

PALSY UPDATE

(PREHOSPITAL ACADEMICS & LITERATURE SURVEY QUARTERLY)

A Newsletter to Evaluate Clinical Practices, Update Medical Knowledge
and Review Academic Information.*

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In This Issue

Disaster Medicine	Patient Volumes at Disasters
Physiology	Hypnatremia
Endocrinology	Criteria for Diabetes
Academic Review	Narrow Angle Glaucoma
Pharmacology	“Sulfa” Allergies
Photos from the Field	Sedgwick County EMS
Terminology	
Resuscitation	Percieved Outcomes & DNRs Glucose Finger-sticks in Hypotensive Patients

*DISCLAIMER: The information in this newsletter is not intended for the purpose of distributing medical advice, nor should it replace guidelines for treatment. The articles herein are only intended to serve as information and a review of literature pertaining to various medical topics. This information should not serve to replace current practice guidelines or judgment.

A Note from the Editor...



We have an obligation to teach each other.

Physicians even swear an obligation to teach their profession and knowledge to others.¹ In fact, the word “doctor” actually means “teacher.”

We have an obligation to learn as well and to take the measures necessary to augment our knowledge in pursuit of improving the care that we provide to people in need.

Regardless of who we are and what position we hold within our organization, it is incumbent upon us as care providers, educators and managers to

¹ “and to teach them this art - if they desire to learn it - without fee and covenant; to give a share of precepts and oral instruction and all the other learning to my sons and to the sons of him who has instructed me and to pupils who have signed the covenant” – excerpt from the Hippocratic Oath

overcome selfish desires to elevate and protect our own status, power, control, and authority.

This notion is particularly true when it comes to matters of emergency care, not only with regard to physiology and medicine, but with regard to all aspects of prehospital functions, including operations and organizational management.

For this reason and in light of the recent disaster in Greensburg, Kansas, I’ve decided to add a ‘Disaster Medicine’ section to the *PALSY Update*. When it comes to disaster management, an important factor in mounting an effective response is to ensure a prepared responder.



Dr. Kathleen Tierney, a well known sociologist who has conducted many studies and written texts with regard to disaster preparedness concludes the following:

The main barrier that impedes effective EMS delivery in disasters is the insufficient level of awareness, education, and organization.

If the main barrier to effective EMS in disasters includes education, then, it is the responsibility those with the knowledge and training to share it. To withhold such information for whatever reason is to contribute to the ineffectiveness of EMS in a disaster.

We have discussed in previous issues the importance of basing our medical and operational practices of prehospital medicine in evidence, (it’s the reason I publish this newsletter). Likewise, it is just as important to do so with regard to disaster preparedness and response. In this issue of the *PALSY Update* and the next, we will compare (perhaps contrast is a better word) some assumptions that are made with regard to disaster

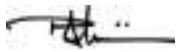
PALSY UPDATE

behavior and evaluate what researchers have proven.

Over the last three years in the course of my continuing education in the administration of emergency health services, I have been introduced to many ideas and lessons in the field of emergency/ disaster management, law & policy, EMS system design & performance, etc. that I believe and hope will make for some thought provoking discussion.

I ask you the readers, to send me your feedback and thoughts on any of the topics discussed in this newsletter. Different perspectives can greatly enhance the quality of information we gain from these articles. I would also like to once again invite anyone interested to feel free to make a contribution to this newsletter.

Again, thanks for reading.
Enjoy!

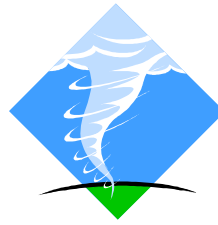


Disaster Medicine

Patient Volumes at Disaster Sites By Paul Misasi

It seems like it was last week when an F5 tornado leveled Greensburg, Kansas. I was just about to fall asleep when a coworker called and told me to get up and ready to go in to work. I remember my response was "there was a what? where?...where's that?"

While I was not among the first medic units to respond, my partner and I did make it to Pratt, Kansas (shortly after midnight) where



we staged at the Pratt Regional Medical Center ER. At risk of understating the situation, I will say that the ER was very busy. Of the folks that did arrive either by ambulance or on their own volition, their injuries did seem to be minor.

While I don't have the victim/patient statistics to evaluate from this disaster, I would dare to say that it was probably consistent with other national disasters of the same magnitude. One of the most daunting tasks in a disaster is the coordination of responding resources. A good disaster preparedness plan plays a large role in how the response will play out; perhaps to say that it will be less chaotic and hectic.

