A comparison of slides used in patient handling

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Patient-handling slides are the most recently introduced moving and handling aid. At present, there is little research-based information available on their use. This study compared four slides currently used in patient moving and handling. Two tasks were performed with each slide, and the ease of learning how to use them and the ease of use of each slide was evaluated.

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The problem of low back pain among health-care workers has been widely reported. Studies have been carried out on nurses (Klaber Moffet et al, 1993; Leighton and Reilly, 1995; Hollingdale, 1997; Smedley et al, 1997), on nursing aids (Heap, 1987; Garg et al, 1992) and physiotherapists (Scholey and Hair, 1989; Mierzejewski and Kumar, 1997).

The aetiology of low back pain is multifactorial, involving both occupational and non-occupational causal factors. Occupational factors include patient-oriented tasks such as patient transfers and repositioning patients in bed, adverse working postures and the cumulative effects of a heavy workload (Harber et al, 1988; Garg et al, 1992; Smedley et al, 1995; Hollingdale, 1997; Mierzejewski and Kumar, 1997). Non-occupational factors include a previous history of low back pain and the psychological wellbeing of the lifter (Heap, 1987; Klaber Moffet et al, 1993; Smedley et al, 1995, 1997).

Figure 1. Task 1: turning a 'patient' in bed.

PATIENT HANDLING SLIDES

In 1993, the Safety, Health and Welfare at Work Regulations were introduced in Ireland. These extended the requirements of the Safety, Health and Welfare at Work Act 1989, which was implemented to encourage improvements in the health and safety of workers in the workplace. The new regulations suggested a move away from the old philosophy of 'safe' lifting and emphasized the need to avoid manual handling where possible.

In response to the regulations, greater emphasis was placed on the avoidance of lifting and increased use of moving and handling aids.

The most recently introduced moving and handling aids are slides, and they have been used in Ireland since 1997. They are made of low friction anti-static nylon material, the inner surfaces of which slide on each other. These aids aim to eliminate the need to bodily lift the patient, thereby reducing the strain on the low back of the health-care worker or carer.

Patient handling slides do not pose the same problems as many of the other aids that have been investigated previously. Slides are considerably more compact and easier to store and do not require large areas of space in which to be used. However, training in the use of slides is just as important an issue as it is for other patient-handling aids.

Although aids used for patient handling tasks could reduce back stress, studies have shown that they are not always used (Garg et al, 1992; Duffy et al, 1999). The reasons why patient-handling aids are not routinely used are quite complex (Bell, 1987). Inadequate training, lack of

space, lack of time and inaccessibility of aids are common reasons quoted in the literature (Pheasant et al, 1991; Moody et al, 1996; Duffy et al, 1999). Yassi et al (1995) found that nurses had difficulty assessing the necessity for moving and handling aids and were therefore not confident in their use.

There is a dearth of research on slides despite their widespread use. A recent study by Bohannon (1999) has started to address this. He investigated the pull forces required to move a supine person between adjacent surfaces with and without different sliding devices. He reported that sliding devices are associated with reduced pull forces. The task under investigation in Bohannon's study is just one of many that can be carried out with slides.

The current study set out to investigate other tasks for which a slide can be used. The main aim of the study was to compare four types of patient-handling slides that are currently in use. The slides that were included were the Locomotor (Loco, 012 compact, 72 cm x 70 cm, Select Healthcare, Higham Ferrers, Northants), the Multiglide (Grimstead multiglide, 97cm x 73cm, Immedia, Cobenhavn, Denmark), the Phil-E-Slide (roller sheet, 67 cm x 63 cm, Ergo-Ike, Oldbury-on-Severn, South Gloucestershire) and Maxislide (Arjo maxislide NFA1000, 71 cm x 167 cm, Arjo Ltd, Gloucester).

The study investigated:

- The ease of learning how to use the slide
- The ease of using the slide
- The time taken to carry out tasks with the slide
- The financial cost of the slide.

