless, the perception of poor rewards (monetary and a lack of recognition relative to efforts put into the job similarly have been shown to contribute to an inability of the profession to retain its most valuable commodity (Aiken et al. 2001, Fagin 2001, O'Brien-Pallas 2001). Aiken et al. (2001) in a five-country study found that burnout, job dissatisfaction and the intention to leave the present job were highly correlated.

### **Organisational structures and management systems**

There are two factors that are to some extent unique to this country in understanding the nursing shortage. The first and perhaps most significant relates to the organisational structures of institutions, particularly in New South Wales. Restructuring has been shown overseas to result in low staff morale and diminished loyalty to organisations, thus potentially increasing turnover (Greene & Nordhause-Bike 1998, Beyers 2001). Perhaps more importantly Tourangeau et al. (*in press*) found restructuring of wards and units led to a loss of experienced nursing staff with a resultant increase in 30-day mortality.

The divisionalised structure so prevalent in Australia has placed nurses (and indeed all clinicians) in silos, leading to mini-fiefdoms that inevitably compete against each other for resources. Nurse executives are responsible for the quality of the services provided, but have limited control over human and financial resources to provide this service in current structures. Despite the lack of evaluation of divisionalised structures, in NSW at least, many institutions are moving now to 'clinical streaming' an as yet undefined and untested model, but one which removes nurse executives even further from the staff they lead. Little consideration has been given to the impact that this may have on nursing retention despite the evidence from overseas cited earlier. Of note in the United States, Kramer (1998) found that with downsizing, the number of nurses declined while the number of administrators (non-clinical) increased. This begs the question – what is the core business of health institutions and who provides these services?

The second somewhat unique feature is the limited and difficult access to administrative databases for research and resource planning in Australia. In Canada administrative and registration databases such as the Ontario Hospital Reporting System, The Canadian Institute for Health Information hospital discharge database and provincial nursing registration data can be accessed for relevant nursing studies. This is confounding situation is most apparent in the state of New South Wales and to some degree in of the other states.

### **Impact on patient and staff safety**

Health care institutions have a non-delegable duty of care to their patients and clients and must ensure that they do not expose patients to unnecessary risks (Forrester & Griffiths 2001). Nevertheless, there are many implications of the current staffing practices that do expose not only patients, but staff to significant risks. Overseas, staffing strategies have been shown to have a negative impact on nurse - job satisfaction (Kramer & Schmalenberg 1988a, Kramer & Schmalenberg 1988b, Blegan 1993, McGillis Hall et al. 2001) and on patient satisfaction with nursing care (Leiter et al. 1999, McGillis Hall et al. 2001). Lower nurse to patient ratios lead to more complications and poorer patient outcomes (Aiken et al. 1996, Needleman et al. 2002). In Intensive Care Units, variations in mortality rates may be partly explained by excess workload (Tarnow-Mordi et al. 2000). Inadequate nurse staffing has been associated with adverse occurrences such as medication errors, decubitus ulcers, pneumonia, post-operative infections and urinary tract infections (ANA 1997, Blegan et al. 1998, Kovner & Gergen 1998). In another study, adverse events increased the number of nursing personnel required (Cohen et al. 1999). Nurses are the primary surveillance system of the hospital (Fagin 2001) and as a consequence, understaffing or a decrease in hours of care per patient day can lead to failure to rescue which is defined as the recognition of an impending or actual complication and rapid intervention (Silber et al. 1992, Needleman et al. 2002). Arguably, this is the most significant role of a registered nurse and the factor which most distinguishes a trained from untrained care provider. Failure to 'rescue' ultimately impacts negatively on patients' welfare and health status.

To manage the shortages, rather than close beds to match nursing hours available, organisations are using overtime as a staffing strategy (O'Brien-Pallas et al. 2001a, Fagin 2001). This is false economy because for every quartile increase of one hour of overtime per week, there is a 70% increase in lost time claims (Shamian et al. 2001). Further, an almost perfect correlation has been noted between sick time and overtime (O'Brien-Pallas et al. 2001a). Other implications that flow from a perceived high workload include an increase in musculo-skeletal symptoms (Bongers et al.