A couple of assumptions that are made with regard to an affected jurisdiction of a disaster are 1) there will be an overwhelming volume of victims requiring medical care, and 2) that local hospitals will be overwhelmed and incapable of managing the influx of victims.

What's interesting is that research of decades worth of past and present disasters demonstrate a contradiction to these assumptions that may affect the way emergency service personnel develop preparedness and response plans.

While it is frequently assumed that the primary agency responding to the disaster will be overwhelmed immediately by a high volume of patients, the acuity or criticality of patient injuries should be given consideration.



Barring information from the hurricane Katrina disaster, "in general, most disaster casualties have minor injuries."¹ The Disaster Research

PALSY UPDATE

Center has found that **only 10-15% of victims require hospital admission.**¹

On July 17, 1981 when the Hyatt Hotel skywalk collapsed in Kansas City, Missouri, 113 people died, 200 people were injured but *only 6 surgeries were carried out the night of the disaster*, and 26 additional surgeries were carried out in the following 3 days.¹ That's 2% and 8% respectively.

So it is easy to see, that a high volume of patients at disasters does not equate to high acuity and preparations should be made to treat a large number of minor injuries, who most likely will not need much more than first aid, x-rays, sutures, etc.

The second assumption that hospitals and healthcare facilities will be overwhelmed (provided that the hospitals are not destroyed) has *not* been supported by research. Dr. Eric Auf Der Heide, a well known disaster scientist concludes that the loss of hospital capabilities is *not* common.¹ Supply shortages occurred only 6% of the time and personnel shortages were found in only 2% of the time.

In fact, in a majority of the cases studied, hospitals found themselves confronted with a problem common to EMS and other agencies responding to disasters; that there were more resources and personnel than they could effectively manage.¹

So what's the lesson here? The chances of a large number of high acuity or critical patients is *not* likely; two, emergency response agencies *should* expect large numbers of *non-urgent* patients; and three, all agencies, including hospitals must prepare to manage an abundance of resources in addition to victims.



Reference

1. Auf Der Heide, E. *Disaster Response: Principals of Preparation and Coordination*. 1989. Available at: <http://orgmail2.coe-dmha.org/dr/flash.htm>. Accessed June 9, 2007.

Physiology

Sodium Can Be More Deadly Than Potassium?

By Paul Misasi

We all know now about the dangers of hyperkalemia (or at least we ought to... see *PALSY Update Vol. 2, Iss. 1* if you need a refresher) but one particular electrolyte derangement is much more deadly! Hyponatremia or elevated sodium carries a mortality rate greater than 50%! Some cases of acute hyponatremia are associated with mortality rates up to 75%.¹



It's important to understand electrolyte abnormalities and to add them to our repertoire of differential diagnoses because their presentations, signs and symptoms are so generalized and vague. This highlights the importance that we not dismiss complaints such as generalized weakness or slight changes in mental status.

Physiology/ Pathophysiology

Our bodies regulate water balance by a couple of mechanisms: **1)** intake and output and **2)** the concentration of urine. Intake

PALSY UPDATE

obviously consists of drinking water and our thirst response, but output includes not only urine output, but insensible losses in the respiratory system, the skin and GI systems.

Remember that the kidneys alter water concentration by the filtration of sodium (since water follows sodium).

When someone becomes hypernatremic, it is for one of two reasons: **1)** there is too little water in the system or **2)** there is too much salt in the system. There are three primary pathological causes for these situations and one that is iatrogenic:

- 1)** There a derangement of the thirst response (or the ability of the patient to respond to their thirst)
- 2)** Kindey disease
- 3)** An alteration in neurohormonal control of water balance (due to a brain leision, CVA, head trauma, etc.)
- 4)** Administration of sodium bicarb in a cardiac arrest situation.

The most *common* cause of hypernatremia by far is free water loss (i.e. vomiting, diarrhea, fever).

When sodium increases, cells become dehydrated. Since sodium is primarily outside the cell membrane, when the concentrations of blood sodium increase, the blood becomes hypertonic drawing the water out of the cell. Also, the osmotic

force of the hypertonic blood draws water out of the cell.

When the cells become dehydrated, they shrink. In response to this shrinking, the cell reacts by changing the electrolyte gradient which alters the resting potential.

The effects of hypernatremia are primarily seen in the CNS due to poorly functioning neurons. If the condition becomes severe enough, the water and sodium drawn into the cerebral veins may cause them to rupture and cause an intracranial hemorrhage.

