



medemagruppen



**compliant**concept

innovations for a better life

Swiss CTI Medtech  
Award Winner 2010



patient@home



Member of  
**WelfareTech**  
Business Innovation

# AMS

# Today's Solutions

Grade I



Risk Assessment

Regular skin  
assessment

Prevention

Pressure  
Relief

Plastic  
surgery



# Early identification and prevention

Grade I



# Today's Solutions

Grade I



Grade II-III



Grade IV



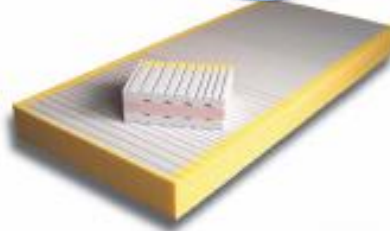
Risk Assessment

Regular skin  
assessment

Prevention

Pressure  
Relief

Plastic  
surgery



## Supersoft mattresses

- ✓ Low costs
- ✓ Easy handling
- High nursing effort



## Pneumatic systems

- ✓ reduces pressure peaks efficiently
- ✓ Reduced nursing effort
- Not appropriate for prevention

# Today's Solutions – need for solution

Grade I



Grade II-III



Grade IV



Risk Assessment

Regular skin  
assessment

Prevention

Pressure  
Relief

Plastic  
surgery

## New Solution

- ✓ Appropriate for Prevention and treatment
- ✓ Reducing nursing effort
- ✓ Mobilizing the patients
- ✓ Less disturbance of patients sleep

Super

- ✓ Low
- ✓ Easy handling

- High nursing effort



Automatic systems

- reduces pressure peaks efficiently
- reduced nursing effort

- Not appropriate for prevention

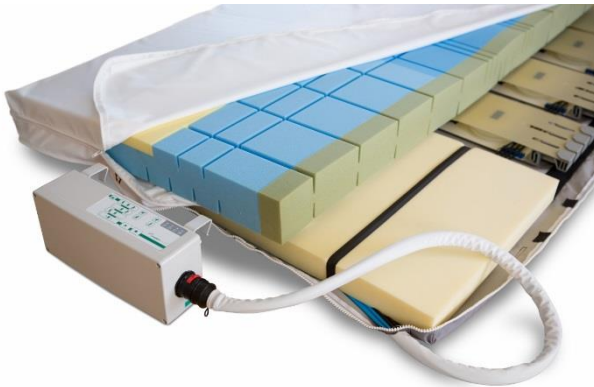
# Active Mobilisation System



Mobilise with  
Comfort

**ams** active  
mobilisation  
system

# Das Active Mobilisation System



- ✓ Long-Term Prevention of Pressure Ulcers
- ✓ Maintaining Patients' Mobility Capacity
- ✓ More Time for Care

## Prävention

Risikopatienten (Punkte nach Norton-Skala)

tief  
25-24 pt

mittel  
23-19 pt

hoch  
18-14 pt

sehr hoch  
9-3 pt



## Behandlung

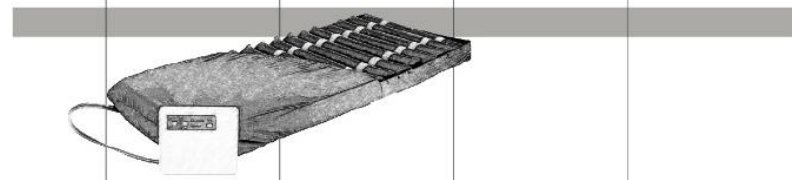
Dekubituspatienten (Grade nach Prof. W. Seiler)

Grad 1

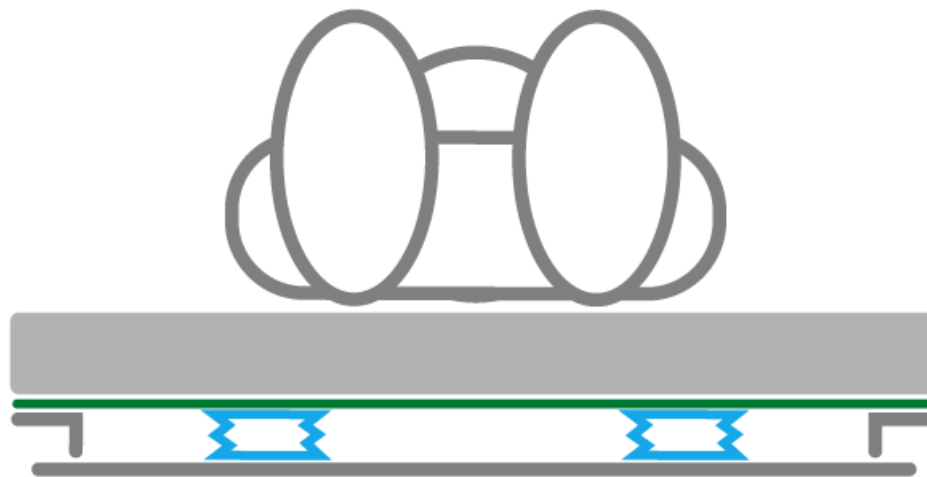
Grad 2

Grad 3

Grad 4

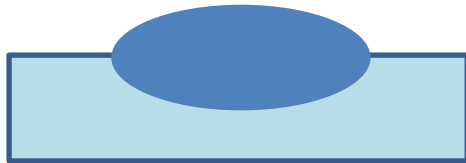


# Well rested thanks to undisturbed sleep

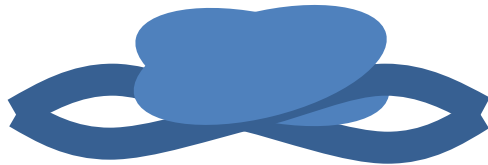


- Repositioning by almost inaudible active elements
- Patient is mobilized slightly from one lateral position to the other
- Critical body parts are additionally relieved

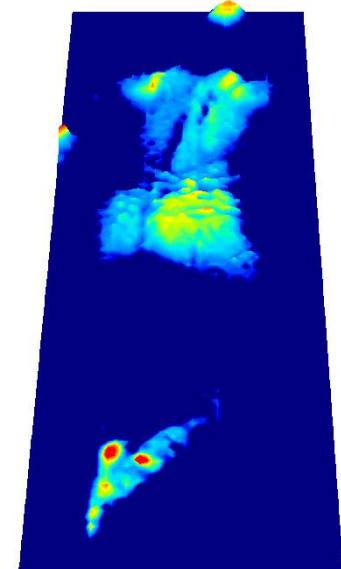
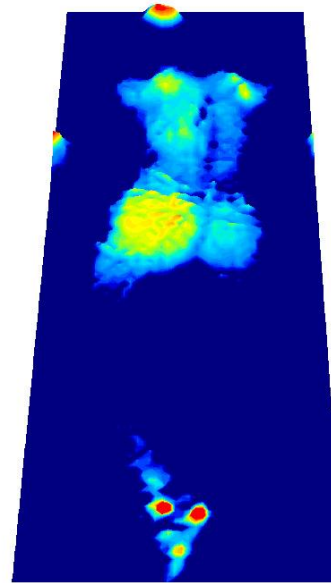
# Basic Principle of AMS



No **pressure redistribution**...



...but continuous  
**shifting of pressure load**...



