Dive Computers and the Magic Bracelet Syndrome
A Diving Medicine Physician's View of Dive Computer Misconceptions

By Gary N. Toups, MD

I'm sure some of you grew up reading DC™ comic books, just as I did. The character Wonder Woman was an Amazon princess thrust into the modern world, where she joined other superheroes in the crime-fighting game. Part of her weaponry was a pair of magic bracelets with which she could deflect bullets. They didn't do it automatically—Wonder Woman had to bring her superhuman speed and reflexes to bear. I often wonder if some divers believe that the computer on their wrist is a magic bracelet to ward off decompression injury, and if all they do is wear it, they'll be safe.

I won't lie—I love my dive computer. I use it every dive (OK, I leave it off in the pool). It is a convenient and (so far) very reliable piece of technology. It automatically calculates my inert gas and oxygen exposure and can do deco calculations on-the-fly. Admittedly, I also do those things by other means, but I still love my dive computer. Among other things, I like the fact that it records the entire dive in a format I can download and reference later. That being said, I refuse to let my computer be my master, and I will not bring myself to fully trust it. It is simply a tool—more of a guide or a reference than something to slavishly follow wherever it leads. Heck, I bring along a backup computer and/or tables because I'm that paranoid. By the way, I'm the guy who treats injured divers for decompression illness (DCI) in our locale.

Dive computers have been used by the general diving population for three decades or so now. In fact, it has become more unusual for recreational divers not to use one regularly. Some diving training agencies are making diving table use optional and allowing students to use computers from day one. Many would agree they have probably affected overall diving safety in a positive way. They give divers an easy way to account for inert gas load—almost a no-brainer. They are user friendly—most turn themselves on upon water contact, and will go into dive mode at a shallow depth on descent. Unless you want to change defaults or use a gas other than air, they are silent partners on a dive and require little input by the diver. They are perfect for the current generation who grew up using electronic devices, games, and computers. Old curmudgeons like me are a little more wary, having lived long enough to have learned to navigate by the stars using hand-cranked math and a circular slide rule (I'm not kidding). Whether you like them or not, at least a diver with a computer is using something as a reference. Before their common use, there were more divers using no planning tool or means to compute inert gas exposure—not even the available dive tables. Of course, those misguided souls still exist today (I treat them in my chamber occasionally), but with the advent of relatively affordable and reliable computers, they are getting harder to find.

There are some significant misunderstandings about dive computers. I am speaking primarily of the diving population at large, not the finely honed and trained technical divers or divers with years of experience who have educated themselves. Some of those folks eschew computer use altogether and rely on commercially available dive tables, tables produced by desktop software, or other techniques. Others use these methods in combination with a dive computer. I count myself among the latter.

As a physician who treats stricken divers, I often see the end result of people's follies. Consider the following misperceptions I've witnessed about dive computers (in no particular order):

Number 1. "My dive computer will take care of me." Wrong. Your dive computer, no matter how stylish or expensive is simply a calculator. It is a non-caring automaton. Your dive computer will let you do things that are not very smart, like making repetitive deep dives with minimum surface interval. It may beep, squeak or ping at you if you exceed your desired ascent rate, but it does not slow you down. You should care enough about yourself not to let your computer lure you into something you'll regret later.

Number 2. "My dive computer "tracks" what is actually going on in my body." Wrong. Your dive computer simply takes depth and time, applies a pre-set group of mathematical rules (or "algorithm"), and spits out either time remaining at depth, or if the no-stop limit is exceeded, an ascent ceiling/time and total ascent time into readable digits. Oh, they do things other than no-stop or deco calculations. They will also dutifully record temperature and other parameters, and give a warning if you exceed prescribed ascent rates. They will even warn you if you exceed the preset dive times, depths, or O2 limits. The really fancy ones will display and record the diver's heart rate if a monitor is worn, although I am pretty sure it does not incorporate this into any calculations. Again, the computer is only applying preset rules.

I once had a diver wonder how console computers worked at all, since they weren't mounted on the wrist where they could "see" the nitrogen bubbles in the blood. I also had a dive equipment manufacturer's representative tell me his computer with the newest Super Duper algorithm "tracked" bubble formation and resolution in the tissues. Absolute nonsense! As I stated before, all dive computers are simply number crunchers. Other than heart rate for some, they are incapable of monitoring any physical or physiological process in the body, and especially not the state of bubbles in tissues. He didn't like my resulting diatribe in front of potentially paying customers.

Number 3. "Simply staying within my computer no-stop limits keep me safe." Wrong. Remember when your instructor admonished you not to consistently dive to the limits of the recreational dive tables (those of you who remember those archaic things)? The reason is that the no-stop limits represent a "black line drawn through a grey area". It means that most people should be safe at those exposures. Statistically, some people will get a decompression injury even when diving within the limits. It is not common, but it happens. We in the dive medicine business call these "undeserved hits." But are they? Many I've seen involved other factors than just depth and time—like rapid ascents, high exertion, dehydration, cold temperatures, etc. I've treated plenty of divers who had no violation recorded or no-stop limit exceeded on their dive computers. Dive those computers and tables conservatively! Going to the no-stop limit of your computer and "riding" no-stop time as you ascend to get max bottom time is no better than going to the limit of a dive table. Staged decompression with higher oxygen-mix gas switches on ascent is a different story, but that is the realm of the technical diver.

