Victorian nurses back injury prevention project Evaluation report

December 2004

Victoria
The Place To Be

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Acknowledgements

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Foreword

The Victorian Nurse Back Injury Prevention Project (VNBIPP) was established in October 1998 to provide funding for health care organisations to assist them to implement programs to prevent back injuries amongst nurses. An Advisory Committee, consisting of representatives from key industry stakeholders and organisations, was formed to oversee the project, which is administered by the Department of Human Services Nurse Policy Branch.

The project was established in response to growing concern amongst nurses and the industry regarding the unacceptably high rate of back injuries in the nursing profession and the enormous financial and human costs associated with such injuries. When the VNBIPP was initiated, nurses accounted for more than 54 per cent of compensation claims by health industry workers.

The aim of the VNBIPP is three-fold:

(i) To assist facilities to implement back injury prevention programs based on no lifting principles.

(ii) To facilitate long term cultural change in health care organisations and among nursing staff. By encouraging new attitudes, the project aims to eliminate unsafe practices that have traditionally led to a high risk of injury amongst nurses.

(iii) To assist health care organisations to implement effective procedures for risk identification, assessment and control of patient handling injuries among nurses.

This Report provides the results of the external evaluation, commissioned by the Department of Human Services, and undertaken by the University of Ballarat. The evaluation aims to:

- Conduct a longitudinal study of the VNBIPP;
- Further validate the findings of the VNBIPP Evaluation Report 2002 and estimate cost benefits of the VNBIPP;
- Identify key components contributable to success and sustainability of back injury programs within participating health care agencies;
- Develop a standardised and valid instrument for assessing competency in No Lifting practices.

This Government acknowledges the outstanding success of the VNBIPP that has been demonstrated in this Report. The evaluation indicates:

- A 24% reduction in the rate of standard back injury claims by nurses in public health service agencies in Victoria.
- A 41% reduction in the rate of working days lost associated with standard back injury claims by nurses in public health service agencies in Victoria.
- The cost savings to Victorian public health service agencies in the post-implementation period (Mar-01 – Jun-03) are estimated to be $6.4M per annum (Jun-03 dollars).
- The mean working days lost per claim was reduced from 100 days per claim in the pre-implementation period to 77 days in the post-implementation period, a reduction of 23%.
- The assessed achievement of the cost recovery break even point is within five years of the commencement of the program. The reasonable presumption that there will be ongoing financial benefits and the acknowledged fact that there are many additional unmeasured benefits, represents an excellent return on investment.

I would like to take this opportunity to thank all the VNBIPP Advisory Committee members for their hard work and dedication. The findings of this Report give me great confidence that Victorian nurses are practising in a safer, well equipped work environment where they are valued for their crucial contribution to the health of all Victorians.

Hon Bronwyn Pike MP
Minister for Health

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Executive Summary

This evaluation confirms the significance of the Victorian Nurses Back Injury Prevention Project (VNBIPP). There is clear evidence of reductions in the claims incidence rate, days lost due to injury, and workers compensation costs, attributable to the implementation of nurses' back injury prevention programs based on No Lifting principles and supported by the VNBIPP intervention. These findings are consistent with the findings of the previous evaluation in 2002. The conclusions regarding the effectiveness of the intervention are considered to be conservative, because the study was based on data pertaining to all public health services, including wards where back injury prevention programs based on No Lifting principles were not implemented and the intervention was not applied. This is likely to have attenuated the results compared to the earlier evaluation, which was based only on wards where programs had been implemented. For those wards, the effectiveness of the intervention is likely to be greater than is indicated by this evaluation.

A cost-benefit analysis of the intervention using three different models shows that facilities stand to gain significant financial benefits/cost savings by implementing back injury prevention programs based on No Lifting principles. Again, these are conservative estimates, based on savings in the direct costs associated with workers compensation claims. Less tangible benefits, such as personal benefits to the individual nurses who have avoided injury as a result of the project, to their families, friends and colleagues; to patients through reduced risk of injury; to both nurses in general and their patients through increased morale and job satisfaction; and to the society as a whole through the attendant productivity gains, were not included in this analysis, but are no less real or relevant for being more difficult to pinpoint and quantify.

