

INTERFACE PRESSURE MAPPING

Protocol and Interpretation

Interface Pressure Mapping (IPM) using the XSENSOR® System is a very effective tool for comparing and evaluating the effectiveness of pressure distribution or relief on a variety of support surfaces. For further information on the advantages and disadvantages please refer to the document titled “Pressure Mapping Information.”

IPM should always be used in conjunction with a variety of other clinical tools and judgements to ensure the best outcomes.

The purpose of this document is to put forward one way of interpreting the data collected, and to give a draft protocol for individual organizations and clinicians to consider. We advise that the protocol be customized to suit the requirements and practices used in different institutions and organizations.

Interpretation will also depend on an understanding of the technology being used. For example, Alternating Pressure Mattress (APM) and cushion devices address the issue of pressure in a completely different way to those devices which attempt to deliver a constant low pressure. To this end we have included a special paragraph to try and address the interpreting of APM systems.

Interpreting XSENSOR Mapping

There is much discussion around how data collected from pressure mapping should be interpreted. The temptation to set a definitive pressure is strong, however there is little evidence to support what is a “good” versus “bad” pressure. While there has been much research carried out to attempt to define at what pressure capillary closure occurs there remains no conclusive evidence to assert such a figure.

In our experience, after several years of using the Xsensor system, pressures vary hugely from individual to individual. Body weight, body type, equipment set up and skeletal asymmetries are just some of the variants that can effect results.

For example, when pressure mapping persons with Spinal Cord Injury in a good seating system, it is far more common to see pressures above 100mmHg. While for able bodied persons in a similar system we may achieve pressures below 80mmHg.

One of the very common misconceptions we hear is that pressure should be below 32mmHg. This figure comes from research carried out in the 1930's by a

researcher named Landis. In his research he found that, at finger nails, capillary closure occurred at 32mmHg. However, his research was carried out on able bodied young males in a supine position. The results of his research have not been repeated, and there are many questions around the techniques used and the validity of his findings.

At a very superficial level, his results do not bear any relevance to persons in a seated position. They also do not relate to those with health issues.

In our experience, for mattress systems, pressures of 50mmHg and below are achieved by the better support surfaces. On an average hospital grade foam mattress it is not uncommon to see pressures in the range 140 – 220 mmHg at the heels, head, pelvis and scapular. In lateral position it is common to see similar pressures around the trochanter.

So if defining a “safe” pressure is difficult to validate, how do we interpret results? How can we effectively compare results to determine the most effective support surface for individuals?

Direct Comparison

When using IPM we believe it is important to set goals. Often the goal is to find the most effective product for an individual, or to see if pressure distribution can be achieved by equipment adjustments. Or it may be to determine an effective way to do a pressure relief (for example, in a seated position can we relieve pressure at the ischial tuberosities by putting the elbows on the knees and leaning forward?). It may be to locate pressure “hot” spots and see if we can minimize these.

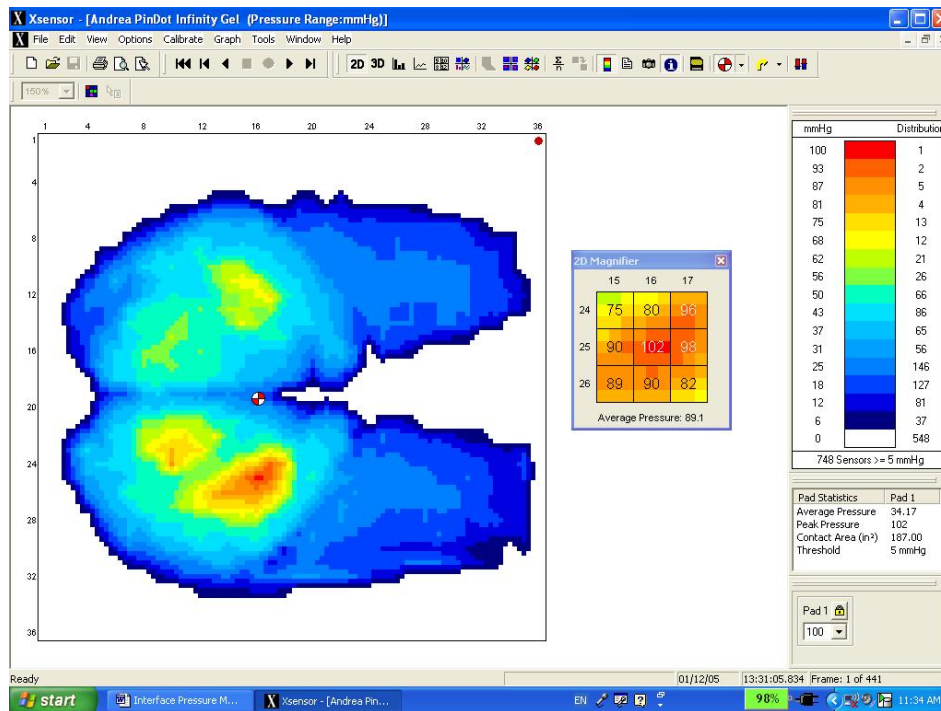
In all cases we require a starting point to begin the comparisons. This may be the seating system the client presents in, or if it is a new client it may be a flat surface with no cushion. It may be the clients existing mattress system, commode chair, backrest etc.

