Analysis of a Transfer Device for Horizontal Transfers and Repositioning on an ICU: Effects on the Quality of Care and the Quality of Work

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ABSTRACT

A new patient lifting device has been developed in close cooperation with the University Medical Center Groningen. This specially designed, transfer sheet (TS) for horizontal transfers and repositioning can stay under the patient at all times and is easily connected to a ceiling- or mobile lifter to facilitate quick and comfortable transfer- and repositioning activities which can be relevant in the complex environment of an ICU. Assumptions are that the device significantly improves the quality of care for patients and the quality of work for nurses. In addition to this, pilot studies indicate that the nursing time required for the transfers is significantly reduced. This, in turn, results in a decrease of occupational hazards and an increased efficiency and productivity of nursing work. Further research is necessary and this study intends to fill this need. In this paper the outline of the study is described (prospective, single center case study with a pre-post design in a clinical setting) and the first results. The post-intervention data are currently being collected and will be presented. The results of the biomechanical part of the study are available and indicate that the TS does result in a significant decrease in physical exposure for nurses by 1. reducing the physical load associated with specified transfers and 2. by eliminating the need for some specified transfers altogether. The effects are more positive when the TS is used in combination with a traverse ceiling-lifter system as opposed to either a single track ceiling-lifter system or a floor lifter.

Keywords: ergonomics, lifting, nurses, occupational health, quality of care, ICU, lifters.

INTRODUCTION

In hospitals multiple horizontal transfers (from stretcher to bed, repositioning on the bed, placing X-ray cassettes under a patient, weighing a patient etc.) are performed. These transfers can be very strenuous both for patients and nurses. There are studies indicating that these transfers result in an increase in pain perception for the patient, an increase in the risks of developing pressure ulcers and provocation of adverse events in ICU patients (f.e. cardiac arrest or ventilatory distress). For nurses these transfers rank among the top 10 of most strenuous transfers with a high risk of developing occupational back-, neck- and shoulder-pain (Hignett et al., 2003, Jansen et al., 2004, Knibbe and Friele, 1999, Koppelaar et al., 2011, Knibbe et al., 2012). In addition to this these transfers and repositioning activities demand a considerable amount of nursing time because they are usually performed with multiple nurses(3 is not uncommon) and, if lifters are used, the sling necessary for the transfer needs to be placed

under the patient before and removed after each transfer or repositioning activity, which can be strenuous in itself (Knibbe et al., 2012).

Transfer Sheet

A solution may be to use a special lifting device, the so-called Maxi Transfer Sheet (TS) that accompanies the patient and stays under the patient. This is a specially designed, lifting sling for horizontal transfers and repositioning. The sling can be connected to a ceiling- or floor-lifter and can be left under the patient before and after the transfer or repositioning comparable to regular bed linen. Assumptions are that the device significantly improves the quality of care for patients and the quality of work for nurses. In addition to this, pilot studies indicate that the occupational risks and the nursing time required for the transfers are significantly reduced. This, in turn, results in a decrease of occupational hazards and an increased efficiency and productivity of nursing work (Knibbe et al., 2012).

Despite these promising positive indications coming from small pilot-studies more research is necessary. This new study is intended to fill this gap in order to assess if this device indeed provides a clinically and ergonomically sound solution, to assess the efficiency of the device when it comes to nursing time and the productivity of nursing work and finally its cost-effectiveness in the complex environment of an ICU. A parallel study is undertaken elsewhere to assess the clinical issues of patient care when it comes to the effect of the fabric of the sling on skin quality and integrity. The device has passed all normal testing procedures and qualifies to the normal standards for use in direct patient care.

METHOD

Research questions

This study focusses on three dimensions: patient, nurse and organization. The study design is a prospective, single center case study with a pre-post design of the introduction of the TS in the clinical setting of an intensive care unit (ICU). The basic assumption is that the TS will lead to significant improvements on all three domains when compared to the baseline of current practice without the TS. The following research questions will be answered.
What are the effects of full implementation of the TS in a clinical setting (ICU) on:

1. The quality of care,
2. The quality of work,
3. Productivity and time efficiency of the work throughout the chain of care- and treatment activities.