Key findings

- Over the period of the intervention there was an estimated 24% reduction in the rate of standard back injury claims by nurses in public health service agencies in Victoria.
- Over the period of the intervention there was an estimated 41% reduction in the rate of working days lost associated with standard back injury claims by nurses in public health service agencies in Victoria. Altogether, from Dec-98 to Jun-03, total savings in working days lost are estimated to have been 35,716 days.
- The total cost of the VNBIPP to the Department of Human Services (DHS) and Victorian public health service agencies over the period 1998-2003 was $24.4M (Jun-03 dollars).
- Three different models were developed to estimate cost savings associated with the VNBIPP. The preferred model, which is considered to be the most realistic, indicates an intermediate level of cost savings. On the basis of this model, the cost savings to Jun-03, due to reductions in compensation payments, lost work time and other ancillary costs, are estimated to be $23.3M (Jun-03 dollars).
- On this basis the net cost of the VNBIPP to Victorian public health service agencies to Jun-03 is estimated to have been $1.1M (Jun-03 dollars). The break-even point is estimated to have occurred early in the 2003-04 financial year (five years after the beginning of the program).
- The cost savings to Victorian public health service agencies in the post-implementation period (Mar-01 – Jun-03) are estimated to be $6.4M per annum (Jun-03 dollars).
- In the immediate post-implementation period the annual savings can reasonably be largely attributed to the initial investment in the intervention. However, to sustain the benefits at this level over the longer term, ongoing support and further expenditure will be required. The annual level of expenditure required to sustain the current level of effectiveness remains unknown, but it is likely to be considerably less than in the initial implementation period, and so ongoing savings should considerably outweigh ongoing costs.
- The mean working days lost per claim was reduced from 100 days per claim in the pre-implementation period to 77days in the post-implementation period, a reduction of 23%.
- The above estimates are based on data for all sections of all Victorian public health service agencies. In the particular locations where the VNBIPP was actually implemented it is reasonable to expect that the benefits will have been more pronounced.
- The estimates of savings are also conservative for another reason; they do not include all indirect monetary costs of injury, and neither do they include intangible benefits to individuals, organisations and the Victorian community.

- The assessed achievement of cost recovery within five years of the commencement of the program, together with the reasonable presumption that there will be ongoing financial benefits and the acknowledged fact that there are many additional unmeasured benefits, represents an excellent return on investment.

Background and Aims

The Victorian Nurses Back Injury Prevention Project (VNBIPP) was initiated in 1998 with the purpose of addressing the high proportion of back injuries incurred by nurses. Funding was provided over the period 1999-2003 by the Department of Human Services (DHS) to assist with the implementation of nurse back injury prevention programs within public health care facilities. An Advisory Committee consisting of representatives of the Australian Nursing Federation (Victorian Branch), Department of Human Services, Injured Nurses Support Group, Royal College of Nursing Australia (RCNA), WorkSafe Victoria, and employer and employee representatives oversees the project.

The extent of the problem had been previously highlighted in a report that investigated the impact of injuries to nurses (Langford, 1997). As a consequence, the Australian Nursing Federation (Victorian Branch) and the Injured Nurses Support Group sought Government support for an appropriate course of action to reduce the numbers of back injuries being sustained by Victorian nurses. The purpose of the project was to address the level of back injuries to nurses, by eliminating or minimising manual handling when moving patients. The basis for the project was the No Lifting policy adopted by the Australian Nursing Federation (Victorian Branch), which in turn was derived from a model developed by the Royal College of Nursing in the United Kingdom. The No Lifting Policy was a radical departure from previous approaches which had focused on training of nurses in manual lifting techniques, exercise and fitness. These approaches had failed to achieve significant reductions in back injuries amongst nurses, and were identified in the literature as being inconsistent with an ergonomic approach. Cultural change was also a critical part of the policy and of the VNBIPP, which sought to change prevailing perception that back pain was an unavoidable part of the job for nurses, and that nothing could be done about it. Funding was provided by DHS to assist with the implementation and roll out of nurse back injury prevention programs within public health care facilities. This constituted one of the largest single investments in occupational health & safety risk control intervention in Australia's history.

Following an earlier preliminary evaluation (DHS, 2002), the University of Ballarat was contracted by the DHS to:

- conduct a longitudinal study of the VNBIPP;
- further validate the findings of the VNBIPP Evaluation Report 2002 and estimate cost benefits of the VNBIPP;
- identify key components contributable to success and sustainability of back injury programs within participating health care agencies;
- develop a standardised and valid instrument for assessing competency in No Lifting practices.

Longitudinal Analysis

This evaluation encompassed all 111 facilities which received funding from the DHS VNBIPP over four funding rounds and over the period 1998-2003 since the inception of the project. Sources of information included compensation data from the Victorian WorkCover Authority (VWA); and surveys of industry participants.