1993). For every unit of improvement in nurse physician relationships, a 64% decrease in the number of musculo-skeletal claims has been shown (Shamian and O'Brien-Pallas 2001). In addition, overtime is almost perfectly correlated with sick time ( $r = .93, p < .0001$ ) (O'Brien-Pallas et al. 2001). Satisfaction improves with a manageable workload (Bauman 2001). Higher perceptions of quality of care on the unit have been found to be associated with higher job satisfaction (McGillis Hall et al. 2001).

One of the most serious, but rarely documented consequences of inappropriate or inadequate staffing and skillmix faced by institutions in this country is the issue of vicarious liability. Forrester and Griffiths (2001) argue cogently about the risks faced by employers of 'allowing' employees to undertake work that may be beyond their skill level. These authors argue that as long as organisational controls about where and when duties are performed are provided by the institution, how the duties are performed becomes less relevant in determining negligence. More importantly they argue, that when skillmix is adjusted so that care is delegated by registered nurses to less skilled staff (assistants in nursing), then the risks of injury to patients and the ensuing litigation which follows increase (Forrester and Griffiths 2001). If a reduction in negligence claims became one of the key performance indicators for CEOs or their salary was determined on the basis of negligence payouts, perhaps the constant adjustments to nursing skillmix and deskilling of care provided would become less frequent. More importantly, Forrester and Griffiths (2001) argue that the fear of increased liability faced by registered nurses supervising less qualified workers may also contribute to nursing shortages.

As if the research findings above are not sufficiently persuasive, the costs of turnover have been estimated to vary from \$US10,000 to \$25,000 per registered nurse (Jones 1990, Johnston 1991). There is a 30% efficiency loss in the first month (Gray et al. 1996). Added to this then are the casual costs (a dollar value and a loss of productivity and continuity of care) and the potential for increased adverse events for both staff and patients that increase costs of service provision. Overtime costs have been calculated as \$25M paid (NSW Nursing DOHRS Report 2001) and \$175M unpaid (an average of one hour per day per employed nurse in New South Wales).

## **Summary**

In Australia we are losing more nurses than we can replace. Placed into an international context and given all that is known about the effects of overwork and increasing demands on nurses elsewhere, the potential for patient error, not to mention the implications for nursing staff, are overwhelming. At a time of increased patient complexity and acuity health care facilities require more skilled and knowledgeable workers rather than substitution with unskilled workers which is rapidly becoming the norm. In fact, in light of the evidence, it may be counterproductive to employ unskilled workers as this may well increase the workload and dissatisfaction of registered nurses, leading to an even greater shortage long term. In addition, the system must 'allow' and encourage these highly skilled professionals to have the clinical autonomy they need to make appropriate clinical decisions. Increased nursing workloads and real worklife concerns will continue to erode the status and capacity of nurses to provide the type of care we as consumers expect and to which we are entitled.

There are many factors impacting on the delivery of nursing services and staff retention which warrant further research such as, managing an increasingly casualised workforce or the relationship between organisational structures such as divisionalisation or clinical streams and staff retention. Organisational structures are a particularly important aspect for consideration given the disempowerment experienced by most senior nurse executives in current structures, exacerbated by the relatively few middle nurse managers who remain. Nursing unit managers are left in the front line to manage their units, the staff and the complexities of health care facilities outlined earlier. In NSW, research indicates that these first-line nurse managers have a mode of one year experience in the role (Duffield & Franks 2001, Duffield et al. 2001, Duffield & Franks 2002) – hardly adequate or appropriate given the critical role they play in staff retention.

