Research Article

The health and fitness profiles of nurses in KwaZulu-Natal

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Back pain has been recognized as a problem in hospitals, with up to 50% of healthcare staff reporting symptoms (Smedly, Egger, Cooper and Coggon, 1997 and Engels, van der Guilden, Senden and van't Hof, 1996). The general purpose of this study was to determine the health and fitness profiles of nurses working in a public hospital. It was hypothesized that there is a correlation between the prevalence of lower back pain and being overweight or obese amongst nurses. One hundred and seven nurses from a local hospital in KwaZulu Natal participated in this study. Responses from a health questionnaire examining medical history, dietary, exercise and lifestyle patterns were analyzed. Fitness tests determined flexibility (sit and reach), muscular strength (back and grip strength), aerobic capacity (Astrand-Rhyming cycle) and anthropometrical data (percent body fat and BMI). Results suggested overall poor health and fitness profiles and a high incidence of back pain correlating with increased body fat percentages, thus accepting the hypothesis. The need for health and wellness intervention strategies in hospitals for the nurses was emphasized.

Introduction

Optimum health is something each individual and employee would want. Ideally, optimum health implies living a relatively disease-free life. Minimising disease development, especially lifestyle-related diseases such as cardiovascular disease, diabetes, cancer or obesity is very possible. Health care industry employees are certainly not immune from lifestyle-related diseases or work-related injury (McAllister and Broeder, 1993:50). With this statement in mind, the general purpose of this study was to determine the health and fitness profiles of nurses working in a public hospital. A tertiary purpose was to develop health and wellness programmes for the nurses as a result of the testing programme. The researchers of this study also hypothesised that there is an association between obesity and the prevalence of lower back pain among nurses.

Lower back pain is thought to be a particular hazard of nursing (Cust, Pearson and Mair, 1972:169). In the United States of America, nursing personnel have one of the highest job related injury rates of any occupation. The rate for hospitals (approximately nine in every 100 full-time workers) was the fourth highest (US Department of Labour, 2002). Similarly, according to the Faculty of Occupational Medicine (2001), back pain is a major cause of morbidity in the working population in the United Kingdom, with a prevalence of 40% overall and accounting for 50 million lost working days each year. Back pain has been recognised as a problem in hospitals, with up to 50% of healthcare staff reporting symptoms (Smedly, Egger, Cooper and Coggon, 1997: 1226). This is an indicator that the back injury problem in nursing personnel is important, however, in South Africa few studies have reported on workplace prevention programmes.

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Similarly, Yassi, Khokhar, Tate, Cooper, Snow, and Vallentyne (1995) found that 51% of nurses complained of back pain and more recently, Maul, Laubli, Klipstein, and Krueger (2003) concluded that lower back pain was prevalent in nurses with an increase of 73% - 76% annually. These statistics emphasize the need for wellness programmes that would advise nurses on preventative and treatment interventions for back pain. Such programmes should comprise of an educational programme, physical fitness intervention and of back injury rehabilitation.

Methodology

Research Design

The research design was a quantitative survey that required participants to complete a questionnaire and perform a series of fitness tests.

Instruments and Tests

The Health and Physical Activity questionnaire was designed by Corbin and Lindsey (1985), which consisted of a total of forty-seven close- ended questions. All participants completed the questionnaire. The questionnaire consisted of three sections. The information obtained from the various sections included, personal and family medical history, smoking and drinking habits; dietary patterns and physical activity profiles.
The fitness test battery comprised of the following components: anthropometrical, flexibility, aerobic and strength.

Anthropometry

The anthropometrical component consisted of height, weight, waist-to-hip ratio and skinfold measurements. The height and weight measurements were used to determine participants Body Mass Indexes. The purpose of this test was to provide an indication of the relationship of an individual's weight in relation to their height. (Bray, 1993) while the purpose of the waist-to-hip ratio was to determine abdominal and hip obesity patterns for each participant (van Itallie, 1988). The last measurement was the skinfold test. Skinfold measurements were taken from three sites on the body to determine the percentage of fat of each subject (Jackson, Pollock and Ward, 1980).

Flexibility

The flexibility component was determined by the modified sit-and-reach test. This test was designed to measure hip and trunk flexion and the ability to stretch the hamstring and lower back muscles. The participant sat on the floor with bare feet flat against the side of the test box and with their entire back in contact with the wall forming a 90 degree angle between the lower and upper trunk. The knees were kept straight throughout the test, with the tester holding the knees down to the floor.