The primary longitudinal analysis employed in this evaluation was an analysis of standard claim frequencies and standard claim incidence rates per 1000 equivalent full time nursing staff (EFTNS). The longitudinal methodology employed utilises both analysis of variance (ANOVA) and a time series approach involving multiple regression methods. The ANOVA approach extended the pre-post comparisons made in a previous evaluation (DHS, 2002).

When the periods before and after initial implementation of the VNBIPP were compared, it was concluded that a statistically significant reduction had occurred in mean quarterly standard back injury claim incidence rates per 1000 EFTNS ($F = 13.83$, $p < 0.0005$). Mean quarterly standard back injury claim rates were estimated to be 3.473 claims/1000 EFTNS before initial implementation and 2.647 claims/1000 EFTNS after initial implementation. This represents a 24% reduction in standard back injury claims/1000 EFTNS by nurses in public health service agencies in Victoria.

This result was further supported by an analysis which examined trends within the periods before, during and after initial implementation. There was no statistically significant trend in quarterly back injury claim rates in the 5-year period before

implementation of the VNBIPP. However, the claim rate declined at a statistically significant rate during the initial implementation period. In the period after initial implementation the quarterly claim rate again stabilised at a new lower level.

Mean quarterly working days lost associated with standard back injury claims were reduced from 346 days/1000 EFTNS before initial implementation to 204 days/1000 EFTNS after initial implementation. This represents a 41% reduction in working days lost associated with standard back injury claims by nurses in public health service agencies in Victoria. Estimated total savings in days lost between December 1998 and June 2003 are estimated to be 35,716 days.

The mean working days lost per claim was also reduced from 100 days per claim in the pre-implementation period to 77 in the post-implementation period, representing a reduction of 23%. This would appear to indicate a reduction in the severity of injuries as well as the rate of injuries, although there may be other contributing factors beyond the scope of this evaluation, such as changes in the management of injuries or rehabilitation procedures.

Changes in the costs of claims are difficult to estimate because lags in finalising claims result in uncertainty in the more recent post-implementation compensation data. Two indirect estimates have been made of the eventual percentage reduction in annual cost of claims per 1000 EFTNS, after all claims have been finalised. These estimates are 24% (based on the reduction in the claims incidence rate, which assumes no change in the average cost per claim) and 41% (based on the reduction in the annual working days lost per 1000 EFTNS, which implies reductions in both the number of claims and the average cost per claim).

These results are broadly consistent with those of the previous evaluation (DHS, 2002); however the estimated changes are less pronounced than those reported in that evaluation. This difference may be explained by the substantial differences in the two methodologies used. The previous evaluation was based on injury data obtained directly from agencies, and was specifically targeted at the wards in which the No Lifting program was implemented in the 27 agencies funded under round 2 of the VNBIPP. Data from 72 wards was analysed, but it was not reported what proportion of participating wards this represented. The evaluation involved a timeframe of three years - two years pre-implementation and one year post-implementation. The present evaluation was based on standard back injury claims data from VWA pertaining to all 111 agencies, and spanning a 10-year period pre-, during and post- the VNBIPP initial implementation period. It is to be expected that the maximum benefit would occur in specifically targeted wards, and that these benefits would be diluted when the whole sector is considered. Furthermore, in the present evaluation, explicit adjustments were made for the uncertainties inherent in the more recent post-implementation compensation data, for changes in the size of the workforce, and for the time value of money over the period. For these reasons, it is considered that the conclusions drawn in this evaluation are robust and applicable to nurses in the Victorian public health service sector as a whole.

Cost-benefit analysis

Cost benefits were assessed by comparing the estimated costs of the VNBIPP intervention and the estimated cost savings resulting from reductions in expenditure incurred due to back injuries. The cost-benefit analysis is predominantly focused at the societal level, because the VNBIPP was limited to publicly funded agencies, and because the most readily quantifiable aspects of both the funding of this intervention and the resulting cost savings (benefits) involve agencies at State level. Costs and benefits at the organisation or enterprise level have also been incorporated in aggregated form.

No direct costs were incurred by individuals in this intervention. Cost savings (benefits) at the individual level are to some degree transferred to societal level by insurance, and are thus included in societal level calculations to the extent that they are factored into compensation payments. It is recognised that other less tangible benefits can result from reductions in human costs at societal, organizational and individual levels, beyond those costs which are represented in monetarised form in claims data. However, there is no agreement about how to quantify such intangible benefits in a cost-benefit analysis (Mossink, 1999) and they have not been included in this evaluation.

