

Using an ergonomics approach for sustainable improvements in safe patient handling

Erasmus + Conference, Kortrijk

Dr Mike Fray



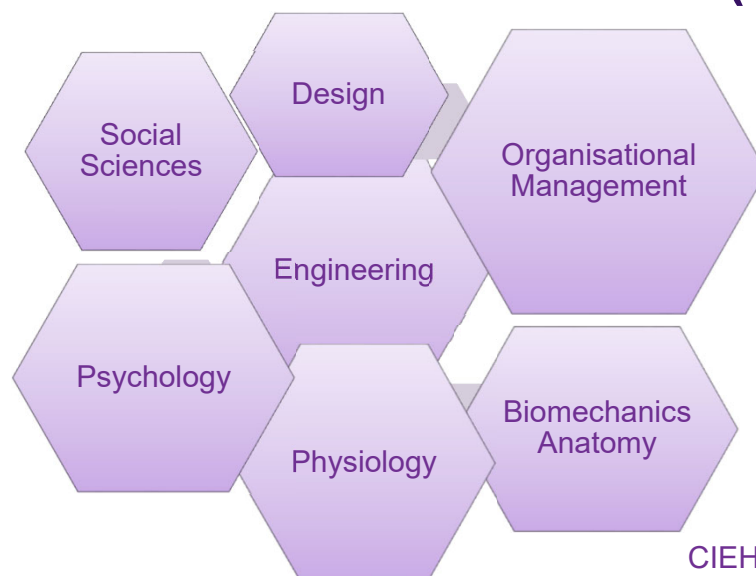
Personal History

- 1997 Postgraduate programme for patient handling
- 2012 MSc Ergonomics in Health and Community Care
- The Guide to the Handling of People 7th Edition Sept 2019
- *An Illustrated Guide to Moving and Handling People (3rd Edition)*. www.clinicalskills.net
- Education and research portfolio, equipment solutions, technique evaluations and SPHM interventions.

Ergonomics and Human Factors (EHF)

- EHF is concerned with the understanding of interactions among humans and other elements of a system. It's the profession that applies theory, principles, data and methods to design to optimise human wellbeing and overall system performance.
- (IEA 2000)

Ergonomics and Human Factors (EHF)



CIEHF White Paper 2018

Ergonomics Solutions

Macro: Organisations, buildings, workforce, regulators, communities, tools, spaces

Meso: People Tools spaces

Micro: Tools

Ergonomics Solutions Outcomes

Macro: Organisations, buildings, workforce, regulators, communities, tools, spaces

Meso: People Tools spaces

Micro: Tools

Society

Organisational

Service provision

Carer Benefits

Patient Benefits

EHF – A THOUGHT ON LANGUAGE

An ergonomic solution
Vs
An ergonomics solution

Patient Handling Ergonomics

Studies, Solutions, Error and
Compliance

What is the main concern for health/care workers in 2019?

Walk into any care facility and what do you see?



Patient Handling Ergonomic(s) Solutions

- Simple
 - Intuitive
 - Error Free
 - Easy to learn
 - Even easier to remember
-
- 'People should deliver the right solution the first time'
 - (Murray et al 2017, You Tube)

Redefining Slide Sheet use in a Healthcare Organisation

Project with GBUK and Darlington and
Durham NHS Trust
(Fray, Daniel et al 2017)

Loughborough University

Bed
200 x 85 cm

Slide Sheet (a)
145 x 71 cm

Slide Sheet (b)
200 x 71 cm

Slide Sheet (c)
200 x 140 cm

Tubular slide sheets –
Shading = open sides

Slide sheet position, size and orientation options for questionnaire

- 1 No slide sheet necessary
- 2 Slide sheet (a) x 2
- 3 Slide sheet (a) x 1
- 4 Slide sheet (b) x 1
- 5 Slide sheet (a) x 1
- 7 Slide sheet (a) x 1
- 8 Slide sheet (a) x 1
- 9 Slide sheet (c) x 1
- 10 Slide sheet (a) x 3
- 11 Slide sheet (c) x 1
- 12 Slide sheet (c) x 1

- Up the bed
- Turning in bed
- Lateral transfer

Loughborough University

Bed
200 x 85 cm

Slide Sheet (a)

Slide Sheet (b)

Slide Sheet (c)

