

+ Dolphin Therapy

Care Solutions



DOLPHIN
Fluid Immersion Simulation®



MED-INNOVA



Dolphin is a reactive mattress system that creates a simulated fluid environment, enabling full immersion and envelopment, significantly reducing pressure, shear and tissue deformation.

As a Result:

- Tissue symmetry is maintained
- Vascular occlusion is minimised, maintaining near normal blood flow
- Tissue ischemia is prevented, even when nursed directly on the affected area
- Positive patient outcomes are achieved

The Origins of Dolphin Therapy

For decades the US Navy has trained Dolphins to undertake underwater reconnaissance. When transported out of water, over long distances to conflict zones the Dolphins started to die. Post-mortem examinations identified the cause of death as circulatory distress due to internal organ trauma; crushing type injuries which were the result of gravity exerting pressure and vertical shear force on the mammals' internal tissues and organs.

US Naval engineers set about developing a support system that could recreate buoyancy during transportation, recreating the Dolphin's natural state. The result was the development of a microprocessor

and software which adopted Boyle's Law and Archimedes' Principle and combined sophisticated algorithms with dynamic pressure waveform analysis to simulate a fluid within a closed air chamber.

The effect was to create a level of immersion and buoyancy sufficient to alleviate the forces of gravity to such an extent as to maintain organ and tissue perfusion and oxygenation at near normal levels in the Dolphins. The technology was then adapted for human application and introduced to treat bomb blast and other major trauma injuries in the Middle East conflicts. The technology has now been released for commercial application and Medstrom are proud to deliver this technology to patients in the acute and community sectors.

The Pressure Redistribution Conundrum

Conventional dynamic support systems concentrate on redistributing pressure either by alternating high and low pressures between adjacent parts of the body or by displacing a patient's weight across the surface of the mattress in an attempt to create immersion. In each case mattress designers struggle with the pressure redistribution conundrum; in an attempt to reduce the overall surface contact pressure more air is forced into part or throughout the mattress thereby increasing the internal mattress pressure.

In Pursuit of an Ideal

No single support surface has been shown to consistently perform better than all others under all circumstances. The only support system available to date that creates immersion at constant low pressure, in every position, without increasing internal air pressure is the air-fluidised bed. (AFB). A Cochrane Review published in 2001¹ concluded (despite stated reservations) that “good evidence from RCTs suggests that air-fluidised beds may improve pressure sore healing rates.” AFB is still reserved for the most difficult and intransigent of wounds including category III and IV pressure ulcers and patients undergoing flap surgery for pressure ulcer repair. Consensus amongst clinicians and biomedical engineers suggests that AFB would be used much more frequently but for its shortcomings in terms of weight, transportation and patient mobilisation from the bed. Dolphin Therapy is the first and only new technology which mimics air-fluidisation and provides the clinical benefits without the drawbacks of the traditional air-fluidised bed.

Indications for Use

- Dolphin Therapy is suitable for all patients who otherwise would be suitable for air fluidised therapy and would be most frequently used in the care of patients within intensive care, burns and plastics, vascular surgery and trauma & orthopaedic units
- Dolphin Therapy is indicated for the care of patients with pressure related tissue damage and those undergoing flap surgery for pressure ulcer repair
- Prevention of skin breakdown in the most vulnerable of patients including spinal cord injury where the spine has been stabilised
- Pain management, including end-of-life care
- Where repositioning is challenging, for example for patients in ICU/CCU
- Patients who are non-concordant with repositioning

Key Findings:

Distance from ischial tuberosities to skin surface:

- Supine, on foam 75, 78mm
- Supine, on Dolphin 109, 99mm

A Review of the Clinical Evidence

CT scans taken at St Joseph's Hospital, Tampa FL, demonstrate tissue symmetry of a healthy individual when placed on a foam mattress and on Dolphin.



Fig 1 shows the compression and distortion of subcutaneous tissue and muscle when placed on foam. Lumen diameter of microcirculation has been reduced and there is a complete loss of the gluteal fold. Distances from the most posterior point of the ischial tuberosities to the skin surface area 75mm and 78mm.

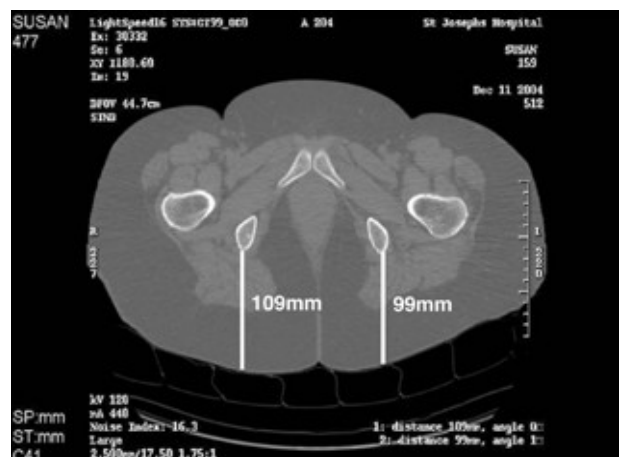


Fig 2 shows that natural symmetry of the gluteal fold has returned, lumen diameter of microcirculation is normal and tissue symmetry is restored. Distances from the most posterior point of the ischial tuberosities to the skin surface area 109mm and 99mm.