Peak Pressure Index – a method for determining peak pressure

To minimize the risk of a faulty sensor or false reading over one sensor, many IPM users are using the average of 8 cells around the peak pressure as the comparison figure. This is often referred to as the Peak Pressure Index (PPI). Using the Xsensor software this can be easily obtained. With the sample displayed in 2D simply move the mouse arrow to the peak pressure area. Then right click on the mouse. This will zoom in on the 9 sensors, and give an average over those cells.

For example, in the sample below, the peak pressure of 102mmhg was identified on the right IT at cell coordinate x16 y25. By moving the cursor onto this cell and

right clicking on the mouse we get the zoomed in view of cell 16,25 with the eight surrounding cells. The Peak Pressure Index is the average pressure over these nine cells, 89.1 mmHg.



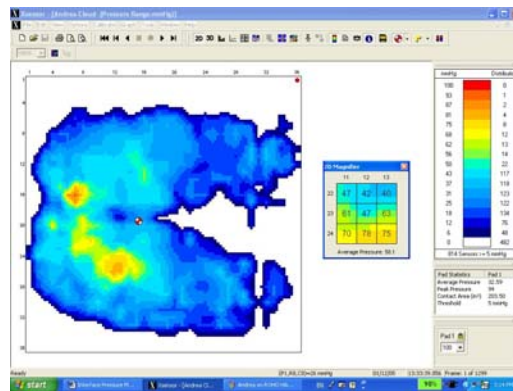
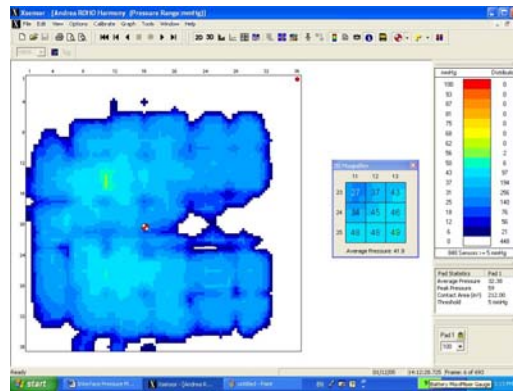
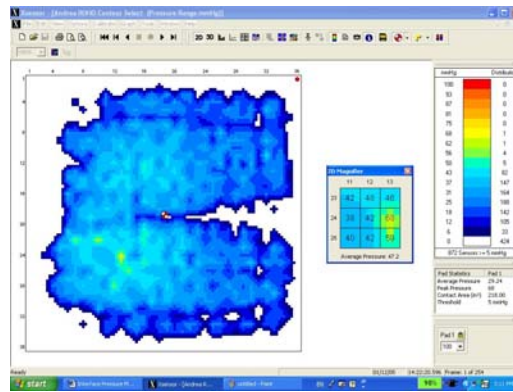
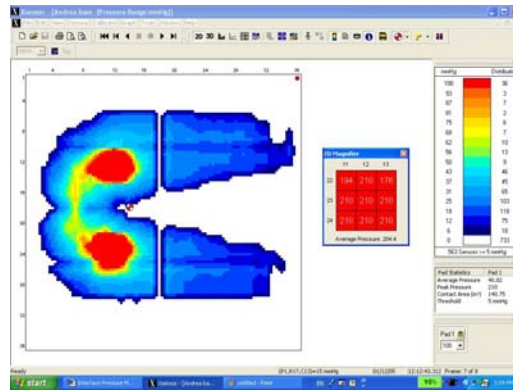
Peak Pressure Index 89.1 mmHg being the average of the nine cells high lighted

Direct Comparison Example

In the following example, following the procedures of our draft protocol, we made sure the sensing mat was not creased, and palpated to ensure the area we were comparing was the boney prominence we were most concerned with. In this case it was the right Ischial Tuberosity which was presenting red.

Once we have a pressure map of the starting point (top image) we can begin to quantify the effectiveness of this and other interventions. In our example, we took four pressure maps of the individual sampled at the same session. Each mapping was carried out with footplates adjusted properly, and ensuring cushion size was correct.

The first map shows the individual on no cushion. Peak pressures at the right IT exceed 210 mmHg, with contact area 140 square inches. In the next map peak pressure for the same area is 68 mmHg and contact area 218 square inches. Third map shows peak pressure at the same area of 49 mmHg with contact area of 212 square inches. Final map shows peak pressure of 75 mmHg at the same area and contact area of 203 square inches. Based purely on this information then the most effective cushion for pressure relief would be cushion 3.



However we may want to look at some other aspects of the above pressure map results. On the right hand side of the images is a graph which shows which colours represent different pressure ranges. It is vital that when comparing maps this be the same for each map. In all the maps above it is set to show low pressures as blue, through to green, yellow and red as pressures rise. Therefore, when looking at the maps, the more dark blue we see the better. The less red, yellow and green we see the better.

Overall, looking at the colour dispersion, we could conclude that cushion 2 and cushion 3 perform better than cushion 1 or cushion 4. In fact, cushion 2 shows more dark blue than cushion 3 and has more contact area (218 versus 212 square inches).

Another visual comparison is the ability to identify boney prominences. Using the images above as an example, on cushion 1 it is easy to identify where the ischial tuberosities are – two red spots. We can also see some yellow around the sacrum area. In image 2 and 3 it is less apparent where the boney prominences are, with leg shape giving us an indication of the front and back of the pelvis. In image 4 we can see yellow around the right ischial tuberosity, and some red around the sacrum.