Assessment

Infants and elderly are more susceptible to hypernatremia. This is due to the fact



that infants do not control their intake. Poor formula preparation and/or poor milk production may also precipitate the derrangement. The elderly

are susceptible, particularly those dependant on caregivers since they too may not control their intake or be able to communicate their needs.

The signs and symptoms of hypernatremia may be somewhat vague and difficult to identify. They include anorexia, restlessness, nausea and vomiting. Neurological findings may include changes in mental status, lethargy, irritability, unresponsivness and myclonic jerking, twitching, ataxia, hyperreflexia, tremors, and seizures.

PALSY UPDATE

Objective assessment of the hypernatremic patient may reveal signs consistent with dehydration and/or hypovolemic shock (i.e. tachycardia, orthostasis, hypotension).

Treatment

In the field, treatment is supportive and should include volume resuscitation with normal saline as needed.



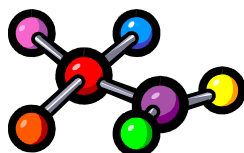
Try to obtain information pertaining to the patient's volume status (i.e. intake, output, vomiting, diarrhea) and seek to determine if the problem is chronic or acute in nature.

Ask if the patient feels thirsty and whether the patient has noticed frequent urination. [Diabetes Insipidus, the inability of the kidneys to concentrate urine can be one renal etiology of hypernatremia].

In the ED, treatment will focus on normalizing sodium slowly (1 mEq/L/hour) and identifying the underlying cause(s).

Take Home Lesson

Hopefully, by learning more about electrolyte derangements, we realize that although vague symptoms of nausea, vomiting and dehydration are seemingly benign complaints that we frequently encounter, we should strive to take a good history to assist in identifying any



electrolyte abnormalities that may be causing the patient's condition.

References

1. Hyponatremia. eMedicine. Sept. 14, 2005. Available at: <http://www.emedicine.com/emerg/topic263.htm>. Accessed June 10, 2007.

Endocrinology

Criteria for Diagnosing Diabetes

- 1) Any single fasting blood glucose over 120 mg/dl (venous or capillary blood) is diagnostic for diabetes.
- 2) Presence of classic hyperglycemic symptoms and elevated blood glucose
- 3) **ANY RANDOM GLUCOSE LEVEL \geq 200 mg/dl.**

Reference

1. Harris, MI. Classification, Diagnostic Criteria and Screening for Diabetes. *Diabetes in America*. Available at: <http://diabetes.niddk.nih.gov/dm/pubs/america/pdf/chapter2.pdf>. Accessed June 10, 2007.

Academic Review

Narrow Angle Glaucoma

We all know or perhaps can remember that there are certain sympathomimetic or paralytic drugs that are contraindicated in patients diagnosed with narrow angle glaucoma, but what is it and why is it a contraindication. After all, it's an emergency situation, right?



PALSY UPDATE

The term “glaucoma” refers to multiple conditions that result in increased intraocular pressure and decreased visual acuity.

Acute Angle-Closure Glaucoma (AACG) is an emergency condition. The criteria for diagnosing AACG include at least 1) two of the following symptoms: ocular pain, nausea and vomiting, blurry vision and halos; and 2) three of the following signs: intraocular pressure > 21 mmHg, conjunctival injection, corneal epithelial edema, mid-dilated nonreactive pupil.

AACG results when the aqueous humor of the eye is unable to diffuse from the posterior chamber into the anterior chamber and subsequently diffuse into the vasculature. This causes an increase in the intraocular pressure, which can damage the structures of the eye and threatens the patient’s vision.

Thus, administering medications that risk further increasing intraocular pressure in a patient with elevated eye pressure carries risk of causing the patient to become blind.

Pharmacology

“Sulfa” Allergies



We frequently hear patients, caregivers and healthcare folks say that certain patients are allergic to “sulfa.” Sometimes we hear people say that they’re allergic to “sulfur,” which is a misnomer and is not correct.

So what is meant by sulfa? The term sulfa refers to drugs containing **sulfonamides**. Some sulfonamides are antibiotics such as Bactrim[®] (sulfamethoxazole/ trimethoprim) commonly abbreviated SMX/TMP, Septra[®], and Pedizole[®].

Incidence of sulfa allergy is 3%. There are however other medications that patients with this allergy are advised to avoid such as diuretics

including hydrochlorothiazide, however Lasix[®] may be given with caution.

Patients with sulfa allergies are also advised to avoid sulfonylureas (oral antihyperglycemic medications) such as glyburide and glipizide.