To perform the test the subject extended their arms forward with hands placed on top of each other, palms facing down. The participant must be measured from the zero starting position on the measuring scale. Once in the starting position the participant slides their hands along the measuring scale on the top of the box. The furthest position that was reached by the subject and held for at least three seconds was recorded (Hoeger and Hopkins, 1992).

Aerobic fitness

According to Baumgartner et al. (2003), aerobic fitness can be measured in the laboratory with either a maximal or submaximal test. At maximal exercise, oxygen uptake can be measured from expired gases, estimated from maximal treadmill time, or estimated from power output. For submaximal tests, the heart rate response to a given power output on a treadmill or cycle ergometer is used to estimate aerobic fitness. A submaximal cycle test was used in this study. The Astrand-Ryhming (1954) cycle test measured the participant's aerobic fitness or submaximal oxygen uptake (VO_2max).

VO_2max is defined as the maximum volume of oxygen that is consumed by the body in each minute during exercise, while breathing air at sea level. Since oxygen consumption is linearly related to energy expenditure, when one measures the oxygen consumption, one is indirectly measuring an individual's maximum capacity to do work aerobically. Therefore, the higher the participants VO_2max, the higher the aerobic fitness of the participant.

Strength

The grip strength and back strength tests were used for this component.
The purpose of the grip strength test was to determine the isometric strength of the upper limb musculature. A handgrip dynamometer was used. The handgrip of the dynamometer was adjusted to fit the subject's hand. The subject holds the dynamometer in one hand in line with forearm and hanging at the thigh. The dynamometer was squeezed as hard as possible and the score recorded. The arm remained locked and straight at the elbow throughout the grip manoeuvre. The hand of the participant was not allowed to touch the body or object while the test is administered (Stoeling, 1970). The participants were allowed two attempts for each hand. The sum of the maximal scores for each hand was recorded and expressed in kilograms.

The second test was to determine the strength of the lower back muscles without any involvement of the arms, legs or body mass. A back dynamometer determined the back strength for participants. Participants bent forward to approximately 90 degrees and held onto a chain that was attached to a handlebar that was then hooked onto the back strength dynamometer. The participant placed their feet shoulder width apart, just behind the attachment of the dynamometer to the platform. Throughout the test, the participant looked up and kept their eyes fixed on a spot in front of them (This is very important so as to assure that the subject will pull the dynamometer with a straight back and thus avoid injury). Two attempts were allowed and the best result was recorded in kilograms Clarke, 1959; Schell and Leelarthaepin, 1994).

All tests were standardized, valid and reliable and methods of testing were employed conforming to criteria set by the American College of Sports Medicine (1991).

Population and sampling

One hundred and ten nurses above the age of 22 years volunteered to participate in this study. The nurses were employees at a provincial hospital in KwaZulu -Natal. The subjects had to be nurses working for at least two years before being included in this study.

The 110 participants were divided into smaller groups were they were briefed at preliminary meetings on various days on the research project at the hospital. The health questionnaire and the components for the fitness testing were discussed. After the briefings, three participants

withdrew, after realising that they will be unable to perform most of the tests. Each of the remaining 107 nurses participated in all fitness tests and completed the health questionnaire.

Data collection

The researchers and their assistants were post-graduates in the field of Biokinetics were responsible for the data collection. The researchers ensured that the assistants familiarized themselves with test procedures and scoring and that all results were accurately recorded. Testing procedures were carried out at the hospital in an appropriate environment. Each test was standardized and all equipment was calibrated before tests were performed. The researchers ensured that the test procedures and administration were alike throughout the testing to promote validity and reliability. The same measuring instruments were used throughout the testing programme.

It was recommended that the participants wore suitable clothing and training shoes during testing. Participants completed a circuit comprising of various stations, with each station measuring a particular fitness component. Prior to the testing, the fitness tests were discussed and demonstrations were held at each station. Participants were familiarized with the equipment used for testing. The purpose for performing each test and the correct technique was explained to the participants to ensure test reliability.

