

Pressure ulcer prevalence and its relationship to comorbidity in nursing home residents: results from phase 1 of the PRIME Trial

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Abstract

Pressure ulcers are a significant cause of morbidity and mortality in the aged care population with prevalence rates reported to be as high as 43% in some aged care facilities. The PRIME Trial was designed to investigate the effectiveness of an integrated pressure ulcer management system in reducing pressure ulcer prevalence and incidence in nursing homes. A total of 1956 residents from 23 nursing homes in NSW, Vic, SA and WA were enrolled in this Commonwealth funded study.

This paper presents the results from phase 1 of the trial and indicates that the prevalence of pressure ulcers in the cohort of 1956 residents was 25.9%. Significant associations between the development of a pressure ulcer and comorbidity level (Charlson Index) ($p=0.01$), risk assessment level (Braden Scale) ($p=0.00$) and the lack of appropriate equipment ($p=0.00$) were detected. Residents who developed a pressure ulcer whilst in an acute hospital showed a trend to develop more than one ulcer and ulcers that were of higher severity than those developed in a nursing home.

The results from phase 1 of the PRIME Trial suggest that emphasis needs to be given to appropriate risk assessment of the elderly nursing home resident that should include comorbidity status and the provision of suitable pressure relieving equipment.

Key words: Pressure ulcer, prevalence, nursing home, comorbidity. *Primary Intentions* 2005; 13(3): 107, 109-110, 112, 114-115.

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Acknowledgements:

Dr Rosina Vogels
Birgit Burge
Jo Glade-Wright
Graeme Prior
Malda Tobin
Margaret Thorp
Hardi Nursing Home Group
Hall & Prior Residential Health & Aged Care Organisation
Prime Life
Southport Community Nursing Home
Cumberland View Nursing Home

Funding:

This study was funded by a grant from the Commonwealth Department of Health & Ageing through the Clinical IT in Aged Care Product Trials Scheme 2004.

Competing interests

None of the authors hold competing interests in the design, methods or results of this study

Introduction

Pressure ulcers are a major iatrogenic contributor to morbidity, mortality and decreased quality of life in the nursing home sector^{1,2}. The frail elderly resident is at particular risk of developing a pressure ulcer if immobile, incontinent and cognitively impaired³. However the relative contribution to pressure ulcer risk of comorbidity in the frail elderly is not well understood. Intuitively, health practitioners believe that the presence of one or more comorbidities may increase pressure ulcer risk, however the actual comorbidities involved and their potential interactions have not been investigated to a great degree in the aged care sector.

This study is part of a larger interventional study known as the PRIME Trial, which investigates the effectiveness of an integrated pressure ulcer prediction, prevention and management system. The PRIME system includes a substantial education program⁴, dissemination of the Australian Wound Management Association's⁵ clinical guidelines for the prediction and prevention of pressure ulcers, the Alfred/Medseed Wound Imaging System⁶, an electronic incidence database and the use of the PURA and PURAMS instruments⁷.

The objective of this study, which forms phase 1 of the PRIME Trial was to firstly investigate the prevalence of pressure ulcers in a cohort of 1956 nursing home residents and secondly, to explore the possible relationships between comorbidity and the development of pressure ulcers.

Prevalence is defined as the proportion of individuals in a population who have the disease in question at a specific instant and provides an estimate of the probability (risk) that an individual will be ill at this point in time⁸. Prevalence as a measure provides a snapshot of the overall problem within a population and includes old and new cases⁹.

International estimates of pressure ulcer prevalence in nursing homes vary greatly due to methodological issues, differing pressure ulcer classification systems used and under reporting¹⁰. Prevalence rates have been reported in the ranges of 11.2% to 23% in the USA^{11,12} and in the UK from 4.6 to 7.5%^{13,14}. European studies have reported rates as high as 83.6% in nursing homes^{15,16}. Recent Australian research in the home care sector detected a rate of 42% in these patients¹⁷.

