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Exertional Heat Stroke (EHS): Common and Unusual Case Presentations

Narrator: Welcome to REACHMD. This special edition of The Pulse of Emergency Medicine is sponsored by Eagle Pharmaceuticals. The following activity is intended for physicians. Here's your host, Dr. John Russell.

Dr. Russell: Exertional heat stroke, or EHS, is a sudden and unpredictable condition which commonly affects young, active, and healthy individuals, but this common patient population doesn't tell the whole story of EHS and who is at risk, which makes the need to understand both typical and atypical case presentations all the more necessary. This is Reach MD and I'm Dr. John Russell. Joining me today are Dr. James Glazer and Dr. Lou Guzzi. Dr. Glazer is the medical director of the Outpatient Physical Therapy and Sports Medicine Program at Memorial Hospital in North Conway, Maine. He is also an assistant clinical professor at Tufts University School of Medicine and is a physician for the United States ski team. Dr. Guzzi is a quadruple-board certified physician in critical care, anesthesiology, internal medicine and neuro critical care.

Dr. Glazer, let's start with a typical exertional heat stroke patient you see in sports medicine. Is there such a thing as a textbook case, and if so, what does it look like?

Dr. Glazer: Well, in most cases we see somebody who has been exerting themselves, and in my area, that's typically an athlete, though we are seeing a rise in heat stroke cases among war fighters as well as among certain trades people and especially firefighters who exert in very hot environments with restrictive clothing, but typically you see this textbook combination of central nervous system effect in terms of sometimes an altered mental status or altered level of consciousness even and that's typically combined with a very high temperature.

Dr. Russell: So, how do you go about diagnosing that, on the field or in the ER, how would you go about diagnosing and then starting initial management?

Dr. Glazer: Well the most crucial step really is early recognition and to recognize these symptoms early, you have to have a high index of suspicion when you have people exerting under heat stress. The other crucial step is to get an accurate temperature, and it turns out that this is not as easy as it might sound, especially at the extremes of temperature; most of our temperature measuring devices are very inaccurate. So, for example, oral temperature, tympanic temperature, sometimes infrared temperatures are very inaccurate, and really the standard of care in these cases is an esophageal temperature or a rectal probe.

Dr. Russell: So, Dr. Guzzi, in critical care spectrum, this exertional heat stroke patient, how do they present in a critical care setting and what are you doing for these patients?

Dr. Guzzi: So quite often, we are the folks who get the patients after Dr. Glazer has seen them, diagnosed them, probably actually initiated therapy and may have initiated a passive or active cooling process and probably even sent off all the labs, but most of these patients have a protracted course where they're going to be in the ICU for an extended period of time, maybe one day, two days, and up to three days in some patients that are very ill or complicated. Oftentimes we get them after therapy has been instituted; we continue with resuscitation; we continue following electrolytes very closely; we watch them for recurrence of EHS. It's not unheard of to see somebody have a recurrence of EHS where they are doing well and then all of a sudden, for want of better words, start to cook again or start to actually get an elevated temperature again, elevated CPKs again, elevated muscle contracture and discomfort and pain and we're the guys that after all that's said and done and we resuscitate and fix, we're the guys that start instituting physical therapy, occupational therapy. Oftentimes we engage them in some sort of neurocognitive testing because it's not uncommon that these patients have a neurocognitive deficit or some other long-term treatment issue. So, it's very important that the ER, which we are very attuned to

working with and critical work together as one, because oftentimes Dr. Glazer will have this patient for a period of time, and depending on his busyness in the day, they may be very rapidly in our hands or vice versa, we may be full and it may take some time, so it's really a joint treatment management for both of us to kind of control and manage this patient.

Dr. Russell: So I imagine in this large spectrum of heat stroke, there are modifiable and non-modifiable risk factors. Dr. Glazer, can you start some of the things that you're thinking about for risk factors and then we'll go to Dr. Guzzi?

Dr. Glazer: Absolutely. One of the most important things that we seek to modify is level of acclimatization. It turns out our bodies are very well designed to shed heat stress, but what that takes is at least three or four days under heat stress in order to acclimatize. So, what we try to advise athletes to do, especially if they're going to be traveling some place that is different climatically than where they're residing normally, we try to get them there early and into acclimatization. Other modifiable risk factors include dehydration, and so hydration during exercise is very important. Obviously, equipment modification is a big deal and we really try to work with our communities and our race sponsors to make sure that there is adequate hydration and that there is also adequate awareness of the risk of heat stroke so that if a race is going to be taking place under hot, climactic conditions we consider changing the start time or even, in some cases, cancelling the race.