Data on compensation paid to date did not provide a valid basis for direct cost comparisons because of the long lag between initial lodgement and final closure of a claim in many cases. In the absence of reliable data on the status of claims, models were developed for deriving indirect estimates of changes in total compensation payments.

Within the scope of the cost-benefit analysis model used, the total cost of the VNBIPP intervention over the period (Dec-98 - Jun-03) is estimated to be $24.4M (Jun-03 dollars). This includes the contribution made by the facilities who

co-contributed to the costs of purchase of equipment, training, consultancy fees and administrative costs. This expenditure reflected a legal responsibility under OH&S legislation for employers to implement measures to eliminate or minimise manual handling injuries, and was also promoted under the project in order to encourage ownership and commitment by facilities. Estimated cost savings for the same period calculated using three different models are $13.5M, $23.3M and $38.7M. The corresponding estimates for the overall financial outcome are a net cost of $10.9M, net cost of $1.1M and net cost savings of $14.3M.

The disparity in these estimates results from different assumptions about the underlying processes. This variability is in turn a consequence of a lack of reliable recent compensation data, due to lag effects, which necessitates the use of indirect models founded on different assumptions. Other factors contributing to the difficulty of making accurate and valid comparisons were:

- great variability in both the cost of individual claims and in the claims incidence rates from agency to agency and from year to year
- a lack of comprehensive data on staff numbers, which necessitated a separate modelling exercise in order to estimate staff numbers from available remuneration data.

The intermediate estimate of cost savings is considered likely to be the most accurate, and has been adopted. According to this model, the net cost of the VNBIPP to Jun-03 was $1.1M, and the break-even point occurred early in financial year 2003-4, around 5 years after the commencement of the project.

The annual cost savings in the post-implementation period are estimated to be $6.4M (Jun-03 dollars). However, the annual expenditure required to sustain the project at this level of effectiveness is unknown.

Finally, it should also be stated that, over and above the uncertainties in the estimates due to incomplete or ambiguous data, and the uncertainties due to unexplained random variation between agencies and between time periods, this analysis of cost-benefit is inherently conservative for another reason. All sources of costs of the VNBIPP, being relatively easy to identify at the level of DHS and the health agencies, have been incorporated in the analysis. However, the calculation of benefits has been limited to readily quantifiable cost savings at organisational and societal level, and to the savings in those individual human costs which are taken into account when determining compensation payments. To the benefits derived from reduction in these monetarised costs can be added the less tangible personal benefits to the individual nurses who have avoided injury as a result of the project; to their families, friends and colleagues; to both nurses in general and their patients through increased morale and job satisfaction; and to the society as a whole through the attendant productivity gains. These additional dimensions of benefit are no less real for being more difficult to pinpoint and quantify.

Components for Success and Sustainability

Components have been identified which are perceived by industry informants (CEOs, DONs and/or Program Co-ordinators) to contribute to success and sustainability. Those factors perceived as contributing to the success of the program included: a sound philosophical base which promotes a risk management approach, high order risk controls and ergonomic principles; well designed facilities; ready availability and accessibility of well designed and easy to use equipment; and integrated and effective training programs which emphasised No Lifting principles and techniques. Organisational support was also mentioned as an important factor contributing to program success. Two main factors emerged as major requirements for future sustainability. These were on-going support from management and outside bodies such as DHS and the Australian Nursing Federation (ANF), as well as on-going training. Isolation from main centres of activity was also cited as an inhibiting factor by a number of rural agencies. This perception was supported by evidence of consistently higher claims rates in country areas.

The two major factors identified as being barriers to success and future sustainability included lack of funding, both within facilities and from external sources, and physical constraint issues such as inappropriate design and lack of storage space. Other factors such as resource issues, staffing issues, allocated time for program co-ordinators, staff complacency and the need to maintain the momentum established by the VNBIPP, were also mentioned relatively frequently.

There was a perception among members of the VNBIPP Advisory Committee that the intervention had succeeded to various degrees in different locations. It was suggested that differences in organisational environments and implementation processes may have influenced the degree of success and the sustainability of that success. These issues were addressed in an illustrative comparison of two cases: one more successful in terms of the primary outcome measure used in the longitudinal study (quarterly back injury claims/1000 EFTNS), and one less successful. The two cases were matched for size, capacity, service delivery, geographical context and available resources.