...through supine tilting position which is best in terms of:

- the interface pressure &
- tissue blood flow

Source: U. Källman, Evaluation of Repositioning in Pressure Ulcer Prevention, Dissertation, Linköping University, Sweden

# Indication & highest benefit

In care of patients with an increased PU risk who do not or not sufficiently tolerate repositionings

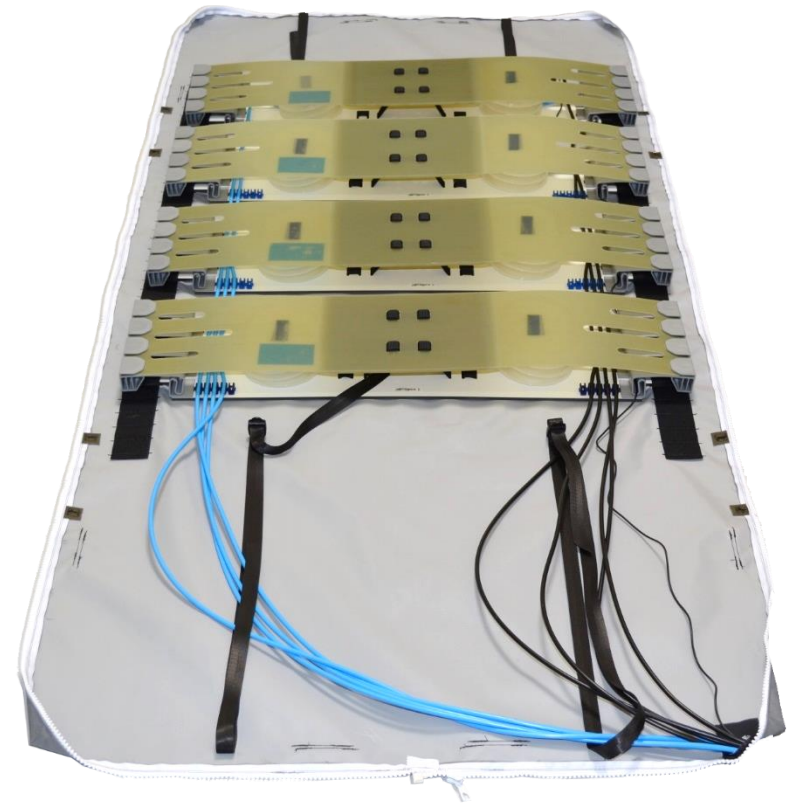
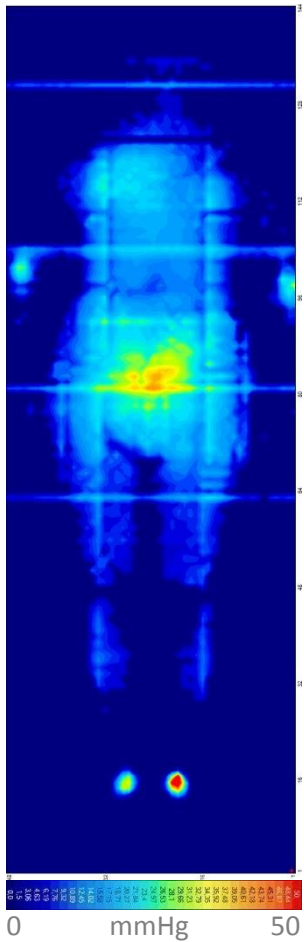
- after stroke
- pain
- limitations of motor function
- dementia

# Prevention due to Pressure Shifting



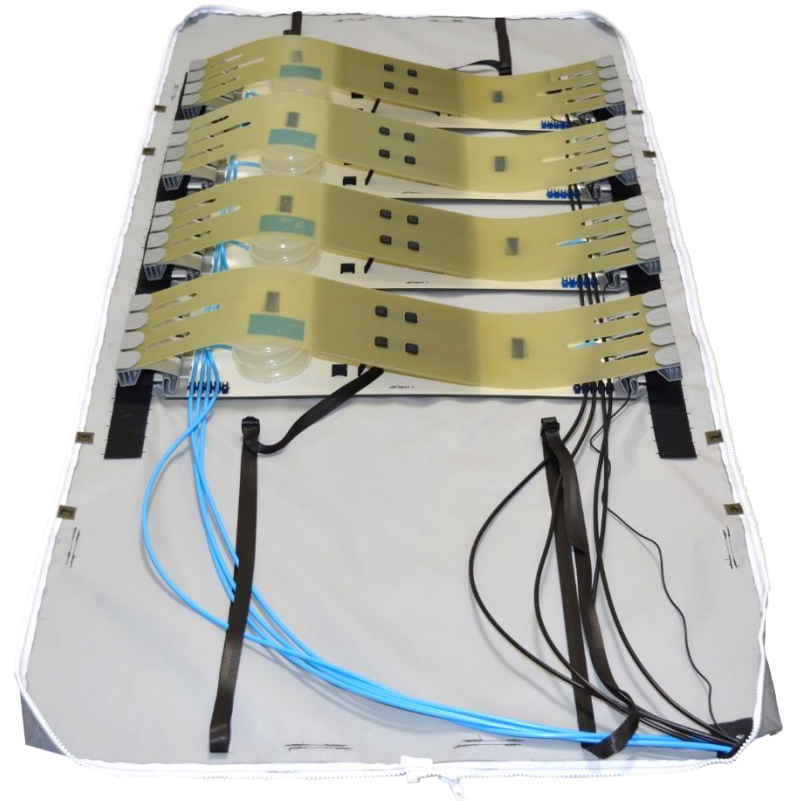
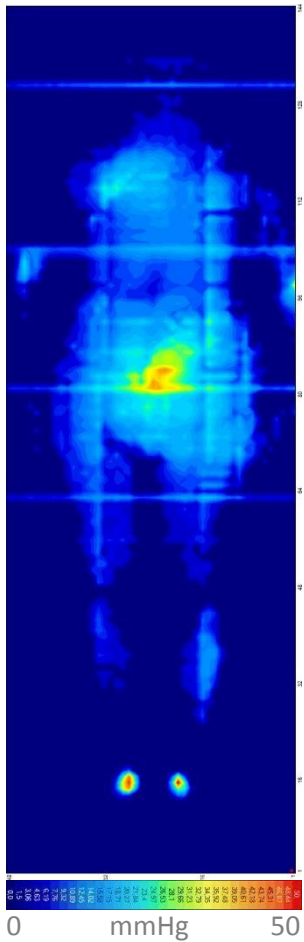
200x (Interval 1) to 1200x (Interval 4) slower in reality