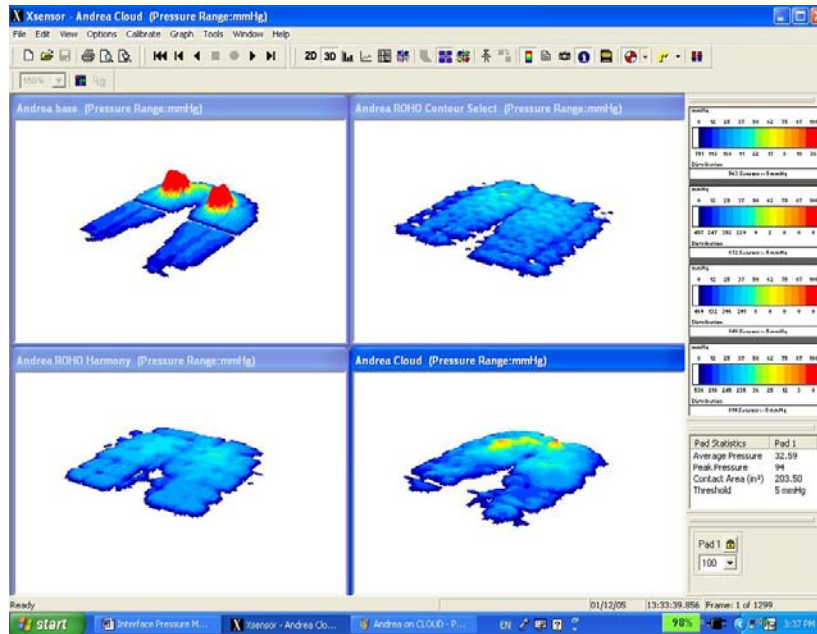
Below are the same results viewed in 3D. 3D images are very useful when looking at the contour of the pressure map. Peak pressures that are considerably different to the surrounding pressures will be viewed as “mountains”.

As a general rule the less mountains the better. The lower the mountains are the better the pressure distribution is. To put it another way, the flatter the map the better the result.

Using a common analogy, if we consider a scuba diver at 10m deep the pressure experienced is approximately 1,400 mmHg. You can see this is significantly higher than the pressures experienced on the cushion used for our sample mapping. However scuba divers do not suffer skin breakdown, due to the fact pressure is distributed evenly over the entire body surface. This means there is no tissue deformation due to pressure differences. If we could pressure map the scuba diver using the same pressure scales used for our cushion samples, the entire map would be red in colour. However, there would be no “mountains”, the entire map would be flat and it would be difficult to identify boney prominences.

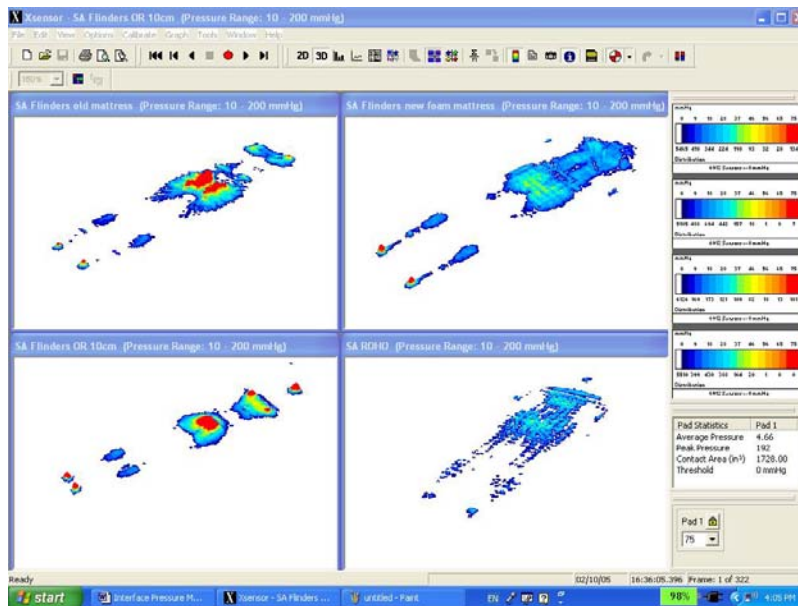
In contrast, if we had a peak pressure of 1,400 mmHg on one spot and the surrounding area was exposed to pressure of say 140 mmHg, then we would see a large “mountain” and would be concerned about skin breakdown.

As a general rule, “mountains” and “hills” seen on a 3D image translate to skin deformation and the risk of skin breakdown. The map which shows the least tissue deformation is most effective in distributing pressures.



The map on the top left hand shows two high “mountains” of pressure, indicating tissue deformation. The maps on the top right and bottom left corners show very flat images, indicating pressure is being distributed well. The map on the bottom left corner shows smaller “hills” of pressure at the right IT and sacrum.

The same applies for mattresses and other support surfaces. For example, viewing the maps below we can see that the mattress on the bottom right corner has less “mountains”, less red and a flatter image.



Based on the above images the map on the bottom right corner is the best product for distribution of pressure

Choosing the relevant frames for comparison

When recording a pressure mapping session the Xsensor system takes a series of frames (images) at a predetermined rate. The default is 10 frames per second. The sampling can then be viewed as in an animated form, as a movie if you like. This allows for recording over a period of time in a variety of positions. In order to compare results, it is important to choose relevant frames.

