Storming

After someone has suffered a moderate-to-severe brain injury, they may develop a group of symptoms such as:

- fast heart rate
- fast breathing rate
- high blood pressure
- fever
- sweating
- increased muscle tone

This syndrome, frequently called "storming", can be very frightening for families and the loved ones of a person with a brain injury.

Through discoveries over the last several years, new knowledge of this syndrome has become available and better treatments have emerged. Experts have developed a new name that better describes the syndrome and will allow us to better measure it in the future:
Paroxysmal Sympathetic Hyperactivity (PSH).

What the name means:

Paroxysmal: This means that the symptoms occur or get worse during specific episodes throughout the day. PSH episodes are thought to be triggered by what is perceived by the body as pain.

Sympathetic: The sympathetic nervous system is responsible for the "fight or flight" response to danger and stress, causing a number of effects such as increased blood pressure, fast heart rate, and sweating.

Hyperactivity: This means that there is an increased activity of the sympathetic response beyond what is healthy and normal.

Where it comes from:

A current theory is that when a brain injury is severe enough, there is damage to a nerve pathway that goes from the upper brainstem down to the spinal cord that usually serves to calm down overactive areas of the spinal cord. Without this calming influence from the brainstem, there is a pattern of over-activity in the spinal cord.

Without the "brakes" from above, a mildly painful sensation may be processed as a severely painful sensation and the normal responses to pain such as increased heart rate and blood pressure get out of control. Eventually, as the spinal cord is overactive for long enough, it may stay in an elevated state, leading to even normally non-painful sensations causing an overactive response.

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How is "Storming" diagnosed?
The treatment team will look at the symptoms and patterns of over-activity, as well as possible causes and the potential for discomfort/pain. Symptoms include:

- fast heart rate
- fast breathing rate
- high blood pressure
- fever
- sweating
- increased muscle tone - **read more** on Abnormal Muscle Tone/Spasticity http://www.myshepherdconnection.org/docs/Spasticity2.pdf

Some causes of storming may include:

- infections
- unrecognized injuries
- additional medical issues

When no further treatable issues are found, symptomatic treatment for PSH will begin. Families and loved ones can help by carefully observing for causes that may trigger a storming episode, and make note any trends in the time of day and length of episodes.

Treatment for storming:
A number of different medications may be used for PSH including:

- pain medicines
- anti-seizure medications
- sedatives
- spasticity medications
- blood pressure medicines

Additionally, bed and wheelchair positioning considerations and spasticity management techniques will be ongoing in an attempt to reduce the effects of severely increased muscle tone.

If more conservative measures are not successful initially, an intrathecal baclofen pump placement may be considered by the treatment team. In that case, a trial injection of baclofen into the space around the spinal cord will be done by a lumbar puncture (spinal tap). If the patient responds well to the trial, a pump placement by a neurosurgeon will be considered.

Families and loved ones can help by monitoring and documenting the storming episodes, and help to find the right positions that may help the person with the injury to relax, what environmental change can be made, and/or what comfort measures can be provided.

How long will a person with a brain injury experience storming?
Most cases of PSH pass within a few days; however, patients in the more severe range and may experience the symptoms for weeks to months, requiring ongoing treatment.