# Motion Sequence Pressure Shift



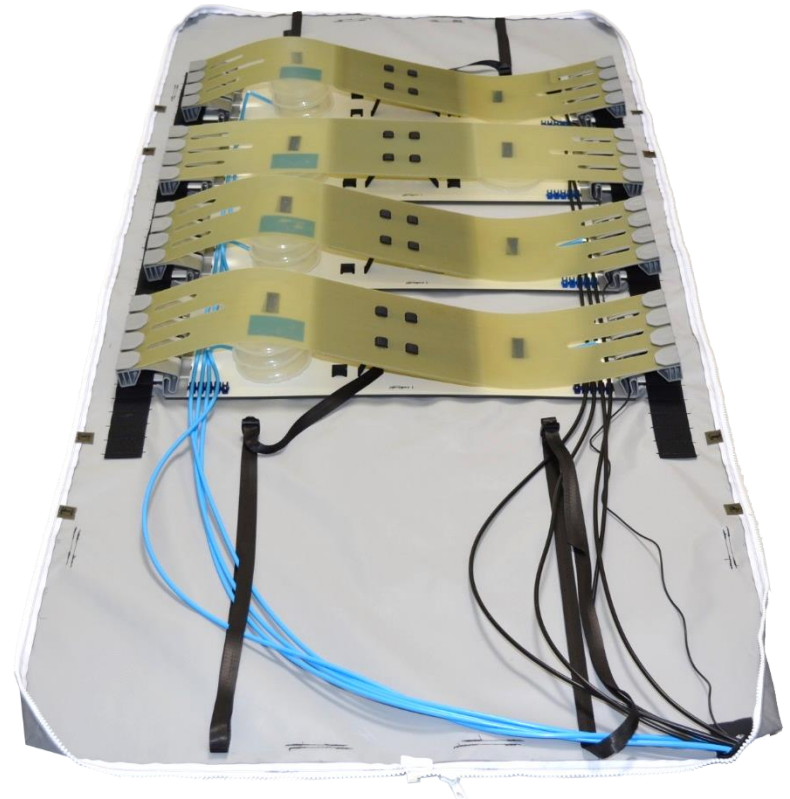
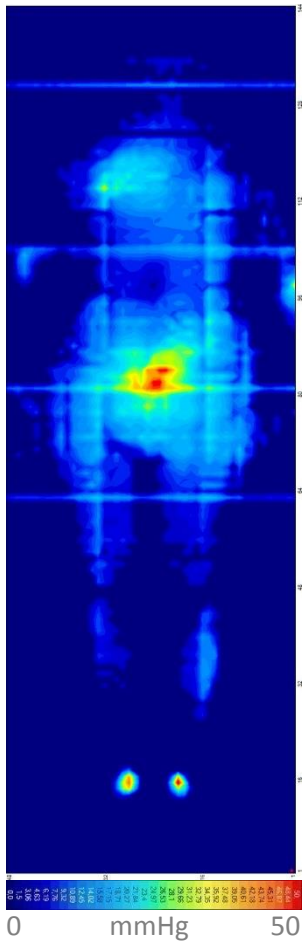
on back

# Motion Sequence Pressure Shift



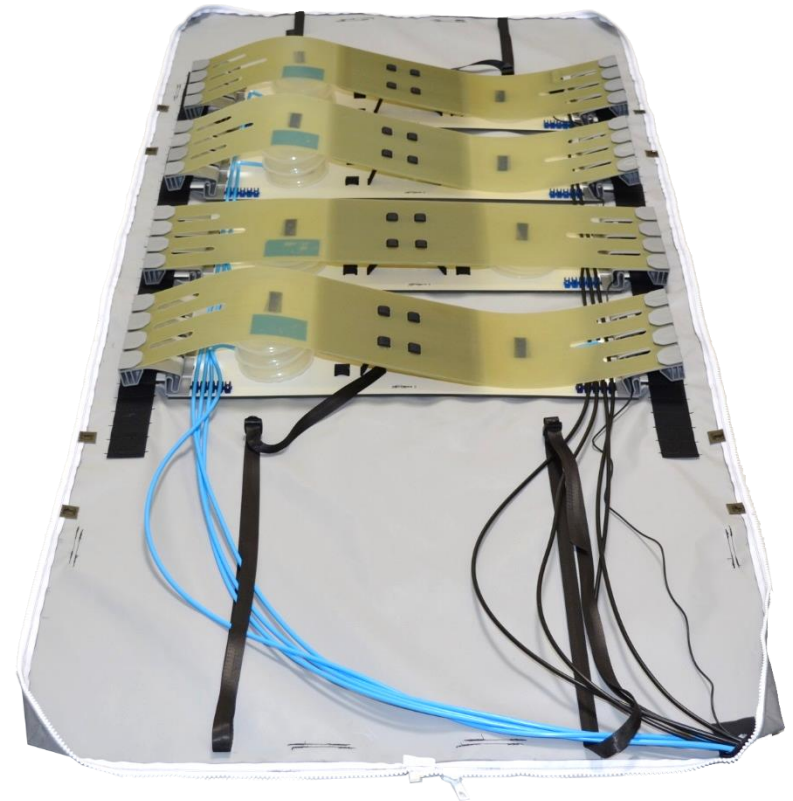
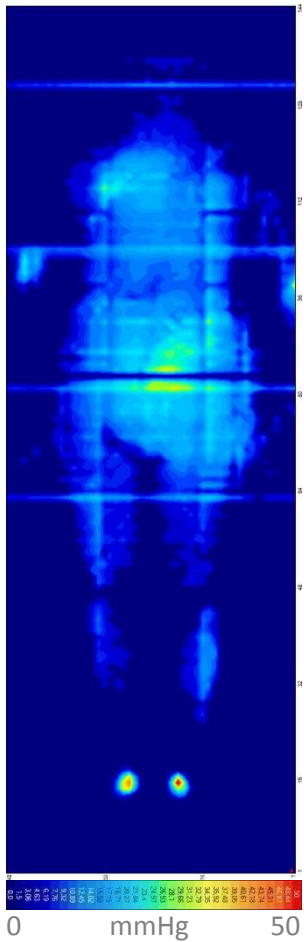
lateral position left

# Motion Sequence Pressure Shift



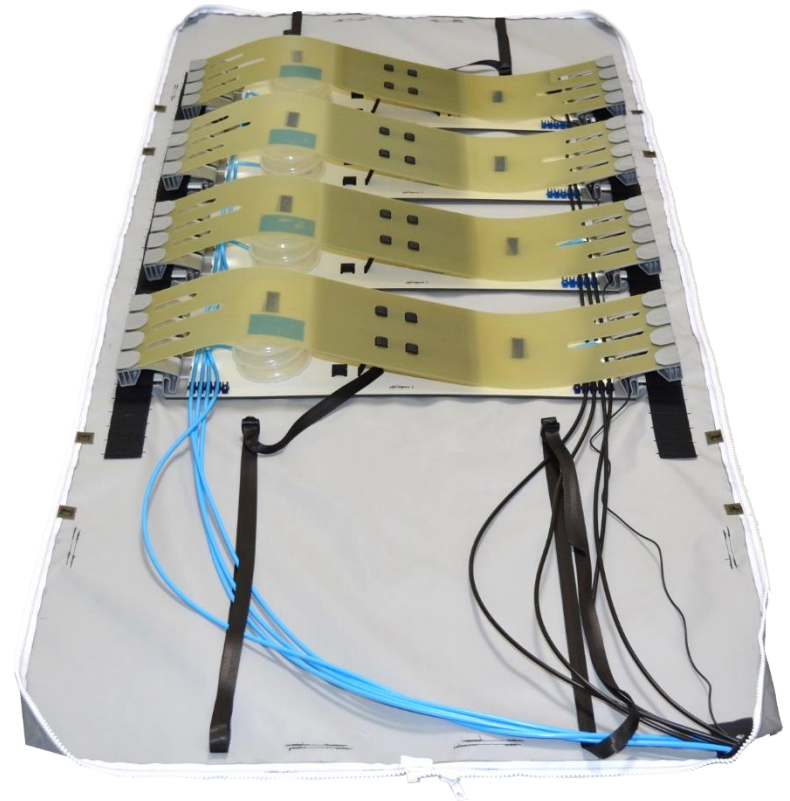
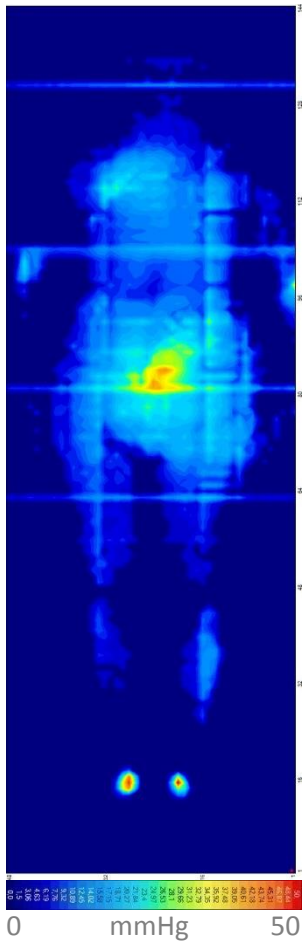
lateral position left – back relieved