Statistical analysis

Data was analyzed by a computerized statistical programme known as SPSS Version 11. Means, standard deviations, t-tests and frequencies were used to analyze data. Differences between groups were established and inter-variable correlations were calculated using the Pearson Moment Correlation Coefficient technique and ANOVA for baseline variables.

Ethical considerations

The study design was accepted by the Ethics committee of the University of KwaZulu-Natal, Westville campus. Subsequently, a letter was written by the researchers to the hospital administrator requesting permission to undertake this study. Permission was granted.

Prior to the data collection process, all participants read and indicated their understanding of the document explaining the research project. The document outlined the testing programme, the length and duration of testing procedures and the possible risks and discomforts that might be experienced during testing procedures. The freedom of a subject to withdraw consent and to discontinue participation was also explained. The participants were assured that all the data gathered would be treated as confidential. Thereafter all participants provided written consent to participate in the fitness tests.

Results and discussion

A summary of the results according to responses from the health questionnaire is presented as well as the results for the fitness components. The average age was 37 years old with height and weight been 1.58m and 74kg respectively. The researchers divided the sample of nurses into four groups according to their responses from the personal medical history section of the health status questionnaire. These groups were the apparently healthy group (n=48) which consisted of nurses that showed no symptoms of disease. The lower back pain group (n=27) were nurses who had a medical diagnosis of lower back pain. Nurses that were diagnosed with lower back pain and had one or more hypokinetic disease, formed the lower back pain and hypokinetic disease group (n=16). Hypokinetic diseases, are also referred to as lifestyle diseases, for example, heart disease, diabetes, lower back pain and hypertension, which are primarily due to inactivity. The hypokinetic disease group (n=16) consisted of nurses with only one or more hypokinetic disease. The results were divided into the four categories as shown in table 1.

Table 1 indicates that 55% of the nurses tested had some form of pathology, including lower back pain, hypertension, asthma and diabetes. Approximately one-third (30%) of the sample presented with one or more hypokinetic disease. The most common hypokinetic disease amongst the nurses was hypertension and diabetes. Incidentally, almost one-quarter of the sample's mothers were treated or suspected of hypertension.

Table 2 reflects responses to selected smoking and exercise physical activity questions.

A positive fact of the study is that 93% of the nurses did not smoke while the remaining seven percent of smokers were from the hypokinetic disease group and the apparently healthy group. Smoking is a major risk factor for coronary artery disease and the hypokinetic disease group had the highest percentage of smokers (12.5%). The participants from this group are overweight. Being overweight and heavy smoking can be used to predict hospitalization for intervertebral disc disorders (Kaila-Kangas, Leono-Arjas, Riihimaki, Luukkonen and Kirjonen, 2003:1860). At present, this group does not experience symptoms of back pain, but if the participants continue to smoke and be overweight, then they are at an increased risk for developing back pain and possible hospitalization.

Eighty percent of the nurses did not exercise at all. The most common form of exercise for those who exercised was walking for an average of 38 minutes. Thirty-eight minutes of walking is acceptable however, a higher duration will assist in the reduction of the high

Table 1 Division of cohort

CATEGORY	n	PERCENTAGE
Apparently Healthy (Group One)	*48*	*45%*
Lower Back Pain (Group Two)	*27*	*25%*
Lower Back Pain and Hypokinetic Disease (Group Three)	*16*	*15%*
Hypokinetic Disease (Group Four)	*16*	*15%*

Table 2 The percentage responses to selected questions

MEASURED COMPONENTS	AVERAGE PERCENTAGE
Do not smoke	*93%*
Exercised on a regular basis	*20%*
Engaged in some form of weight loss	*52%*
Would prefer a walking programme	*73%*
Would prefer an aerobic dance programme	*35%*

percentage of body fat amongst the nurses.

A significant percentage of the participants appear to be enthusiastic to participate in preferred exercise programmes. Seventy-three percent would participate in a walking programme and thirty-five percent would participate in an aerobic dance programme. Garber, McKinney, Richard and Carleton (1992) stated that aerobic dance programmes result in similar improvements in aerobic fitness as compared to a jog/walk programmes. Hence, these preferred programmes will help the nurses improve their health and physical status, as well as serve as a motivational tool.
Several studies have underlined the importance of exercise in lowering chronic diseases such as hypertension (American College of Sports Medicine, 1991; Hagberg, Park and Brown, 2000:193-206; Chiriac, Dima-Cozma, Georgescu, Turcanu and Pandel, 2002:258-263; Thiele, Pohlink and Schuler, 2004:401-405). When an individual exercises, the blood vessels dilate to increase blood supply. This vasodilation reduces the pressure exerted against the artery walls, and in turn lowers blood pressure.