METHODOLOGY

The study was conducted in two parts: a training phase and an evaluation phase. Two tasks were assessed using each of the four patient-handling slides. These particular tasks were chosen because they are two commonly performed tasks and because they can both be performed with all four slides. The tasks were turning a 'patient' in bed (task 1, *Figure 1*) and sitting and moving a 'patient' up in bed (task 2, *Figure 2*).

Figure 2. Task 2: sitting and moving a 'patient' up in bed.

Subjects

Ten volunteer subjects who had no previous experience of moving and handling patients with a slide were included in the study. All subjects had knowledge of spinal anatomy and the principles of moving and handling. Each subject received verbal information about the nature of the study and their role in it before signing a consent form. They were assured confidentiality and their right to withdraw at any stage. They gave written informed consent to participate.

A screening questionnaire for exclusion criteria was administered to volunteers before the study. The exclusion criteria were a history of low back pain or any lower limb musculoskeletal problem which would impede participation in the practical aspects of the study.

Patient

Four volunteer subjects acted as the patient.

Assessment tools

It was necessary to develop tools of assessment specifically for the study as this type of study

had not been undertaken previously. A training evaluation form, slide user evaluation form and observer's checklist were developed. Subjects rated the ease of learning how to use each of the slides on the training evaluation form. A four-point scale which ranged from 'no difficulty learning how to use the slide' to 'much difficulty learning how to use the slide' was used.

The slide users evaluation form sought information on subjects' ratings on aspects of using a slide (ease of placement, ease of removal, perceived exertion and user comfort). Subjects rated ease of placement and ease of removal of a slide on a four-point scale where 1 = I found this slide very easy to insert and 4 = I found this slide very difficult to insert. They rated perceived exertion on a five-point modified Borg Scale. They rated comfort on a five-point scale where 1 = I found this slide very comfortable to use and 5 = I found this slide very uncomfortable to use. Subjects were also invited to give any other comments regarding the use of each slide to perform a task.

TABLE 1.
Observer's evaluation checklist (task 1)

1.	Place the slide between patients' shoulders and hips	[ ]
2.	Position patient for log roll	[ ]
3.	Log roll in walk–stand position	[ ]
4.	Insert slide accurately	[ ]
5.	Leader adopts walk–stand position	[ ]
6.	Leader places hands on patient's shoulder and hip	[ ]
7.	Assistant adopts appropriate grasp of slide	[ ]
8.	Assistant adopts walk–stand position	[ ]
9.	Leader agrees command, informs patient	[ ]
10.	Procedure carried out on agreed command	[ ]
11.	Patient is moved until shoulder is at edge of bed	[ ]
12.	Leader tucks slide under patient	[ ]
13.	Assistant positions patient for log roll	[ ]
14.	Leader lowers the bed and log rolls the patient	[ ]
15.	Assistant removes slide and places it on table	[ ]

Time taken _____

TABLE 2.
Observer's evaluation checklist (task 2)

1.	Position the slide appropriately	[ ]
2.	Log roll appropriately to position slide	[ ]
3.	Leader lowers bed	[ ]
4.	Slide users assist patient to sitting	[ ]
5.	Assistant supports patient	[ ]
6.	Leader pulls out backrest to marked position	[ ]
7.	Slide users position themselves on bed	[ ]
8.	Slide users secure a comfortable through arm grasp	[ ]
9.	Leader agrees command, informs patient	[ ]
10.	Procedure carried out on agreed command	[ ]
11.	Assistant supports the patient	[ ]
12.	Leader prepares to remove slide	[ ]
13.	Leader removes slide and places in on table	[ ]

Time taken _____

The observer's checklist contained components which were considered essential to the correct technique of using each slide. The observer indicated with a tick if each component was carried out. The checklist for task 1 had 15 components (*Table 1*) and the checklist for task 2 had 13 components (*Table 2*).

