



MAYHEM: This wreck during October's NASCAR Sprint Cup Series race at Talladega (Ala.) Superspeedway resulted in a second concussion for Dale Earnhardt Jr., forcing him to miss two races.

HHP/BRIAN LAWDERMILK PHOTO

Investigating Concussion Policies

By **BOB FISHER**

Voted the most popular driver in NASCAR for the 10th consecutive year in 2012, Dale Earnhardt Jr. was effectively taken out of the running for the NASCAR Sprint Cup title because of a concussion.

Earnhardt sought help for his symptoms. He wasn't sure what the problem was but knew he had to do something about the headaches he was experiencing. Diagnosed as having suffered two concussions in a short period of time, doctors at the University of Pittsburgh worked with the driver to get him back in the car safely.

Would other drivers have done the same thing in the same or similar circumstances? Should the decision even be left up to the driver? What are the major motorsports series doing with respect to diagnosing and treating athletes with concussions to ensure they have fully recovered before being permitted back into competition?

Prior to examining what the different series are doing with respect to concussions, let's examine what a concussion actually is.

Dr. Charles Tator, of Toronto Western Hospital, explained that "a concussion is a temporary disruption in mental functioning that normally resolves within a few weeks." A concussion can be caused by a direct hit to the head, or a hit to the body that causes movement in the head. The result, in either case, is that the brain moves or "jiggles" inside the skull. Rotational movement seems to be particularly causative. No two people are affected the same way by a concussion.

What actually causes the disruption in the normal mental functioning is still not completely clear. The Centers for Disease Control in Atlanta theorizes that the movement of the brain causes a wave of energy

to be created that disrupts the normal electrical impulses.

Tator noted that there is no actual, physical injury to the brain as a result of a concussion and thus "imaging is useless in its present state. The ordinary CT scan or MRI misses concussion, even misses repetitive concussion."

The science around concussions — diagnosing and recovery, is evolving quickly. As knowledge about concussions improves, a set of "best practices" for dealing with concussions has emerged.

The Consensus Statement on Concussion in Sport (the Zurich Statement), issued following the third International Conference on Concussion in Sport in Zurich, outlines the following: Baseline testing; use of a tool such as the SCAT2 (Sport Concussion Assessment Tool) where an athlete is suspected of having been concussed; follow-up examination and monitoring by a medical professional trained in managing concussions — "This can be a general practitioner or a sports medicine doctor as long as they are properly trained, it need not be a neurologist or neurosurgeon," said Tator; graded "return to play," which includes complete rest until symptom free — complete rest means no physical exertion or mental stimulation including such things as reading or watching television, followed by a gradual increase in physical exertion while remaining symptom-free; and a retake of the baseline test where the score is within an allowable margin of the original baseline test.

SCAT was developed as a part of the Zurich Statement for use as an on-site diagnostic tool. It is produced in two forms, a short "pocket" version that takes about 5 to 10 minutes and a longer version which takes about 20 minutes. It is designed to be used in a wide variety of sports and can also

be used as a baseline test.

The most used baseline test is the ImPACT (Immediate Post Concussion Assessment and Cognitive Testing) test developed by Mark Lovell, Ph.D., and Joseph Maroon, M.D., of the University of Pittsburgh. ImPACT is an online, neurocognitive test that evaluates a number of factors including memory and reaction times.

With respect to baseline testing, Lovell indicated that a baseline for the individual athlete is best, but an average of all scores may be used as a baseline. Lovell explained that "using an average of all scores is a distant second best, particularly in professional athletes."

When referencing elite athletes at the pinnacle of their sports such as Formula One and NASCAR, these athletes perform at levels far above the mean, so using general population averages is less effective. Lovell said that for averages to have any validity in these elite athletes "it needs to be a comparison to that very specific group."