Dolphin Prevents Tissue Ischemia, even when Nursed Directly on the Affected Area

Sparrow Speciality Hospital in Lansing, MI conducted a study in 2012 to compare the efficacy of Dolphin Therapy as an alternative to Air Fluidised (AF) therapy for flap patients.²

Implementation of Dolphin Therapy into the post-operative care protocol for patients post-myocutaneous flap procedures led to incisional healing, successful flap closure and improved patient comfort post-operatively during the evaluation period.

In addition the study reported the following benefits:-

- No occurrence of acquired pneumonia (a previous concern on AF) as there was no longer a requirement to nurse patients in a recumbent position
- Patients on AF complained that they felt uncomfortably warm; this did not happen on Dolphin
- The facility halved their treatment cost in the study

Based on the clinical outcomes and ease of clinician use, as well as the significant cost savings documented, the Dolphin mattress system has become the surface of choice in the facility's post-operative flap protocol.

Key Findings:

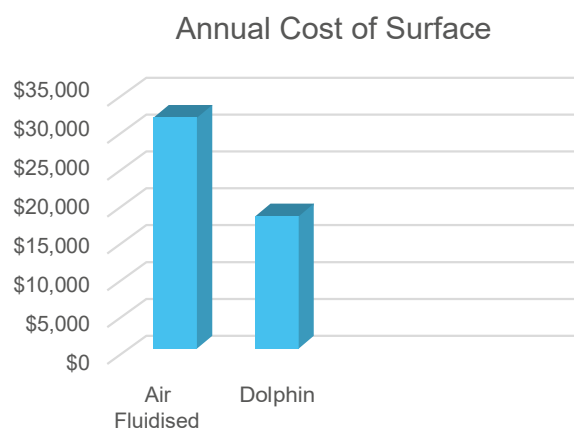
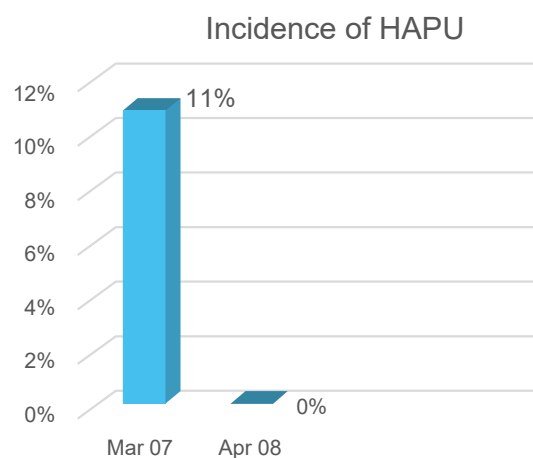
- Incisional healing
- Successful flap closure
- Improved comfort
- Zero occurrence of hospital acquired pneumonia
- Treatment cost halved

Spinal cord injury patients are at a high risk of developing pressure ulcers. Memphis VA Medical Centre, a 225-bed hospital with a 60-bed spinal cord injury centre invested in 44 Dolphin mattresses for use on its two spinal cord injury units. They had previously used Air Fluidised therapy for these patients but still experienced an 11% rate of hospital acquired pressure ulcers in heels (HAPU). Their goals in trialing Dolphin were to:

- Prevent or reduce HAPU development
- Reduce rental costs associated with AF

As a result of using Dolphin, pressure ulcers reduced from 11% to 0%. This was felt to be an unprecedented result for such a high risk population. They also achieved reduced costs equating to \$13,000 per bed.³

Key Findings:



Dolphin Minimises Vascular Occlusion and Maintains Near Normal Blood Flow

A study⁴ was performed in 2015 by the Faculty of Health Sciences from the University of Southampton to assess the physiological effects of three immersion settings of Dolphin Therapy while an individual was in supine, side lying or high sitting posture (at 44° head of bed angle). Transcutaneous oxygen (TcPO₂) and carbon dioxide (TcPCO₂) were measured for 20 volunteers.

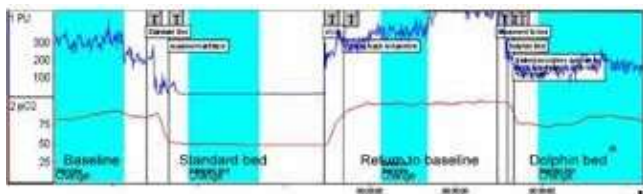
Responses were Categorised According to Chai and Bader 2013:⁵

- Category 1 - no reduction in TcPO₂,
no increase in TcPCO₂
- Category 2 - a reduction in TcPO₂,
no increase in TcPCO₂
- Category 3 - a reduction in TcPO₂ increase
in TcPCO₂