Dr. Russell: Dr. Guzzi, what are some of the things that you are seeing in your patient population?

Dr. Guzzi: Well, the patient population, again, it's not just anybody who lives in the south and warm areas. I obviously live in Florida, but you can see it anywhere because heat can occur anywhere, the environment of heat can occur anywhere, even being in a stuffy building can occur anywhere, so to kind of reiterate what Dr. Glazer said, it's absolutely essential that people have the opportunity to acclimatize to where they're at plus athletes, people working, people outside in hot environments, whether you're cutting your grass, whatever you're doing, it's very important that you acclimate to where you're actually at. Hydration – I just cannot say it enough. Seeing enough heat stroke patients, that always seems to be the trigger starts when they just can't dissipate their heat and perfusion allows you to dissipate your heat. The more dehydrated you get, the more constricted you get, the most your shunt your blood, the more you have less opportunity to actually dissipate your heat. We are incredible animals at dissipating heat, but the reality is, it requires that we actually have an appropriate volume on board. So, in a dehydrated patient, interestingly enough as we all know, alcohol and teas are profoundly dehydrating in terms of their diuretic effect, so somebody who is drinking on a hot day thinks they are refreshing themselves with a cold beer, when in reality they are becoming even more dehydrated and then go ahead and move into some sort of heavy physical activity or heavy physical exertion, can end up in trouble. Laborers – we see a lot of laborers who work in hot environments, people who work in factories, farmers who work in silos, construction workers, pavement people who get all that extensive heat coming off the ground, and again thinking about some of other populations, our older population, folks that are in restricted environments, maybe a non-air conditioned building, a non-air conditioned apartment, or a mobile home, all are at heavy, heavy risk for heat stroke, or more importantly, heat exhaustion and actually EHS.

Dr. Russell: You're in Florida, so are you seeing a lot of this happening in your geriatric population down there?

Dr. Guzzi: We actually have. Again, it's a strange time of year at times when people don't use their air conditioning and Florida is an odd environment because it can be just as hot in January as it can be in the summer. People don't acclimate. I mean, as you know, or snow birders come down here from up north and right away jump into all their activities and we see patients that way. A lot of these folks are on diuretics. A lot of these folks are taking medications which by definition are keeping them somewhat dry, so I see quite a bit of dehydration. As part of that dehydration, I see a lot of older folks that come in with an unexplained, which is where Dr. Glazer's team is absolutely essential. Unexplained altered mental status and a low-grade temperature, we all jump on sepsis right away then we suddenly see a clean urine and all the other things, then you start thinking what else would be giving him a high temperature and you often forget that EHS is just another component of altered mental status.

Dr. Russell: So, Dr. Glazer thinking about these unexpected cases, do you have an interesting unexpected case of exertional heat stroke you'd like to share with us?

Dr. Glazer: Yeah, absolutely. Well, some time ago I was working as a doc on an island in the Bahamas and we had a dive boat bring in one of their patrons and he had been diving all day and had become ill and had been below deck for a few hours not feeling well. He came in with a suspicion of actually having had a stroke. His mental status was altered. He was a man who was in his 60s with some hypertension and so the captain thought that a neurologic diagnosis was the most likely. Well, it turns out that despite the fact that he had spent his day in the water diving, he was in a restrictive wet suit, was diving in water that was a lot warmer than what he was used to and went immediately from that environment to a very hot, shipboard environment and when we measured his temperature, it turned out he was 105 degrees. So, we cooled him down and he felt a lot better and it was a good outcome for everybody involved, but again, not a first thing on the differential diagnosis for most people but important to keep in mind, especially given the environmental pressures that he was under.

Dr. Russell: Dr. Guzzi, do you have any unusual cases of EHS that have presented to your critical care unit?