Table 3 reflects the mean percent body fat and body mass index (BMI) and waist-to hip ratio (WHR) results

According to Miller (2002), BMI values greater than 27.3 for females are indicators of excessive weight and have been associated with increased risks for several health problems, including hypertension, coronary artery disease and diabetes. Individuals with a BMI greater than 30 are considered obese, and those with a BMI greater than 40 are considered morbidly obese and are in the need of medical attention.

The researchers agree with Miller (2002) due the results presented in this study. Almost all the groups had a BMI of over 30. Particularly, the hypokinetic disease groups had a body mass indexes that are higher than the other two groups.

Part of a study by Smedley, Trevelyan, Inskip, Buckle, Cooper, and Coggon, (2003) observed the one-month prevalence of lower back pain among nurses in England and found that the most frequent reports of lower back pain was by nurses with a body mass index equal to or greater that 30 kg/m^2. This finding was similar to that of this study were the lower back pain groups had BMI ratios greater than 30 kg/m^2.

The percent body fat values from the individual groups are very high and in an unhealthy range. Percent body fat in the lower back pain and hypokinetic disease group is the highest at 38.7%.

Individuals with central, visceral types of obesity (increased fat tissue that accumulates beneath the muscle wall that surrounds the organs and other structures within the abdominal cavity) are particularly at risk for developing cardiovascular disease and other illnesses associated with poor metabolic profiles (Bouchard, 2000). This central visceral obesity is measured by the waist-to-hip ratio. Waist-to-hip ratios were above 0.86cm in all groups, hence an unhealthy range.

Leboeuf-Yde, Kyvik, and Bruun, (1999) and Berner, Alwash, Gaber, and Lovasz (2003) believed that there was a relationship between the prevalence of lower back pain and being overweight or obese. With regard to this statement it is clear that if the nurses decrease excessive body fat, there may be a significant reduction in the incidence of lower back pain.

Modified Sit-and Reach Test

Table 4 represents the modified sit-and-reach tests means and standard deviations.
The modified sit-and-reach test proved

Table 3 Mean percentage body fat, body mass index and waist-to hip ratio

Group	Mean Body Fat (%)	Mean BMI (kg/m^2)	Mean WHR (cm)
Apparently Healthy (n=48)	*30.4**	*28.7***	*0.89*
Lower Back Pain Only (n=27)	*34.3**	*30.6***	*0.89*
Lower Back Pain and Hypokinetic Disease (n=16)	*38.7**	*34.9***	*0.93*
Hypokinetic Disease Only (n=16)	*37.0**	*32.6***	*0.93*

**p<0.05 Significant differences between groups*
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Table 4 Modified sit and reach test means and standard deviations (SD) for the nurses

SAMPLE SIZE	MEAN (cm)	SD
Total Sample (n=106)	*34*	*8.15*
Apparently Healthy (n=48)	*35*	*8.53*
Lower Back Pain Only (n=26)	*35*	*7.62*
Lower Back Pain and Hypokinetic Disease (n=16)	*33*	*8.53*
Hypokinetic Disease Only (n=16)	*32*	*6.10*

to be a good indicator of poor hamstring and lower back flexibility. The mean score for the sample was 34cm. The hypokinetic disease group presented with the lowest flexibility score of 32cm. The lower back pain group had the highest score of 35cm, together with the apparently healthy group. However, according to the American Alliance for Physical Education, Recreation and Dance (1980) modified sit-and reach test norms, the average score for women is 46cm (SD = ± 9.99). A study conducted by Andrews (1990) on South African women, had a mean flexibility score of 41cm. This shows that the nurses in this study when compared to the South African female population are still below population norms.

There was a moderately high correlation (r = 0.76) between incidence of lower back pain in the lower back pain group and the group's flexibility scores. The lower back pain and hypokinetic disease group presented with a moderate correlation of 0.65.

