

# Clinical Study – Alternating Pressure Wheelchair Cushions

**Effect of using powered, alternating pressure, wheelchair cushion systems to help heal and prevent pressure ulcers even while increasing the individual's sitting time.**

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## **Summary**

The overall pilot study objective was to gather evidence that utilizing dynamic, alternating pressure cushion systems in wheelchairs can help heal and prevent pressure ulcers for those individual's who are at high risk, even while sitting time is increased.

## **Purpose**

Conduct a pilot study to demonstrate the effectiveness of the Airpulse PK cushion system, a commercially available dynamic, alternating pressure cushion system designed for use by those individuals who are at high-risk for pressure sores.

## **Design**

Small Pilot Study.

## **Method**

Increase the sitting time of each of the subjects while measuring current pressure sores to see evidence of healing and inspect skin to see if any new skin breakdown was evident. Daily sitting logs were kept and skin was inspected on a daily basis.

## **Subjects**

Individuals who are at high risk of skin breakdown and who either currently had, or had a history of, pressure ulcers in the pelvic or spinal weight bearing areas. A total of seven individuals were selected to participate in this study.

## **Intervention**

The Airpulse PK powered, alternating pressure, cushion system manufactured by Aquila Corporation. The cushion systems were customized for each of the subjects based on their physical characteristics and pressure ulcer status.

## **Setting**

All of the subjects are in a home care environment with scheduled outpatient visits to a medical facility.

## **Duration**

Each of the subjects started utilizing the Airpulse PK cushion system at various times over an 18 month period. Each of the seven participants kept daily sitting and skin inspection logs for a period of two months. The study began with the first subject in May, 2007, and ended when the last subject completed the two month process in October of 2008.

## **Results**

Although the pilot study group was small, two findings were demonstrated:

- a. Subjects experienced no new occurrences of pressure ulcers after beginning to use the dynamic, alternating pressure cushion system even though sitting time was increased.
- b. Existing pressure ulcers improved during use of the dynamic, alternating pressure cushion system.

## **Conclusion**

We participated in a study of patients with pressure ulcerations of pelvic and spinal weight bearing locations, who were being treated with standard wound care modalities, including commercially available static offloading devices. All patients had severely impaired ability to sense and respond to pressure, and all had experienced at least one, Stage 3 ulceration, and most had undergone previous surgical intervention for pressure ulcerations with recurrences. The wound care therapies were continued in each of the cases, with the sole new intervention limited to institution of a dynamic, alternating pressure cushion. The patients were allowed to continue using a wheelchair with the study cushion during their treatment. Each of the study subjects experienced improvement in size and/or depth of his/her pressure ulcer, and none developed new or worsening wounds during the study. This limited study suggests that further investigation of dynamic, alternating pressure wheelchair cushions is warranted as a modality to treat as well as protect patients who are at high risk for pelvic pressure ulceration.

J. Gregory Jones, MD  
Principal Investigator

## **Comments**

As the facilitator of this study, I was able to view first hand the amount of sitting time and the status of the pressure ulcers of each of the subjects. In general, all of the subjects were able to increase or maintain sitting time while improving the status of their existing pressure ulcers. No new pressure ulcers were formed during the course of the study. I also observed an overall improvement in the quality of life of the subjects utilizing this alternating pressure relief cushion directly related to their activities while sitting upright rather than being confined to bed.

Julie Shogan, RN  
Facilitator

## **Supporting Documentation**

See the attachments for supporting documentation including general physical information for each participant (Attachment A) and specific wound status and sitting chart summaries for each participant (Attachment B).

*Note: Daily sitting logs and skin inspection logs were kept on each participant for a two month period. A summary of the logs is provided in attachment B. The summary uses an average sitting time at each two week reporting date. The pressure sore status is reported in this summary as the skin inspection occurred on the exact date.*

(Attachment A)

## **General Physical Information for Each Participant**

**Subject A** – Male, age 61, 260 lbs.

Quadriplegia as a result of a stroke and confined to either his bed or wheelchair. Pressure ulcer history includes a spinal ulcer in 1997 and a recurrent Stage III pressure ulcer on his right ischial. Before the study, Subject A had utilized gel and static air cushions as well as a home made donut type cushion. Over the two month study period, Subject A was able to continue sitting for 7 to 9 hours per day while his pressure ulcer improved.