# Motion Sequence Pressure Shift



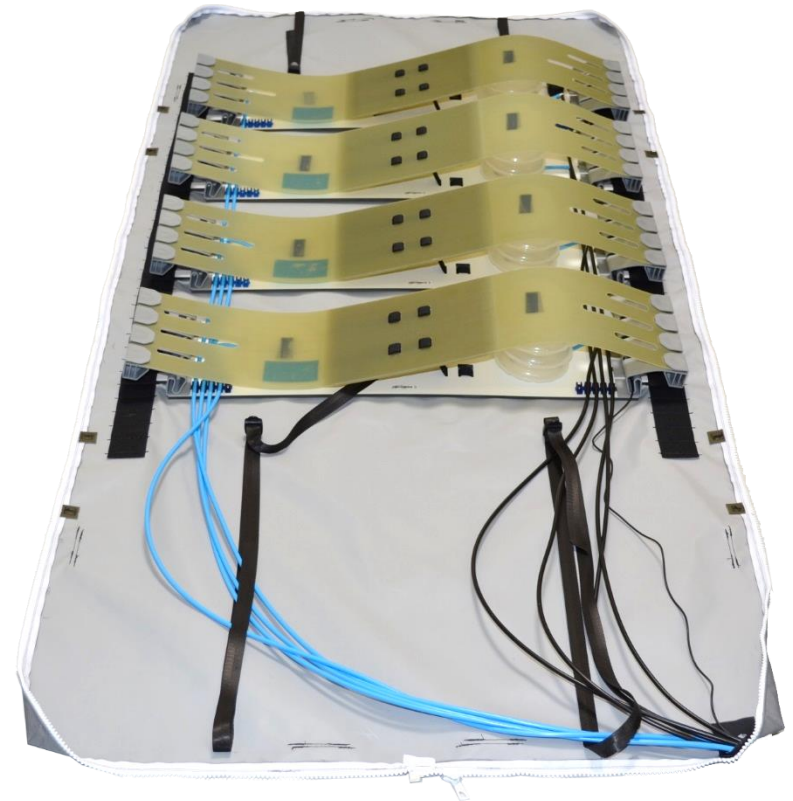
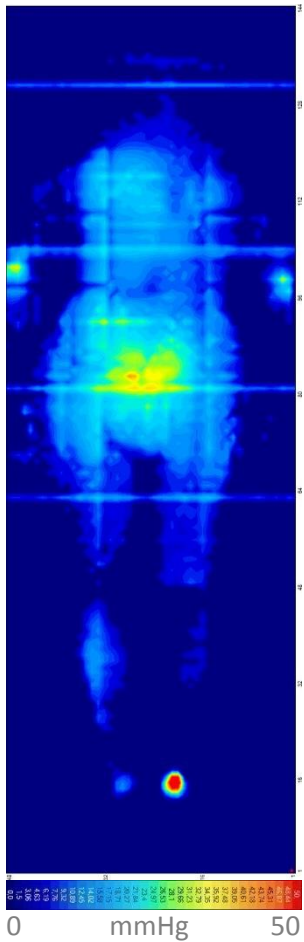
lateral position left – sacrum relieved

# Motion Sequence Pressure Shift



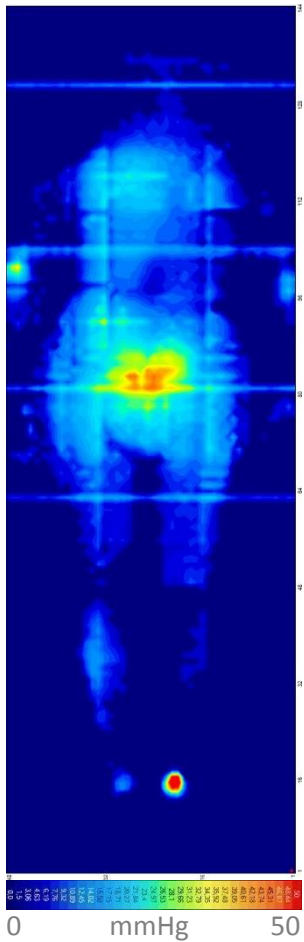
lateral position left

# Motion Sequence Pressure Shift



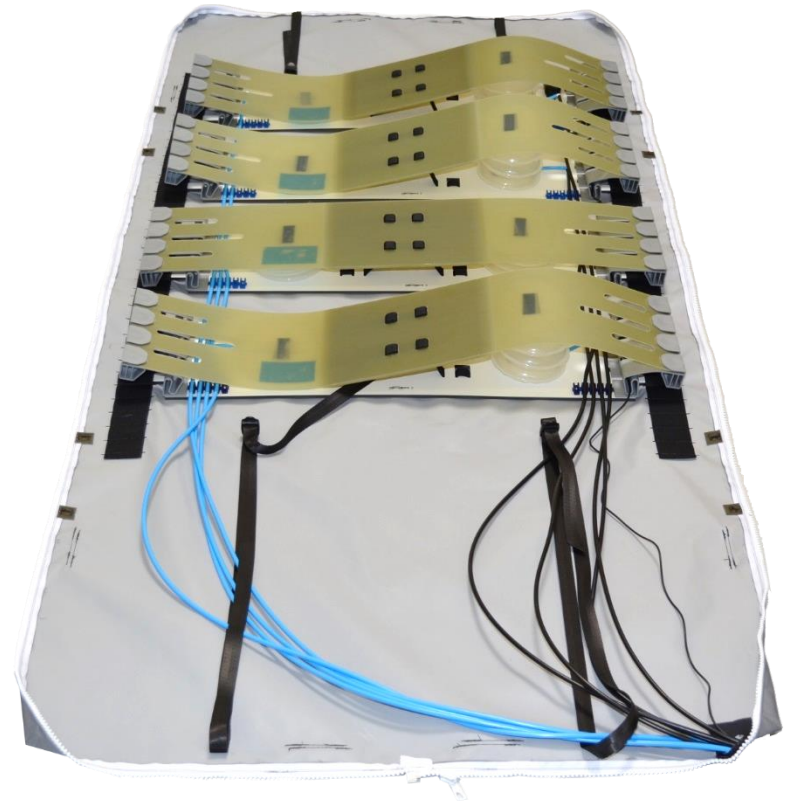
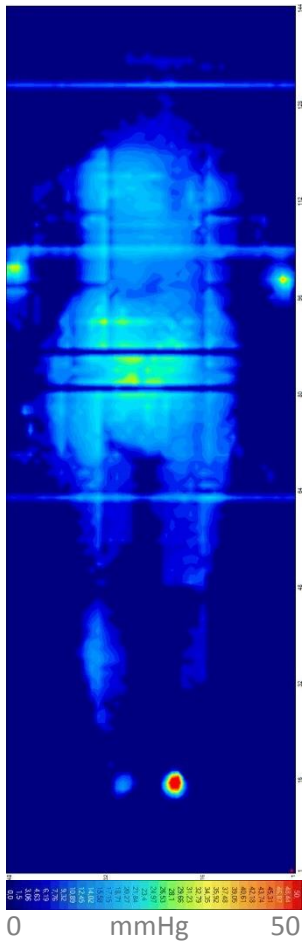
lateral position right