Studies have suggested that adequate flexibility of the oblique, hamstring, hip flexor and lower back muscles is necessary for a healthy lower back (Foster and Fulton, 1991:187-209; Plowman, 1992:221-242). The flexibility of the spine provides for a functional mechanical advantage, while tight or shortened back muscles adversely affect spinal mechanics (Farfan, 1975:135-144; Kravitz and Andrews, 1995:45). A lack of pelvic mobility, due to tightness in the hip flexors, could limit pelvic mobility and cause strain on the lumbar spine. In addition, tight hamstring and hip extensor muscles could reduce the lordotic curve, which may impair spinal loading and consequently result in lower back pain.

Grip Strength and Muscular Back Strength Tests

Table 5 represents the means and standard deviations (SD) of the cohort for both grip strength and back strength tests.

The grip strength test is a common isometric strength test. Grip strength is a combined value of both left and right hand values. Results from the combined grip strength tests show that the nurses have fairly strong forearm flexors. The lower back pain and hypokinetic disease group presented with the lowest mean grip strength result of 56kg, while the lower back pain group scored the highest score of 61kg, together with the apparently healthy group.

Back strength is highest in the hypokinetic disease group with a mean of 60kg. The lowest means were in the lower back pain groups. These low values may be due to the incidence of lower back pain hence decreasing lower back strength in the groups with lower back pain pathology. The lower back pain group's result was a mean of 52kg and the lower back pain and hypokinetic disease group was lower at 49kg.

According to Addison (1980), it should be emphasized that the greatest losses in back strength have been found in the trunk extensors. Workers with high levels of muscular strength are less prone to back injury. The researchers support Addison (1980), as similar findings in this study showed that strength of the back extensors in the nurses was poor, hence, increasing the risk of back injury.

Submaximal Aerobic Cycle Test

This test was used to assess the subject's functional working capacity/aerobic fitness. (Table 6)

The number of participants in each group is reduced. This is due to the reason that many participants had excessive body fat and the bicycle seat was uncomfortable and that some participants were unable to complete the test due to extremely low aerobic fitness.

Table 5 Means (standard deviations) obtained from combined grip strength and back strength tests

SAMPLE	n	GRIP STRENGTH (KG)	BACK STRENGTH (KG)
Total Sample	*107*	*60 (12.21)*	*54 (18.61)*
Apparently healthy	*48*	*61 (14.41)*	*53 (16.87)*
Lower Back Pain Only	*27*	*61 (12.47)*	*52 (19.53)*
Lower Back Pain and Hypokinetic Disease	*16*	*56 (8.19)*	*49 (21.45)*
Hypokinetic Disease Only	*16*	*60 (6.93)*	*60 (19.09)*

Table 6 Means (standard deviations) of predicted maximal oxygen consumption (ml/kg/min) levels

SAMPLE	MEAN (SD) (ml/kg/min)
Total Sample (n=68)	*33 (10.72)*
Apparently Healthy (n=36)	*37 (10.77)*
Lower Back Pain Only (n=16)	*28 (9.50)*
Lower Back Pain and Hypokinetic Disease (n=8)	*29 (8.22)*
Hypokinetic Disease Only (n=8)	*29 (7.19)*

The results from this study show that the mean predicted maximal oxygen consumption (VO_2max) of the sample is 33ml/kg/min. The highest predicted VO_2max score is in the apparently healthy group with a score of 37ml/kg/min and the lowest score was recorded in the lower back pathology group. The remaining group's scores were also very low.

The aerobic capacity of the nurses is below average or poor for most of the sample. According to Blair (1995), poor aerobic capacity is associated with increased risk of mortality. Cardiorespiratory fitness indicates a high state of efficiency of the circulatory and respiratory systems in supplying oxygen to the working muscles. The more oxygen an individual is able to inhale and utilize, the longer an individual is able to work or exercise, before fatigue or exhaustion occurs (Miller, 2002).

Nurses should have good cardio-respiratory fitness due to the nature of their occupations. Nurses are continuously walking, lifting and transferring patients and need to move quickly to aid patients during an emergency situation. Being aerobically unfit, inflexible and decreased muscular strength will decrease their quality of work and in turn, affect the well-being of the patient. These efforts are also supported by Blue (1996), where it was believed that exercise, increased flexibility, muscle strength and endurance are encouraged to reduce the gap between job physical demands and human capabilities.

