THE EPIDEMIOLOGY OF OSTEOPOROSIS

IN THE FRAIL INSTITUTIONALIZED ELDERLY

BY

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STATEMENT OF ORIGINALITY

I declare that this submission is my own work. To the best of my knowledge and belief it contains no material previously published or written by another person. No part of this thesis has been used to obtain any other degree.

Jane Zochling

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PUBLICATIONS RESULTING FROM THIS THESIS

Peer reviewed papers

Zochling J, Sitoh YY, Lau TC, Cameron ID, Cumming RG, Lord SR, Schwarz J, Trube A, March LM, Sambrook PN. Quantitative ultrasound of the calcaneus and falls risk in the institutionalized elderly: sex differences and relationship to vitamin D status. Osteoporos Int 2002;13(11):882-887.

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Sitoh YY, Zochling J, Lau TC, Schwartz JM, Brnabic AJ, March L, Cameron ID, Cumming RG, Lord S, Sambrook P. Hypovitaminosis D is common, and more severe in winter, in institutionalized older people in Sydney. Gerontology 2001;47(Suppl.1):561

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ABSTRACT

As our population ages, the proportion of frail elderly people requiring assisted accommodation in aged care facilities is increasing. This population is at high risk of falls and fractures, which bring significant morbidity and mortality. The prevalence of osteoporosis also increases with age, but there have been few studies of bone density in residents of hostels and nursing homes. This thesis looked at the prevalence of osteoporosis and falls in elderly people in residential care, to define the size of the problem and identify risk factors for low bone density and falling, with particular reference to vitamin D levels.

Two thousand and five men and women aged between 65 and 104 years were enrolled in the Falls and Fracture Risk in the Elderly Epidemiology (FREE) study between 1999 and 2003. The key findings from analysis of this population were firstly, that quantitative ultrasound (QUS) measures were higher in men than women independent of age, and that in men there was no significant decline in either BUA or VOS, but in women BUA declined by over 3% per decade and VOS by 1% per decade. Both ultrasound machines used in the study were shown to be reliable, with precision unaffected by advanced age. QUS was found to be sensitive to longitudinal change even in this frail elderly cohort.

Vitamin D deficiency was found in the majority of elderly aged care facility residents but supplementation conferred higher serum 25-OH-vitamin D levels. Vitamin D levels were not shown to be related to BUA, VOS or the risk of falling in this

population. Serum parathyroid hormone might be important in determining future falls risk.

In summary, the results of this thesis give an important insight into the prevalence of osteoporosis and falls in the frail elderly, and how these might be predicted. Future study of prospective fracture rates in this group will then be able to assess relative risk factors for osteoporotic fracture, and identify those individuals who might benefit from directed fracture prevention strategies.

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LIST OF ABBREVIATIONS

1,25-OH-Vit D	1-25 dihydroxy Vitamin D
25-OH-Vit D	25 hydroxy Vitamin D
ANOVA	Analysis of Variance
bALP	Bone-specific alkaline phosphatase isoenzyme
bSD	Between-subjects standard deviation
BMC	Bone mineral content
BMD	Bone mineral density
BMI	Body mass index
BUA	Broadband ultrasound attenuation
CI	Confidence interval
CTx	Carboxy-terminal cross linked telopeptide of type I collagen
CV	Coefficient of variance
dB	Decibel
DEXA	Dual energy X-ray absorptiometry
DOES	Dubbo Osteoporosis Epidemiology Study
DPA	Dual energy photon absorptiometry
Dpy	Deoxypyridinoline
EPIDOS	Epidemiology of Osteoporosis Study
EPOS	European Prospective Osteoporosis Study
EVOS	European Vertebral Osteoporosis Study
FREE	Falls and fracture Risk Epidemiology in the Elderly Study
FRI	Fracture Risk Index
LoA	Limit of agreement

LSC	Least significant criterion
MHz	Megahertz
NH&MRC	National Health and Medical Research Council (Australia)
NOF	Neck of femur
NTx	Amino-terminal cross linked telopeptide of type I collagen
OC	Osteocalcin
OR	Odds ratio
PTH	Parathyroid hormone
Pyr	Pyridinoline
QCT	Quantitative computed tomography
QOL	Quality of life
QUS	Quantitative ultrasound
RCS	Resident classification score
ROI	Region of interest
RR	Relative risk
SD	Standard deviation
SE(M)	Standard error (measurement)
SMMSE	Standard Mini-Mental Status Examination
SPA	Single energy photon absorptiometry
SPSS	Statistical package
SXA	Single energy x-ray absorptiometry
VOS	Velocity of sound
wCV	Within-subjects coefficient of variability
WHO	World Health Organization
wSD	Within-subjects standard deviation