Tubular slide sheets –
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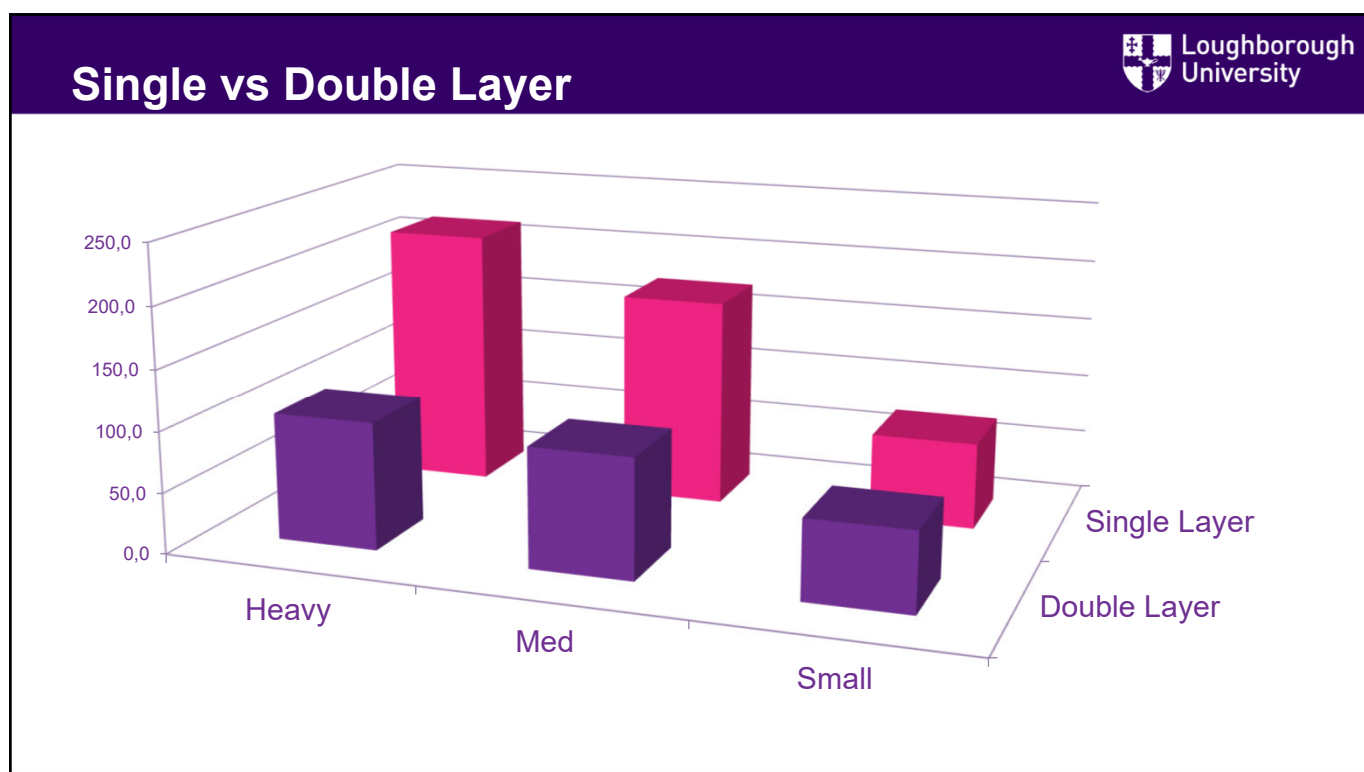
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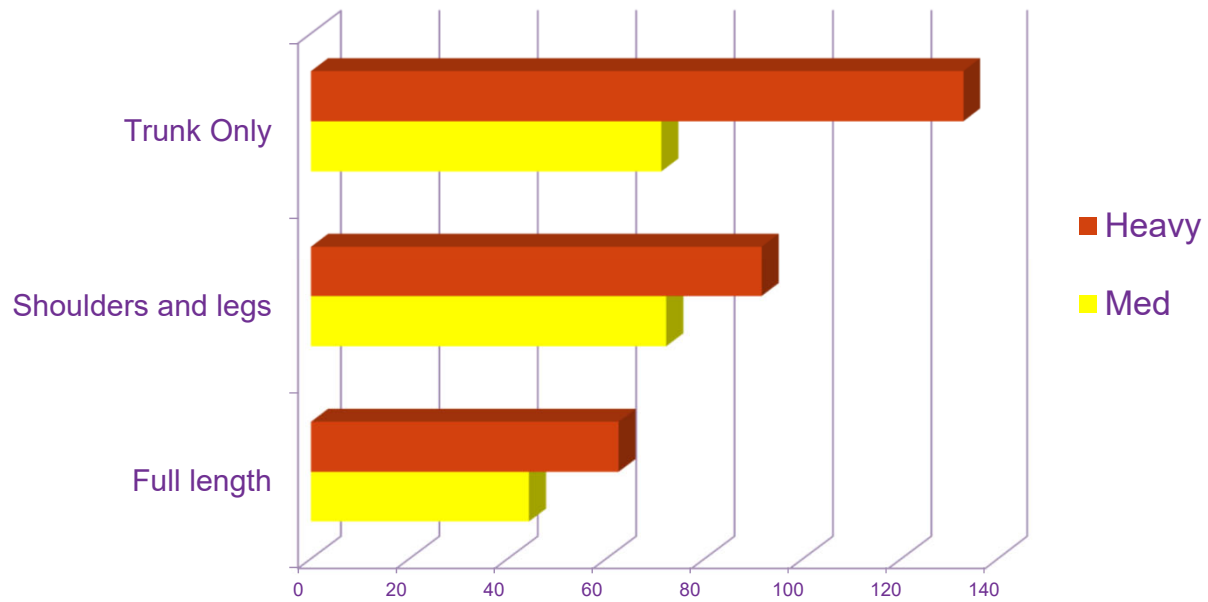
- Up the bed
- Turning in bed
- Lateral transfer