Dr. Guzzi: I do. We have a case of a very healthy, very robust, 80-year-old gentleman who managed to get in nine holes of golf every morning. In fact, his goal was to play nine holes of golf every day until he died. He would pull his bag behind him and he would often go in to play golf, and he was out playing one of moderately warm mornings and his buddy started noticing he was confused. He almost stepped into one of their swings. He walked a long way up a fairway, so immediately they called 9-1-1 and 9-1-1 got out there on the golf course, picked him up, brought him in, and as Dr. Glazer said so eloquently, obviously everybody thought neurologic injury, stroke, TIA, or something else going on. So, he comes in and everybody rushes and he is confused. He is disoriented. His wife said he is not like this and that he's usually on top of his game. His friends said this isn't him. So, you know, everybody got in there and he ends up with a CT scan, which was negative and then all of a sudden, it's a TIA diagnosis. And to show you it doesn't always follow a normal pathway, he was only about 103 or 103.5 on arrival, but very confused, very disoriented but perspiring profusely but with a dry perspiration and they asked us to come down and see him and see if there was anything else we felt was going on. Did we need to ship him somewhere for more definitive testing? We looked at him and started looking at his labs. He was profoundly dehydrated. His CPKs were up around 20,000 to 25,000 and two to three days prior to admission had had this progressive nausea with, as his wife said, multiple episodes of diarrhea and seemed to not be able keep up with his volume, and it is just fascinating to me that this guy went out, did all this, and it just caught up to him and yet in our mind, we thought, "Oh my goodness, this has to be just simply a septic issue. Does he have colitis? Does he have a UTI?" none of which he had. Hydration, cooling him down, very, very close observation and it was more interesting to me, his neuro status, because I think Dr. Glazer and I can probably both agree, we sometimes don't realize the neuro effect of heat. It took this gentleman, who is a very intact, very robust man, it took him nearly five to six days to almost come back to where he could recognize his family members, converse normally, and required extensive physical therapy because of the extensive amount of heat damage he suffered to his muscles. So, we often forget that it's not just the heat; it's the heat in the brain and the heat in the muscles and the recovery time afterwards. So, again, I always think to myself, very healthy guy who wanted to play those nine holes; God bless him, but the reality was, it's what got him in trouble.

Dr. Russell: So, Dr. Guzzi, with your years of experience, are there any hidden pearls about exertional heat stroke that you've kind of tucked away in seeing these patients?

Dr. Guzzi: I've had the very cool blessing of learning off of some very wise and old physicians, both in the military and out, and one thing I've learned and I'm sure Dr. Glazer will say the same thing, it's all about recognition, observation, and appearance. Oftentimes we become so used to seeing the 80-year-old patient with a UTI, the young patient with dehydration and not putting two and two together, we often think of heat stroke of what we once thought of as just sun stroke, warm, they'll be fine, but it's much more complicated than that. It's having that very high index of suspicion that if you can't put two and two together, that there's no sign of sepsis, that there's no sign of infection, that there's something else going on, your immediate suspicion should be, "Possibly could this be a case of EHS that is going unrecognized, and I think the big pearl here is we never have taken into account the significant neurologic effect of exertional heat stroke in patients.

Dr. Russell: And Dr. Glazer, a two-part question just to finish up, if you have any pearls, and the second part of the question is, you know, a lot of our young people, our children, our grandchildren, are playing sports during warm weather, are there some things as a sports doctor that you would really recommend that we make sure our coaches and our children are doing?

Dr. Glazer: Absolutely. Well, Dr. Guzzi is exactly right in his observations and I agree with him entirely. I think that rapid recognition and, in this case, rapid treatment is especially important. One of the things that we've learned with exertional heat stroke is that the sooner we can get these athletes cooled down, the less likely they are to have long-term sequelae. Dr. Guzzi's comments about the brain cooking and how important that is are right on target. If an athlete is recognized rapidly, if they are cooled down rapidly, we can turn this condition, which in many cases can have a very high mortality and morbidity rate, we can turn it into an important phase. One of the suggestions that I have really for the people who I talk to about exertional heat stroke is that if you are considering that diagnosis, don't delay in cooling and even for the EMS crews that we work with, we encourage them to initiate cooling in the field. One of the pearls that I think parents can really take from this and athletes can really take from this is just to recognize the risk of exertional heat stroke and to respond quickly in terms of prevention. You know, we have a lot of opportunities to hydrate ourselves. We have opportunities to rest in the cool, and we have opportunities really to moderate our level of exertion when we're under heat stress. I think we can plan ahead for races by allowing adequate time to acclimatize, and we can also use the buddy system when we're exerting and sometimes in remote environments where it might be a little tougher to get medical help. We can really watch our buddies and make sure that if they're showing signs of fatigue; if they're showing signs of maybe getting a little loopy, don't let those things go. Really, take those things seriously and try to make sure that we don't get to the point where an athlete is deeply impaired and sometimes out of reach as to immediate medical care.

Dr. Russell: And with that, I'd like to thank Dr. James Glazer and Dr. Lou Guzzi for joining me to share cases on exertional heat stroke. It was great having you both on the program today.

Dr. Glazer: Thank you.

Dr. Guzzi: Thanks very much.

Narrator: You've been listening to The Pulse of Emergency Medicine on ReachMD. The preceding program was sponsored by Eagle Pharmaceuticals. If you have missed any part of this discussion, visit ReachMD.com/EmergencyMed. Thank you for listening.