Celebrex[®] is a sulfonamide as well, but there have not been any documented reactions. Others include Imitrex[®] (for migraines) because it is structurally similar to sulfonamides and Zonisamide[®] (for seizures) which is a sulfonamide.



Reference

1. More, D. Sulfa Allergy. About.com. April 28, 2007. Available at: <http://allergies.about.com/od/medicationallergies/a/sulfa.htm>. Accessed June 10, 2007.

Photos from the Field



While not necessarily a photo of EMS in action, this picture was taken on scene of a diabetic emergency call. (The eyes have been blacked out to protect the identity of the cat).

[Please feel free to submit any photos, please ensure that you obtain permission from your employer to submit any pictures, all patient identities will be protected.]

PALSY UPDATE

Terminology

Pain vs. Tenderness

Pain = an unpleasant sensory or emotional experience arising from actual or potential tissue damage or the perception of an uncomfortable stimulus or response to the perception.

Tenderness = sensitivity to pain upon the application of pressure.

Iatrogenic vs Nosocomial

Iatrogenic (adj.) = induced or cause by medical treatment. *Iatrology* is the greek term for 'medical science' and the suffix *-genesis* means 'to produce.' *Iatros* is the greek word for healer and relates to either 'medicine' or 'physician'.

Thus, this term is commonly used to describe an adverse medical condition cause by medical intervention. This term can also be used to describe a condition "caused by physician."

Nosocomial (adj.) = Occurring or pertaining to a hospital. *Nosokomos* is the greek term for 'one who cares for the sick.' This term is commonly used to describe an illness aquired in a hospital, i.e. 'nosocomial infection'.

Resuscitation

Why no DNR?!

A study published in the Journal of the American Osteopathic Association evaluated elderly patient's understanding of resuscitation and their decision to sign a Do Not Resuscitate order. The findings are quite suprising.



The study found that 81% believed their chance of survival to discharge was greater than 50%. 23% of the respondants believed that their chance of survival to discharge was greater than 90%!

It is clear to us that too many people are subjected to the futile efforts of resuscitation, especially people who were significantly moribund to begin with and have little chance of a meaningful recovery from their primary disability, let alone a cardiac arrest.

Anyone who has tried to explain the futility of resuscitative efforts in the heat of the moment to a frightened family member knows that feeling of frustration that people do not realize we are performing CPR because their relative is no-longer alive. Furthermore, patients "mistake chest compressions, intubation and cardioversion as benign interventions."

Some of these decisions are influenced by the media, some of which portrays inaccurate scenarios. It has been measured that prime-time medical dramas hold a resuscitation rate as high as 75%.



This study helps to demonstrate the poor communication of patients and their care providers regarding this matter, thus patients are left to make uninformed decisions.

Reference

1. Adams, DH, Snedden, DP. How Misconceptions Among Elderly Patients Regarding Survival Outcomes on Inpatient Cardiopulmonary Resuscitation Affect Do-Not-Resuscitate Orders. *Journal of the American Osteopathic Association*. 2006; 106(7): 402-4.

PALSY UPDATE

Blood Glucose: Finger-stick or Venous?

A study evaluating the accuracy of capillary or finger-stick blood glucose accuracy raises serious concerns about the practice.

A prospective study of 50 code blue patients receiving CPR was conducted comparing finger-stick blood glucose vs venous blood glucose samples. Of the 50 total patients, finger-stick glucose levels indicated that 8 patients were hypoglycemic. When compared to venous blood glucose samples, *only three were actually hypoglycemic*, two were really hyperglycemic and the remaining three were normoglycemic.



This study recommends the use of venous blood when assessing the blood glucose in a code blue patient.

Reference

1. Thomas, SH, et al. Accuracy of Fingerstick Glucose Determination in Patients Receiving CPR. *South Med J.* 1995; 88(6): 697-8

Furthermore, there no studies to date that demonstrate the effectiveness of the Trendelenburg position.

Reference

1. Bivins, HG, et al. Blood Volume Distribution in the Trendelenburg Position. *Annals of Emergency Medicine.* 1985; 14(7): 641.



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Trauma

Trendelenburg Revisited

The Trendelenburg position is frequently utilized in an effort to increase blood pressure. The theory behind the practice is that by elevating the patients body above the head, gravity will permit an autotransfusion of blood to the core of the body.



The study referenced demonstrates (using radionuclide scanning) that the trendelenburg position displaces only 1.8% of blood volume to the body's core. This amount of displacement is negligible and unlikely to have any effect.