The risks of competing while suffering from a concussion are high. An athlete who suffers a second concussion while not fully recovered from the first risks more serious injury and even death. In most sports, the athlete is really only at risk to themselves; however, in motorsports, with anywhere from 15 to more than 40 other competitors, team members in the pits and fans in the seats, the risks of even a slight reduction in cognitive functioning and reaction times are far greater.

Tator stated, "yes, they will not have good judgment and their physical performance will be less than if they weren't concussed."

As knowledge continues to improve these best practices will be updated and amended and it will be up to the sanctioning bodies to take proactive steps to remain up to date.

The Fédération Internationale de l'Automobile is the governing body for Formula One. The FIA's head of Medical Affairs, Sandra Silveira Camargo, indicated that drivers will be assessed for concussions based on a number of factors, including "type of accident, initial on-track data, telemetry (G peak), clinical exams, ImPACT test with baseline values and possible imaging data."

Camargo declined to provide any additional information or answer any additional questions.

MotoGP and World Superbike, are sanctioned by the Fédération Internationale du Motocyclisme.

The FIM does not use baseline testing of individual athletes. Population averages are used as a comparative. No specific test is mandated. It is left to the individual rider's medical consultants to determine what baseline test to use post-concussion. Dr. David McManus, director, International Medical Commission of the FIA, acknowledges that top athletes may "potentially exceed these norms and indeed this is the subject of ongoing research and discussion." On-site tests to aid in diagnosing concussion, such as SCAT2, are encouraged but not mandated.

A rider who is diagnosed with a concussion is put under the care of a medical professional knowledgeable in concussions in their home country. That medical professional is charged with determining the manner in which the rider will be evaluated for return to competition. Reports from the medical professional are required to be presented to the chief medical officer and medical director of the next event the rider is to compete in after recovery for final clearance.

Riders are required, as a condition of their license, to self-report if they feel unwell or experience symptoms of concussion post-race or between

aces.

The FIM is in the process, said McManus, of updating its policies and expects to issue a revised, more comprehensive, concussion protocol in March.

The American Motorcyclist Ass'n is the sanctioning body for MotoGP and Supercross in the United States. Medical services for both series, including the establishment and implementation of concussion protocols, is handled by the Asterisk Mobile Medical Centre.

All riders are required to undergo a baseline ImPACT test. In the event of an accident where a concussion may be suspected, riders are examined by medical personnel and a SCAT2 test is given. In the event a concussion is diagnosed, riders are referred to a concussion expert in their home area for further follow-up and retesting.

Riders are not permitted to retake the ImPACT test until they are confirmed to be symptom free at rest. Once they are symptom free at rest and the result of a retake of the ImPACT test is back to baseline, riders are permitted to undergo a three-day graded exercise program. If the rider is symptom free at each stage, they are permitted to move to the next stage of increased exertion. At any point, if the rider begins to exhibit symptoms, the program stops and they must move back to the previous stage when symptom free.

Once the rider is symptom free at all levels of exertion, he or she can be cleared to return to competition. The final decision is made by the chief medical officer of the next event on the rider's schedule.

"All riders, mechanics and team managers have been provided educational material concerning concussions and the importance of prompt evaluation," according to Dr. Paul Reiman, medical adviser for the AMMC Concussion Program.

Set to merge with NASCAR's Grand-Am Rolex Series in 2014, the American Le Mans Series comes under the auspices of the International Motor Sports Ass'n.

IMSA requires ImPACT baseline tests for all drivers every other year, although the organization is evaluating that position and may change to annual baseline tests.

If a driver is suspected of having a concussion after an accident, he or she will retake the ImPACT test within 24 to 48 hours. If the result of this test does not match the baseline, the



STEVE ETHERINGTON PHOTO
RAINING DEBRIS: Fernando Alonso's Ferrari flies through the air as does a shower of debris during a crash at the Belgian Grand Prix in September.

driver is deemed unfit to drive. The driver must be symptom free at rest before being re-evaluated. The ImPACT test will be taken once the driver is free of symptoms and if the result is back to baseline and no new symptoms occur, the driver begins a graded exercise program. If the driver passes through this program without symptoms, he or she will be cleared to race.