Again there is no consensus regards a method to pick the relevant images. Some clinicians will average out the entire or part off the mapping results (using the “Average Analysis Mode” feature of the Xsensor software. Others will pick particular frames for use.

It is important that whatever method is used it is fair to all products mapped. This will eventually result in the best possible clinical result for the client.

Using a pre determined protocol will assist in this process. Sometimes it comes down to a clinical judgment such as “is this the most typical seating position for this client?” It is important to ensure the frames chosen are typical of the overall results, and represent a result which is repeatable.

Using the “Comments Docker” incorporated into the Xsensor software during pressure mapping sessions will assist greatly when reviewing results and deciding on most appropriate frames. We strongly suggest a protocol be developed to ensure comments are uniform and allow for ease of transfer between case managers.

Some people like to use the “best case” map, others the “worst case” map. I prefer to look at most typical and repeatable maps for comparison.

Alternating Pressure Devices

The use of Alternating Pressure systems is widespread in Australia and it is important to include a section which specifically addresses IPM in relation to these devices.

To understand how IPM can be used to measure the effectiveness of a system it is important to understand how the system is designed to work. The following information is a summary of how alternating pressure devices are designed to address pressure management. This summary is based on information from suppliers of AP devices.

AP systems are designed to provide a pressure – no pressure cycle at interface between system and client. That is, by pumping air in and out of cells the tissue at any point of the body will have a pressure load followed by a close to zero

pressure. The pressure load is referred to as the peak, the low pressure cycle is referred to as the trough.

There is much contradictory information on how AP systems should work, and what differentiates a “good” system against a “bad” system.

The most predominant theory in Australia relies on the AP system being able to enhance reactive hyperemia. To do this the high/low pressures are required. AP requires that a percentage of the body supports the entire body weight while a percentage of the body is exposed to close to zero pressure.

For example, an AP mattress system may have a cycle that runs over 12 minutes. During that cycle, 50% of the body is supported by inflated cells (the peak), while 50% of the body is exposed to close to zero pressure (the trough). As the cycle moves, the 50% that was exposed to the trough will move into the peak cycle, while the 50% that was exposed to the peak will move into the trough cycle. Between cycles the entire body surface may be exposed to pressure.

By definition pressure = force/area. That is, weight divided by support area in contact with the body. AP systems therefore tend to create relatively high pressures during the peak cycle. In fact, higher pressure followed by the trough is a design feature for many systems. The higher pressure causes occlusion of blood for a short period of time, then a rapid release of this pressure causes reactive hyperemia and reperclussion.

AP systems vary in performance and specifications. For example, some system may have 3 cycles and some 2 cycles. Some systems will actually use a vacuum to ensure the air is removed rapidly from cells to create the pressure trough, some will not be as effective in rapid reduction of pressure.

When evaluating AP systems suppliers advise that the three factors that measure the effectiveness are:

1. Ability to create a close to zero pressure trough. For example, if pressure over a specific area varies from peak of 70mmHg to a trough of 40mmHg this would not be effective. If on another system the same area experiences peak of 70mmHg with a trough of 5mmHg this would be effective.
2. Time for system to change from peak to trough pressure. According to suppliers, to ensure reactive hyperemia the change from peak to trough needs to be rapid.
3. Time period for peak and trough loading. The time tissue is exposed to peak pressures should be short enough to not cause permanent tissue damage. The time tissue is exposed to trough pressures should be long enough to ensure blood flow is restored and oxygen levels are back to normal.

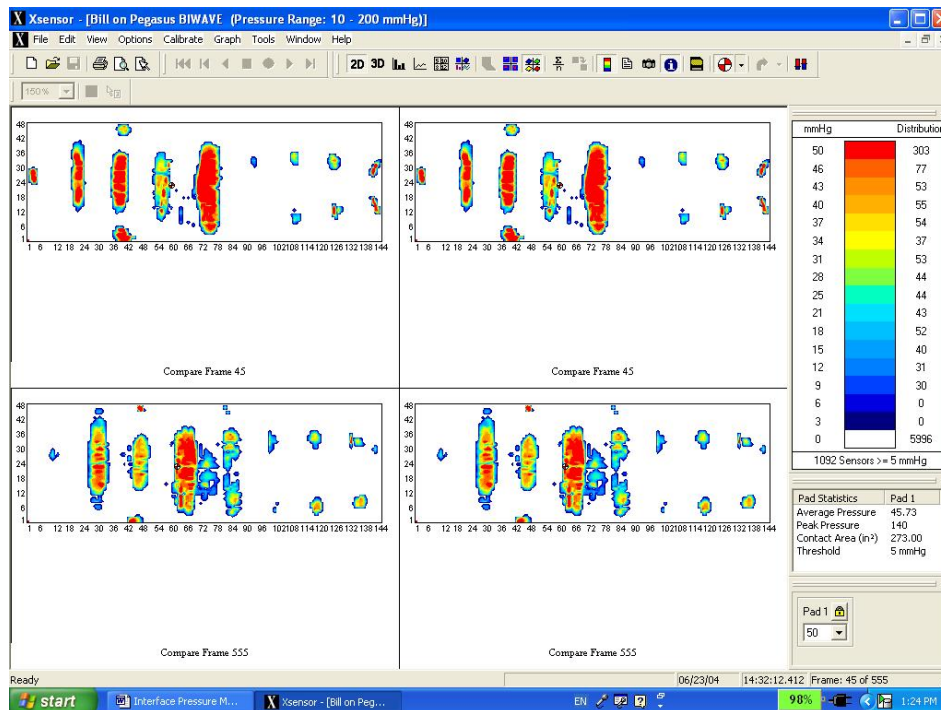
Again, there is very little literature to say what an ideal AP system should look like. There is also little literature on methods for comparing AP systems. The National Pressure Ulcer Prevention Association of the USA has been developing protocols for comparing different support surfaces and has a protocol for comparing constant low pressure systems, but is still working on the alternating pressure systems.