It was concluded that the large differences in spending in relation to the categories *Administration* and *Other* were likely to reflect program management differences between the two locations. In responses to the survey of agencies, the agency which exhibited a substantial reduction in claims rate reported an organisational commitment to the program and a willingness to empower staff and include them in decision making. Issues such as sustainability and the need for the organisation to enthusiastically embrace the No Lifting policy were clearly important. Terms such as 'open mindedness', 'staff enthusiasm' and staff involvement were included in the responses made, and it appeared that the VNBIPP and the No Lifting policy had influenced the culture of the organisation. Conversely, the responses from the agency which exhibited no reduction in claim rate seemed to reflect a more traditional OH&S approach based on a more 'mechanistic' or systems-oriented perspective, with a focus on equipment, facilities and legislation. Issues addressed included concern for the cost of the policy implementation, need for a regular maintenance program, need for equipment storage and the need to adhere to OH&S legislation. Whilst no direct causal relationship has been established, these differences may well represent potential explanatory indicators for the different patterns of quarterly back injury claims by nurses in different agencies.

An Instrument for Assessing Competency in No Lifting Practices

An instrument has been developed to aid in the assessment of competency of nursing staff in patient handling utilising No Lifting principles and techniques. It was designed with regard to the following principles elicited from a working party of industry informants:

- The instrument should emphasise the No Lifting philosophy, principles and techniques.
- The instrument should be relatively short and simple to use.
- The scope should encompass: knowledge of policies and procedures; understanding of principles; and skills.
- The instrument should be both generic in form, and capable of adaptation to local contexts.
- The assessment criteria should be clearly delineated, but not spelt out in prescriptive detail.
- The instrument should provide a framework which is potentially applicable in all facilities, all units, and at all levels of the training/testing/accreditation/certification hierarchy.

In accordance with these principles, the instrument which has been developed:

- includes a common core of knowledge, understanding and skill-based competency items based on No Lifting principles, with provision for the addition of further facility-specific and unit-specific skill-based items;
- includes generic specifications for assessing competence; and
- makes reference to secondary sources for all substantive details of required competencies. These sources include the publications *Transferring People Safely* (WorkSafe Victoria, 2002), *Manual Handling Regulations*, 1999, *Manual Handling Code of Practice* (WorkSafe 2000), Australian Nursing Federation (Victorian Branch) No Lifting Policy, 2003, together with facility training manuals and other facility-specific and unit-specific documentation.

The instrument has undergone limited initial field testing and has been assessed positively.

Issues for Future Consideration

This report adds to the growing body of evidence supporting the very considerable benefits to be gained from such interventions as the VNBIPP. Much of the existing evidence relates to small scale implementations involving up to six locations, (Engkvist, 2001, Passfield, et al, 2003, Collins et al 2004). This evaluation and its predecessor (DHS, 2002) relate to a large scale intervention in more than 100 locations across the State of Victoria. The cost benefits analysis has demonstrated an excellent return on the initial investment at all levels: individual nurses, health service agencies and the broader Victorian community. This is despite the acknowledged limitations of the evaluation methodology with regard to the indirect monetary costs of injury and the intangible benefits to individuals, organisations and the Victorian community.

To maximise the potential benefits the VNBIPP needs to be introduced into all sectors of the health industry. In addition, the current momentum needs to be sustained and maintained within those agencies who have participated in the VNBIPP. This will require leadership at all levels and consideration of a range of issues identified in this evaluation including:

- facilitators and barriers to sustainability;
- funding and resourcing;
- equipment purchasing policies and procedures;
- workplace design;
- ongoing support by outside bodies, for example, DHS, ANF;
- ongoing monitoring to ensure effective maintenance and sustainability of programs.

In particular the two factors most cited as requirements for future success and sustainability were continued funding and the need for the requirements of a No Lifting regimen to be considered as an integral part of future workplace design.

With regard to ongoing evaluation of projects of this nature, this report has identified the difficulties involved in evaluating such interventions, and particularly in attributing outcomes to specific components or aspects of the intervention, because of the high level of variability and the long time lags inherent in injury data. Both of these limitations can best be addressed by continuing the longitudinal evaluation further into the future. The methodology developed in this evaluation could be extended into the future with relatively little demand on individual facilities for extra data. A consistent relationship has been shown to exist over a 10-year period between EFTNS and VWA remuneration data. So long as this relationship remains valid, then only records of ongoing expenditure on No Lifting programs would be required, with ongoing collection of injury data at a central level such as VWA assisting in the long term monitoring and evaluation of the intervention. Consideration should be given to instituting arrangements to enable supplementary evaluation in the future.

The methodological framework developed in this evaluation provides a model that could also be usefully applied to the evaluation of other large scale occupational health and safety interventions.