82 % of respondents
gave a wrong
selection

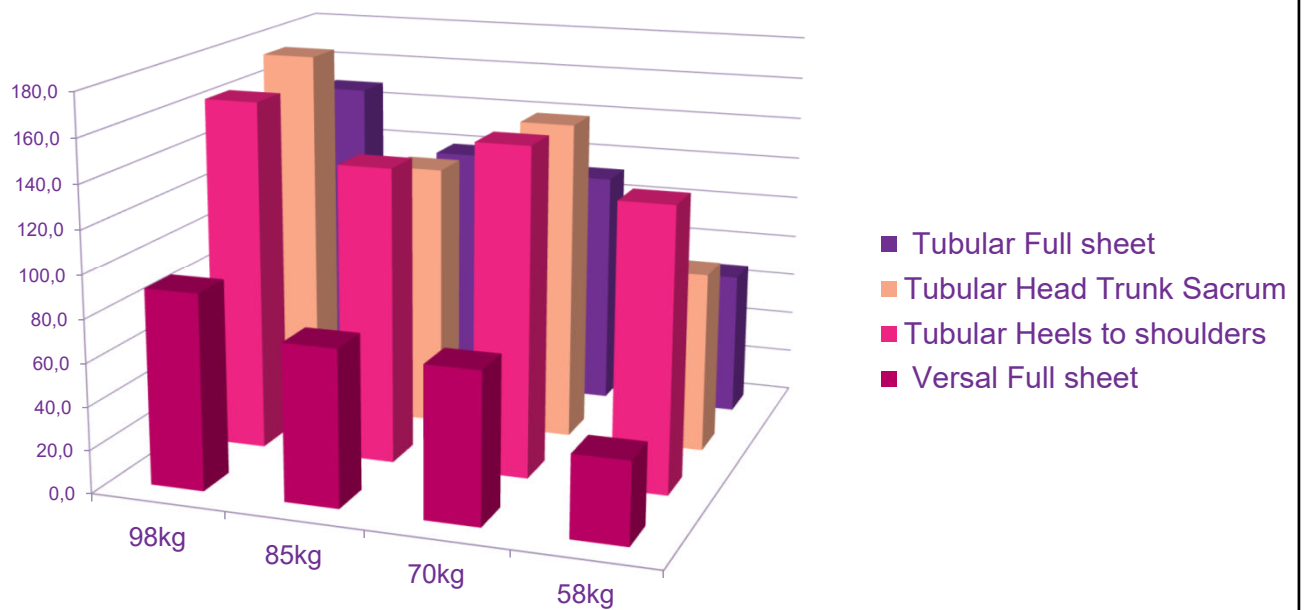
Loughborough University		
	Equipment	Sizecm
1	Single layer Theatre Sheet A	70x190
2	Single layer Theatre Sheet B	70x190
3	Pair of Flat Sheets (Coated Polyester, no handles)	70x200
4	Pair of Flat Sheets (Green Plastic)	70x200
5	Pair of Flat Sheets (Coated paper)	70x200
6	Tubular Double bed size (Coated Polyester)	140x200
7	Tubular Slide Sheets (Coated Polyester, 3 of, full body length)	70x145
8	Pair of Flat Sheets (Coated Polyester Handles)	70x200
9	Redi Slide (Coated Polyester, Novel design)	90x220
10	Tubular Slide Sheets (Polyester 2, Shoulder & hips/calf)	70x145
11	Tubular Slide Sheets (Polyester 1 of, Shoulder to hips)	70x145
12	Pair of Flat Sheets Double bed size (Polyester Handles)	140x200