The following is based on Australian supplier information. We would strongly recommended discussing the information with your supplier of AP systems and asking for supportive literature.

When pressure mapping an AP system it is important the surface be pressure mapped through the entire cycle (see "Protocol For AP Systems").

In our example we will use an AP mattress system designed to deliver a trough at close to zero with rapid transition from peak to trough. Having pressure mapped the AP system through the entire system, we need to identify a particular area to focus on. For this example the concern was sacrum pressure. The client is lying in a supine position.

AP Example

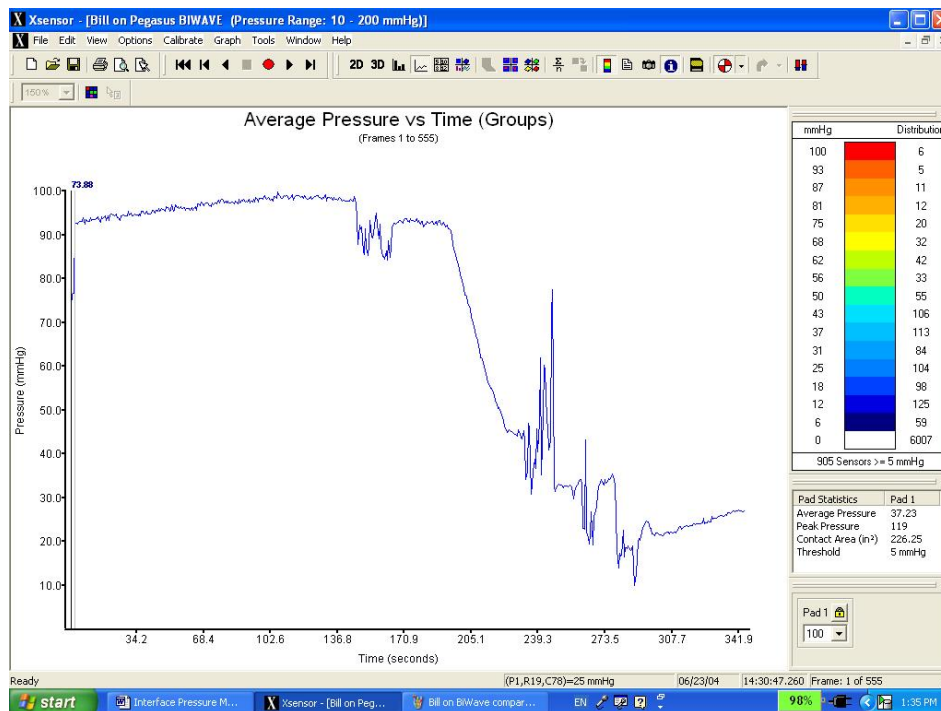


Sample of AP mattress through entire cycle. Looking specifically at the sacrum located at sensor coordinates x72-76 and y22-26 we can see pressure is present through the entire cycles, with a peak around 100mmHg and a trough around 20mmHg

By palpating the sacrum we located it at sensor coordinates x72-78 and y22-28.

Mapping through the entire cycles we see that the pressure at peak is around 100mmHg, while at trough about 20mmHg. The 20mmHg is usually considered below capillary closure pressure, however a pressure closer to zero would be preferred.

To assess whether the transition from peak to trough was rapid, we used the “Group” feature of the Xsensor software. By clicking on the “Sensor Groups” icon within the software, we defined a group of sensors to isolate the sacrum. That is, the group of sensors 72-76 and 22-26, consisting of 16 sensors in total. Then clicking on “Show Graph” we can see the gradient of the drop in pressure.



Using the Group option within the Xsensor software we isolated the 16 sensors located directly under the sacrum. The Average pressure vs Time graph shows the speed of transition from peak to trough

From the graph we can see that the average pressure over the 16 sensors dropped from around 90mmHg at 170 seconds down to around 20mmHg at 273 seconds. Transition from peak to trough was approximately 103 seconds. If we extended the sampling time the above graph would also give us the related times for peak and trough pressure at the isolated area. When we stopped the sampling the time the sacrum had experienced trough pressure was approximately 70 seconds.

Using this data we could compare this against other systems to see if the transition from peak to trough is rapid, if the trough pressures are as low and if the time for peak and trough pressure exposure are similar.

As a general guideline, the exposure to peak pressure should be around 8-12 minutes, the exposure to trough pressure around 2-4 minutes. Trough pressures should be as close to zero as possible. The transition from peak to trough pressure should be as quick as possible.

Interpretation of IPM Summary

The above information represents the bulk of the information regards interpretation for the purpose of this document. We feel that the above outlines the most appropriate way to interpret the results of IPM in the clinical setting.