The assumptions of the effect of the TS are:
ad 1. Patient aspects: Improve pain and comfort scores, reduce (the risks of developing) hospital acquired pressure ulcers (HAPU) and reduce the incidence of adverse events in ICU patients.
ad 2. Nurse aspects: Reduce exposure to physical overload, time demands, work interruptions, perceived exertion and comfort, perceived quality of care and work.
ad 3. Organizational aspects: Increased efficiency and improved quality of care and work.

Main study parameters that are part of the measurement instruments are:
1. Patient outcome: pain and comfort level, agitation, adverse events (TISS, VAS, RASS, Apache II & IV),
2. Exposure to physical (over)load of nurses working on the ICU (static and dynamic load and compared to Dutch national guidelines in line with ISO/TR 12296, 2012),
3. Time required by nurses to perform the activities (per activity),
4. Overall frequency with which activities are performed,
5. (Subjective) perceived quality of care and quality of work of the activities,
6. Cost (time) of implementation of the TS compared to the baseline situation.

Research instruments

1. A survey for the nurses (Knibbe et al., 2008),
2. A validated 24-hour log (Knibbe et al., 1999 and 2012),

3. Biomechanical analysis of the forces with and without the use of the TS under specified conditions (calibrated MecMesin, and the 3D SSPP biomechanical model, version 6.05 (2013).

Assessments 1 and 2 have been performed at baseline and are currently being collected for the post-intervention period. The biomechanical assessments (3) have been performed and are ready.

Comparisons are and will be made with the baseline situation, general data on these transfers available in our national database of monitoring results (Knibbe et al., 2008 and in press) and the (inter) national guidelines and standards on pressure ulcer prevention, occupational health and the ISO/TR 12296 (2012) on the handling of patients.

RESULTS

Currently baseline data have been gathered and the TS has been implemented on the ICU's. Biomechanical measurements have been performed and the post-intervention data are being collected. Full results will be presented at the conference. The first biomechanical results are available now and we will give an outline below.

Measurements have been performed during the following transfer- and repositioning-activities under controlled conditions (standardized patient of 70 kg and 1.70 tall, with and without the use of the TS and with the standardized measurements with sliding sheets, regular slings and manual transfers according to the Dutch Guidelines for Practice, Knibbe et al., 2008 and see for an English version ISO/TR 12296 (2012), see also Hignett et al., (2014).

1. Horizontal transfer from bed to stretcher
2. Repositioning in bed (sideways, turning, up in bed)
3. Placing an X-ray cassette under the patient

Ad 1. Significant reduction of the exposure during the transfer when compared to manual transfers, transfers with a sliding sheet and when compared to a transfer with a non-permanent sling.
Ad 2. Significant reduction of exposure when compared to manual transfers, transfers with a sliding sheet and when compared to a transfer with a non-permanent sling.
Ad 3. Significant reduction of exposure when compared to regular routines.

In addition to these effects the elimination of the need to place and remove the sling prior to and after the transfer contributes significantly to the total reduction of the exposure level for the nurses. This elimination effect is increased, when the total exposure on ward level is calculated as currently a maximum of two nurses is required whereas beforehand more nurses (up to 4) may occasionally be required to perform a transfer safely.

The results were best when the TS was used in combination with a traverse ceiling system as opposed to either a single track ceiling system or a floor-lifter. A traverse ceiling system enabled precise and light positioning in the final stages of the transfer and also a better and safer guidance of lines and other ICU-equipment that is often attached to the patient.

The majority of the results is currently being collected and will be presented in this context at the conference.

CONCLUSIONS

The results so far are positive. The TS results in a significant reduction of the physical load for nurses. The reduction in exposure to physical (over)load for the nurses is achieved in two ways.

1. A significant reduction in the biomechanical load during the transfer- and repositioning-activities on the ICU and the total exposure level for the nurses working on the ICU.
2. An elimination of the need for certain transfer- and repositioning-activation on the ICU.

A difference was found between the technical set-up of the lifters with which the TS was used. The results were significantly better when the TS was used in combination with a traverse ceiling-lifter as opposed to a single track ceiling-lifter. Although in both situations the exposure was reduced significantly the traverse system proved to be the better solution. Both the time required, the perceived exertion for the nurses and the comfort for the patient was better. With a single track system additional and more precise positioning was sometimes required.

Full results will be presented at the conference.

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