Procedure

Training phase: All subjects attended a half-day training session given by the senior physiotherapist in ergonomics at the participating hospital. An ergonomic approach to moving and handling was discussed, followed by a description of each slide. Subjects were then matched for height in pairs and worked together for both the training and evaluation phases. A demonstration of task 1 using all four slides was given. Subjects practised task 1 using all four slides until they and the senior physiotherapist in ergonomics were satisfied with the technique. The same format was followed for task 2. The training concluded with an overview of the use of the slides. The subjects then completed the training evaluation form.

Evaluation phase: The evaluation was carried out within 14 days of the training. Evaluation took place in the same unit and under the same conditions as the training. A standard height-adjustable hospital bed was used. The slides were placed on a table which was at the foot of the bed. Two writing stations, one on each side of the bed, were available for the subjects to complete the slide user evaluation form.

Each pair of subjects performed both tasks using each of the four slides. No other subjects were present in the room at the time. The order in which slides were used and tasks undertaken was randomized to minimize sequence bias.

The patient was positioned on the bed by one of the researchers before the subjects entered the room. The patient was instructed to act as a passive model but to cooperate as requested by the subjects.

Subjects were instructed that a task begins when the slide is removed from the table and

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ends when the slide is replaced on the table. They were instructed to carry out the task in their own time. The time it took to perform each task was recorded because 'lack of time' has been cited in the literature as a reason why health-care workers do not use moving and handling aids (Takala and Kukkonen, 1987; Duffy et al, 1999). Although the tasks were being timed, the subjects were not made aware of this as it was felt that technique could be compromised in the effort to carry out the task in the shortest possible time.

All subjects' technique was assessed by the same person using the observer's checklist. On finishing each task with a particular, slide the subjects completed the slide user evaluation form at separate writing stations.

The time to perform a task was recorded using a standard stop-watch. The timing began when a slide was taken from the table and ended when a slide was replaced on the table. One factor that could have affected the time recorded for any given task was failure to adjust the bed height. Lack of knowledge or skill on the part of the subject would have been the reason for this as opposed to any inherent fault of the slide. In order to standardize this factor, the time taken to adjust the bed height was recorded by a second person using a standard stop-watch. If the time taken to adjust the bed height was 2 seconds greater than all of the other recorded times for a particular task using a particular slide, the greater time was amended to the average of the recorded times. The recorded times were totalled and the average time to perform a task with that slide was calculated.

Data analysis: Data were analysed descriptively. Each subject gave individual scores to each slide. For training evaluation, the maximum individual score was 4, the minimum was 1. The minimum score was the best score and the maximum score was the worst. A total score was achieved by adding the 10 subject's individual scores. The maximum total score was 40, the minimum was 10. For the slide user's evaluation form, the maximum individual score was 18 and the minimum was 4. Again the minimum score was the best score and the maximum was the worst. The maximum total score was 180 and the minimum was 40.

The cost of the slides was obtained from the Irish suppliers of the products. Slides were ranked for increasing costs, where the least expensive was ranked 1st.

The scores obtained from the observer's checklist were not included in the final analysis. It was felt that it was a measure of the subjects' technique and not the slides and therefore could have skewed the results for the slide usage. The purpose of observation was to identify any faulty technique which could have contributed to problems using the slides and which therefore could have influenced the final scores.