Since aerobic fitness is highly associated with overall fitness and weight management, the importance of aerobic fitness to reduce lower back pain is signified. This association is not as strong of a cause-effect relation that is seen with decreased levels of muscular strength, flexibility and muscular endurance with lower back pain. The exact mechanism for reduced pain with aerobic exercise is not clear, since the intensity of the muscular contractions is not considered intense enough to strengthen the muscles (Kravitz and Andrews, 1995:44-52).

Beliefs by Kravitz and Andrews (1995) are supported by Wittink, Michel, Sukiennik, Gascon and Rogers (2002) where the association of pain with aerobic fitness in patients with chronic lower back pain was investigated. Wittink et al. (2002) concluded that low aerobic fitness levels do not contribute to pain intensity in patients with chronic lower back pain.

Various hypokinetic diseases such as diabetes, coronary artery disease and hypertension are associated with poor aerobic fitness. Good aerobic capacity is associated with an increase in high-density lipoprotein (HDL) cholesterol (Uusitupa, 1996:445-449). An increase of HDL in the body has a positive effect on an individual's health status, more so in a coronary artery disease patient.

Conclusions

Lower back pain was prevalent in 40% of the sample, primarily due to weak back strength and high percentages of body fat. In all the groups the percentage body fat was above the norm (25%). A high percentage of body fat is related to coronary heart disease, hypertension and diabetes. Already there is a 30% prevalence of these diseases. Ivanov and Ivanov (2000) believed that an increase of body mass increases the frequency of hypertension and further increases the blood pressure in an already hypertensive subject.

The spine is designed to carry the body's weight and distribute the loads encountered during rest and activity. When excessive weight is carried, the spine is forced to assimilate the burden, which may lead to structural compromise and damage, especially to the lower back. Obesity may aggravate an existing lower back problem and contribute to the recurrence of the condition (Silveri and Spinasanta, 2003).

A high negative correlation (r = -0.85) between back strength and percent body fat was determined i.e. increased percentages of body fat correlated with decreased back strength and hence the increased risk to lower back pain. Thus the hypothesis is accepted. This is supported by a study conducted by Bayramoglu, Akman, Kilinc, Cetin, Yavuz and Ozker (2001), where it was concluded that obesity together with low back muscle strength are important factors influencing the risk of chronic lower back pain.

In general, flexibility was found to be poor. This inflexibility may give rise to shortened hamstring muscles as well as lower back muscles. Therefore decreased flexibility could be a major contributing factor to lower back pain.

Back strength was below the norm for the population due to the lack of exercise. Weak back muscles increases the risk of lower back pain. This is supported by a study conducted by Yip (2001:803), where it was concluded that education aimed at the prevention of lower back pain should include fitness training particularly performed to increase muscle strength and flexibility of the back.

Aerobic capacity was found to be poor. This is due to the lack of physical activity and exercise.

Recommendations

Based on the results and the conclusions derived from the study, the following recommendations appear to be warranted:

Exercise is safe for individuals with back pain because it does not increase the risk of future back injuries if the programme is well-designed (Rainville, Hartigan,

Martinez, Limke, Jouve and Finno, 2004:106-115). The value of exercise as a measure in the management of lifestyle disease and work related injury should be formally recognized in the development of a primary health care strategy in South Africa.

The importance of health and fitness education should be emphasized as a primary health care mechanism in hospitals and nursing training institutions, not only to patients but as well as employees.

The results indicate that the walking that the nursing do on a daily basis in the wards and around the hospital is not sufficient to derive an aerobic benefit. Hence, a structured programme of fitness is required for all nursing staff. It is therefore necessary to embark on the process of implementing health and wellness centres in hospital. Lifestyle and rehabilitation management programmes, have been successful in improving the wellness of patients with chronic diseases and poor fitness levels in the corporate environment (Coopoo, Patterson and van Selm, 2000:19). Similar centres will help the nurses to overcome specific fitness problems and in turn will help improve worker efficiency.

Similarly, according to Proper, Koning, van der Beek, Hildebrandt, Bosscher and van Mechelen (2003), the implementation of workplace physical activity programmes is supported to increases the level of health and fitness and to reduce the risk of musculoskeletal disorders. Hospitals should therefore consider having a fitness centre where a biokineticist/physical therapist would provide assistance for nurses concerning weight management; health assessments; education for the reduction of the risks of hypokinetic diseases and provide an exercise programme to rehabilitate lower back problems.