Surface Area Effect



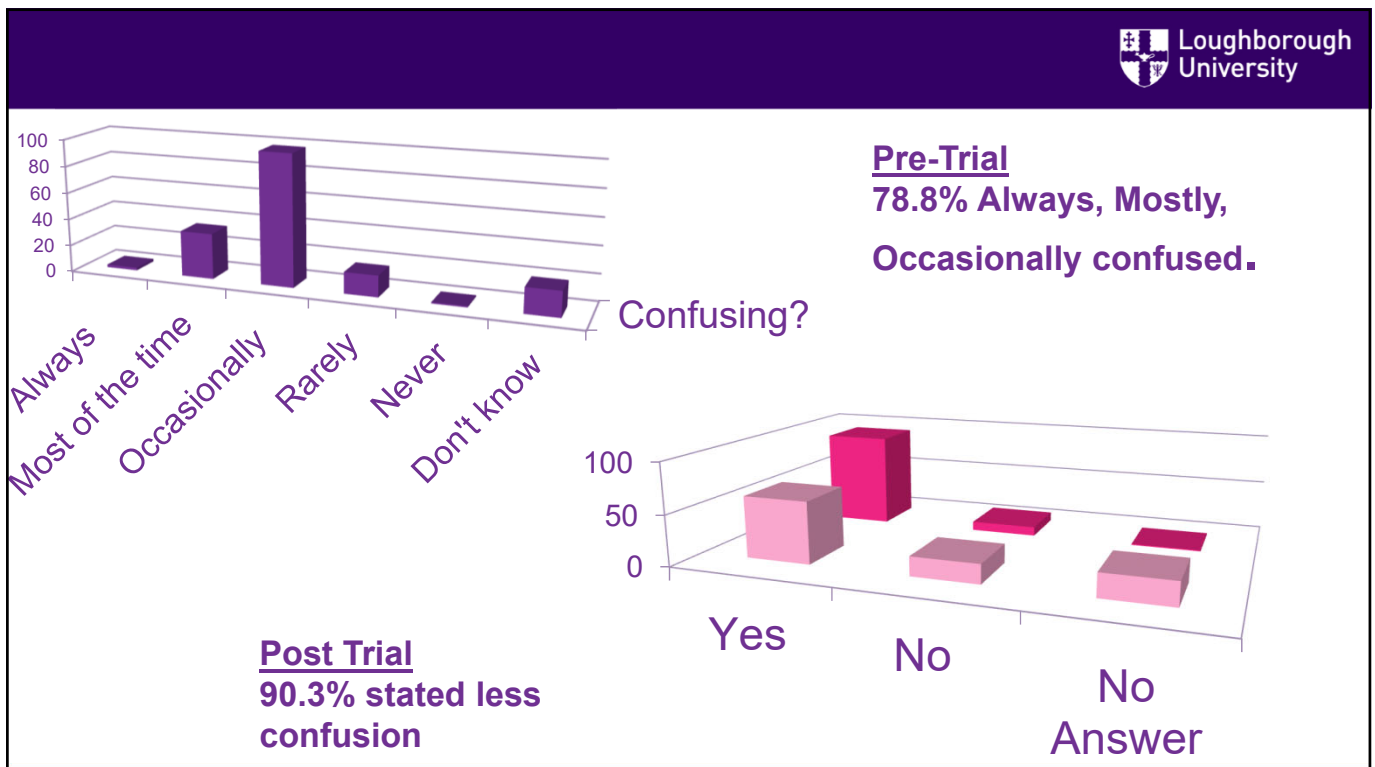
Move Up the Bed Errors



Worst Force Errors



	Best Force	Worst Error Force	% Increase
Up bed	90.8	175.1	92.8
Turning	61.9	174.8	182.4
Lat On Bed	63.5	167	163.0
Single vs Double	104.7	214.7	105.1
Surface Area	62.5	132.8	112.5



Positional effect on the loads for horizontal transfers

Fray, Holgate 2018 IEA Congress



Aim / Overview

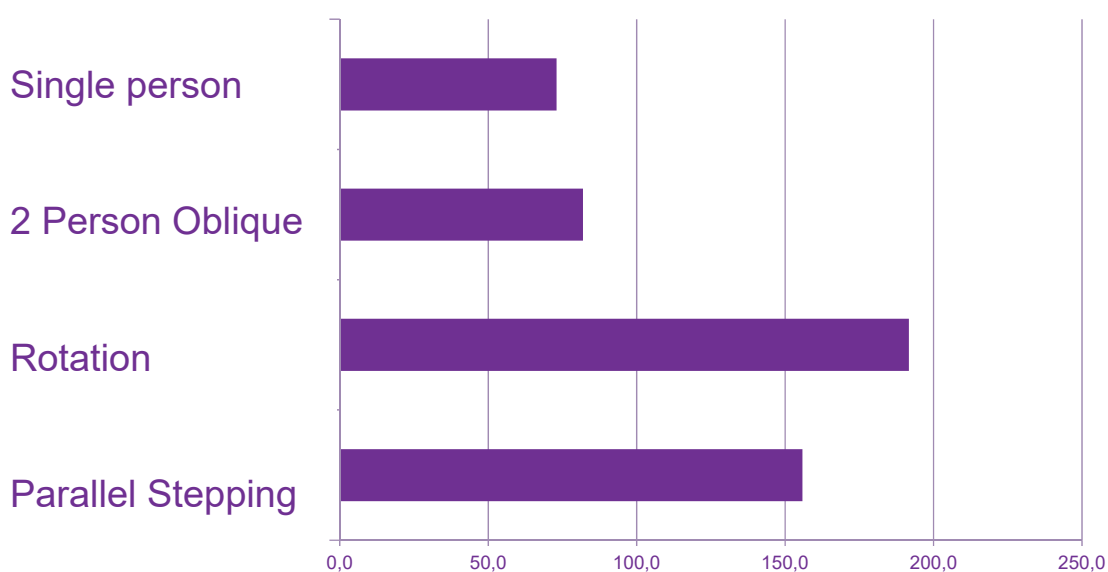
- To quantify the amount of force required in each condition of transfer for both novice and expert users.
- To compare and rank the different conditions from best to worst in terms of force needed.
- Conditions
 1. Parallel Stepping - up the bed (2Px)
 2. Rotation - feet fixed (2Px)
 3. Two person oblique from top of bed (2Px)
 4. Single person pull up the bed

