

LIGHTNING DATA CENTER MINUTES

July 12, 2019

ST. ANTHONY HOSPITAL WEST, LAKEWOOD, CO

www.lightningdatacenter.org

Quote of the Month: “There are no great limits to growth because there are no limits of human intelligence, imagination and wonder.” - Ronald Reagan

1. Members Present: Clark, Wachtel (Howard & Clara) and Wells. The LDC welcomed the following guests from UC Health: Nancy Biaggi, Bridgett McCrory, Laurie Lovedale, Stephanie Vega, Mary Clark, Amber Lormain, Zac Lensgraf, Regina Krell, Robyn Wolverton, Brittany Hickle, Kim Phillips, Catherine Gavidreault, Eve Lindemann, Pam Michelli and Jessica Berry. Meeting began at 11:50 AM and ended at 1:00 PM. Clark moderated.
2. The LDC is accepting donations, either as cash or check. If you donate via check, please make your check payable to Steve Clark at 755 S. Clinton Street, #2A; Denver, CO 80247. He will cash the check and keep the cash holdings specifically for the LDC. When the LDC incurs expenses, Steve will pay for services rendered through his bank account using the cash from LDC’s cash holdings. A log will be maintained detailing the inflow and outflow of monies. At the present, the LDC has \$154.00 in cash holdings.
3. Carl Swanson said he could not attend the meeting. He said The First Responder Data Collection Project shows 12 people have been hit by lightning this year. Of those, four were injured and eight others felt a tingle, but refused treatment. Carl will obtain additional data.
4. Ken Langford also could not attend, but he advises of a website that provides weather forecasts and lightning outlooks aimed at hikers in the Colorado mountains. The link to the website is at: <https://www.bouldercast.com/summitcast-hiking-forecast/> We will discuss this at the August meeting.
5. The LDC met at the University of Colorado’s Anschutz Campus in Aurora, Colorado. Our featured speaker was Dr. Anne L. Wagner, a burn specialist. Her talk was titled: “Electrical Injury”, part of which addressed some cases of survivors burned by lightning. We had a well-attended meeting. Here are my incomplete notes on a fast-moving, yet very detailed talk.

Some Background on the Burn Center

The burn center was established in 1978 and it admits over 500 burn patients per year. The burn center is “Verified”, meaning it meets or exceeds certain criteria set forth by the American Burn Association and the American College of Surgeons. Verification is done every three years and the burn center has been verified since 1998. There are at least 25 members in the burn unit, which is comprised of nurses, dietitians, case managers, psychologists, administrators, three burn physicians, and others. All three burn physicians are board-certified. The burn center sees patients from Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska and Kansas.

The burn center established an international presence with its Rwanda Burn Scholarship, where one resident and one attending physician from Rwanda come to the Aurora campus to receive training in burn medicine. The survival rate for burns in Rwanda is not good. In Rwanda, if a patient presents at the hospital for burns at 30% or greater, the patient is told to go home as the prospect of recovery from that extent of burning is poor. Hopefully, the training they receive here will help to reverse that trend.

A Few Notes on Electrical Burns

Persons burned by electricity tend to suffer from higher morbidity and tend to have longer stays in the hospital.

For adults injured by electricity, 3% are work-related deaths, of which, 90% are males. Among children, the ratio of injury is 2:1 male-female. Most occur around the home.

Approximately 97% of electricians have been shocked or injured on the job. Electrocution is the 4th leading cause of work-related deaths. The term “electrocution” means the shocked individual has died.

There are two mechanisms of electrical injury. Electrical current passing through tissues causes damage by the direct action on protein and cell membranes and by heating of the tissue. The severity of injury is multi-functional and depends on voltage, current, the type of current, the path of flow and the duration of the current..

There are four types of electrical injury: flow of current, arc (flash) injury, flame injury from ignition, and lightning. Types of tissue resist the flow of current in increasing order of resistance as follows: nerves < blood vessels < muscle < skin < bones.

According to animal models, the body acts as a single uniform resistance and electrical injury is inversely proportional to the cross-sectional area of the involved body part.

Both macro-vascular and micro-vascular injuries tend to be irreversible.

A Few Notes on the Care of Electrically Burned Patients

Lightning strike patients get fluid resuscitation for burns covering 20% or more of their body.