# Motion Sequence Pressure Shift



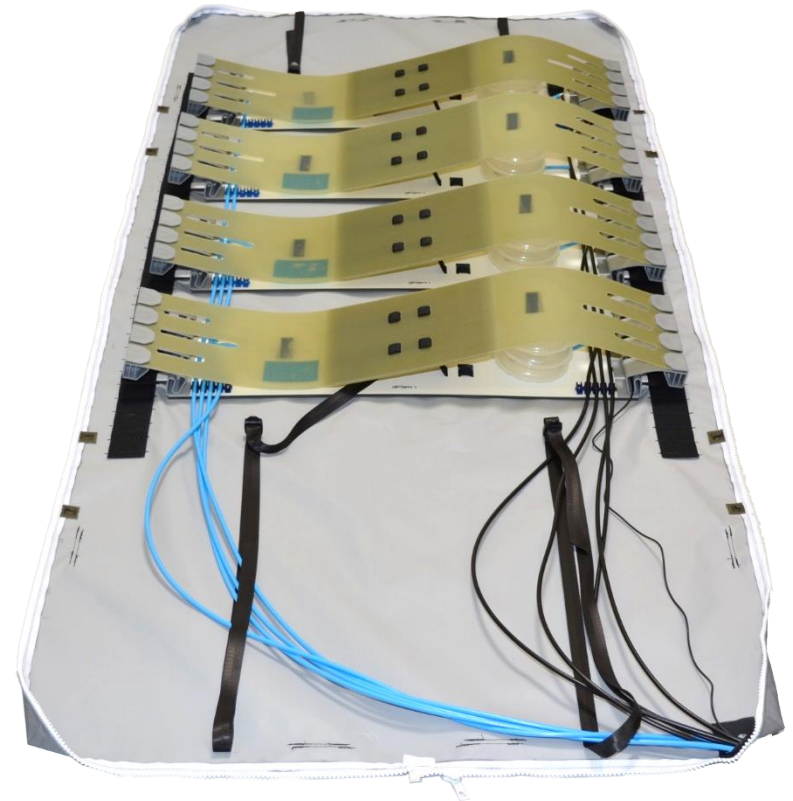
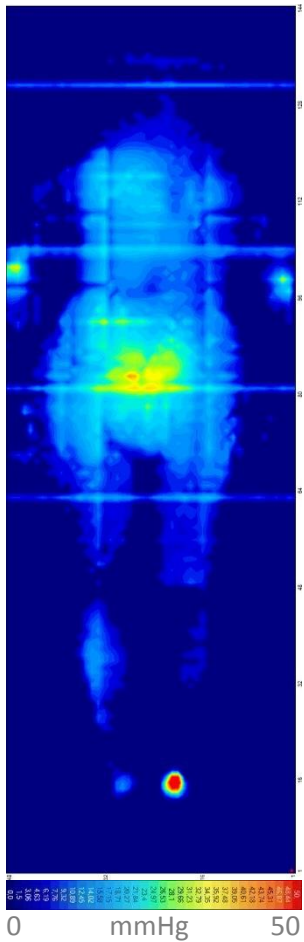
lateral position right – back relieved

# Motion Sequence Pressure Shift



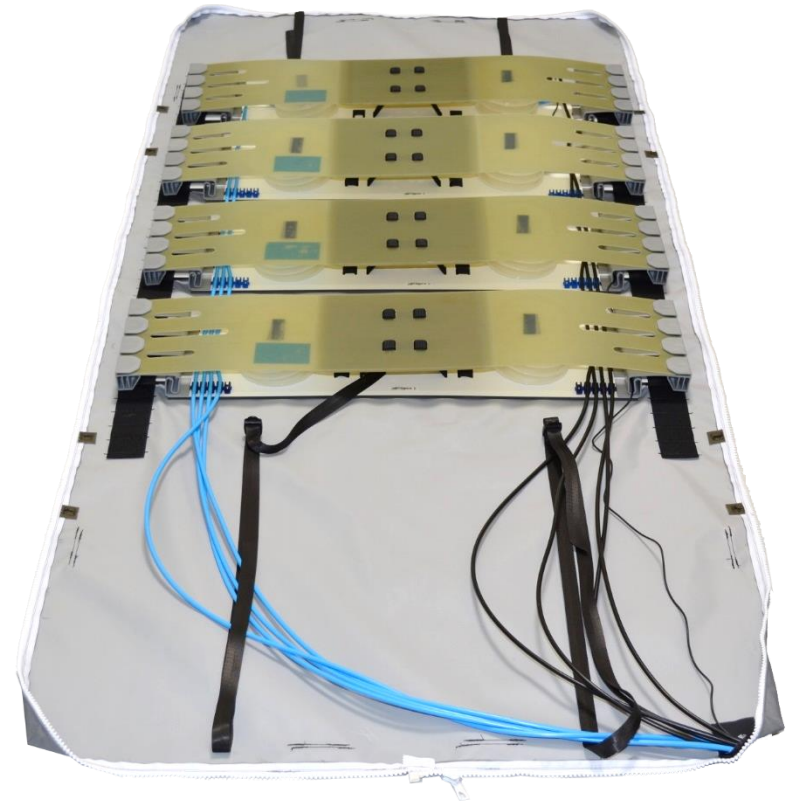
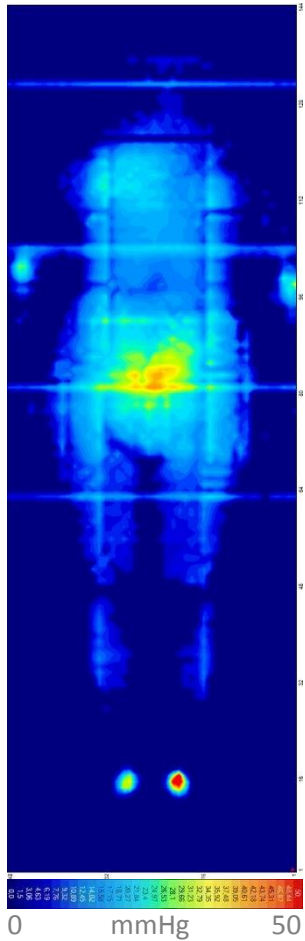
lateral position right – sacrum relieved

# Motion Sequence Pressure Shift



lateral position right

# Motion Sequence Pressure Shift



on back

# Positive Observational Studies



Rahel Pfändler  
APH Sunewies,  
Switzerland:

*«One patient entered with a pressure ulcer of 2<sup>nd</sup> degree. We put her on the AMS and within one week the pressure ulcer had healed without additional repositioning»*



Karin Gläsche  
Swiss Paraplegic Center:

*«The automatic repositioning was hardly noticed by the patient. The noise emission is minimal; This was highly valued by the patient.»*



Andrea Christen  
Waid Hospital, Zürich,  
Switzerland:

*«Cognitively impaired patients sleep through the night due to the continuous mobilization of AMS and are therefore ready to follow our therapies during daytime.»*