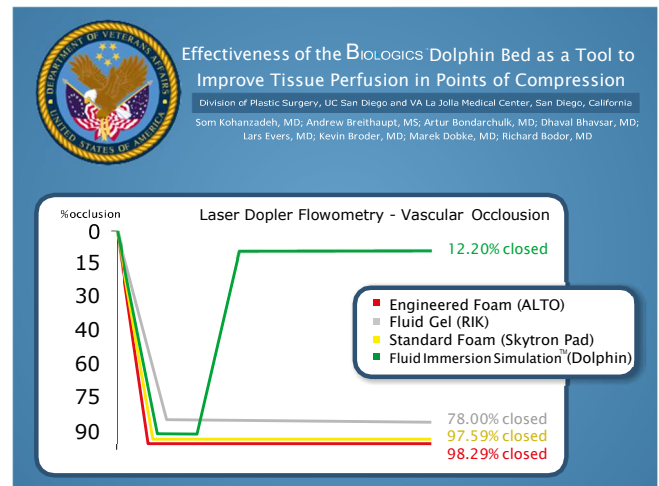
Key Findings:

82% of patients exhibited a favourable category 1 or 2 response

In a study done by the Division of Plastic Surgery at La Jolla Medical Centre, California⁶, it was found that 87% of tissue perfusion was retained by patients placed on Dolphin Therapy versus 16% by patients on standard foam mattresses. They concluded that this was a statistically significant improvement of tissue blood flow.



Laser Doppler Flowmetry was also performed to measure vascular occlusion of patients on Dolphin vs other surfaces. Vascular occlusion was measured at just 12% when the subject was placed on Dolphin, versus 78 – 98% on alternative surfaces.



Key Findings:

| | Foams | Dolphin |
|----------------------------|--------|---------|
| Tissue perfusion retained: | 16% | 87% |
| Vascular occlusion: | 78-99% | 12% |

A study was completed by the Division of Plastic Surgery, University of California, San Diego, CA, and the Department of Plastic Surgery, University of Luebeck, Germany, into the potential of using Dolphin Therapy to prevent intra-operatively acquired pressure ulcers.⁷

Laser Doppler Flowmetry was used to measure dynamic changes in the microcirculation when patients were placed on Dolphin vs a standard trolley.

The mean reduction of perfusion on the regular trolley was 90.52%, and on the Dolphin bed only 22.31%.

The mean reduction of perfusion from Dolphin to the regular trolley was 88.71%. The differences were considered to be statistically significant by the authors.

Key Findings:

| | Standard trolley | Dolphin |
|-------------------------|------------------|---------|
| Reduction in perfusion: | 90.52% | 22.31% |

Dolphin Achieves Positive Outcomes for Patients

In 2014 a small-scale evaluation of the Dolphin Fluid Immersion Simulation Mattress was conducted by Cardiff & Vale Health Board.⁸ The aim of this evaluation was to assess the performance of the Dolphin to determine whether the product provided an effective alternative to existing standard pressure ulcer treatment.

18 patients completed the evaluation, chosen as they were high risk and particularly challenging. Primary diagnoses included spina bifida, multiple sclerosis, Hodgkin's lymphoma, ovarian mass and brain tumour.

The majority of patients displayed no skin deterioration and 50% of those with pressure damage (8 out of 16 patients) either healed or improved. All but three patients had their turning periods extended.

The study concluded that Dolphin appeared to provide a useful addition to the specialist equipment available for patients at high risk of pressure ulcers who may have other complex needs.

In 2015 a review of the outcomes of 91 Dolphin Therapy patients from 12 hospital sites was conducted by Jacqui Fletcher, Clinical Editor of Wounds UK and Fellow of NICE.⁹

The patients had multiple and complex comorbidities, including:

- Palliative/end-of-life care/carcinoma
- Renal disease
- Diabetes
- Spinal problems/paralysis
- Amputee
- Wound to perineum/genitals
- Post-surgical patients (wound debridement, abdominal/chest surgery, flap surgery)
- Existing and/or multiple pressure ulcers
- Non-concordance with repositioning

The top three clinical objectives for these patients were pressure ulcer management, pain management and reduced repositioning frequency.

Reported outcomes included:

- Wound healing & pressure ulcer prevention
- Improved comfort levels
- Improved prevention & treatment of wounds, comfort and ease of repositioning versus previous surfaces
- Earlier patient discharge
- Ability to be repositioned directly onto existing wounds with no compromise to the wound status
- Healing of moisture damage
- Improvement in comfort and quality of life at the end-of-life stage

Key Findings:

- Healing of pressure and moisture damage
- Prevention of skin damage
- Earlier patient discharge
- Improved comfort
- Assisted end-of-life care

If you would like a demonstration of Dolphin Therapy or if you have a specific patient in mind and would like to discuss a trial please contact:

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Technical Specification:

Dimensions

Adult therapy mattress: 89cm(w) x 208cm (l)
x 25cm (d)

Paediatric therapy mattress: 71cm (w) x 127cm (l)
x 10 cm (d)

Wheelchair/seat cushion: 43cm (w) x 43cm (l)
x 10cm (d)

Max Patient Weight

Adult therapy mattress: 248kg (39st)

Paediatric therapy mattress: 110kg (17st)

Wheelchair/ seat cushion: 113.6kg (18st)

Min Patient Weight

Paediatric therapy mattress: 2.5 – 110kg
(5½ lbs – 17st)

References:

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