The burn center will perform cardiac monitoring for patients who have one or more of the following: loss of consciousness, ECG abnormality, documented dysrhythmia, CPR given in the field, and other standard indicators.

Myoglobinuria (presence of myoglobin in urine) indicates significant muscle damage and possibly shows ongoing ischemia. The urine is usually a dark color. Maintain a UO @ 1-2 cc/hr for adults and a UO @ 2+ cc/hr for peds. Consider alkalization.

Approximately 15% of electrical burns sustain traumatic injuries, such as falls, being thrown and tetanic muscle contractions (compression fractures).

For high-voltage injuries, compartment pressures are checked. Two clear signs of a developing compartment syndrome are nerve dysfunction and failure to resuscitate. The decision to operate is usually clear-cut. There is significant morbidity associated with high-voltage injuries.

Lightning

In Florida, there are an average of 25.3 lightning strikes per square mile. Florida averages approximately 1.45 million strikes per year. NOTE: From 2008 to 2017, the National Lightning Detection Network showed Florida had an average of 1,170,979 cloud-to-ground flashes and an average flash density of 20.4 flashes per square mile.

Link: https://www.weather.gov/media/safety/08-17Flash_Density_State.pdf

On average, Dr. Wagner sees 7-8 lightning burn patients per year. Here are a few of her cases.

Case 1: There was a lightning fatality on a golf course. Two golfers were standing two feet apart from one another under a tree when lightning hit. One golfer was killed and the other survived. On the golfer who died, the vessels were destroyed from the nipples on down.

Case 2: A man was riding on an ATV and was struck on his scalp. He had cardiac arrest and had some neurological issues.

Case 3: A person was struck in a cemetery and suffered cardiac arrest. CPR was performed by a bystander. The person was neurologically impacted and was intubated at the hospital. There was 3% TBSA involving chest, left thigh and bilateral feet. The patient was released after day 4.

Dr. Wagner said ferning is caused by a little bit of blood that gets into subcutaneous tissues, then disappears within 24-48 hours.

The ears need to be carefully examined. The types of ear damage include ruptured eardrums, middle and inner ear destruction and sensorineural hearing loss. Damage to the ears can lead to an increased lifetime risk of vertigo. Howard Wachtel asked if the ear damage was thermal or acoustic. Dr. Wagner said it is not known.

The American Burn Association has a registry of burn patient data from verified burn centers across the country. Electrical burns are listed by the type of burn as noted earlier: flow of current, arc injury, flame injury from ignition, and lightning. The Journal of Burn Care & Research is their official publication.

A PDF file of the slides Dr. Wagner used in her presentation is attached to these minutes as a separate file titled: "Electrical Injury July 2019 final.pdf".

A Lightning Survivor's Story

We closed our meeting by meeting with a lightning survivor, whose account has been extensively covered by the local media. This man was camping in the Colorado mountains near a highway. It had just started to rain. He heard a distant rumble of thunder and another, closer rumble of thunder. Shortly thereafter, he was hit, but does not remember being hit. The remainder of this account was told to him by others. He was face down outside a tent. His girlfriend saw a flash. He had stopped breathing and his eyes were rolling toward the back of his head. There was a small mark on the front of his chest and ferning further down his chest. His face had different colors. CPR was given and breaths were given, since his diaphragm was paralyzed. His girlfriend started screaming for help. A fellow camper showed up and helped load him into their car. He was taken to the ambulance, where he started regaining consciousness and became very cranky. He wondered if he had wrecked the car. He didn't believe it when he was told he had been hit by lightning. He was hospitalized for 48 hours and was released with soreness in his back and neck. The soreness was gone in 2 weeks. Now, he promotes CPR. He is currently in college and gainfully employed with no apparent aftereffects. Local media was present for his talk. Here is the link: <https://kdvr.com/2019/07/12/colorado-lightning-strike-survivor-shares-his-story/>

6. In the June minutes, Barb Stemple said a woman at the conference had told her she had used the Bemer device and reported beneficial results. She also claimed to have been struck by lightning twice. Following the dissemination of the June minutes, Mary Ann Cooper sent me an e-mail, which I quote directly below, with her permission:

“The lady who says she had been struck by lightning and that ‘the Bemer device saved my life’ asked the MC at the meeting to speak at the conference. He consulted me and I believe Phil for advice as we have had many charlatans over the years. Steve has an eagle eye for these but was not in good form at the conference. When the MC asked for her card to be able to remember her name for introductions, it turned out she was a Bemer distributor.