Number 4. "I can trust my dive computer." Wrong. Dive computers will kill you through device failure and lack of due diligence on your part. See number 1 regarding uncaring automatons. If you don't believe me, then consider the following warning from the owner's manual of my personal favorite dive computer:

"This computer will fail. It is not whether it will fail but when it will fail. Do not depend on it. Always have a plan on how to handle failures. Automatic systems are no substitute for knowledge and training."

I applaud their honesty. I will continue to use their products with the appropriate amount of distrust. I have had dive computers fail, by the way. By using my "old school" watch and dive tables (or a backup computer), I have yet to miss a dive.

Number 5. "My computer is simple to use, and reading the owner's manual is superfluous." Wrong. I'm surprised how many divers only know how to look for depth, time, and "time remaining at depth" on their computer. Amazingly, some are not sure about even that. I sometimes get quizzical looks when I ask what happens to the computer display if they exceed the no-stop limits and how they would handle inadvertent deco. Many have never read that far in the manual, if they have opened it at all. Wonder Woman's magic bracelets at work!

Perhaps the worst example I know was the bends patient a physician friend of mine treated some years ago. This gentleman unwittingly dove his computer in gauge mode thinking he was getting nitrogen exposure information. Not so amazingly, it was a new and very expensive computer being used by a very inexperienced diver who had never owned a computer previously. He had no idea of the nuances of its operation, having never read the manual. His over-long bottom time was topped off with an out-of-air event and rapid ascent.

Number 6. "My computer will make me a better diver." Wrong. I once had the opportunity of assisting another instructor in an "advanced open water" course. One of the less skilled students spent so much time staring at the angelic face of his sleek and expensive dive-computer-with-the-really-great-color-display, that he could not keep up with his buddy, control his depth and buoyancy, or even appreciate the beautiful surroundings we were in. He took constant prodding to get his eyes off the thing. When I asked him what was up after the dive, he replied that the computer was going to save his life. I advised him that the opposite was true, that he needed to use it as a reference rather than a prayer book, and that maybe a less pretty computer would be more appropriate.

You become a better diver by diving more and developing good diving habits and techniques. In my opinion, over reliance on or spending too much money on a computer can hinder the process. Good buoyancy control, proper weighting, posture in the water and proper finning technique are the important improvements to make early on. These basics are much more essential than owning an overpriced electronic gadget that really gains little advantage over a cheaper model or even a watch and a dive table. Many people buy much more computer than they need at the beginning of their diving career. By the time they are able to use the advanced features, the computer may well be obsolete or at the end of its useful life. For divers just starting out, buy a simpler computer for less money, and instead buy a better regulator and fins, or invest in some advanced training with the money you save. Even better, spend the money on a dive vacation.

Number 7. "My computer will spit out decompression stops, so I'm an instant technical diver." Or maybe "It's OK if I just get a little bit into decompression—the computer will keep me safe." Wrong and wrong. OK, it's your life. If you really want to get into deco diving, please take at least an intro Tec diving course. I've treated more than one diver who blindly followed his/her computer into deco on consecutive dives with no consideration as to gas planning, only to find they needed about an hour of deco and not enough breathing gas to do it. Hours later, they have my not-so-happy mug peering at them through the chamber porthole at 2 am. Some think I am judging them—I'll never tell. Some divers have enough experience to do this on-the-fly, but most recreationally trained divers don't.

I remember one prodigal son who prided himself on his phenomenal SAC rate, and spent more time on the wreck with his single aluminum 80 than the more experienced divers using redundant gas supply and deco bottles. We noted he was hanging at 20 feet well after the rest of us were on the boat after the second dive. Knowing him, we quickly deduced what happened, and one of our more experienced divers (our own local Wonder Woman) brought him extra gas. Thankfully, she averted a crisis (and a trip to my chamber). After a much needed intervention on buddy use and gas planning (by Wonder Woman), he acquiesced and took a Tec course (from Wonder Woman).

Number 8. " If I don't have my own computer, I can rely on my buddy's computer. No need to pull out those nasty tables!" Wrong. Did you and your buddy hold hands during the entire dive? The patients I've seen who were bent relying on a buddy's computer admitted to going deeper than the diver with the computer. 'Nuf said.

Number 9. "Readability is secondary to other cool features of this computer. " Wrong. Can you read it when you need it? The older I get, the bigger the digits need to be on my computer. Consider a prescription mask or "gauge inserts" if you need them to read the info on your dear computer (or your watch, depth gauge, compass, etc). Consider the following unedited email excerpt from a friend of mine:

"OW student bought a nice wrist computer and I was guiding her as divemaster. When we got to 15 feet, wanted to do the safety stop. Trying to show her the countdown from 3 minutes her computer was showing. She didn't have a prescription mask, needed bifocals and she couldn't read the display on the computer. Not sure what she bought it for and what she thought she was getting out of it. Pretty spooky."

In conclusion, your real dive computer is between your ears, not a magic bracelet on your wrist or console. Use computers with caution, and be spring-loaded with a plan in the event of failure. Just wearing one won't make you safe—you have to read and understand the manual to make it work for you. You may not have superhuman speed and reflexes, but you can bring your brain to bear. Wonder Woman would approve.

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