The role of comorbidity status in the development of pressure ulcers in nursing home patients has not been specifically investigated, however a number of studies have been conducted that prospectively investigated the spectrum of risk factors

associated with pressure ulcer development¹⁸. Specific risk factors include age, mobility, activity, poor nutrition and low serum albumin levels^{19,20}. We believed that given the chronic disease burden found in nursing home patients it would be worthwhile investigating the relative contribution made by comorbidities to pressure ulcer formation risk. A number of comorbidity indices have been developed predominantly for the acute care sector and include instruments such as the Index of Coexisting Comorbidity (ICED) and the Cumulative Illness Rating Scale (CIRS)²¹ however the Charlson Index (CI)²² is the most extensively studied index with high validity and reliability²³. The CI produces three main scores being; weighted index of comorbidity (WIC), Charlson Comorbidity and Age Related Index which is an age adjustment applied to the WIC. Finally the CI calculates the 10-year survival probability expressed as the percentage of individuals expected to be alive in 10 years based on the particular age and comorbidity profile.

The objective of this study was to investigate the prevalence of pressure ulcers in Australian nursing homes and explore the possible relationship between prevalence rate and comorbidity status. The following research questions were formulated:

1. What is the prevalence rate of pressure ulcers in frail elderly nursing home residents?
2. Do relationships exist between comorbidity and the prevalence of pressure ulcers?
3. What other pressure ulcer risk factors exist within this group of residents?

Methods

Design

We conducted a prospective point prevalence survey in 23 nursing homes classified as 'High Care' facilities in four Australian states (2 VIC, 13 WA, 1 SA and 7 NSW) during September to November 2004 following institutional human research ethics committee approval. Subjects consisted of all consenting residents in each facility (n = 1956).

Instrumentation, data collection and interrater reliability

Three main data collection instruments were used in this phase of the study. Pressure ulcer prevalence was assessed using methods adopted from Prentice¹ and the Silver Chain Pressure Ulcer Risk Assessment (PURA)⁷ which includes a Braden Score and Carer Support Score. Comorbidity was

assessed from the residents' clinical record with the Charlson Index²⁷. The third area of data collected was resident demographics, use of steroid medication (systemic, inhaled or topical) smoking status and the presence of lymphoedema.

Prior to data collection all prevalence surveyors participated in an education program²⁸ provided by three of the research team (KC, JP & NS) covering study protocol, pressure ulcer aetiology, pathology, staging and instrument use. Each surveyor was then tested to ensure pressure ulcer staging interrater reliability with a minimum pass requirement of 85% on a standardised interrater test. Data collection was then undertaken by the surveyors working in pairs in each facility according to methods defined by Prentice, Stacey and Lewin⁴.

Statistical analysis

All statistical analyses were undertaken using SPSS V12. Demographic and prevalence data were explored using descriptive statistics. Relationships between variables were analysed using Pearsons product moment correlation coefficients and differences between groups were investigated with t tests for independent groups. In all cases significance was set at 0.05.

Table 1. Comorbidity profile

Comorbidity	n	%
Dementia	1140	62.4
Cerebrovascular disease	663	36.3
Chronic heart failure	364	19.9
Diabetes	338	18.5
Chronic obstructive pulmonary disease	276	15.1
Hemiplegia	269	14.7
Tumour	135	7.4
Renal disease	175	9.6
Peripheral vascular disease	102	5.6
Myocardial infarction	96	5.3
Liver disease	77	4.2
Lymphoedema	26	1.4
Leukaemia	10	0.5
Malignant lymphoma	12	0.7

NB only valid percentages are reported in all tables

Results

Subject demography

The mean age of the cohort was 82.8 years (range 56 – 103) with 35.9% (n=639) of residents being male and 64.1% (n=1140) female. The mean Resident Classification System (RCS) category of the cohort was 1.8 with a median of 1 that was consistent with the "high care" classification of the participating nursing homes.

Table 2. Charlson Comorbidity Scores for the total cohort

Variable	Mean	SD
WIC	2.65	2.14
CC&ARI	6.41	2.12
10-Year survival	12.70	22.01

Table 2 reveals that the cohort has a significant comorbidity burden in the CC&ARI and WIC indices and that as a cohort has a 22% chance of being alive in ten years. It should be noted that ten-year survival predictions are generally only used in individual prediction of survival rather than group.