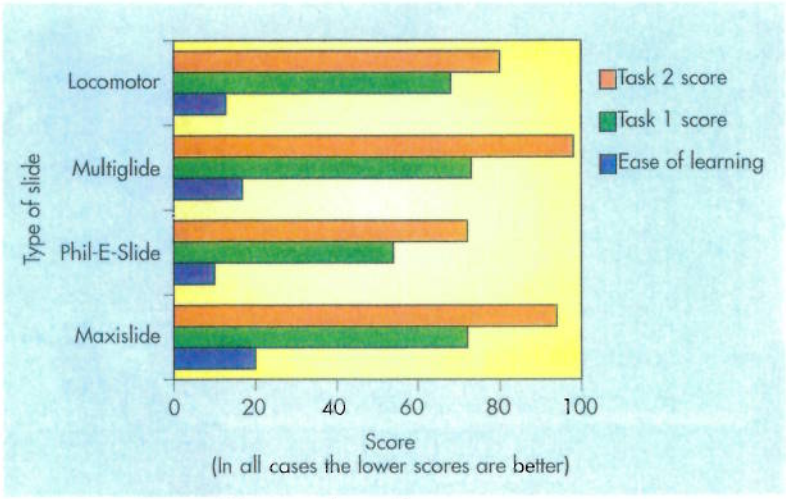

Figure 3. Scores for ease of learning and ease of use.

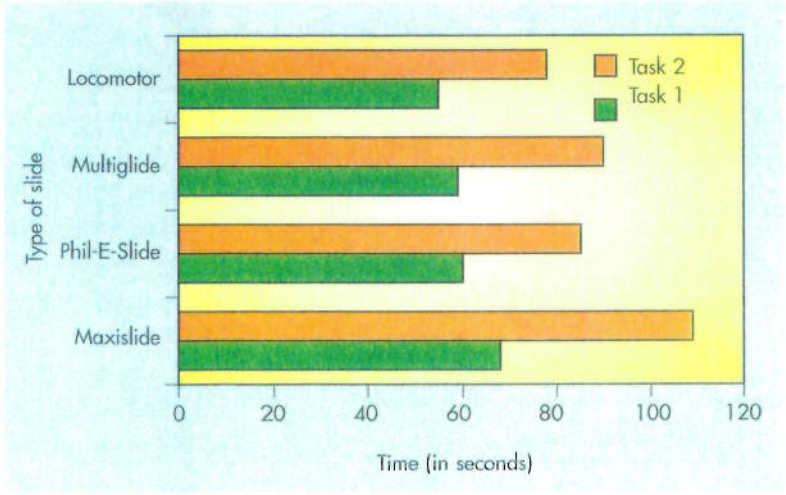

Figure 4. Average times for performance of tasks.

RESULTS

Ease of learning

The Phil-E-Slide was considered unanimously to be the easiest slide to learn how to use with a minimum score of 10. The Locomotor was 2nd easiest with a score of 13, followed by the Multiglide (17) and the Maxislide (20) (*Figure 3*).

Ease of use

Task 1: The Phil-E-Slide was ranked 1st by subjects for performing task 1 with a score of 53. The Multiglide was ranked 4th with a score of 73 (*Figure 3*).

Task 2: The Phil-E-Slide was ranked 1st by the subjects for performing task 2 with a score of 72.

It was found to be the easiest slide to place under the patient, the most comfortable slide to use and required least exertion. The Locomotor was ranked 2nd (80), the Maxislide 3rd (93) and the Multiglide was 4th with the highest score of 98 (*Figure 3*).

Timing

Task 1 was performed in the shortest time using the Locomotor (53 sec). This was followed closely by the Multiglide (58 sec) and the Phil-E-Slide (60 sec). The Maxislide was slowest (1 min 8 sec).

Task 2 was also performed in the shortest time using the Locomotor (1 min 17 sec). The Phil-E-Slide was 2nd (1 min 25 sec), the Multiglide was 3rd (1 min 29 secs) and the Maxislide was slowest (1 min 48 secs) (*Figure 4*).

Financial cost

The Locomotor was ranked 1st for financial cost and the Multiglide was 2nd, i.e. the Locomotor was the least expensive of the four slides (*Table 3*).

An overall ranking of the slides was then calculated based on the results of the various factors under investigation (*Table 3*).