## References

- Aiken LH, Sochalski J & Andersen G 1996, 'Downsize the hospital nursing workforce', *Health Affairs*, vol 15, no 4, pp 88-92.
- Aiken LH, Clarke S P, Sloane D M, Sochalski JA, Busse R, Clarke H, Giovannetti P, Hunt J, Rafferty AM & Shamian J 2001, 'Nurses' reports on hospital care in five countries', *Health Affairs*, vol 20, pp 43-53.
- American Nurses Association 1997, '*Implementing nursing's report card: A study of RN staffing, length of stay and patient outcomes*', American Nurses Association, Washington.
- Australian Institute for Health & Welfare 2001, '*Nursing labour force 1999 AIHW catalogue 20*', Canberra.
- Baumann A, Giovanetti P, O'Brien-Pallas L, Mallette C, Deber R, Blythe J, Hibberd J, & DiCenso A 2001, 'Health care restructuring: the impact of job change', *Canadian Journal of Nursing Leadership*, vol 14, no 1, pp 14-20.
- Blegen MA, Goode CJ & Reed L 1998, 'Nurse staffing and patient outcomes', *Nursing Research* vol 47, no 1, pp 43-50.
- Beyers M 2001, 'Nursing Workforce: A perspective for now and the future', *JONA'S Healthcare Law, Ethics, and Regulation*, vol 3, no 4, pp 109-113.
- Bongers PM, de Winter C R, Kompier MA & Hildebrandt VH 1993, 'Psychosocial factors at work and musculoskeletal disease', *Scandinavian Journal of Work, Environment & Health*, vol 19, no 5, pp 297-312.
- Buchan J 1999, 'The 'greying' of the United Kingdom nursing workforce: implications for employment policy and practice', *Journal of Advanced Nursing*, vol 30, pp 818-26.
- Cohen MM, O'Brien-Pallas LL, Copplestone C, Wall R, Porter J, Rose DK 1999, 'Nursing workload associated with adverse events in the postanesthesia care unit', *Anesthesiology*, vol 1, no 6, pp 1882-1890.
- Creegan R, Duffield C & Forrester K 2002, 'Casualisation of the nursing workforce in Australia: driving forces and implications' (*in press*)
- Department of Education, Science & Training 2001, '*National Review of Nursing Education*', Canberra.
- Diers D & Bozzo J 1997, 'Nursing resource definition in DRGs', *Nursing Economic\$,* vol 15, no 3, pp 124-30.
- Doran D, McGillis Hall L, Sidani S, O'Brien-Pallas L, Donner G, Baker GR and Pink G 2001, 'Nursing staff mix and patient outcome achievement: the mediating role of nurse communication', *International Nursing Perspectives*, vol 1, no 2-3, pp 74-83.
- Duffield C & Franks H 2001, 'The role and preparation of first-line nurse managers in Australia: where are we going and how do we get there?', *Journal of Nursing Management (UK)* vol 9, pp 87-91.
- Duffield C, Moran P, Beutel J, Thornton A, Bunt S, Wills J, Cahill P & Franks H 2001, 'Profile of first-line nurse managers in the 1990s', *Journal of Advanced Nursing* vol 36, no 6, pp 1-9.

Duffield C & O'Brien-Pallas L 2002, 'The Nursing Workforce in Canada and Australia: Two sides of the same coin', *Australian Health Review*, vol 25, no 2, pp 136-144.

Duffield C & Franks H 2002, 'Qualifications and experience: how well prepared are nurse managers compared to health service executives?', *Australian Health Review*, vol 25, no 2, pp 182-190.

Fagin C M 2001, 'When Care Becomes a Burden: Diminishing Access to Adequate Nursing', <http://www.milbank.org/010216fagin.html>, pp 2-24.

Forrester K & Griffiths D (2001), 'So where will the buck stop? Liability and the move for a more diverse health care workforce', *Journal of Law and Medicine*, vol 9, pp 159-163.