"The exact process of additional testing and return to activity is left to the teams," according to Dr. George Paul of the IMSA medical staff.

Once diagnosed with a concussion, a driver is referred to a specialist for follow-up, monitoring and retesting.

IMSA doesn't use a SCAT2 or similar sideline test to aid in the diagnosis of concussion, instead it relies on the knowledge and feedback from its drivers, teams and track personnel. Drivers, team and track personnel are advised of what to look for and how to spot signs of concussion. Paul indicated "The threshold is very low to retest a driver," he continued that "thus far teams have been very forthcoming if a concern is suspected."

With respect to imaging, Paul said, "Concussions are a functional process not anatomical, at least not with standard imaging, as a result imaging is not part of the evaluation of concussion."

IndyCar mandates that all drivers complete an ImPACT baseline test

prior to their first race of the season. The SCAT2 test is used as an on-site tool to aid in diagnosing concussions. This test will be administered to drivers who exhibit physical symptoms of concussion or who, as a result of the type of accident, may be at greater risk of a concussion.

"All of our drivers wear tri-axial accelerometers in each of their earpieces, so we know what Gs their head experienced in a crash in real time," explained series medical director Dr. Michael Olinger.

Drivers and teams are educated on the symptoms associated with concussions and the risk of suffering a second concussion before the first is fully resolved and are encouraged to self-report in the event the onset of symptoms is delayed. Imaging is not used directly in the diagnosis of concussion.

For drivers who are diagnosed with a concussion, rest and a graded exercise program are used in determining when a driver will be permitted back in the car. When a driver is symptom-free, they are able to retake the ImPACT test. The results must be back to baseline to be allowed back on track. The final decision to allow a driver back in the car is made by Olinger.

NASCAR does not require baseline testing, nor does it mandate the use of an on-site diagnostic tool such as SCAT2. Tracey Judd, NASCAR's director of Racing Operations Communications, said, with respect to baseline testing, that NASCAR is "consistently reviewing its policies and procedures and to say that might be on the table would probably be accurate."

Speaking about SCAT2 specifically, Judd said, "That's a tool that was developed for use on an NFL sideline and is a tool that's designed for full-contact sports." She continued, "We feel with the experts we use and the tools they have available, the way that NASCAR policies and procedures are, are what we're comfortable with and confident in."

Not all drivers involved in an accident are required to be evaluated at the track care center. If the car is driven back to the garage, the driver is not required to be evaluated by medical personnel.

NASCAR relies on the doctors at the tracks' care centers and doctors a particular driver decides to consult with to determine how a concussion may be diagnosed and recovery managed. A driver suspected of having suffered a concussion is sent to the local hospital for further evaluation, which typically includes MRI or CT scans.

If a concussion is diagnosed, the driver is "required to be seen by a board certified neurologist or neurosurgeon that has a minimum of five years experience in dealing with sports-related head injuries," said Judd. Judd further explained: "That specialist who the driver chooses to work with determines if the driver can return to previous NASCAR activity without restriction."

For drivers who experience symptoms after the fact, it is largely an issue of self-reporting. Judd explained, "Local medical professionals are trained and know their area best and know the drivers well," but would not state that team or non-medical track personnel were advised of what signs to look for nor were they required to report a driver who exhibited symptoms of a concussion.

With respect to Grand-Am, Judd indicated, "They follow and look to NASCAR's policies and procedures in this area."

What is consistent among these sanctioning bodies is that there is a lack of consistency in how concussions are being handled.

Some are following the currently accepted best practices very closely and some are clearly not. Some are well informed and up to date, and some appear to be fairly un- or misinformed on best practices and diagnostic processes. ■



GINNY HEITHAUS PHOTO

POUNDING THE PAVEMENT: Cal Crutchlow crashes during preparations for last August's MotoGP race at Indianapolis Motor Speedway.