DISCUSSION

The aim of this study was to compare four slides that are currently used in patient handling. Two patient-handling tasks were assessed using each of the four slides. The slides were evaluated for ease of learning how to use, ease of operation, time taken to perform the tasks and financial cost. It is acknowledged that some of the slides evaluated in this study can be used for tasks other than those under investigation and the final overall rankings may have been different if such tasks were included. The specific tasks that were chosen for the study were those that were commonly carried out and could be performed with all four slides. It must be noted that the Multiglide tends to be used in moving and handling with a neuromuscular approach. With this approach, the therapist holds the patient and not the slide, therefore there is no need for handles on the slide.

It is also acknowledged that the importance of infection control with the use of slides was not investigated here. Given that this study had volunteers who acted as 'patients' and that the study was carried out in a back care education unit it was decided not to include infection control in this study. However, it is intended by the researchers that a further clinically-based study will investigate this issue.

Although there is a lack of research on the use of moving and handling aids some studies have evaluated hoists used in patient moving and handling. Some aspects of those studies, e.g. time taken to complete a task (Hignett, 1998) and comfort (McGuire et al, 1996), are similar to the current study. Bohannon's study (1999) on sliding devices is the only one known to the authors, but because of differing aims and methodology, it is not comparable to the current study. Thus, it is not possible to compare the findings of this study with others.

Training phase

The Phil-E-Slide was considered to be the easiest to learn how to use. This was because of the design of the slide, in particular the seat pad which gave the subjects a reference point for placement of the slide in relation to the patient's buttocks. A further design feature which influenced the ease of learning was the tubular design of the Phil-E-Slide. The Maxislide, designed in the form of a sheet, was considered to be the most difficult slide to learn how to use. Subjects were required to fold the slide before use. The amount of material folded varies depending on patient size as well as the required transfer distance. Therefore, a judgment has to be made about the fold length. In addition, the fold has to be orientated in the direction that the patient is sliding. This resulted in the Maxislide being more complicated to learn how to use than any of the other slides, which were all tubular designs. Ease of learning is an important issue, because despite the availability of aids, they will not be used if health-care staff do not feel competent in their use (Wright, 1981; Yassi et al, 1995).

The identification of tasks, aids or techniques that are particularly difficult is necessary so that greater emphasis can be placed on them

TABLE 3.
Overall ranking of slides

		Rankings			
		Locomotor	Multiglide	Phil-E-Slide	Maxislide
Ease of learning		2	3	1	4
Ease of use	Task 1	2	4	1	3
	Task2	2	4	1	3
Timing	Task 1	1	3	2	4
	Task 2	1	3	2	4
Financial cost		1	2	4	3
Overall ranking		1	3	2	4

during training and supervision. The identification of tasks that particularly contribute to low back pain is also important. Tasks such as repositioning in bed and patient transfers have been found to be associated with high stresses and are cited as contributing factors to low back pain in health-care workers (Harber et al, 1988; Garg et al, 1992; Smedley et al, 1995; Hollingdale, 1997; Mierzejewski and Kumar, 1997). These are tasks where the strain on the low back could be significantly reduced by the use of a slide as opposed to manual lifting or supporting the patient.

Evaluation phase

The tubular design slides were considered easier to place under the patient than the flat sheet, with the Phil-E-Slide reported to be the easiest of all. The Phil-E-Slide was also easiest to remove when performing task 1 because of its compact size, but was ranked 2nd for ease of removal for task 2 (the Locomotor was ranked 1st). The reason for this was revealed by the observer's checklist, which found that one pair of subjects had incorrectly placed the Phil-E-Slide under the patient and consequently had great difficulty removing it. It has been noted in the clinical situation that the Phil-E-Slide can be difficult to remove if the patient has large thighs. However, patient anthropometrics were not under investigation here.

