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The effect of improving sitting posture in nursing home residents on the burden of care

Key Messages

1. Adapted seating devices can improve poor sitting posture in nursing home residents.
2. Improved sitting posture reduces use of physical restraints and disturbing behaviour among residents and reduces the burden of care for their caregivers.

Introduction

Poor sitting posture is a common problem among the elderly, especially in nursing homes residents.[1] Contributory factors include kyphotic changes in the spine resulting in limited flexibility; decline in muscle strength and trunk control and general loss of condition, all of which impair the ability to maintain normal posture in the sitting position.[2] Moreover, prolonged sitting with poor posture increases the risk of developing pressure sores.

In Hong Kong, many old people reside in residential care homes. Seating devices commonly available in these institutions include the commode chair, wheelchair, and geriatric chair. Attention is seldom paid to the ergonomic design of seating devices. Often they do not fit the relatively small body size of elderly Chinese people, nor provide sufficient support for maintaining good posture. Those with impaired sitting posture often lack appropriate positioning equipment. To prevent the elderly from sliding out of their chairs, restraints are frequently applied. It is well known that physical restraints are ineffective for maintaining sitting posture and may have undesirable side-effects.[3]

Poor sitting posture in nursing home residents increases the burden on caregivers because they require frequent re-positioning throughout the day and also tend to be more agitated, probably due to discomfort.[1] Such disturbing behaviour may increase psychological tension among caregivers.

With the growing demand for better seating for elderly people, there is a need to develop seating devices that provide comfortable, functional posture, relieve stress on bony points and relieve the burden of care for the caregiver.

Methods

Subject selection

This study was conducted from July 1997 to June 1998. Thirty-five subjects were chosen from three nursing homes by convenience sampling according to these criteria: (1) at least 65 years of age, (2) poor sitting posture (eg leaning sideways, sliding out of the chair), (3) unable to adjust sitting posture without assistance, (4) sitting out daily, (5) at high risk of developing pressure sores (Norton score of ≤14), and (6) needing intensive nursing care (eg repeated repositioning) because of poor sitting posture.

Implementation

The selected subjects were assessed by an experienced occupational therapist trained to measure study outcomes by a seating specialist. After a detailed seating assessment, a tailor-made adapted seating device was given to each individual. The seating devices used in this study consisted of three parts: a foam contour seat for pressure relief; a back support to provide extra trunk support which could be contoured to accommodate kyphotic spines, and a pelvic belt which prevented the person from sliding out of the chair. The seating devices were adapted to existing chairs used in the nursing homes. Caregivers were taught the correct application and maintenance of the seating devices.

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Data collection
Data collected on study subjects included mental functioning (abbreviation mental test), activities of daily living (Barthel index), and the risk of developing pressure sores (Norton score).

Sitting posture using the conventional chair (first measurement) and adapted seating device (second measurement) were measured. The first measurement involved correctly positioning the nursing home resident on their usual chair. The researcher then measured postural displacement and peak ischial pressure at baseline. The subject remained seated for 30 minutes, after which changes in postural displacement and peak pressure were recorded. The second measurement was done the same way, after the tailor-made seating device was applied to the client's chair.

Key outcome measures
Improvement in seating posture by comparing measurements using conventional versus adapted chair

(1) Posture displacement: forward displacement was measured using a meter rule placed perpendicular to the front edge of the chair seat. The distance from the front edge of the chair seat to the peak of the patella with the knee flexed to 90 degrees was measured. Lateral displacement was measured by the degree of tilting of the anterior superior iliac spine from the horizontal. (2) Peak sitting pressure: peak seating pressure over the sacrum and ischium was measured using the Tekscan "seat" prototype (Tekscan Inc, Cambridge [MA], US) consisting of an array of 2056 sensors on a sensing surface. A computer translates these signals into a graphic plot of different pressure areas.

Changes in burden of care before and after the programme

Prior to, and 1 month after, the seating programme, the daily routine workload and the modified Cost of Care Index[4] at each institute was recorded to assess the burden of care. The daily routine workload associated with residents included application and adjustment of physical restraints, repeated repositioning of the residents, responding to agitated behaviour of the residents, and assistance in activities of daily living. The modified Cost of Care Index included two dimensions: 'physical and emotional health' and 'care recipient as provocateur'. Caregivers responded to each question by checking one of four categories: strongly agree, agree, disagree, or strongly disagree.