Methods

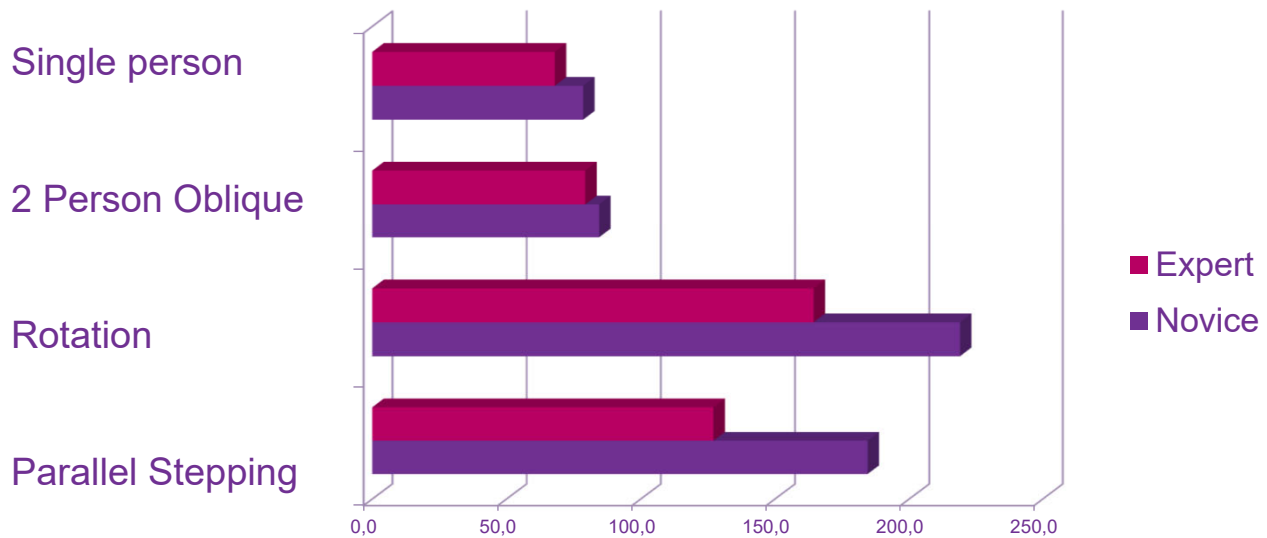


- Subjects informed of actions.
- Time to familiarise
- Inline electronic force meters were used with flexible hand grips
- Repeated measures for each action x 3
- Variations >5% on the maximum removed
- Subjective data recorded, effort, security, safety, likelihood of use (Expert only)
- (n=10 Novices, 11 Experts)

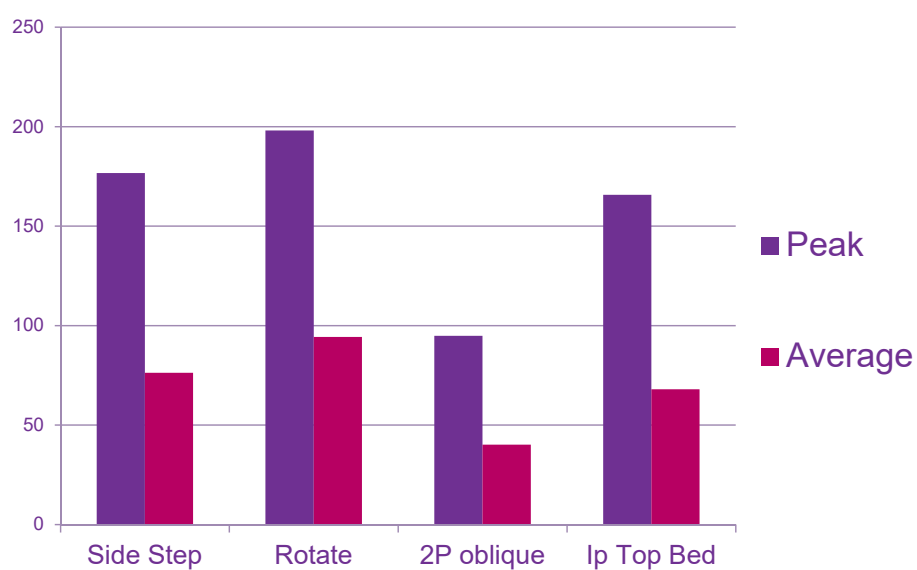
Total Force per Transfer. R & L Hand n=21



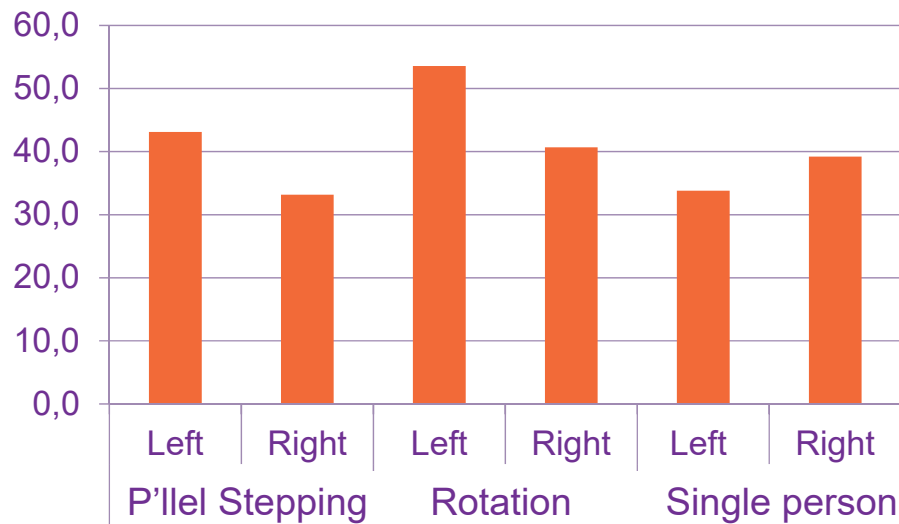
Total Force per Transfer. Expert vs Novice