The Phil-E-Slide was reported to require the least exertion to use. The provision of handles which allowed a good grip could have accounted for this. The Locomotor and Multiglide were ranked 3rd and 4th respectively. Neither had handles, and the subjects found that this made them difficult to grip, giving rise to a feeling of greater perceived exertion. It is acknowledged that a number of other factors (e.g. strength, gender, health) could influence perceived exertion. These factors were not under investigation in this study. The perceived exertion scores for task 2 were higher than for task 1. The patient was moved a greater distance in task 2, and this could have accounted for the difference.

Another factor, noted on the observation checklist, was that the 'through arm grasp' required for using a slide to perform task 2 was done incorrectly for 75% of the observations. The through arm grasp was chosen instead of the palm to palm hold as it is found to be more widely applicable in clinical practice. This was an important component of the technique and failure to carry it out correctly causes concern. The findings of this study would suggest that the through arm grasp may not be correctly applied despite training. Therefore, it is a component of the technique that needs to be emphasized.

An interesting observation was made in relation to perceived exertion and bed height. On some occasions, subjects failed to adjust the bed to a correct height. One would have thought that an incorrect bed height would influence the ability to achieve good technique, particularly with regard to proper weight transference, and contribute to increased perceived exertion. However, the perceived exertion scores of subjects who failed to adjust the bed to a correct height were low.

Timing

Tasks 1 and 2 were performed in considerably faster average times using the tubular slides than the sheet slide. This was because the sheet slide (Maxislide) had to be folded into a tubular form before use and therefore required more time. Of the tubular slides, the Phil-E-Slide was the slowest. This slide had to be placed under the patient in such a way that the handles were accessible to the slide users. This took longer than the other two, which did not have any handles.

Financial cost

The Locomotor and the Multiglide were the least expensive of the four slides. Both of these are sold as a one-slide pack. The Maxislide was ranked 3rd. In the Republic of Ireland, it is supplied in a pack containing two flat sheets and a small tubular slide for the feet. The Maxislide represents good value for money as it can be used for tasks other than those assessed in this study. Although the Phil-E-Slide was the most expensive, it comes with a case, which must add to the cost. It is supplied in a pack of three slides comprising a small, medium and a large slide. It was felt that the small and medium slides would only be suitable for moving very small patients or when used under the patient's feet in conjunction with a bigger slide. One would question the wisdom of supplying a pack of three slides when one or two of them are rarely used.

Overall ranking

The Locomotor was given an overall ranking of 1st (*Table 3*). The manufacturers hoped that the low cost of this slide would enable all health-care professionals involved in moving and handling patients to possess a slide and have it available at all times. The Phil-E-Slide

was the favourite with the subjects but its low ranking for cost contributed to an overall ranking of 2nd. The Multiglide came 3rd. Given the tasks that were under assessment in this study, the lack of handles on the Multiglide contributed largely to this ranking. The Maxislide was ranked 4th. The subjects found it difficult to learn how to use and difficult to use. However, it has added functions that were not under investigation here, for example, it can be used for sliding the whole body. It can also accommodate patients of a variety of sizes and dimensions.

CONCLUSION

Although only four slides were compared in this study for two specific tasks, it is apparent that some slides are better in some situations than others. This study was carried out with volunteer slide users and patients in a back care education unit. The Phil-E-Slide was ranked best by the subjects in this study but the Locomotor came first when all criteria were taken into account. Thus, the decision to choose one slide over another can be based on different criteria, such as the training and experience of the potential user, the available budget and the needs and abilities of the patients. Further studies involving real patients in hospitals, clinics and in the community are recommended so that issues other than those investigated here and which are specific to individual patients or patient groups can be addressed.

There is a need for further research in order to have information upon which an informed purchasing decision can be made and the slides that are most suitable to the particular needs will be chosen. BJTR

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KEY POINTS

- This study evaluated four patient handling slides that are currently in use.
- Two specific tasks were included in the study.
- Tubular design slides were easier to use than sheet designs.
- The provision of handles on a slide made it easier to use.
- Research on slides is in its infancy and needs to continue.

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