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PROFESSION

Doctors use Formula One pit crews as safety model

Hospitals are learning to translate the timing and synchronization of auto racing teams to the handoffs of patients from surgery to recovery.

By KEVIN B. O'REILLY, *amednews* staff. *Posted Oct. 4, 2010.*

First it was aviation, then the Toyota assembly line. Now physicians are looking to auto-racing pit crews for ways to improve health care quality and patient safety.

Hospitals in at least a dozen countries, including the U.S., are learning how to translate the split-second timing and near-perfect synchronization of Formula One pit crews to the high-risk handoffs of patients from surgery to recovery and intensive care. The racing crews can refuel a car and change all four tires in seven seconds, and no F1 driver has died at the wheel in a Grand Prix race since 1994.

The key lessons physicians, nurses and other health professionals can get from these well-honed teams is how to use briefings and checklists to prevent errors, apply technology to transfer key information and learn afterward by mining data, according to a recent study published in the British medical journal *Quality and Safety in Health Care*. The findings were based on structured interviews with the technical managers of nine F1 racing teams.

"In Formula One, they have checklists, databases, and they have well-defined processes for doing things, and we don't really have any of those things in health care," said Ken Catchpole, PhD, study lead author and senior postdoctoral scientist in the Quality, Reliability, Safety and Teamwork Unit at the Nuffield Dept. of Surgical Sciences at the University of Oxford in England.

"At the moment, we kind of say, 'Well, we do it this way.' Everybody thinks they know really what happens, but not everyone does," Catchpole said. "There is lots of individual variation that creeps into these things. Sometimes that's good, and it's responsive to individual patients. But often that creates these uncertainties that increase the opportunities for errors to happen."

Catchpole has helped physicians at London's Great Ormond Street Hospital for Children use F1 techniques to improve their handoff of pediatric heart surgery patients to intensive care, with results first published in the May 2007 issue of *Pediatric Anesthesia*. New protocols developed in response to video examination of pit stops and visits with F1 racing crews helped cut the duration of patient handoffs and reduced omissions of critical information and technical errors by 67%, the study showed.

Physicians in U.S. hospitals are catching on. The University of California, San Francisco, Medical Center's pediatric intensive care unit has implemented the Great Ormond Street model, as have physicians at Children's Hospital Boston.

"If you watch a Formula One team change tires, you'll see there's precision and absolute clarity about what people are doing," said Dr. Peter C. Laussen, chief of the division of cardiovascular care at Children's Hospital Boston, which adopted the pit crew approach two years ago.

"The other piece we take from this is situational awareness. There are four separate crews changing tires and another person refueling the car, but the driver is aware of all those events going on around him and you can see him watching so he doesn't pull away before things are ready and can see whether or not a complication is developing."

Transferring a patient from surgery to recovery poses many chances for mistakes, Dr. Laussen said.

"There are multiple conversations that may take place at one time and as a result people hear different things and are therefore not on the same page as to what the goal is in terms of management, or what to expect after the surgery," he said. "There's no closed loop of conversations. That leads to error both in decision-making and obviously in communication and important information is lost."

Dr. Laussen's teams care for infants who have had heart bypass surgeries and arrive from the operating room with critical problems that can worsen quickly.

Communication is key

The handoff process now is much more regimented, he said. The surgeon and anesthesiologist talk in turn about why the surgery was done and what happened in the operating room. They share any problems or concerns. The operating room nurse then discusses any family issues and what blood products are available.

The ICU attending physician summarizes what's been said and lays out the care plan. Before closing, he or she asks everyone in the room if any important information has been forgotten.

"Now we have a system for when the patient comes out of the operating room, and it happens every time without deviation and it's an absolute expectation now built within the culture of this place that that's how it's going to happen," Dr. Laussen said.

Experts leading the movement to learn from auto racing acknowledge that the analogy is inexact. But the great variation among patients makes well-defined protocols for handoffs that much more important.

"The way we treat people has to respond to the individual's needs," Oxford's Catchpole said.

"What that means is that we need to control the things we can control, as much as we can. ... Then, that makes the things you can't control -- the patient variability -- that much easier to deal with."

The print version of this content appeared in the Oct. 11 issue of *American Medical News*.

ADDITIONAL INFORMATION:**From pit stop to ICU**

Here are a few of the ways that physicians at hospitals in London, Boston, San Francisco and elsewhere have changed patient handoff protocols based on how Formula One pit crews operate.

LEADERSHIP

Formula One: The "lollipop man" coordinates pit stop

Old medical practice: Unclear who was in charge

New medical practice: Anesthesiologist given coordination responsibility, then transferred to intensivist when handoff ends

TASK SEQUENCE

Formula One: Clear rhythm, order to events

Old medical practice: Inconsistent and nonsequential

New medical practice: Three defined phases of equipment and technology handoff, information handoff, discussion and plan

CHECKLISTS

Formula One: Well-established culture of using checklists

Old medical practice: None

New medical practice: Checklist defined and used as admission note by receiving team

TRAINING

Formula One: Fanatical approach to training and repetition of pit stop

Old medical practice: No training existed

New medical practice: Protocol can be learned in 30 minutes; formal training is introduced and laminated training sheets detailing process is provided at bedside

Source: "Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality," *Pediatric Anesthesia*, May 2007 (www.ncbi.nlm.nih.gov/pubmed/17474955)

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"Patient handovers within the hospital: translating knowledge from motor racing to healthcare," *Quality & Safety in Health Care*, Aug. 19 (www.ncbi.nlm.nih.gov/pubmed/20558474)

"Patient handover from surgery to intensive care: using Formula 1 pit-stop and aviation models to improve safety and quality," *Pediatric Anesthesia*, May 2007 (www.ncbi.nlm.nih.gov/pubmed/17474955)

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FROM PIT STOP TO ICU			
Old medical practice		New medical practice	
Leadership	Formula 1: The "lollipop man"	Old medical practice: Unclear who was in charge	New medical practice: Anesthesiologist given coordination responsibility, then transferred to intensivist when handoff ends
Task sequence	Old medical practice: Clear rhythm, order to events	New medical practice: Three defined phases of equipment and technology handoff, information handoff, discussion and plan	
Checklist	Old medical practice: Inconsistent and nonsequential	New medical practice: Checklist defined and used as admission note by receiving team	
Training	Old medical practice: No training existed	New medical practice: Protocol can be learned in 30 minutes; formal training is introduced and laminated training sheets detailing process are provided at bedside	

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