Electronic motion sensors (pedometers) are commonly used to measure physical activity across adult populations including the monitoring and encouragement of walking mobility of older people in sub-acute aged care settings. The accuracy of step counts in older slower walkers with and without gait aids appears poor. Systematic review and quantitative analysis of published clinical pedometer trials and validation studies in people over 50 years of age were conducted. Pedometers tested among the older population underestimated the actual step counts with accuracy decreasing with slower walking speeds. Error rates of 10.5% at 67.8 metres/minute to 35.1% at 38.4 metres/min were reported. There is significant under-counting of steps by a pedometer worn in the traditional position at the waist of an older person. Other positions may offer greater sensitivity to the capture of vertical displacements during ambulation. We are extending research in this domain by investigating the accuracy of pedometers worn at the knee.

Pilot trials at Peninsula Health of the pedometer worn at the knee rather than the traditional hip position have provided encouraging clinical results though this appears not to be widely used across healthcare and aged settings. The objective of the study was to investigate what is currently known about the accuracy of pedometers used by older people and to establish directions for future research with regard possible alternative positions for pedometer application.

RESULTS
An initial yield of 147 papers was drawn from the data base search. Application of inclusion criteria though reading the title, abstract and full text reduced this to 30 articles. Quality assessment reduced this further to four included studies. Trials typically investigated traditional (hip) mounting positions. The pedometer studies included in this review revealed varying degrees of error, with no studies reporting that the pedometer was 100% accurate in counting the number of steps. Pedometers tested among the older population underestimated the actual step counts with accuracy decreasing with slower walking speeds. Significant variations were observed among slower walkers with error rates of 10.5% at 67.8 metres/minute walking to 55.1% at 38.4 metres/minute being reported. Despite some variability, consistently the pattern was one of under-reporting. These slower walking speeds remain equivalent to those amongst the aged population in sub-acute settings within Peninsula Health. One study had unsuccessfully trialled the ankle as an alternative site for pedometer use and another study had proposed the potential of trialling the knee instead of the hip. No studies had completed a clinical trial of the knee as an alternative.

REFERENCES

DISCUSSION
The findings of this review are similar to the findings of many other pedometer studies, in that the accuracy of the pedometer decreases with slower walking speeds (Crouter et al., 2003). Research specifically investigating the accuracy of pedometers placed at the knee of older people does not exist and requires further investigation.

This forms the basis of an ongoing project currently underway at The Mornington Centre and due for completion in early 2010.

CONCLUSIONS
There is significant under-counting of steps by a pedometer worn in the traditional position at the waist of an older person. Other positions may offer greater sensitivity to the capture of vertical displacements during ambulation.

We are extending research in this domain by investigating the accuracy of pedometers worn at the knee.