



# The impact of a multifaceted ergonomic intervention program on promoting occupational health in community nurses<sup>☆</sup>

G.P.Y. Szeto<sup>a,\*</sup>, T.K.T. Wong<sup>a</sup>, R.K.Y. Law<sup>b</sup>, E.W.C. Lee<sup>c</sup>, T. Lau<sup>d</sup>, B.C.L. So<sup>c</sup>, S.W. Law<sup>c</sup>

<sup>a</sup>Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong

<sup>b</sup>Alice Ho Mui-Ling Nethersole Hospital, Hospital Authority, Hong Kong

<sup>c</sup>Prince of Wales Hospital, Hospital Authority, Hong Kong

<sup>d</sup>Taiipo Hospital, Hospital Authority, Hong Kong

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## ABSTRACT

**Introduction:** Community nurses are exposed to high physical demands at work resulting in musculoskeletal disorders. The present study examined the short- and long-term benefits of a multifaceted intervention program designed especially for community nurses in Hong Kong.

**Methods:** Fifty community nurses working in 4 local hospitals participated in the study. All of them underwent an 8-week intervention program consisting of ergonomic training, daily exercise program, equipment modification, computer workstation assessment and typing training.

**Results:** All participants showed significant improvement in musculoskeletal symptoms and functional outcomes comparing pre- and post-intervention results. Significant reduction in symptom score was observed at 1-year follow-up compared to post-intervention. Symptomatic group ( $n = 40$ ) showed more significant changes overall compared to asymptomatic group ( $n = 10$ ).

**Conclusion:** Results support the positive benefits, both short- and long-term, of the multifaceted ergonomic intervention programme for community nurses.

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## 1. Introduction

The nursing profession is known to have some of the highest prevalence rates of work-related musculoskeletal disorders (WMSD) among all healthcare professional groups (Hignett, 2003; Nelson et al., 2006). It has been reported by Hignett (1996) that back injury to nurses had an annual prevalence rate of 40–50% and lifetime prevalence of 35–80%. Locally in Hong Kong, 1-month prevalence rates of 59% has been reported for back pain by Yeung et al. (2004) and over 40% in a 12-month period by Yip (2001). Patient-handling activities have been widely reported to be the major factor contributing to back pain in nurses (Hignett, 2003), but recent studies have identified the importance of total physical workload as well as psychosocial stress to be significant risk factors

for WMSD in this profession (Bos et al., 2006; Yassi et al., 1995). In a study specifically on home care nurses in Hong Kong, 12-month prevalence rates of upper and lower back pain have been reported at 71.2% in a group of 265 nurses (Cheung et al., 2006).

Hong Kong has a community nursing service (CNS) network that serves all geographical regions of the territory, and the CNS teams are based at the local public hospitals in different regions. Their main duties are to provide nursing care to patients who cannot travel to the local hospitals to receive such care, and this includes those who live at home as well as those who reside in private nursing homes that do not have adequate nursing support. Commonly performed tasks by the community nurses in Hong Kong include wound dressing, changing foley catheters, stoma care and medication checks (Szeto et al., 2010). Together the physical work demands have rendered these nurses vulnerable to cumulative stress and strain of the musculoskeletal system.

The high prevalence rates of WMSD in nurses have persisted over the years despite extensive efforts in promoting occupational health training and implementing various interventions in different countries. Ergonomic interventions such as introducing assistive lifting devices and training of correct lifting postures have been adopted in different countries and results of controlled studies have been reported in the literature (Hignett, 2003; Bos et al., 2006). In

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\* Corresponding author. Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong SAR, China. Tel.: +86 852 27666706; fax: +86 852 23308656.

E-mail address: [rsgszeto@inet.polyu.edu.hk](mailto:rsgszeto@inet.polyu.edu.hk) (G.P.Y. Szeto).

recent years, “zero” or minimal lifting or transfer of patients has been advocated as an effective approach to reduce or prevent the problem of low back pain in nurses (Nelson et al., 2006). In most reports, patient-handling techniques were taught in group sessions on a more theoretical basis. Bos et al. (2006) reviewed studies that combined different approaches of education for nurses, and concluded that training and education combined with an ergonomic intervention were effective in reducing musculoskeletal symptoms in the nursing profession. For example, in Denmark, Hartvigsen et al. (2005) reported combining an “intensive” education program with “low-tech” ergonomic interventions such as use of slide sheets to assist in patient transfers. Their education program involved a 1-h session per week for 2 years continuously with 1 instructor managing a group of 8–12 nurses. However, the results failed to show any significant benefit of this intensive training compared to only one session of instruction for 3 h.