Researchers and scientists will approach pressure mapping in a very different way and the methodology of their work will determine the interpretation of the data.

It is important to understand the technology being evaluated and how it is designed to delivery therapeutic results. In some case reliance on information from suppliers may be required.

Other factors such as friction, shear, moisture, posture, nutrition, age, disease etc need to be considered in conjunction with pressure mapping.

INTERFACE PRESSURE MAPPING

Protocol and Interpretation

Protocols

In order to collect pressure mapping samples that can be compared and interpreted in a meaningful way it is important to follow a basic set of protocols that ensure consistency of data collection.

The following is a draft protocol and is not meant to be the definitive answer. Individual therapists, clinicians, institutions and organizations should develop protocols that are workable for their unique environment. The ideal would be to have an internationally accepted protocol for IPM and I believe there are panels in place looking into this.

This protocol is split into three basic sections;

1. Seating systems
2. Constant low pressure mattress systems
3. Alternating pressure mattress systems

This protocol does not include protocols for file and folder naming. We strongly recommend that a standard naming procedure be established. Each client may have all IPM files named with their individual unique identifier and date of sampling and product used. Files may be stored in a folder with the client name and unique identifier.

Using Windows, this may mean having a Folder in My Documents named Xsensor Data. Within Xsensor Data individual folders for each client may be created. For example, John Smith with the unique hospital number 01 may have a folder named JOHN_SMITH_01. Within this folder files saved over a period of time could be stored, for example J_S_01_12052005 ROHO QUADTRO.xsn. The file name tells me this is John Smith identifier 01 sampled on the 12th May 2005 on a ROHO® QUADTRO SELECT™.

Protocol for Wheelchair Cushions and Seating Systems

The following protocol is recommended for pressure mapping wheelchair cushions and seating systems:

1. Set goals for pressure mapping. For example, the goals may be to determine the best cushion for an individual and to determine an effective pressure relief technique.
2. Explain the procedure to the client and any caregivers present.

3. Once goals have been established, use the wheelchair system that the client actually uses.
4. Place pressure sensing mat onto the surface. In some cases this may be the back and seat.
5. Have client sit on the sensor pad, not yet connected to the computer.
6. Ensure footplates, armrests, backrest etc are adjusted properly. If possible ask the client to move around a little so that they can assume a natural position. Ensure cables and cards are in a position where they cannot be damaged.
7. Once the client is positioned comfortably and in their most common posture, ensure cushion is properly adjusted and positioned.
8. Attach sensor mat to computer. Ensure the correct calibration file for the sensor mat is defined.
9. Set a standard Xsensor screen for pressure mapping. We recommend that for sampling purposes the Comments Docker, Pressure Legend Docker and Statistics Docker and Pressure Range Selection toolbar all be displayed.
10. Determine a standard Pressure Range for the sampling. As a general rule we recommend that for seated sampling the Pressure Range Selection toolbar be set to 125mmHg. This means that pressures of 125 mmHg and above will be darkest shade of red.
11. Wait 5 minutes to allow for cushion to conform to body shape.
12. During the 5 minutes use the "Comments Docker" in the Xsensor software to make citations relating to the sampling. This should include date of mapping, client name, description of equipment, goals for the pressure mapping etc.
13. After the 5 minutes begin recording. If at all possible position screen so that client and caregivers can view the sampling. This will help them become involved in the process, and may result in improved compliancy.
15. Ensure there are no creases or kinks in the pressure mat. These may present as high pressures in an area where surrounding pressures are low. If there are creases or kink straighten the mat out until inconsistent sampling are no longer present. Then stop recording, and remove all frames by using the "Edit" "Remove Frames" range 1 to highest number.
16. Begin recording again. Once confident the sample is consistent and a proper representation of the support surface press the "Stop record" button. If peak

pressures are visible use hands to identify the cause. For example is it a boney prominence such as an IT? It may be a seam in jeans.

17. On the bottom of the “Comments Docker” panel there are three options, General, Frame and All Frames. As soon as the recording is stopped the Frame option will show the number of the last frame recorded. Click on this option and make a note that this is the frame that is most appropriate for future reference.

18. Press record again and evaluate any other information required. For example, common seating positions used by the client during the day (eg. Legs crossed). Does the client achieve a pressure relief by leaning forward and putting weight through elbows onto knees? If the client uses a lift to relieve pressure, ask them to do it to determine if they do achieve it? What effect does tilt or recline have at the seated surface? Make citations at relevant frames while recording.

19. If comparing cushions, for example, we recommend you save a file for each product evaluated. Save the above sampling in a relevant folder with a relevant name. Then open a new file and repeat the above for the next product.

Protocol for Constant Low Pressure Mattress Systems

The following protocol is recommended for pressure mapping constant low pressure mattress systems.

1. Set goals for pressure mapping. For example, the goals may be to determine the best mattress for an individual and to determine what effect elevating the bed head has on sacral pressure.
2. Explain the technology and process to the client and any caregivers who are present.
3. Once goals have been established, use the bed system that the client actually uses.
4. Place mattress replacement or overlay onto the bed, then the sensing mat on top of this. Ensure pillows and positioning devices are under the sensing mat.
5. Have client lay on the sensor pad, not yet connected to the computer.
6. Ensure bed is in most common setting used. For example in a completely flat position with no head or foot elevation.
7. Once the client is positioned comfortably and in their most common laying position, ensure mattress is properly adjusted and positioned.