The two evaluations of the VNBIPP, whilst their conclusions are in general agreement, have utilised different approaches. The first evaluation was sharply focused. The conclusions were based on one funding round and the data were more finely grained at ward level, but this fine detail was difficult and costly to obtain, and impossible to obtain completely. The second evaluation was global in scope – organizationally and temporally - and more cost-effective because of its greater reliance on VWA data. However, ward-level detail was not available, and more highly-aggregated data still proved difficult or impossible to obtain retrospectively from many facilities.

In order to better prepare for evaluations of large programs such as the VNBIPP, it is strongly recommended that evaluation data requirements be identified at the time that a project is being designed, and that appropriate record keeping, data management and reporting requirements be specified as a condition of grant funding. Appropriate professional advice about evaluation and data requirements should be obtained as an integral part of program development.

Abbreviations, acronyms and terminology

ANF	Australian Nursing Federation
CEO	Chief Executive Officer
DALY	Disability-adjusted life years
DHS	Department of Human Services
DON	Director of Nursing
EFTNS	Equivalent Full Time Nursing Staff
HALY	Health-adjusted life years
KPI	Key Performance Indicator
NCVER	National Centre for Vocational Education and Research
NIOSH	National Institute for Occupational Safety and Health (USA)
NOHSC	National Occupational Health and Safety Commission
OHS	Occupational Health and Safety
OSHA	Occupational Safety & Health Administration (USA)
QALY	Quality-adjusted life years
TOOCS	Type of Occurrence Classification System
VNBIPP	Victorian Nurses Back Injury Prevention Project
VWA	Victorian WorkCover Authority
WDL	Working Days Lost
WTA	Willingness to accept
WTP	Willingness to pay

Throughout this report, the terms **agency** and **facility** are used interchangeably to refer to the public health service organisations funded under the VNBIPP. The term **campus** is used generically to represent the first level of organisational subdivision within an agency or facility. This corresponds to the VWA **workplace** identification.

1. Introduction

1.1 Background

1.1.1 The Victorian Nurses Back Injury Prevention Project (VNBIPP) was initiated in 1998 with the purpose of addressing the high proportion of back injuries incurred by nurses. The extent of the problem had been previously highlighted in a report that investigated the impact of injuries to nurses (Langford, 1997). As a consequence, the Australian Nursing Federation (Victorian Branch) and the Injured Nurses Support Group sought Government support for an appropriate course of action to reduce the numbers of back injuries being sustained by Victorian nurses. The purpose of the project was to address rising injury numbers in nurses, by eliminating or minimising manual handling when moving patients. The basis for the project was the No Lifting policy adopted by the Australian Nursing Federation (Victorian Branch) which in turn was derived from a model developed by the Royal College of Nursing in the United Kingdom. Funding was provided by the Department of Human Services (DHS) to assist with the implementation and roll out of nurse back injury prevention programs within public health care facilities. This constituted one of the largest single investments in occupational health & safety risk control intervention in Australia's history.

1.1.2 DHS through the VNBIPP has currently provided over $8.35 million in funding to Victorian public health care facilities over the period 1998-2004, to implement back injury prevention programs based on No Lifting principles. The program has been directed at eliminating or minimising manual handling when moving patients. This has been achieved through the provision of patient handling aids and equipment, and education in No Lifting principles and techniques. Importantly, critical components of the VNBIPP were directed at encouraging cultural change and ownership by nurses. These included raising the awareness of nurses, encouraging nurses to be proactive in identifying hazards and reducing risks of injury in the workplace, educating nurses in patient risk assessment, encouraging patient independence and mobility, and encouraging patients to assist in their own transfers. Additionally, organisational commitment was sought at all levels, thereby facilitating long term cultural change throughout the health service industry.

1.1.3 Following an earlier evaluation of the VNBIPP (DHS, 2002), the University of Ballarat was contracted by the DHS to undertake a retrospective longitudinal evaluation through a statistical analysis of injury and claims data, as well as seeking to identify key factors for success and sustainability. The evaluation team was also required to develop and validate a competency assessment tool for nursing staff with regard to No Lifting work practices.

1.1.4 University of Ballarat personnel involved in the project, and their affiliations and specialisations, were Prof Dennis Else (VIOSH Australia; Occupational Health & Safety), Peter Martin (School of Information Technology and Mathematical Sciences; Statistics), Dr Jack Harvey (School of Information Technology and Mathematical Sciences; Statistics & Program Evaluation), Dr John Culvenor (VIOSH Australia; Ergonomics), Prof Warren Payne (School of Human Movement and Sport Sciences; Human Factors), Prof Sally Wellard (School of Nursing; Nursing) Assoc Prof John McDonald (Centre for Health Research and Practice; Health Program Evaluation) and David Borys (VIOSH Australia; Occupational Health & Safety).