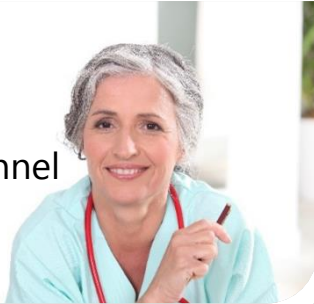
Thank you for your attention



# Additional slides AMS

# Benefits for all Stakeholders

Care  
Personnel



- ✓ **secure your standard of care**
  - well rested patients for therapy
  - low physical effort needed with heavy weight patients
  - more safety due to sophisticated product properties (easy to use)

Patients



- ✓ **increased comfort**
  - better sleep quality due to undisturbed sleep  
→ improved quality of life
  - more security due to guaranteed regular repositioning
  - best possible prophylaxis of pressure ulcers without loss of body perception

Institution



- ✓ **secure the quality of your institution**
  - Institution is more attractive due to high quality of care and quality of life for the patients
  - reduce costs of complications due to high quality of care

# Patient Example



Mr. Kaiser has dementia. He needs repositioning every three hours.

Every time he is repositioned during the night, he stays awake for one hour, calling the nurse every 5 min.

60 times a night.

Since he does not sleep well, he is aggressive during daytime.

On the AMS he does not wake up. He is in a good mood throughout the day.

**The AMS allows nurses to do their job.**

# Facts & Figures

## COSTS

PU cost an estimated  
**\$11 billion<sup>1</sup>**  
per year.

Average cost to  
treat a PU is  
estimated to be  
**\$43K<sup>1</sup>**

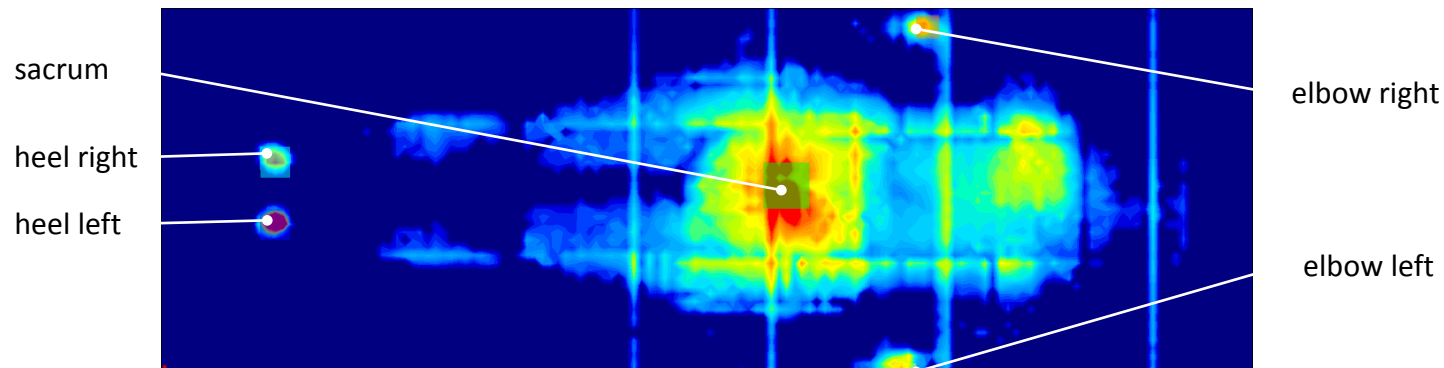
## PREVALENCE

**2.5 million<sup>1</sup>**  
patients suffer  
from PU every  
year in the U.S.

## PREVENTION

The cost of  
treating pressure  
ulcer is  
**2.5X<sup>2</sup>**  
the cost of  
preventing them

# Prophylaxis by pressure redistribution

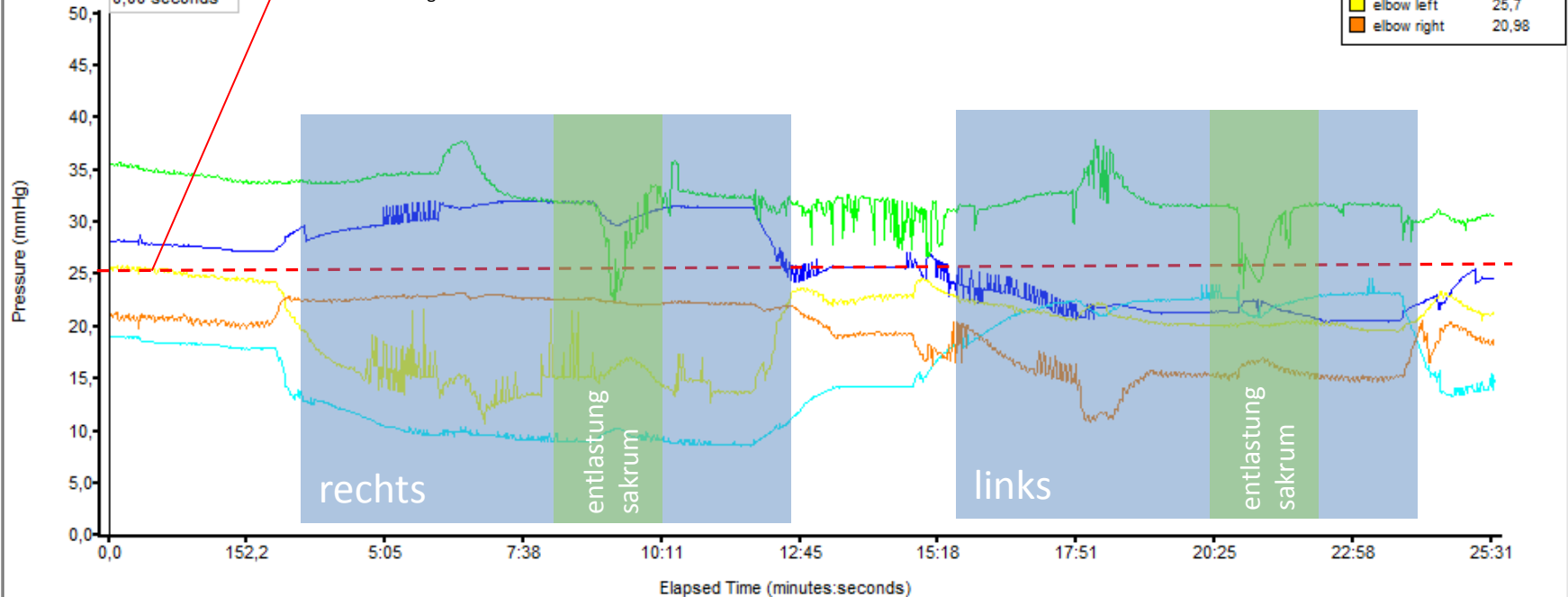


## Pressure vs Time

(Frame 1 to 1454)