Other studies on occupational interventions have reported on the positive benefits of physical exercise training in reducing work-related musculoskeletal disorders, but which types of exercises are most appropriate is still open to debate. Some studies have compared an endurance exercise program against specific strength training, and both types of training were able to reduce musculoskeletal symptoms in nurses up to a 7-month follow-up period (Oldervoll et al., 2001). However, in that study there were no outcome measures related to the nurses’ work performance or work practice, and this may be an important factor to consider. Horneij et al. (2001) compared an individually designed physical training program with a workplace stress management program on home care personnel, and found no significant difference in the nurses’ back and neck pain scores between the two types of programs. This may be due to the fact that each intervention would address only one aspect of the problem, and therefore may not be able to have an overall effect in alleviating musculoskeletal disorders.

Several researchers have commented that single interventions are not effective and multifaceted intervention strategies are necessary in order to address all different aspects in the work of nurses that may have contributed to musculoskeletal disorders (Nelson et al., 2006; Stetler et al., 2003). It has been proposed that multifaceted intervention strategies should include elements in engineering controls, administrative controls as well as training/education (Nelson et al., 2006). This is also in line with occupational research literature that has demonstrated that work-related musculoskeletal disorders are multifactorial in nature (Feuerstein et al., 2004). In every occupational setting, it is most important to conduct a detailed job analysis first, in order to identify all the salient risk factors, and then design a suitable multifaceted intervention program to address all the issues that may contribute to work-related disorders or injuries.

In a pilot study reported earlier, we have examined the work of community nurses servicing the New Territories East region in Hong Kong, which is composed of a mixture of urban housing estates as well as rural residences (Szeto et al., 2010). Previous research on home care nursing service has mainly focused on the quality and outcome of nursing care in specialized areas such as palliative care (Candy et al., 2011), mental health (Keady, 2007) and pediatrics (Fraser et al., 2009). De Vlieghe et al. (2005) reported on the various types of interventions that were delivered by “professional home nursing” service in Belgium, and the most commonly performed tasks were mainly involving patient’s self-care and coping with daily living. In Hong Kong, many elderly patients or disabled persons may already have a full-time carer to help with self-care activities, and our community nurses were more often involved in technical nursing duties such as wound dressing, pressure sore management, changing foley catheters and diabetic

foot care. Hence there may be differences in community nursing interventions due to different cultural and social context in different countries. It is estimated that the situation in mainland China and other Asian countries such as Taiwan may be similar in that elderly persons are often cared for at home. However, to our knowledge, other countries in the region may not have such a comprehensive system of community nursing care service as in Hong Kong.

Based on a comprehensive job analysis, a multifaceted intervention program was specially developed for these community nurses, and the results demonstrated a significant reduction in the musculoskeletal complaints with improved functional outcomes among symptomatic nurses who underwent the intervention. While the results lend support to the effectiveness of this multifaceted ergonomic program at the post-intervention period, the long-term benefits of such program are not known. The aim of the present study is to investigate if the intervention effect can be sustained for longer periods of time and whether the program can be effective as both a secondary as well as a primary intervention for community nurses.

## 2. Methods

### 2.1. Study design

This study employed a longitudinal study design to determine the effects of a multifaceted ergonomic intervention program in preventing or reducing WMSD. The community nursing service (CNS) teams of four public hospitals of the New Territories East Cluster in Hong Kong were approached and the purpose of the research project was explained to them. Participants had to be aged between 20 and 50 years old, and worked as full-time community nurses based at one of the four hospitals. Individuals with serious medical pathology, such as cancer or systemic inflammatory diseases were excluded. Ethics approval was obtained from the Hong Kong Hospital Authority as well as the Hong Kong Polytechnic University. Informed consent was signed by each participant prior to the start of the study.

### 2.2. Participants

Altogether 66 eligible subjects were identified in the CNS teams in the 4 participating hospitals. Sixteen nurses did not participate in the study, either due to transfer out or they refused due to personal health reasons. Eventually 50 nurses were successfully recruited with 27 of them participating from the pilot study onwards.

The pilot study first took place during 2007 and 2008 in which 12 nurses and 15 nurses were recruited into the control and intervention groups respectively. In the pilot study, the subjects in the intervention group underwent the ergonomic intervention program for 8 weeks whereas control group only received the pre- and post-intervention measurements. Due to the difficulty of randomizing subjects into different groups within the same hospital, subjects within the same hospital were included in the same group. For the multifaceted interventions, it was also not possible to blind the participants or the outcome assessors.

The present study took place during 2009 and 2010. Twenty-three newly recruited subjects in the present study underwent a 3-month control period followed by an 8 weeks intervention program. The 12 subjects from the pilot study (the Pilot Control Group) directly proceeded to the intervention program after 1-year control period in 2008 (Fig. 1).

As the present study aimed to develop an intervention program that could benefit all nursing staff, it was not feasible to have any group to remain purely as the control group in the study. Hence we

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