A lifting team should be established in hospitals in order to lift and transfer patients. The lifting team is a multi-factorial ergonomic approach, encompassing engineering controls (lifting devices and equipment), administrative controls (policies mandating the use of lifting teams and devices) and responsibility for personal practices (calling the lifting team instead of lifting alone). The dramatic reduction in back injuries to nurses and other health care personnel demonstrated in these programme evaluations is encouraging (Haiduven, 2003:217).

Further research, exploring the role of exercise and various ergonomic interventions in the prevention of lower back pain appears justified.

In the nursing training curriculum, the value of exercise, fitness and lifting techniques should be taught and emphasized.

A dietary modification plan is also needed in order to compliment the exercise programme. Possible behaviour modification counseling is further suggested in order to succeed with weight loss programmes.

It is suggested that employers strive to develop tools to better quantify the value produced by employees. One such tool is the introduction of incentives. Successful incentives to influence participation in a workplace health and wellness programme include: throwing parties; increasing insurance coverage; cash bonuses; and days off for meeting weight and or exercise goals (DeMoranville, Schoenbachler and Przytulski, 1998).

References

ADDISON, R 1980: *Trunk strength in patients seeking hospitalisation for chronic low-back disorders. Spine. 5: 539-544.*

AMERICAN ALLIANCE FOR HEALTH, PHYSICAL EDUCATION, RECREATION & DANCE 1980. *Health-Related Physical Fitness Test Manual. Reston, VA: Author.*

ASTRAND, PO & RHYMING, I 1954: *A nomogram for calculation of aerobic capacity for pulse rate during submaximal work. Journal of Applied Physiology. 7: 218-221.*

AMERICAN COLLEGE OF SPORTS MEDICINE 1991: *Guidelines for Exercise Testing and Prescription. Philadelphia: Lea and Febiger.*

BAYRAMOGLU, M; AKMAN, MN; KILINC, S; CETIN, N; YAVUZ, N & OZKER, R 2001: *Isokinetic measurement of trunk muscle strength in women with chronic low-back pain. American Journal for Physical Medicine and Rehabilitation. 80(9): 650-655.*

BENER, A; ALWASH, R; GABER, T & LOVASZ, G 2003: *Obesity and low back pain. Collegium Anthropologicum. 27: 95-104.*

BLAIR, SN 1997: *Effects of Physical Activity on Cardiovascular Disease Mortality Independent of Risk Factors. In: Leon, A.S, Eds. Physical Activity and Cardiovascular Health. Champaign: Human Kinetics.*

BLUE, CL 1996: *Preventing back injury among nurses. Orthopaedic Nursing. 15(6): 9-20.*

CHIRIAC, S; DIMA-COZMA, C; GEORGESCU, T; TURCANU, D & PANDELE, GI 2002: *The beneficial effect of physical training in hypertension. Rev Med Chir Soc Nat Iasa. 107(2): 258-263.*

CLARKE, HH 1959: *Application of measurement to health and physical education. Prentice-Hall: United States of America.*

COOPOO, Y; PATTERSON, D; VAN SELM, C & BUNN, C 2000: *Chronic diseases rehabilitation programme - Mondi paper Durban. Occupational Health South Africa. 6(4): 15-19.*

CUST, G; PEARSON, JCG & MAIR, A 1972: *The prevalence of low back pain in nurses. International Nursing Review. 19: 169-179.*

DEMORANVILLE, C.W; SCHOENBACHLER, DD & PRZYTULSKI, J 1998: *Wellness at work: Marketing Health Services. 18(2) Summer 1998: 14-24.*

FACULTY OF OCCUPATIONAL MEDICINE 2001: *Good Medical Practice for Occupational Physicians. London: Faculty of Occupational Medicine.*

FARFAN, HF 1975: *Muscular mechanism of the lumbar spine and the position of power and efficacy. Orthopeadic Clinics of North America. 6: 135-144.*

FOSTER, DN & FULTON, MN 1991: *Back pain and exercise prescription. Clinics in Sports Medicine. 10: 187-209.*

GARBER, CE; MCKINNEY, JS; RICHARD, MS & CARLETON, A 1992:

Is aerobic dance an effective alternative to walk/jog exercise training? Journal of Sports Medicine and Physical Fitness. 32(2): 136-141.