Gray AM, Phillips VL & Normand C 1996, 'The Costs of Nursing Turnover: evidence from the British National Health Service', *Health Policy* vol 3, pp 117-28.

Greene J & Nordhouse-Bike AM 1998, 'Nurse Shortage: where have all the RNs gone?', *Hospitals & Health Networks*, vol 72, no 15/16, pp 78-80.

Hoffman K, Donoghue J & Duffield C 2002, 'Decision-making in clinical nursing: Investigating contributing factors', (*in press*).

Jakob SM & Rothen HU 1997, 'Intensive care 1980-1995 - change in patient characteristics, nursing workload and outcome', *Intensive Care Medicine*, 23 (11), pp 1165-1170.

Johnston C L 1991, 'Sources of work satisfaction/dissatisfaction for hospital Registered Nurses', *Western Journal of Nursing Research*, vol 3, pp 503-13.

Jones C B 1990, 'Staff nurse turnover costs: Part II. Measurements and results', *Journal of Nursing Administration*, vol 20, pp 27-32.

Kovner C & Gergen PJ 1998, 'Nurse staffing levels and adverse events following surgery in U.S. hospitals', *IMAGE: Journal of Nursing Scholarship*, vol 30, pp 389-93.

Kramer M & Schmalenberg C 1988a, 'Magnet Hospitals: Institutions of excellence. Part I', *Journal of Nursing Administration*, vol 18, no 1, pp 13-24.

Kramer M & Schmalenberg C 1988b, 'Magnet Hospitals: Institutions of excellence. Part II', *Journal of Nursing Administration*, vol 18, no 2, pp 11-19.

Lawlor J 1991, '*Behind the screens*', Churchill Livingstone, Melbourne.

Leiter MPP, Harvie P & Frizzell C 1998, 'The correspondence of patient satisfaction and nurse burnout', *Social Science & Medicine*, vol 47, pp 1611-17.

McGillis Hall L, Doran DI, Baker GR, Pink GH, Sidani S, O'Brien-Pallas L & Donner GJ 2001, '*The impact of nursing staff mix models and organizational change strategies on patient, system and nurse outcomes*', Faculty of Nursing, University of Toronto: Toronto, Canada.

Mion LC, McLaren CE, Frengley JD 1988, 'The impact of patients' severity of illness and age on nursing workload', *Nursing Management*, vol 19, no 12, pp 26-8, 30, 32.

Needleman J, Buerhaus P, Mattke S, Stewart M & Zelevinsky K 2002, 'Nurse-staffing levels and the quality of care in hospitals', *New England Journal of Medicine*, vol 346, no 2, pp 1715-1722.

NSW Department of Health 2001, '*New South Wales Nursing DOHRS Annual Report 2001*',

NSW Department of Health, Sydney.

O'Brien-Pallas L, Irvine D, Peereboom E & Murray M 1997, 'Measuring nursing workload: understanding the variability', *Nursing Economic\$,* vol 15, no 4, pp 171-82.

O'Brien-Pallas L, Hirschfield M, Baumann A, Shamian J, Adams O, Baknok I, Isaacs E, Land S, Salvage J, Birch SA, Miller T, Islam A & Luba M 1999, 'An evaluation of WHO resolution 45.5: health human resource implications', *Canadian Journal of Nursing Research,* vol 31, pp 51-67.

O'Brien-Pallas L & Baumann A 2000, 'Towards evidence-based policy decisions: a case study of nursing health human resources in Ontario', *Nursing Inquiry,* vol 7, pp 248-57.

O'Brien-Pallas L, Thomson D, Alksnis C & Bruce S 2001a, 'The economic impact of nurse staffing decisions: Time to turn down another road?', *Hospital Quarterly,* vol 4, pp 42-50.

O'Brien-Pallas L, Baumann A, Donner G, Tomblin Murphy G, Lochhaas Gerlach J, & Luba M 2001b, 'Forecasting models for human resources in health care', *Journal of Advanced Nursing,* vol 33, pp 120-129.