1.1.5 Four rounds of funding have been made by DHS under the VNBIPP, during the period 1998-2003. The results of the first two rounds of funding have been evaluated by an analysis of claims data and surveys of participating nurses (DHS, 2002), supplemented by an unpublished survey by DHS at the time of the fourth funding round.

1.1.6 The previous evaluation study (DHS, 2002), framed in terms of data aggregated across all participating facilities, reported a 48% reduction in injury rates, a 54% reduction in annual cost of claims, and a 74% reduction in annual 'days lost' due to injury. Determinants of success and sustainability were identified and discussed at length, on the basis of the information from surveys of program co-ordinators and nurses, but no conclusions were drawn about the relative contributions of the different components of the program. This was recommended as an issue for future evaluation (DHS, 2002, P29).

1.1.7 It was also noted in the evaluation report (DHS, 2002, P29) that collection of comprehensive detailed data from individual health care agencies was arduous. A simpler approach was recommended, using only lost time injury data available from Victorian WorkCover Authority (VWA) databases (DHS, 2002, P29). Reference was also made to inconsistency in the assessment of patient handling requirements (DHS, 2002, P2) and in competency assessment (DHS, 2002, P24).

1.2 Aims

1.2.1 Specifically, the requirements of this evaluation included the following deliverables:

a. conduct a longitudinal study of the VNBIPP;

b. further validate the findings of the VNBIPP Evaluation Report 2002 and estimate cost benefits of the VNBIPP;

c. identify key components contributable to success and sustainability of back injury programs within participating health care agencies;

d. develop a standardised and valid instrument for assessing competency in No Lifting practices.

1.3 Scope

1.3.1 The previous evaluation focused primarily on immediate impacts of the first two funding rounds involving 25 facilities. The scope of the present evaluation included all rounds, and utilised a 10 year timeframe, beginning some five years before the first funding round, for longitudinal evaluation of impacts and outcomes involving all facilities funded under the VNBIPP.

1.3.2 With respect to the first two deliverables, the timeframe of the evaluation has spanned a period before the commencement of the VNBIPP, the initial implementation period and the period after initial implementation. Comparisons have been made between injury rates in different groups of employees, and between the incidence of back injuries and other types of injury. The available data was not sufficiently detailed to enable meaningful comparisons to be made between funded and non-funded locations at particular points in time. This is likely to have attenuated the results compared to the earlier evaluation, which was based only on wards where programs had been implemented. However, the approach adopted is considered to present an accurate picture of the global outcomes across Victorian public health services.

1.3.3 To enable valid comparisons, numbers of claims were converted to standardised incidence rates. Staffing data supplied by a subset of the agencies was combined with VWA data to derive a model which was used to estimate incidence rates for all agencies.

1.3.4 Whilst it would have been desirable to make these comparisons at the level of wards (locations), this was not feasible for the following reasons:

a. VWA data are only available at workplace (campus[1]) level.

b. The VNBIPP Advisory Committee and agency representatives advised that data at the level of wards were incomplete.

c. Agency representatives advised that obtaining retrospective data at the level of wards would be difficult.

Consequently, campus level data were used throughout the analysis.

1.3.5 With respect to the third deliverable, a survey of agencies enabled the identification of components which are perceived by CEOs, DONs and/or Program Co-ordinators to contribute to success and sustainability. This issue was further investigated in an illustrative comparison of two agencies: one very successful in terms of the primary outcome measure used in the longitudinal study, and one much less successful.

1.3.6 With respect to the fourth deliverable, after considerable consultation with DHS, the VNBIPP Advisory Committee and a working party of industry informants, it was agreed that a generic assessment instrument should be developed in the form of a "secondary checklist", which does not itself embody the specifications of competent performance, but rather provides a consistent framework for competency assessments referenced to existing resources such as published WorkSafe guidelines (WorkSafe Victoria, 2002).

[1] The term *campus* was used generically to represent the first level of organisational subdivision within an agency. This corresponds to the VWA workplace identification.