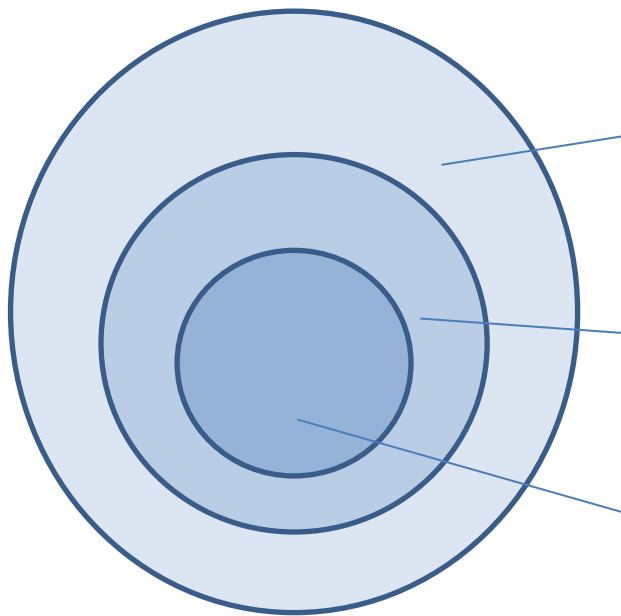
Frame 1  
0,00 seconds

Der normale Perfusionsdruck der Haut beträgt im durchschnitt 25 mmHG. Jeder Druck über 25 mmHG\*; der über längere Zeit auf ein Körperareal einwirkt, kann potentiell zum Dekubitus führen.  
Dekubitusvortrag - DGKP Christian Balon 1998



# Indication & highest benefit

Highest benefit in care of patients with an increased PU risk who do not or not sufficiently tolerate repositionings – e.g. after stroke, pain, limitations of motor function or dementia.



Patients/ Residents	Relevance	Benefit for patients	Benefit for nursing personnel
1) With demand for repositionings	Longterm Care: 47% of residents <sup>1</sup> , geriatrics: 70% of patients <sup>2</sup>	Less nocturnal disturbance	Less repositionings
2) ...with sleep disorder...	38% of all over 65-years old <sup>3</sup>	Better & longer sleep(+3h)	Less repositionings
3) ...with dementia	39% of residents <sup>4</sup> , 40% of these with sleep disorder <sup>3</sup>	Better & longer sleep, less disorientation	Less repositionings, less ringing

<sup>1</sup> Robert Koch-Institut (2003). Gesundheitsberichterstattung des Bundes, Heft 12: Dekubitus, Berlin: Robert Koch-Institut, s.10.

<sup>2</sup> Kundenstatistik compliant concept

<sup>3</sup> Bombois, Durambure, Pasquier F. & Monaca C., 2010

<sup>4</sup> Swiss Federal Statistical Office

# AMS vs APS Summary

## AMS – Active Mobilisation System

- Encouraging / stimulating the patient's own movement
- No loss of perception
- Supporting the care staff
- Increasing the quality of sleep and therefore the quality of life
- Increased comfort
- Feels like a regular bed
- Very quiet
- Well perceivable pressure relief
- Harmonious and gentle motion
- Stable during transfer (Getting in and out of bed)



## APS - Alternating Pressure System

- Reduces the patient's mobility
- Loss of body perception
- Reduces sleep quality
- Uncomfortable
- Noisy
- Artificial, plastic atmosphere
- Dizziness
- Squishy during transfer

Low Air Loss system



Alternating pressure system



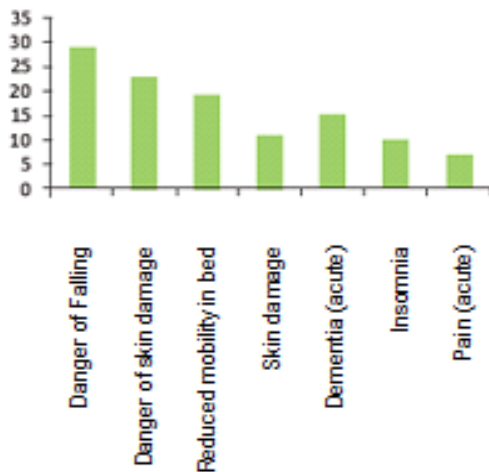
# Studies MM

# Studies - City Hospital Waid



## Clinic for Acute Geriatrics

- 72 beds
- Ø age of patients: 84 years
- Ø duration of stay: 22 days
- June 2013: 6 Mobility Monitors



Graphic: City Hospital  
Waid, Zurich

## Study Setting:

- March to August 2014
- 83 patients examined (60% women), average age 84 years old
- Most common reason for admission was falling (51.8%), 32.5% resulted in a fracture
- Additionally 76% of the patients showed some form of cognitive disorder

## Integration into the Nursing Process:

- MM was integrated into individual care planning as an intervention.
- MM often is used for several care diagnoses at the same time; for example for preventing falls and for evaluation of sleep quality.
- 53 patients (64%) were undergoing pressure ulcer prophylactic measures (Care diagnosis: danger for skin damage, reduced mobility in bed).
- For 32 patients (39%) unrest, sleep disorders or pain were in the foreground.
- For 29 Pat. (35%) MM was used to prevent falling.
- On average MM was used for 13 days per patient. This time frame makes it possible to take measures, to evaluate and to adjust them.

## Results

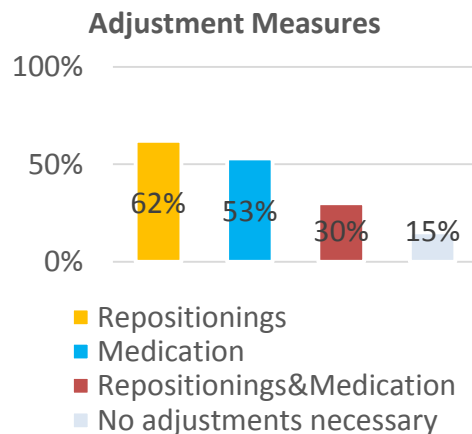
- For 22% of patients the repositioning intervals during the night were increased to ensure the prevention of pressure ulcers, or, with sufficient movement by the patient, reduced to prevent unnecessary disturbing of sleep.
- For 19% of patients adjustments to medication were arranged with medical staff, for example increasing pain medication dosage, but also reducing dosage of sleep aids, when micro-activity became too low.
- While during the first half of the implementation phase still four cases for pressure ulcers had to be treated, during the second half no new cases of pressure ulcers were found.
- Staffing fluctuation sank by 47% since 2013.

Reduction of pressure ulcer incidence from 4 to 0, staffing changes cut in half

# Studies - APH Rosenberg



- 130 residents
- ca 20 general practice physicians
- 2013: night staff reduction from 4 to 3 staff members.
- April 2013: 12 Mobility Monitors to support the night staff.



## Retroactive Evaluation of Nursing Care Documentation (EWMA May 2014)

### Care Quality:

- Pressure ulcer incidence dropped to zero.<sup>2</sup>
- Adjustments to repositioning plans for 62% of residents.
- Medication adjustments for 53% of residents, overall substantially fewer medications prescribed.
- Only 15% of residents did not need any type of intervention.

### Financial Results:

- MM supports the reduction of night staff from 3 to 2, with an annual savings of CHF 104,563.

### Job Satisfaction:

- Usage of MM is integrated into the care process and the facility concept.
- None of the nursing staff left the institution since June of 2013<sup>3</sup>

Cost Savings	CHF	EUR
Annual costs for night staffing	125'295	89'990
Annual costs for 12 Mobility Monitor units	17'232	14'159
Other Investments	3'500	2'875
<b>Annual Cost Savings</b>	<b>104'563</b>	<b>85'905</b>

<sup>2</sup> With the exception of one resident, who refused repositionings and the use of alternating pressure mattresses

<sup>3</sup> As of 05.2014. No resignations due to dissatisfaction; number of blind applications increases continuously.