User satisfaction

Seventy-five caregivers were asked to express their level of satisfaction with the programme using a visual analogue scale (0-10). Subjects' satisfaction levels were not measured because most had a low abbreviated mental test score or communication difficulties.

Data analysis
The Statistical Package for the Social Sciences (Windows version 6.1; SPSS Inc, Chicago [IL], US) was used for data analysis. The one-tailed paired *t*-test was used to compare pre- and post-treatment (improvement in seating posture) for each subject, using the assumption that the intervention would improve sitting posture in the subjects. Data on the burden of care were analysed by frequency count. The Chi squared test was used to evaluate the relationship between the burden of care and improvement in seating posture.

Table 1. Subjects' demographics (n=29)

Characteristic	No.
Sex	
Male	8
Female	21
Age (mean±SD) [years]	80±6.25
Diagnosis*	
Stroke	19
Dementia	8
Parkinsonism	5
Fracture	4
Abbreviated mental test (mean±SD)	2.14±2.26
0-5	27
6-10	2
Barthel index (mean±SD)	12.76±10.4
0-10	18
11-20	4
21-30	6
>30	1
Norton score	
<14 (high risk)	1
<12 (very high risk)	28
Abnormalities in sitting posture*	
Sliding forward	24
Leaning to side	23
Leaning forward	5
Kyphosis	19
Lordosis	1
Scoliosis	5

* Not mutually exclusive

Results

Of the 35 subjects selected, six died during the study period so were excluded. The characteristics of the remaining 29 subjects are described in Table 1. Adapted seating significantly improved subjects' sitting posture when compared with the conventionally used chair (Table 2).

Forward sliding
Thirteen of 29 subjects had forward sliding of >3 cm on conventional chairs, while none experienced such sliding on their adapted chairs (P=0.001). The mean forward sliding recorded on conventional and adapted chairs was 3.07 cm and 0.4 cm respectively.

Stability
Pelvic obliquity was significantly decreased after using the adapted chair (P=0.002). Nine of 29 subjects had a pelvic tilt of >10º on conventional chairs, whereas none had such obliquity while on the adapted chairs. The mean pelvic obliquity angle for the conventional chair was 5.86º compared with 2.31º on the adapted chair.

Table 2. Comparison of sitting posture and pressure using conventional versus adapted chair

Sitting posture	Conventional chair (No.)	Adapted chair (No.)
Sliding forward (mean±SD)	3.07±2.87	0.4±0.51
>3 cm	13	0
2-3 cm	4	1
1-2 cm	6	2
<1 cm	6	26
Increased pelvic obliquity (mean±SD)	5.86±5.36	2.31±2.41
>10°	9	0
5-10°	2	5
Ischial pressure (mean±SD) [mm Hg]		
Peak	226.00±95.25	156.50±59.26
Increase	41.17±59.62	26.43±26.61
Sacral pressure (mean±SD) [mm Hg]		
Peak	144.1±80.1	105.60±44.36
Increase	37.53±46.52	23.09±30.11

Peak pressure over ischial tuberosities and sacrum

Adapted seating significantly reduced the peak pressure over the ischial tuberosities and sacrum compared with conventional seating devices. Eleven of 29 subjects had an increase in pressure (>50 mm Hg) over their ischial tuberosities on conventionally used chairs, while only five showed increased ischial pressure on the adapted chairs. Two subjects had >100 mm Hg increase in sacral pressure on conventional chairs compared with none for adapted chairs. The mean rise in peak ischial pressure on conventionally used chairs (41.17 mm Hg) was significantly greater (P=0.001) than that on adapted chairs (26.43 mm Hg). Similarly, the mean increase in peak sacral pressure on the conventionally used chairs (37.53 mm Hg) was significantly higher (P=0.01) than that on adapted chairs (23.09 mm Hg).

Burden of care

Use of physical restraint

After the implementation of the programme, the use of physical restraints was significantly reduced. Initially, 20 of 29 subjects were restrained in their conventionally used chair, and 11 of them required application of the restraint more than twice daily. After the introduction of adapted seating, four of 29 subjects required restraints (P=0.001) with only one needing application of restraints more than twice daily (P=0.001).