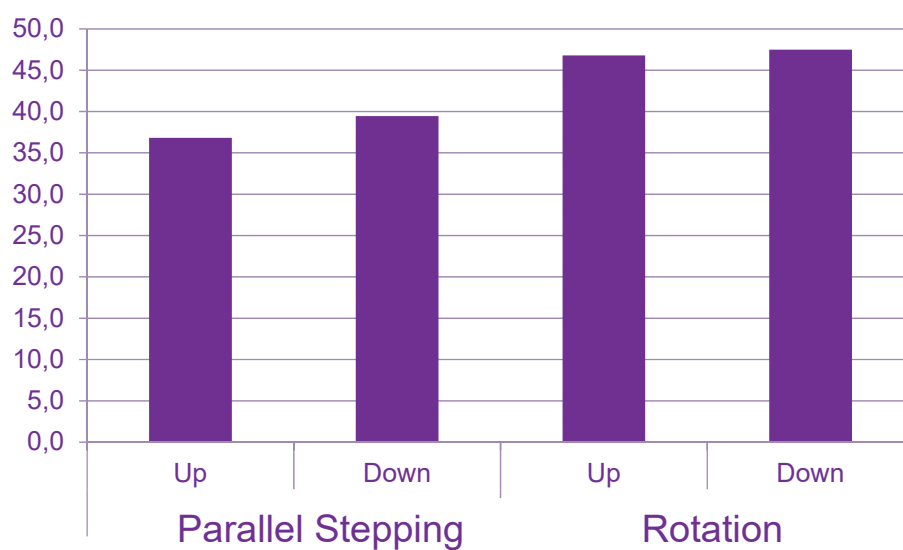
Force per person. All subjects.



Single Hand Loads. Left vs Right



Single Hand Loads. Up vs Down



Subjective Data

- Comfort and safety directly correlated
- Perceived force showed Rotation disliked more than other conditions ($p < 0.05$)
- Perceived force indicated 2 Person Oblique easiest NS.
- Top of the bed positions both (1 and 2 Px) scored best for:
 - Comfort
 - Safety
 - Individual Acceptance

Conclusions.

- Novices > Experts
- Left hand > Right hand
- Significant differences between the conditions
- Oblique 2 person is preferred
- Palms up, flexed elbow = lifting
 - Kemp (2018) 4 different conditions
 - Flexed elbow is key factor on load
- Individual loads did not exceed the recommended loads
- Side stepping and rotation equated to single person top of the bed.

Best hoist format

Get it right from the start.

Fray, Curren, Guldman ab (in Press)

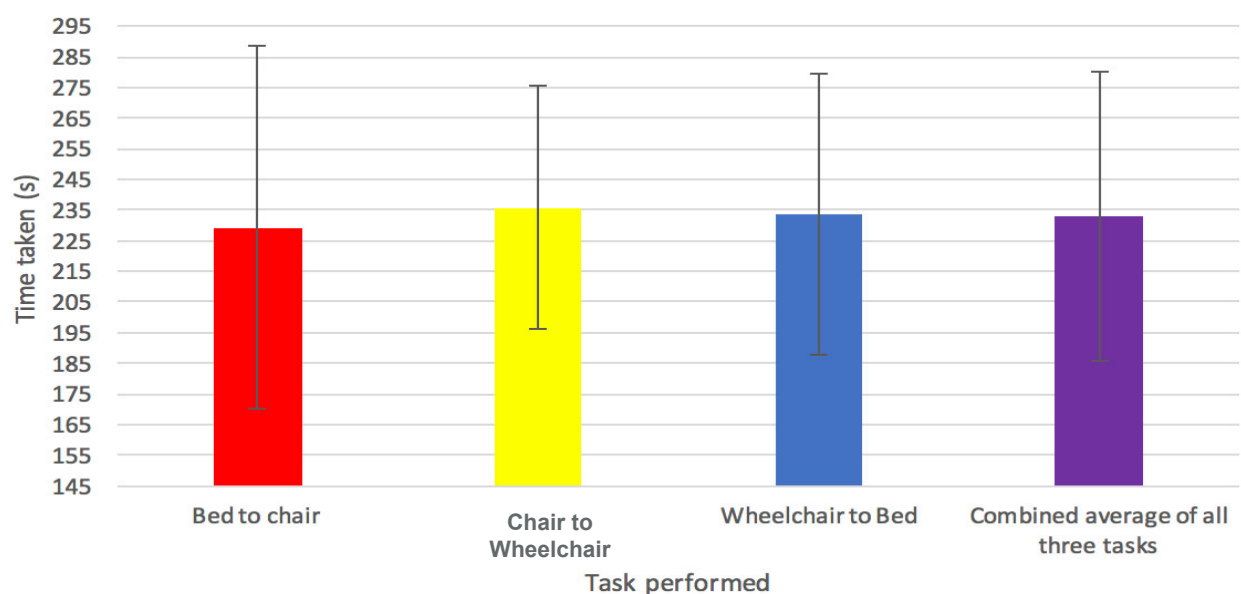
Aim / Overview

- Repeated measures (n=15 trained carers)
- Quantify and compare the time taken to use 3 hoist types for a range of transfers
- Hoists:
 - Floor Standing Mobile hoist, Single Track Gantry, H-Frame Gantry
- Transfers:
 - Bed to bed-side chair, Bed-side chair to wheel chair, Wheel chair to bed