Pressure ulcer prevalence

The total pressure ulcer prevalence for the cohort was 25.9% (n=471) with a range of 0-53.5%.

Table 3. Pressure ulcer aetiology

Cause	n	%
Pressure	305	67.5
Shear	112	24.8
Friction	8	1.8
Unknown	27	6.0

Table 4. Anatomical site of primary pressure ulcer

Site	n	%
Sacrum	218	46.7
Posterior heel	47	10.1
Lateral malleolus	35	7.5
Toe	26	5.6
Medial heel	18	3.9
Trochanter	16	3.4
Lateral heel	14	3.0
Spine	13	2.8
Elbow	9	1.9
Ear	9	1.9
Other	62	13.2

Table 4 presents the anatomical distribution of detected pressure ulcers and reveals that more than half (56%) were either sacral or heel ulcers.

Table 5. Pressure ulcer stage

Stage	n	%
1	205	44.1
2	204	43.9
3	26	5.6
4	30	6.5

Table 6. Prevalence of multiple pressure ulcer

Number of ulcers	n	%
1	291	16
2	115	6.3
3	35	1.9
4	14	0.8
5	8	0.4
6	3	0.2
8	2	0.1

Table 6 indicates those residents with up to two pressure ulcers made up nearly one quarter (24.2%) of the cohort with a pressure ulcer.



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Relationships between individual factors and the development of a pressure ulcer

We posed the question of what individual resident factors may be associated with developing a pressure ulcer. To begin the exploration of this question we calculated Pearson's product moment correlation coefficient for all variables collected for each resident. Table 7 presents a correlation matrix of significant relationships between the presence of an ulcer and a range of individual resident variables and one organisational variable. The two factors with the greatest association with the presence of a pressure ulcer were the residents' Braden Scale risk score and the availability of appropriate equipment in the aged care facility. Two of the Charlson Index comorbidity scores (CC&ARI and 10-year survival) were also significantly correlated with pressure ulcer presence. Of note was that the weighted index of comorbidity was not correlated to the development of an ulcer. We also note that there was a clear significant inverse relationship between the development of an ulcer and decreased weight.

Table 7. Correlations between pressure ulcer formation and individual resident variables

Variable	r	p
Weight	-.152	0.020
CC&ARI	0.05	0.016
10 year survival	-.060	0.015
Equipment	-.198	0.000
Braden score	-.235	0.000

Table 8. Differences between residents with and without a pressure ulcer

Variable	t	p	mean difference	95% CI
Weight	2.33	0.02	0.28	0.44 - 0.51
CC&ARI	2.43	0.01	-0.28	-0.50 - 0.054
10-year survival	2.40	0.01	2.92	0.054 - 5.31
Braden score	10.15	0.00	2.08	1.67 - 2.48
Equipment	7.94	0.00	0.22	0.16 - 0.27

A slightly different perspective is gained when the question is; are there differences between residents that have an ulcer and those that do not?

Table 8 presents the significant differences between these two groups of residents when all variables are used to compare the groups using a t test for independent groups. Once again Braden Scale risk score and availability of appropriate equipment are the most different between the groups however CC&ARI, 10-year survival and weight are also significantly different.

We explored the type of facility where pressure ulcers that were detected in the survey occurred. Table 9 demonstrates that 12.5% of ulcers were acquired in an acute health care facility.

Table 9. Facility where the pressure ulcer was developed

Facility	n	%
Nursing home	391	83.0
Acute hospital	56	11.8
Unknown	24	5.0

To investigate the possibility that there were differences between the residents who developed an ulcer in an acute facility and those that developed one in their nursing home we separated the two groups and compared the residents on the parameters of CC&ARI and Braden Score because our earlier findings indicated that these variables were associated with ulcer development.

We reasoned that these two variables might indicate if these residents are different in terms of ulcer risk and comorbidity

Table 10. Number of pressure ulcers based on facility where ulcer was acquired

Facility	Number of ulcers	n	%
Nursing home	1	253	67.4
	2	93	23.8
	3	27	6.9
	4	9	2.3
	5	5	1.3
	6	3	0.8
	8	1	0.3
	Hospital	1	28
2		16	28.6
3		5	8.9
4		4	7.1
5		3	5.4