

**LIGHTNING DATA CENTER  
ST. ANTHONY HOSPITAL, DENVER, CO  
FEBRUARY 14, 2003  
MINUTES  
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Quote of the Month:

“When given a book, thank the giver within 48 hours; otherwise, you really will have to read it.”  
Thomas Turner (as quoted by Ivan Oransky) Lancet 2002;360:1431

1. Meeting began at 11:30 am and adjourned at 1:30 pm.
2. Member present: Benson, Blanke, Boyle, Bradley, Brantner, Burrows, Cherington, Davis, Elland, Fielder, Foley, Gift, Glancy, Hodanish, Keen, Kozak, Lines, Mc Donough, Paton, Sanders, Wachtel, Wallace, Yarnell.
3. I brought the following article (abstracted in part here):
  - a. Dwyer JR, Uman MA, Rassoul; HK, et al. Energetic radiation produced during rocket-triggered lightning. Science 2003;299:694-697.  

“Using a NaI(Tl) scintillation detector designed to operate in electrically noisy environments, we observed intense bursts of energetic radiation (>>10 kiloelectron volts) during the dart leader phase of rocket-triggered lightning...These results provide strong evidence that the production of runaway electrons is an important process during lightning.”
  - b. Krider PE. Deciphering the energetics of lightning. Science 2003;299:669-670.  

“...Dwyer et al. report the first observations of energetic radiation – x-rays, gamma rays, and/or relativistic electrons – during rocket-triggered lightning...they suggest that such radiation is probably present in all cloud-to-ground flashes.
  - c. Lee MS, Gunton KB, Fischer DH, Brucker AJ. Ocular manifestations of remote lightning strike. Retina 2002;22:808-10.  

“In our patients, we saw three visually significant effects of lightning injury: cataracts, macular hole, and incomplete CRAO {central retinal artery occlusion}. Both patients had cataracts in the anterior and posterior subcapsular regions. This is thought to occur secondary to increased resistance through the lens capsule, which causes a denaturation of the adjacent lens proteins...It is thought that because macular RPE {retinal pigment epithelium} contains higher concentrations of melanin...macular damage occurs more commonly.”
  - d. Cherington M, Yarnell PY. Lightning-related involuntary movement disorders. (Abstract) Neurol (Suppl 3) 2002;58:A138.  

“Central nervous system complications of lightning strikes are common. IMD are rarely seen in lightning-strike patients...The explanations for IMD after lightning strikes vary from a causal to a precipitating to a coincidental relationship.

- e. Koumbourlis AC Electrical injuries. Crit Care Med 2002;30:S424-S430.

“The severity of the injury depends on the intensity of the electrical current..., the pathway it follows through the victim’s body, and the duration of the contact with the source of the current. Immediate death may occur either from current-induced ventricular fibrillation or asystole or from respiratory arrest secondary to paralysis of the central respiratory control system or due to paralysis of the respiratory muscles...Although nervous system injury..is a common clinical manifestation of electrical injury, there is no specific histologic or clinical finding that is considered pathognomonic.”

- f. Ferreiro I, Melendez J, Regalado J, et al. Factors influencing the sequelae of high tension electrical injuries. Burns 1998;24:649-653.

“The current pathway, as well as its point of entry, does not show any relation with presence of renal failure, cardiac arrhythmia and cataracts. A clear relationship between the point of entry of the current and appearance of neurologic injury with the presence of paralysis and permanent regional anaesthesia at the same level was observed.”

- g. Whitcomb D, Martinez JA, Daberkow D. Lightning injuries. South Med J 2002;95:1331-1334.

“Because the duration of a lightning strike is extremely short, little of the massive energy is transferred internally to the victim. Rather, the majority of the energy flows externally over the victim’s body. However, enough energy passes through the body to disrupt and short-circuit electrical systems with the body, especially the heart, vasculature, respiratory center of the brain, reticular activating system, and autonomic nervous system. The major cause of death in lightning injuries is cardiopulmonary arrest due to asystole. However, asystole can be readily converted to a coordinated cardiac rhythm with timely and aggressive cardiopulmonary resuscitation.”

4. Bob Wallace and Beth Elland presented the Lightning Data Center Plan to Develop a Business Draft Outline. Bob commented that a.) this plan is the route to take LDC to its next step; b. LDC will need full time and/or part time help; and c.) grant money. All members are invited to send their comments to Bob and Beth. Their email addresses are: [bobwallace@centura.org](mailto:bobwallace@centura.org) [bethelland2@centura.org](mailto:bethelland2@centura.org). Dave Benson asked: Who is the audience? Bob answered: Foundations that provide money for start-up operations. The Draft Outline (rev. 1/13/03) is attached.
5. Bill Sanders asked if anyone could comment on the relationship between long duration positive lightning strikes and forest fires. Michael Brantner stated that his firefighting outfit downloads co-ordinates of positive strikes each day and check those areas of the forest. They have found 4 fires that they were able to control.
6. Allen Bradley brought a videotape of a program, Hit by Lightning, that was shown on the Discovery Channel.
7. Gene Lines brought the following article: Grim P. When lightning strikes. Discover August 2002;46-51.

8. Our guest speaker today: Stephan Hodanish, Senior Meteorologist at National Weather Service in Pueblo, CO. His topic: "Documentation of a shallow convective updraft producing a fatal lightning flash on top of Pikes Peak, Colorado." Steve's presentation was outstanding and there was enthusiastic audience participation in Q & A and discussion.

I cannot do justice in these minutes to Steve's elegant presentation. Here are a few details from my notes.

The lightning strike was the first one of the morning. It happened at 12:56 pm on the top of Pikes Peak. Pikes Peak elevation is 14,112 feet.

Lee Fielder and Michael Brantner are EMTs who are assigned to the Pikes Peak region. They provided important clinical information about the case. They stated that Sheryl Olson was one of the flight nurses who also attended the patient. Michael reported that the patient was apneic and pulseless. His dental braces appeared to have "exploded" and caused trauma to mouth and head. CPR was administered for approximately 26 minutes. Sheryl applied an Automatic Defibrillator. The patient's cardiac tracing revealed PEA (pulseless electrical activity). Phil Yarnell commented that PEA represents electromechanical dissociation. I wondered if the explosive nature of the blast could account for some of the findings (e.g dental braces).

Steve speculated that since the distance for electrification to travel from the cloud to the top of Pikes Peak was only about 5000 feet, this lightning strike was more dangerous than if the distance from cloud to ground were more like 20,000 feet (for example if the cloud were above Denver – elevation 5280 feet). Bob Glancy reminded us that this case shows how dangerous lightning is in Colorado. On a day with little reason for people to take shelter, the first lightning strike on a nearly cloudless day turned out to be very dangerous. He pointed out the many tourists to the mountain on that day did not have the usual reasons to take shelter (e.g hearing thunder, seeing lightning and clouds, etc.). An important rule that does apply in Colorado is: Avoid mountain peak territory after 11:00 am.

9. These minutes do not represent official positions of LDC and its members. They reflect the comments of members present at the meeting.
10. Next meeting will be held at 11:30 am on Friday, March 14, 2003 in the Main Auditorium of St. Anthony Central Hospital

Respectfully submitted,

Michael Cherington, MD  
Director, LDC, St. Anthony Hospital