8. Attach sensor mat to computer. Ensure the correct calibration file for the sensor mat is defined.

9. Set a standard Xsensor screen for pressure mapping. We recommend that for sampling purposes the Comments Docker, Pressure Legend Docker and Statistics Docker and Pressure Range Selection toolbar all be displayed.

10. Determine a standard Pressure Range for the sampling. As a general rule we recommend that for mattress sampling the Pressure Range Selection toolbar be set to 75mmHg. This means that pressures of 75 mmHg and above will be darkest shade of red. This can be varied if more contrast is required.

11. Wait 5 minutes to allow for mattress to conform to body shape.

12. During the 5 minutes use the “Comments Docker” in the Xsensor software to make citations relating to the sampling. This should include date of mapping, client name, description of equipment, goals for the pressure mapping etc.

13. After the 5 minutes begin recording. If at all possible position screen so that client and caregivers can view the sampling. This will help them become involved in the process, and may result in improved compliancy.

14. Ensure there are no creases or kinks in the pressure mat. These may present as high pressures in an area where surrounding pressures are low. If there are creases or kink straighten the mat out until inconsistent sampling are no longer present. Then stop recording, and remove all frames by using the “Edit” “Remove Frames” range 1 to highest number.

15. Begin recording again. Once confident the sample is consistent and a proper representation of the support surface press the “Stop record” button. If peak pressures are visible use hands to identify the cause. For example is it a boney prominence such as the sacrum? Is it a positioning device?

16. On the bottom of the “Comments Docker” panel there are three options, General, Frame and All Frames. As soon as the recording is stopped the Frame option will show the number of the last frame recorded. Click on this option and make a note that this is the frame that is most appropriate for future reference.

17. Press record again and evaluate any other information required. For example, how does the surface perform in supine, lateral and prone position? How does the surface perform with bed head elevated at 30 and 45 degree head elevation.

18. If comparing mattress surfaces, for example, we recommend you save a file for each product evaluated. Save the above sampling in a relevant folder with a relevant name. Then open a new file and repeat the above for the next product.

Protocol for Alternating Pressure Mattress Systems

The following protocol is recommended for pressure mapping Alternating Pressure systems.

1. Set goals for pressure mapping. For example, the goals may be to determine if the alternating system delivers an effective trough pressure at the heels, or with the bed head elevated.
2. Explain the technology and process to the client and any caregivers who are present.
3. Once goals have been established, use the bed system that the client actually uses.
4. Place mattress replacement or overlay onto the bed, then the sensing mat on top of this. Ensure pillows and positioning devices are under the sensing mat.
5. Have client lay on the sensor pad, not yet connected to the computer.
6. Ensure bed is in most common setting used. For example in a completely flat position with no head or foot elevation.
7. Once the client is positioned comfortably and in their most common laying position, ensure mattress is properly adjusted and positioned.
8. Attach sensor mat to computer. Ensure the correct calibration file for the sensor mat is defined.
9. Set a standard Xsensor screen for pressure mapping. We recommend that for sampling purposes the Comments Docker, Pressure Legend Docker and Statistics Docker and Pressure Range Selection toolbar all be displayed.
10. Determine a standard Pressure Range for the sampling. As a general rule we recommend that for mattress sampling the Pressure Range Selection toolbar be set to 75mmHg. This means that pressures of 75 mmHg and above will be darkest shade of red. This can be varied if more contrast is required.
11. Use the "Comments Docker" in the Xsensor software to make citations relating to the sampling. This should include date of mapping, client name, description of equipment, goals for the pressure mapping etc.
12. Do a quick recording to ensure there are no creases or kinks in the pressure mat. These may present as high pressures in an area where surrounding pressures are low. If there are creases or kink straighten the mat out until inconsistent sampling are no longer present. Then stop recording, and remove all

frames by using the “Edit” “Remove Frames” range 1 to highest number.

13. Determine the beginning of a cycle by feeling the mattress cells. Find a cell which is full of air and leave hand on top of cell to determine when the air begins to exit.

14. When the beginning of the cycle has been determine begin recording. If at all possible position screen so that client and caregivers can view the sampling. This will help them become involved in the process, and may result in improved compliancy.

15. Continue to record while the AP system goes through at least one cycle. Identify change in cycles by feeling for inflation and deflation of cells. Have paper handy while recording and make a note of frame numbers at change of cycle. Hint, the frame number appears at the bottom right hand corner of the screen.

16. Once you are confident a full cycle has been recorded, stop the sampling.

17. On the bottom of the “Comments Docker” panel there are three options, General, Frame and All Frames. Using the notes made while recording, use the “View” “Go To Frame” option to locate the relevant frames for cycle changes. Make notes for each frame in the Comments Docker for later reference.

18. Press record again and evaluate any other information required. For example, how does the surface perform in supine, lateral and prone position? How does the surface perform with bed head elevated at 30 and 45 degree head elevation. Remember to make notes for inclusion in the Comments Docker later.

19. If comparing AP systems, for example, we recommend you save a file for each product evaluated. Save the above sampling in a relevant folder with a relevant name. Then open a new file and repeat the above for the next product.