HAGBERG, JM; PARK, JJ & BROWN, MD 2000: *The role of exercise in the treatment of hypertension: An update. Journal of Sports Medicine. 30(3): 193-206.*

HAIDUVEN, D 2003: *Lifting teams in health care facilities. Journal of the American Association of Occupational Health Nurses. 51(5): 210-218.*

IVANOV, Z & IVANOV, M 2000: *Obesity, hypertension, and the lumbar syndrome in workers at the Neoplante Me plant in Novi Sad. Med Pregl. 53(5-6): 297-300.*

JACKSON, AS; POLLOCK, MI & WARD, A 1980: *Generalized equations for predicting body density of women. Medicine And Science In Sports And Exercise. 12: 175-182.*

KAILA-KANGAS, L; LEONO-ARJAS, P; RIIHIMAKI, H; LUUKKONEN, R & KIRJONEN, J 2003: *Smoking and overweight as predictors of hospitalization for back disorders. Spine. 28(16): 1860-1868.*

KRAVITZ, L & ANDREWS, MS 1995: *Fitness and low back pain. IDEA Today. 13(4): 44-52.*

LEBOEUF-YDE, C; KYVIK, KO & BRUUN, NH 1999: *Low back pain and lifestyle. Spine. 24(8): 779-783.*

CORBIN, CB & LINDSEY, R 1990: *Concepts of physical fitness. (7th Edition). Dubuque, IA: Wm. C. Brown Co.*

MAUL, I; LAUBLI, T; KLIPSTEIN, A & KRUEGER, H 2003: *Course of low back pain among nurses: a longitudinal study across eight years. Journal Of Occupational Environmental Medicine. 60(7): 497-503.*

MCALLISTER, R & BROEDER, CE 1993: *Wellness strategies help workers adopt healthy habits in lifestyles. Journal Of Occupational Health And Safety. August: 50-59.*

MILLER, DK 2002: *Measurement by the physical educator: Why and how. (4th Edition). New York: McGraw Hill.*

PLOWMAN, SA 1992: *Physical activity, physical fitness, and low back pain. In: Holloszy, J.O. (Eds), Exercise and Sport Sciences Reviews (pp. 221-242.). Baltimore: Williams and Wilkins.*

PROPER, KI; KONING, M; VAN DER BEEK, AJ; HILDEBRANDT, VH; BOSSCHER, RJ & VAN MECHELEN, W 2003: *The effectiveness of worksite physical activity programs on physical activity physical fitness and health. Clinical Journal of Sports Medicine. 13(2): 106-117.*

RAINVILLE, J; HARTIGAN, C; MARTINEZ, E; LIMKE, J; JOUVE, C & FINNO, M 2004: *Exercise as a treatment for chronic low back pain. Spine. 4(1): 106-115.*

SILVERI, CP & SPINASANTA, S 2003: *Connection to Back Pain and Development of Obesity. In: http://www.spineuniverse.com/displayarticle.php/article2391.html.*

SMEDLY, J; EGGER, P; COOPER, C & COGGON, D 1997: *Prospective cohort study of predictors of incident low back pain in nurses. British Medical Journal. 314: 1225-1228.*

TATE, RB; YASSI, A & COOPER, J 1999: *Predictors of time loss after back injury in nurses. Spine 15. 24(18): 1930-1935.*

THIELE, H; POHLINK, C & SCHULER, G 2004: *Hypertension and exercise: Exercise regimes for the hypertension patient. Herz. 29(4): 401-405.*

U. S. DEPARTMENT OF LABOR BUREAU OF LABOR STATISTICS 2002: *Lost-work time injuries and illnesses: Characteristics and resulting time away from work.*

UUSITUPA, MI 1996: *Early lifestyle intervention in patients with non-insulin-dependent mellitus and impaired glucose tolerance. Annals of Medicine. 28(5): 445-449.*

YASSI, A; KHOKHAR, J; TATE, R; COOPER, J; SNOW, C & VALLENTYNE, S 1995: *The epidemiology of back injuries in nurses at a large Canadian tertiary care hospital: implications for prevention. Occupational Medicine. 45(4): 215-220.*

YIP, Y 2001: *A study of work stress patient handling activities and the risk of low back pain among nurses in Hong Kong. Journal of Advance Nursing. 36(6): 794-804.*