1.4 Potential Confounding Factors

1.4.1 Caution must be exercised when interpreting the results of the longitudinal analysis. The validity of the longitudinal analysis is limited by various factors that act to distort the claims distributions across time in ways which are difficult or impossible to quantify. These include:

a. the effect on claims data of pre-existing or chronic conditions;

b. the effects of staff mobility and changing skill mix;

c. the effects of health service re-configurations;

d. the effect of casual employment through nursing agencies, and the consequent difficulty or impossibility of assigning VWA claims to facilities;

e. the exacerbation of point d. by changes in patterns of casual employment throughout the study period;

f. the effects of changes in policy governing ratios of nursing staff to patients

g. the fact that available claims data did not include self-insurers, whose data is provided to VWA only on a quarterly basis, is less detailed than for other insurers, and cannot be released;

h. the extent of any industry culture of "carrying" low-level injuries;

i. the lag between injury & claim, which can reportedly be up to several years and which is extremely variable;

j. the fact that common law claims tend to be larger in magnitude and delayed for longer periods than standard claims;

k. the lack of a clear indication in the VWA data that a claim has been finalised; and

l. the fact that the implicit inclusion in the study of wards which did not have a no lifting program would tend to obscure the real reductions achieved in participating wards.

1.4.2 The accuracy of the longitudinal analysis is also dependent on the accuracy of incidence rates, which had to be estimated on the basis of incomplete data supplied by a subset of agencies.

2. Literature review

2.1 General Evaluation of OHS Intervention Programs

2.1.1 The systematic evaluation of injury initiatives with appropriate scientific tools is an important requirement if the discipline of occupational safety is to be advanced and applied confidently in the workplace (Robson et al., 2001). Effective evaluation of OHS interventions requires researchers and practitioners to make use of these tools to provide proper scientific evidence, which in turn is needed to build a relevant knowledge base. Evidence based decision making relies upon the provision of proper scientific evidence.

2.1.2 The National Institute for Occupational Safety and Health (NIOSH) has published an extensive guide to evaluation of OHS interventions (Robson et al., 2001) which has wide international recognition. However, whilst this document is largely devoted to quantitative methods, the focus is mostly on clear-cut pre- and post-intervention comparisons. More subtle longitudinal analysis techniques are only briefly discussed in an appendix. Inferential techniques for rate ratios and rate differences are discussed, but it is pointed out that these techniques are only appropriate in the absence of trend in the historical data. Where trend is evident the suggestion was to use regression techniques and in particular time series analysis using autoregressive integrated moving average (ARIMA) models to account for autocorrelation in the data.

2.1.3 The Australian National Centre for Vocational Education and Research guide to evaluating the effectiveness of training interventions (Doucouliagos and Sgro, 2000) presented a much more thorough treatment of time series and multiple regression methods, which are appropriate when:

a. the intervention occurs in stages over a period of time;

b. the response to the intervention is gradual; and

c. factors other than the intervention are also influencing the response variable.

2.1.4 Doucouliagos and Sgro made use of dummy variables (including seasonal effects) in a multiple regression analysis to assess the impact of training upon performance. This technique enabled the impact of training (dependent variable) to be separated from the seasonal, autoregressive and time trend effects. A methodology was also given with respect to cost-benefit analysis or return on investment (ROI). Costs were analysed according to direct and indirect costs associated with training and compared to benefits arising from training. As they reported a series of case studies, the cost benefits were assessed at the company level.

2.1.5 The technique of piecewise linear regression with dummy variables has previously been employed by one of the authors in an evaluation of a seven-year program of OHS interventions in a multinational engineering company (Stacy, 2003).

2.2 Evaluation of Interventions Relating to Back Injuries

2.2.1 The manual lifting and transferring of patients exposes nursing staff to high physical loads and it is this exposure to high physical loads that is related to back injuries in nurses (Engkvist et al. 1992). The traditional approach of teaching safe manual handling techniques to nurses has been ineffective in reducing the risk of patient handling injuries (Carlton, 1987, and other studies cited in DHS, 2002). Garg et al. (1992) identified many of the factors associated with failures in previous approaches to manual handling amongst nurses. Given the reported failures of "safe lifting" approaches, No Lifting represents a more radical paradigm which should result in a decrease in the risk of these injuries. No Lifting programs involve replacing manual lifting and transferring of patients with modern hoists and other patient transfer devices. Patient independence and mobility are promoted, and patients are encouraged to assist in their own transfers. Other critical components of No Lifting programs include ownership by nurses, procedures for regular assessment and review of patients' physical mobility and cognitive abilities and their handling needs, a safe physical environment, and a cultural shift in attitudes which previously accepted back pain as part of the job. Such programs, using employee management advisory teams (participatory-team approach), have been implemented in nursing homes and hospitals in order to reduce injuries to health care workers resulting from manual and transferring of patients (Garg, 1999).


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