Quality of care increased, costs saved and recruiting problem solved

# Studies - Cura Bruchsal (D)



- 67 residents
- 5 units for 23 days for 9 residents
- Long-term care setting of Cura Group with 50 facilities



Sonja Wacker, facility manager

«At times we were very amazed by the complexity of the results (...)  
Our employees were engaged in the discussion to an extent, which I have rarely experienced.»

	Content	Relevance	Effect in h per year	Effect in € per year
1.	Reduction of repositioning intervalls	For 3 of 9 residents	292	12,527 €
2.	Elimination of nightly control rounds	for 6 of 9 residents	146	3,796 €
3.	Cost reduction in care planning (direct)	for 7 of 9 residents	2	72 €
4.	Cost reduction with patient observation / Care planning for expecially expensive resident constellations	for 1 of 9 residents	24	744 €
5.	Elimination of dressing changes due to pressure ulcers	for 2 of 9 residents	61	2,427 €
6.	Prevented falls	for 1 of 9 residents	20	480 €
7.	Cost reduction for care (indirect)	for 9 of 9 residents	108	2,808 €
8.	Cost reduction in administration	for 2 of 9 residents	12	372 €
	<b>Total:</b>		665	<b>23,226 €</b>
		in FT equiv.	0.42	
		per bed:		346.66 €

Quality of care increased & standardized, reduction by 0.5 full-time positions per facility

# Studies - Herdecke

Results Application Study Herdecke: Phase 1 to Phase 2 over 10 Days					
Resident	Positioning Phase 1	Positioning Phase 2	Improvement Skin Condition	Falls prevented	Improved Sleep Behavior* <sup>1</sup>
Mister St.	0	3	n/a* <sup>2</sup>	✓	n/a* <sup>2</sup>
Miss W.	0	8	✓	✓	n/a* <sup>2</sup>
Miss B.	66	49	✓	n/a* <sup>2</sup>	✓
Miss G.	66	32	✗* <sup>3</sup>	✓	✗* <sup>3</sup>
Miss L.	58	27	✓	✓	✓
Miss H.	45	1	n/a* <sup>2</sup>	✓	✓
Miss A.	58	33	✓	n/a* <sup>2</sup>	n/a* <sup>2</sup>
Miss D.	39	9	✓	✓	n/a* <sup>2</sup>
Miss R.	66	69	✓	n/a* <sup>2</sup>	✗* <sup>3</sup>
Miss G. (palliative care)	57	16	n/a* <sup>2</sup>	n/a* <sup>2</sup>	n/a* <sup>2</sup>
Miss Sch.	65	58	✓	n/a* <sup>2</sup>	n/a* <sup>2</sup>
<b>Sum</b>	<b>520</b>	<b>305</b>			
<b>Positionings reduced by</b>	<b>215</b>				
<b>In %</b>	<b>41</b>				

\*<sup>1</sup> Sleep quality was only evaluated according to measured micro-activity; this means that better sleep due to fewer interruptions was not included.

\*<sup>2</sup> n/a indicates, that this item was not relevant for the MM test setting for this resident and therefore was not recorded.

\*<sup>3</sup> Skin condition and related sleep patterns for this resident did not improve during Phase 2, but also did not deteriorate.

# Studies - Deventer Ziekenhuis

## Correlation between electronically generated nurse feedback and the frequency of position changes

E.S.M. Koopman RN, Deventer Ziekenhuis, Netherlands

### RESULTS

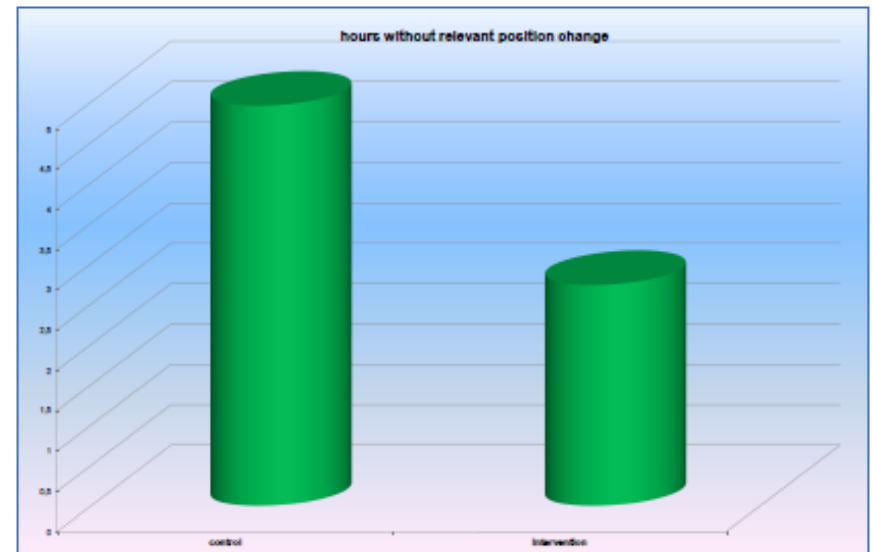
Out of 14 nurses interviewed, 13 nurses said they considered the Mobility Monitor® a very useful tool, relieving them of the burden considering which patient to turn. One nurse considered the nightly alarms as undesirable.

**The average time without relevant position change was reduced by 57% .**

The device was used for 61 days with 12 patients. The figure shows an average time of 4.9 hours without relevant position change in the control group and an Average of 2.8 hours in the intervention group.

### CONCLUSION

Despite the small sample size, the Mobility Monitor® reduces the average time a patients stays in one position. Therefore it is a valuable tool in improving the effectiveness of nursing care. Further research is needed to see if the use actually reduces the number of new pressure ulcers.



Time interval between relevant position changes

# Validation MM

# Mobility Monitor validation

## Fundamentals



### Literature

Scientific basis about movement pattern and pressure relieve

### Medical Experts

Prof. W. Seiler

## Lab Experiments



### Analysing and classifying movement patterns

- A. Major/minor movements per hour
- B. Maximal time between movements
- C. Movement distribution

## Observational studies



### Verifying/Validating the movement pattern detect. with different groups

- A. Young, healthy subjects
- B. Elderly, healthy subjects
- C. Elderly subjects with high risk of decubitus

3 years of development

2.5 years on Market (Switzerland, Germany, Austria, Netherlands)

# Mobility Monitor Quality Assurance



## 1. Fully automated test bench for Sensorunit

Each sensor unit is tested. Functional check of the individual sensors, drift measurement and correction, linearity measurement and correction, variance measurement.



## 2. Semi automated position test for Sensorunit

Each sensor unit is tested.  
The position test verifies the accuracy of the movement detection.



## 3. Functional check of Mobility Monitor Set

Optical inspection, electrical measurement, functional test of essential performance.



## 4. Final Control

Final control by quality manager. Optical inspection, check of all test protocols, release for sale.

# Facts & Figures:

## Pressure Ulcer

### PREVALANCE

**2.5 million<sup>1</sup>**

patients suffer from PU every year in the U.S.

### COST

PU cost an estimated

**\$11 billion<sup>1</sup>** per year.

Average cost to treat a PU is estimated to be **\$43K<sup>1</sup>**

## Falls

### PREVALANCE

**2.5 million<sup>2</sup>**

patients are treated for non-lethal falls in the U.S.

### COST

Falls cost an estimated

**\$34 billion<sup>2</sup>** per year.

Average cost to treat a fall is estimated to be **\$21K<sup>2</sup>**

## Assessment

### RISK

**29%<sup>2</sup>**

of patients' mobility is overestimated by nursing professionals