**Subject B** – Female, age 70, 155 lbs.

Multiple Sclerosis left Subject B confined to a wheelchair. Pressure ulcer history includes three pressure ulcers since 1985 in the right ischial area. Referred to the wound clinic in 2007 with a pressure ulcer which was being treated with Integra injection, antibiotics, Prosit, Aquacel Ag, and eight months of Wound Vac before the study. Subject B had utilized a foam cushion and had scheduled visits to the wound clinic weekly. After receiving the Airpulse PK, and over the two month study period, Subject B was able to increase her sitting time to 14 hours per day while her pressure ulcer healed. Subject B's wound clinic visits were reduced to every other week.

**Subject C** – Male, age 34, 165 lbs.

Spina Bifida since birth, T-3 T-4 paraplegic. Pressure ulcer history includes recurrent skin breakdown in the left ischial area resulting in hospitalization for treatment and flap surgery in the past. Before the study, Subject C had utilized a static air cushion for his manual wheelchair and just prior to the start of the study, was confined to bed with a healing Stage IV pressure ulcer. After the two month study concluded, Subject C was able to return to work full-time.

**Subject D** – Male, age 33, 230 lbs.

Accident that resulted in C-4 C-5 C-6 incomplete quadriplegia. Pressure ulcer history over the past 15 years includes: a total of 10 pressure ulcers; three flap surgeries; debridement; bone infections required shaving of ischial bones; and multiple hospitalizations. Prior to the study, subject was sitting for three hours per day. Sitting time was increased during the study period to eight hours per day while the pressure ulcers on the left and right ischial area improved.

**Subject E** – Male, age 33, 155 lbs.

Quadriplegic as a result of a car accident. Pressure ulcer history includes flap surgery on the left ischial in 2002 and five recurring pressure ulcers in the same area since. Before the study, Subject E was sitting five to 10 minutes per day. During the study, Subject E increased his sitting time to two hours per day without an increase in the size of an existing pressure ulcer. The pressure ulcer did epithelize and further medical attention will be needed.

**Subject F** – Male, age 27, 195 lbs.

T-5 paraplegic as a result of an accident causing spinal cord injury. Pressure ulcer history includes a total of 35 to 40 wounds since 2002. Subject F began the study in November, 2007, sitting on the Airpulse PK system for 30 minutes per day with a recently healed Stage III on his left ischial area. By January of 2008, Subject F was sitting for eight hours a day with no redness or additional wounds.

**Subject G** – Female, age 61, 150 lbs.

Multiple Sclerosis diagnosed in 1990 with a fixed pelvic obliquity. Subject G had been using a wheelchair for mobility for almost 15 years, utilizing both static air and gel cushions during that time. Subject G has a history of pressure ulcers in the right ischial area and the coccyx. Severe pain when sitting required repositioning every 5 minutes. Subject G increased sitting time during the study and the repositioning intervals for pain relief were greatly reduced.

(Attachment B)

## Participant Sitting Log and Wound Status Chart

<b>Subject A</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	8/7/2008	9/9/2008	10/10/2008
Daily Sitting Time	7 hours	9 hours	8 hours
Wound Measurement	4L x 3W x .5D	2.6L x 2W x .7D	2.2L x 1.8W x .8D
<b>Subject B</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	5/2/2008	5/29/2008	6/25/2008
Daily Sitting Time	14 hours	14 hours	14 hours
Wound Measurement	0.3L x 0.2W x 0.1D	0.3L x 0.2W x 0.3D	Wound Healed
<b>Subject C</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	10/17/2007	12/1/2007	1/15/2008
Daily Sitting Time	30 minutes	12 hours	12 hours
Wound Measurement	Healed Stage IV	No redness	Remained Healed
<b>Subject D</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	1/11/2008	2/7/2008	2/18/2008
Daily Sitting Time	3 hours	8 hours	8 hours
Wound Measurement #1	2.5L x 2.5W	2.5L x 2 W	2.5 x 1W
Wound Measurement #2	2L x 1.5W	Healed	.5L x 1W
<b>Subject E</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	5/15/2007	8/1/2007	11/1/2007
Daily Sitting Time	5 minutes	1 hour	2 hours
Wound Measurement	1L x 1W x 4D	1L x 1W x 4D	Epithelization Occurred
<b>Subject F</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	11/2/2007	12/1/2007	1/3/2008
Daily Sitting Time	30 minutes	8 hours	8 hours
Wound Measurement	Recently healed stage III		Remained Healed
<b>Subject G</b>	<b>Start Date</b>	<b>Mid Term</b>	<b>End Date</b>
	8/2/2007	8/25/2007	9/14/2007
Daily Sitting Time	11.5 hours	10 hours	11 hours
Wound Measurement	Recently healed stage III		Remained Healed
*all wound measurements are in centimeters			