O'Brien-Pallas L & Baumann A 2000, 'Towards evidence based policy decisions: A case study of nursing health human resources in Ontario', *Canada. Nursing Inquiry,* vol 7, no 4, pp 248-257.

O'Brien-Pallas LL & Baumannn A 1999, '*The State of Nursing Practice in Ontario: The Issues, Challenges and Needs*', Nursing Effectiveness, Utilization and Outcomes Research Unit, Toronto.

O'Brien-Pallas, LL, Baumann A & Lochhaas-Gerlach J 1998a, '*Health Human Resources: A Preliminary Analysis of Nursing Personnel in Ontario*', A Report prepared for the Ontario Ministry of Health Nursing Task Force. Nursing Effectiveness, Utilization and Outcomes Research Unit. University of Toronto and McMaster University, Canada.

O'Brien-Pallas L, Irvine Doran D, Murray M, Cockerill R, Sidani S, Laurie-Shaw B & Lochhass Gerlach J 2001, 'Evaluation of a client care delivery model part 1: Variability in nursing utilization in community home nursing', *Nursing Economic\$,* vol 19, no 6, pp 267-276.

O'Brien-Pallas L 2000, 'Where to from here?', *Canadian Journal of Nursing Research,* vol 33, no 4, pp 3-14.

O'Brien-Pallas L, Irvine Doran D, Murray M, Cockerill R, Sidani S, Laurie-Shaw B & Lochhass Gerlach J 2002, 'Evaluation of a client care delivery model part 2: Variability in client outcomes in community home nursing', *Nursing Economic\$,* vol 20, no 7, pp 13-21.

Pelletier D, Donoghue J, Duffield C, Adams A & Brown D 1999, 'Why undertake higher degrees in nursing?', *Journal of Nursing Education (USA),* vol 37, no 9, pp 422-42.

Shamian J, Nagle LM & Catt MA 1997, 'Health-Related Outcomes Management: Moving Forward Standing Still', *Nursing Informatics,* vol 46, pp 99-104.

Shamian J, O'Brien-Pallas L, Kerr M, Koehoorn M, Thomson D & Alksnis C 2001, '*Effects of job Strain, hospital organizational factors and individual characteristics on work-related disability among nurses*', Workplace Safety and Insurance Board, Canada.

Silber JM, Williams SV, Krakauer H & Schwartz JS 1992, 'Hospital and patient characteristics associated death after surgery: a study of adverse occurrence and failure to rescue', *Medical Care,* vol 30, pp 615-629.

Tang KC, Duffield C, Chen J, Choucair S, Creegan R, Mak C & Lesley G 1997, 'Predictors of



intention to study nursing among school students speaking a language other than English at home', *Australian Journal of Advanced Nursing*, vol 5, no 2, pp 33-39.

Tang KC, Duffield C, Choucair S, Chen J, Creegan R, Mak C & Lesley G 1999, 'Nursing as a career choice: perceptions of school students speaking Arabic, Serbo-Croatian, Spanish, Turkish or Vietnamese at home', *Australian Health Review*, vol 22, no 9, pp 107-121.

Tang KC, Duffield C, Choucair S, Chen J, Creegan R, Mak C & Lesley G 1996, '*Perceptions of nursing as a career choice among a sample of year 11 and 12 students speaking either Arabic, Serbo-Croatian, Spanish, Turkish or Vietnamese at home in Sydney*', NSW Department of Health, Sydney.

Tarnow-Mordi WO, Hau C, Warden A & Shearer AJ 2000, 'Hospital mortality in relation to staff Workload: a 4 year study in an adult intensive-care unit', *Lancet*, vol 356, no 922), pp 185-189.

Tourangeau AE, Tu JV, Wood M & Giovannetti P 2002, 'The effects of nursing-related hospital factors on 30-day mortality rates', *Canadian Journal of Nursing Research* (in press).