Need for repositioning

There was a significant reduction in the need for repositioning. Twenty-two of 29 subjects needed repositioning more than twice daily in their conventionally used chair and the mean number of repositionings was 3.78. After adapted sitting, only three of 29 subjects required repositioning, and the mean of number of repositionings was reduced to 1.04 (P=0.001).

Disturbing behaviour

This was significantly reduced with 12 subjects behaving in a disturbing manner while in their conventional chair but only four showing such behaviour after the introduction of the adapted chair. The mean number of episodes of disturbing behaviour before and after introduction of adapted chairs was 2.15 and 0.66, respectively (P=0.001).

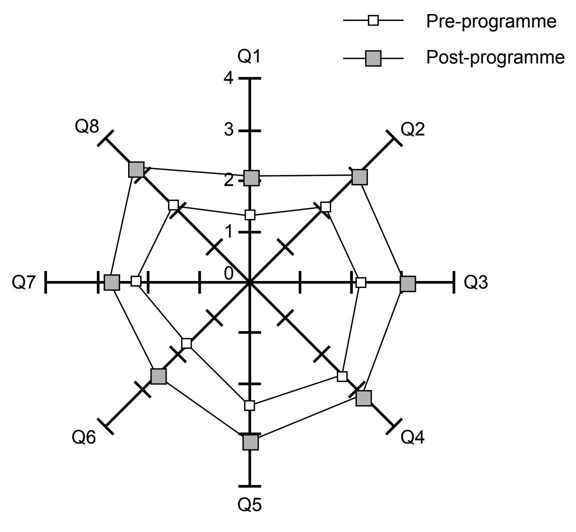

Fig. Improvement in burden of care

Carers were asked eight questions (Q1-Q8) related to their perceived burden of care before (pre-programme) and after (post-programme) introduction of adapted seating. Scores for each question ranged from 1 (strongly agree) to 4 (strongly disagree)

Dependence in feeding and grooming

Before the programme, 19 of 29 subjects were dependent or required assistance with feeding and 22 needed help with grooming. After the adapted chair was introduced, 10 (50%) subjects gained independence with feeding and four (18%) were able to groom themselves independently. These changes were not statistically significant.

Modified Cost of Care Index

Significant improvements were observed in the index score after the seating programme was introduced. The Figure shows the improving trend in perceived burden of care.

The total score before the seating programme was 16.55 and 22.97 after introduction of adapted seating (P=0.001). Over 75% of nursing home staff agreed that the programme improved subjects' sitting posture, which in turn improved the image and quality of service of their institutes. Nearly two thirds (65%) of staff thought that the programme reduced their workload and burden of care.

Relationship between improved sitting posture and burden of care

This study hypothesises that the improvement in sitting posture parameters (sliding forward, pelvic obliquity, peak ischial and sacral pressure) was related to a reduction in the burden of care (caregivers' workload and modified Cost of Care Index). Chi squared analysis found no relationship between the prevalence of restraint use and sitting posture. Decreased use of restraints after the seating programme was introduced reflects an overall improvement in sitting posture. The need for repositioning the subjects was significantly correlated with the amount of sliding forward (P=0.04), pelvic obliquity (P=0.03), and peak ischial pressure (P=0.006). A significant correlation (P=0.03) was found between disturbing behaviour and reduction in the burden of care (modified Cost of Care Index).

Discussion

Adapted seating devices effectively improved sitting posture in nursing home residents, which in turn reduced the frequency of use of restraint, need for repositioning, and level of disturbing behaviour among the subjects. In addition, the improvement in sitting posture decreased the workload of caregivers, even though there was no significant change in functional capacity.

Drawbacks of this study include: (1) the lack of a control arm due to the small sample size; (2) the inability to assess the level of comfort or satisfaction subjects had with the adapted seating as most of them were demented; (3) long-term follow-up was not done because the subjects were extremely frail (at 6 months, eight of 29 subjects had been admitted to hospital or transferred to other institutions such as infirmary units, and five had died); and (4) data on presence of pressure sores were not collected (28 of 29 subjects had a Norton score of <12 indicating high risk of developing pressure sores). Although pressure sore prevention was not the aim of this study, avoiding high peak pressures is important among this frail group. Adapted seating was useful for reducing peak pressure and controlling forward sliding.

In conclusion, adaptive seating is effective for improving sitting posture in frail nursing home residents and for decreasing the burden of care among their caregivers.

Acknowledgement

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