She cornered other leadership, too. When she cornered me (and before the MC told me who she was, she did not have the usual persona of a survivor/family member and little knowledge. She asked me if we ‘would ever figure out what to tell people to avoid this injury’ and obviously have never listened to weather broadcasters, Googled it, looked at the NOAA lightning safety site or done any other background work like most of our survivors and families have done. From her lack of knowledge, we all had the feeling she had not been hit by lightning and that her interest was in selling the device to survivors. After she gave the MC her card and he found she was a dealer, he told her she could not have time to speak and she left the conference. She was not seen the second day.”

7. LDC welcomes your medical questions. Please send them via e-mail to Steve Clark at sclarktoto@gmail.com. Your medical questions will be forwarded to Dr. Phil Yarnell for his review and will usually be taken up for discussion in the next month's meeting. Please be advised any questions posed are for the general consideration by the group and do not constitute a formal medical opinion. If a formal evaluation is requested, arrangements can be made directly with Dr. Yarnell. If you have a medical emergency, please call 911 or your local EMS.

8. Questions, comments, notification of errors, and critiques of these minutes are welcome. Please forward those to Steve Clark at: sclarktoto@gmail.com. Please keep your communications professional and respectful. Communications will be forwarded to the appropriate author(s) of the minutes and addressed accordingly.
9. LDC Disclaimer: These minutes do not represent official positions of the LDC or its members. They simply reflect the comments made at the meeting. Furthermore, the LDC does not implicitly or explicitly recommend or endorse any product or service. Any product or service presented in these minutes is done so for purposes of discussion and analysis. The merit (or lack thereof) is open for the consideration and review by the entire membership.
10. Next meeting: Friday, August 9, 2019, from 11:45 AM to 1:00 PM at St. Anthony Hospital, Conference Rooms E & F. Format: Roundtable.

Respectfully Submitted,
Steven E. Clark, Consulting Meteorologist

Lightning Links

This is a monthly listing of periodicals, websites, and videos about lightning and allied areas from a variety of sources. A headline or description is listed, followed by the link. Please note that some of the links are perishable, which means you'll need to go to the source for the information.

Garrison, R., 2019: 8 Injured, 1 Critically, After Lightning Hits Near Group of Devil's Head Hikers. *KMGH-TV*, June 30 and July 1, 2019. Link: <https://www.thedenverchannel.com/news/local-news/7-injured-1-critically-after-lightning-hits-near-group-of-devils-head-hikers/>

Web Staff, 2019: Lightning Strike Injures 7 in Douglas County. *KDVR-TV*, June 30, 2019. Link: <https://kdvr.com/2019/06/30/lightning-strike-injures-three-in-douglas-county/>

Wada, Y., T. Enoto, Y. Nakamura, Y. Furuta, T. Yuasa, K. Nakazawa, T. Morimoto, M. Sato, T. Matsumoto, D. Yonetoku, T. Sawano, H. Sakai, M. Kamogawa, T. Ushio, K. Makishima and H. Tsuchiya, 2019: Gamma-Ray Glow Preceding Downward Terrestrial Gamma-Ray Flash. *Communications Physics*, June 25, 2019. Link: <https://www.nature.com/articles/s42005-019-0168-y.pdf>

Valera, S., 2019: Shocking Moment Lightning Strikes Boat in Boston Caught on Camera. *Boston 25 News* and *geek.com*. July 7, 2019. Link: <https://www.geek.com/news/shocking-moment-lightning-strikes-boat-in-boston-caught-on-camera-1794721/>

Michels, A., 2019: What To Do When Lightning Strikes: Hikers Have Close Call With Dangerous Lightning on Colorado 14er. *KDVR-TV*. July 7, 2019. Link: <https://kdvr.com/2019/07/07/what-to-do-when-lightning-strikes-hikers-have-close-call-with-dangerous-lightning-on-colorado-14er/>

Porter, J., 2019: Hikers Experience Electric Shocks on Colorado 14ers Over the Weekend. *KMGH-TV*, July 8, 2019. Link: <https://www.thedenverchannel.com/news/local-news/hikers-experience-electric-shocks-on-colorado-14ers-over-the-weekend>