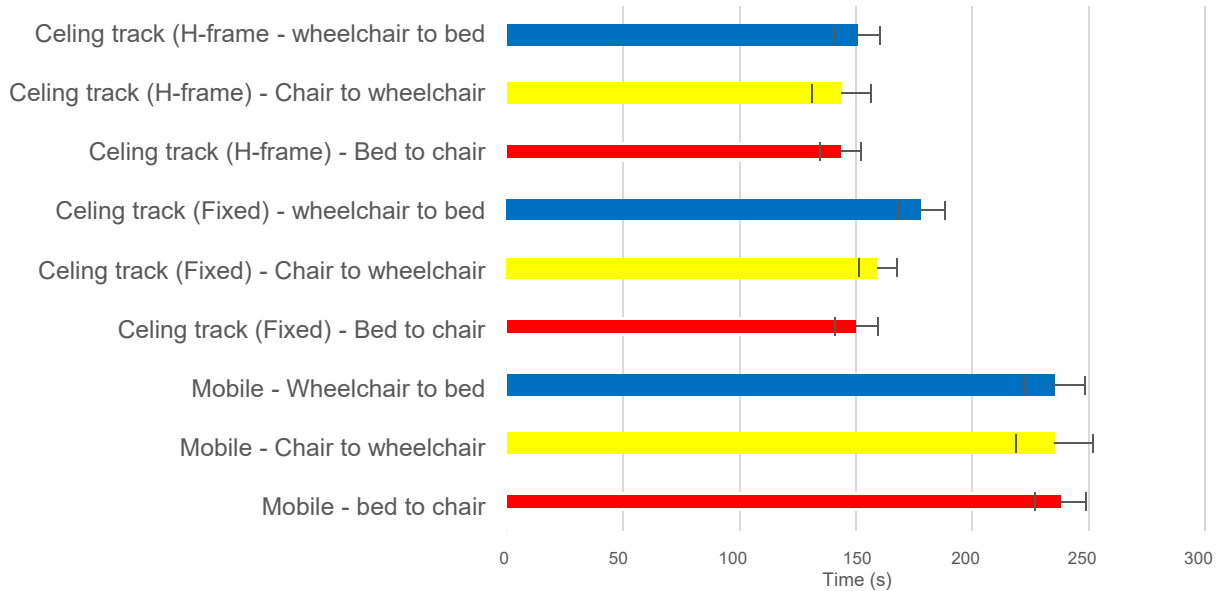
Methods:

- Single participants, all tasks, squared order
- Manakin Load, Sling in place.
- Video recorded.
- Hierarchical Task Analysis – Task Lists
- Accuracy of placement
- All phases timed and reviewed
- Subjective feedback from participants after all tasks and debrief

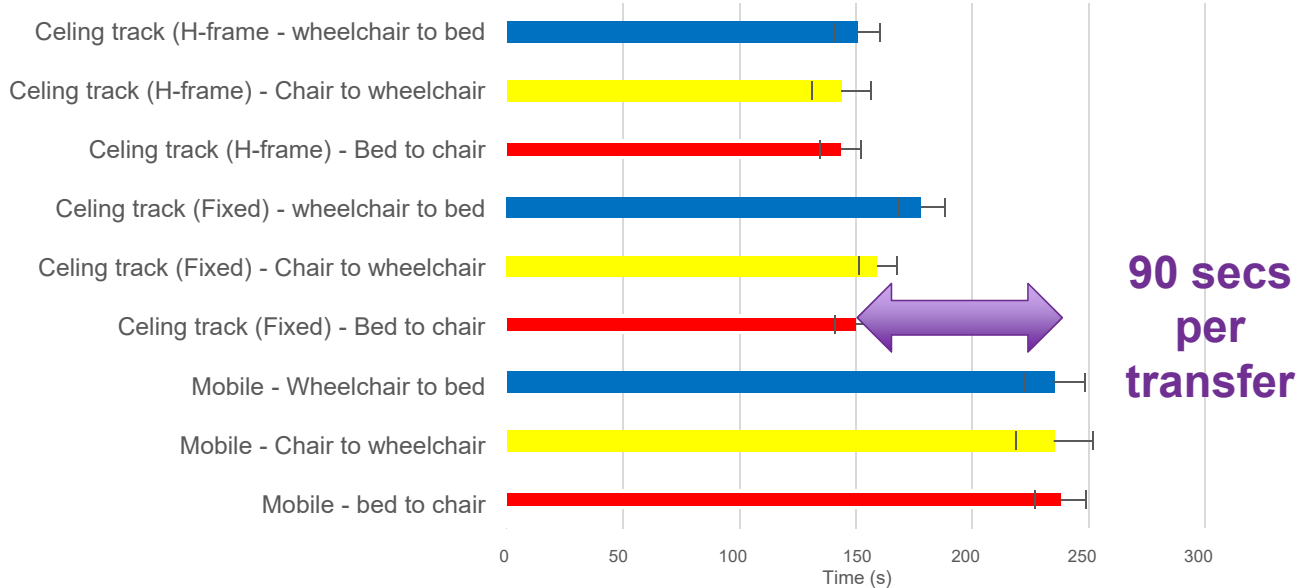
Task Comparison:



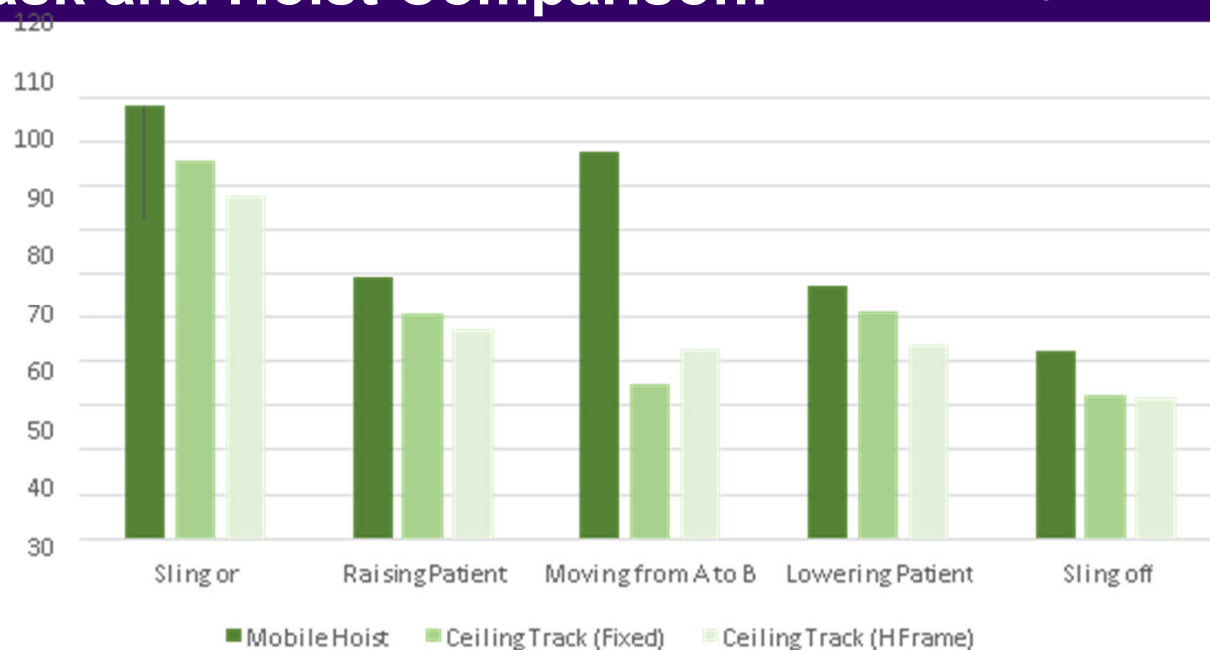
Task and Hoist Comparison:



Task and Hoist Comparison:



Task and Hoist Comparison:



Subjective Comparison:

Hoist - Task	Very easy	Easy	Neutral	Hard	Very hard
Mobile – Bed to chair	0	4	6	4	1
Mobile - Chair to wheelchair	0	3	2	9	1
Mobile - Wheelchair to bed	1	2	5	7	0
Fixed- Bed to chair	2	2	6	5	0
Fixed- Chair to wheelchair	1	3	4	6	1
Fixed - Wheelchair to bed	2	2	5	6	0
H-frame - Bed to chair	8	7	0	0	0
H-frame - Chair to wheelchair	7	6	1	1	0
H-frame - Wheelchair to bed	6	7	1	1	0

Participant feedback

- Mobile Hoist
 - Space was an issue
 - Time consuming with a single carer, and was seen as a 2-person transfer
 - Postural compromise
 - Thought needed to complete the activities
- The Ceiling Track (Fixed)
 - Difficulty in positioning the hoist and extra manoeuvring of equipment was needed
More steps required than the H-frame
 - Very Easy to operate and move the hoist
 - Less effort required to hoist the patient
- The Ceiling Track (H-frame)
 - Easy to position the hoist as there was minimal preparation
 - There was no restriction to the access of the hoist
 - Positioning the patient was hard on the bed, due to the moving hoist.

Using Ergonomics to support Single Handed Care

Fray, & Thornton (Applied Ergonomics in Review)

In a Social Care Setting

- Compared Two Person with Mobile Hoist
Versus
- Single Person with Ceiling Track Hoist
- Laboratory study
- Field Trials
- Objective and Subjective

Results

- Risks to staff equal or better for SHC with Ceiling track
- Time to deliver equal or better for SHC with Ceiling track
- Feedback from person
 - Better engagement with carer
 - Better security
 - Better comfort ratings
 - Some negative comments from carer groups
- Risk Assessment process to support rollout

What have I learned from these studies?

Work as imagined is usually not work as done.

K.I.S.S.

What have I learned from these studies?

Utilise single equipment and technique solutions

Make the solution easy to learn & remember

Standard and correct responses

Ergonomic(s) solutions can enhance performance?

- To gain support from management
 - Collect evidence to support the purchasers goals
- Explore the relationship between interventions and outcomes (TROPHI)

Thank you!

Dr Mike Fray

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Loughborough
University

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