Xsensor® Pressure Mapping Data Collection

Date: __/__/__ Client Name: _____

Therapist Name: _____

Location and Organisation: _____

Sensor type (eg. X236 seat pad or X6912 mattress pad) and Calibration file name:

Goal and Purpose of Pressure Mapping (eg. Compare cushions, evaluate equipment set up, follow up after surgery, recognize areas of high pressure, education)

Relevant Clinical Considerations (eg. Asymmetry and obliquity, dislocated joints, existing pressure sore etc) _____

Description of Equipment (eg wheelchair with anti shear tilt in space, with ROHO® CONTOUR SELECT™ CUSHION) _____

File Name and location of saved sampling: _____

Constant Low Pressure Support Surface for Bed - Mattress or Overlay

Name of Mattress or Overlay: _____

Head elevation at 0°, 30°, 45° supine, then lateral (complete form for each position)

Head Elevation at 0° and Supine - Bony Prominences Noted and Confirmed by Palpation – Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Heel mmHg _____ Sensor Location x ____ y ____

Right Heel mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Head Elevation at 30° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Heel mmHg _____ Sensor Location x ____ y ____

Right Heel mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Head Elevation at 45° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Head Elevation at 0° and Lateral - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Trochanter mmHg _____ Sensor Location x ____ y____

Right Trochanter mmHg _____ Sensor Location x ____ y____

Left Malleolus mmHg _____ Sensor Location x ____ y____

Right Malleolus mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Comments: _____

Wheelchair cushions

Name of Cushion: _____

Tilt at 0°, 30°, 45° supine, then lateral (complete form for each position)

Tilt at 0° - Bony Prominences Noted and Confirmed by Palpation – Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Trochanter mmHg _____ Sensor Location x ____ y ____

Right Trochanter mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Tilt at 30° and Supine - Bony Prominences Noted and Confirmed by Palpation:
Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Trochanter mmHg _____ Sensor Location x ____ y ____

Right Trochanter mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Tilt at 45° and Supine - Bony Prominences Noted and Confirmed by Palpation:

Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Trochanter mmHg _____ Sensor Location x ____ y____

Right Trochanter mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Comments: _____

Alternating Pressure Support Surface for Bed - Mattress or Overlay

Name of Mattress or Overlay: _____

Head elevation at 0°, 30°, 45° supine, then lateral (complete form for each position and each Cycle).

Cycle 1 Head Elevation at 0° and Supine - Bony Prominences Noted and Confirmed by Palpation – Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Heel mmHg _____ Sensor Location x ____ y ____

Right Heel mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Cycle 2 Head Elevation at 0° and Supine - Bony Prominences Noted and Confirmed by Palpation – Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y ____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y ____

Coccyx mmHg _____ Sensor Location x ____ y ____

Left Heel mmHg _____ Sensor Location x ____ y ____

Right Heel mmHg _____ Sensor Location x ____ y ____

Other (name and mmHg) _____ Sensor Location x ____ y ____

_____ Sensor Location x ____ y ____

Cycle 3 Head Elevation at 0° and Supine - Bony Prominences Noted and Confirmed by Palpation – Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Head Elevation 30 Degree

Cycle 1 Head Elevation at 30° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 2 Head Elevation at 30° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 3 Head Elevation at 30° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Head Elevation at 45 Degrees

Cycle 1 Head Elevation at 45° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 2 Head Elevation at 45° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Turberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 3 Head Elevation at 45° and Supine - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Right Ischial Tuberosity mmHg _____ Sensor Location x ____ y____

Coccyx mmHg _____ Sensor Location x ____ y____

Left Heel mmHg _____ Sensor Location x ____ y____

Right Heel mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Head Elevation 0 Degree – Lateral

Cycle 1 Head Elevation at 0° and Lateral - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Trochanter mmHg _____ Sensor Location x ____ y____

Right Trochanter mmHg _____ Sensor Location x ____ y____

Left Malleolus mmHg _____ Sensor Location x ____ y____

Right Malleolus mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 2 Head Elevation at 0° and Lateral - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Trochanter mmHg _____ Sensor Location x ____ y____

Right Trochanter mmHg _____ Sensor Location x ____ y____

Left Malleolus mmHg _____ Sensor Location x ____ y____

Right Malleolus mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Cycle 3 Head Elevation at 0° and Lateral - Bony Prominences Noted and Confirmed by Palpation: Relevant Frame Number for Reference _____

Left Trochanter mmHg _____ Sensor Location x ____ y____

Right Trochanter mmHg _____ Sensor Location x ____ y____

Left Malleolus mmHg _____ Sensor Location x ____ y____

Right Malleolus mmHg _____ Sensor Location x ____ y____

Other (name and mmHg) _____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

_____ Sensor Location x ____ y____

Comments: _____

It is strongly recommended that the information collected in the above forms be entered into the Comments Docker of the saved Xsensor data file as soon as practical after the pressure mapping session. Notes for the individual frames can be entered, and will assist greatly when reviewing the information.

If you have access to a digital camera a relevant image can be loaded into the Xsensor data file by going through the File, Attach Image feature in the Xsensor software.

To ensure consistency of pressure mapping results a suitable protocol is recommended.

If you have any questions or comments regards the information within this document please contact Malcolm Turnbull on 0409 784 982.

The information presented in this document is intended for consideration only, and it remains the responsibility of institutions and users of IPM technology to develop the most applicable methodologies and best practices for their needs.