

Clinical Care, HIT, and Mike Trout

By Barry P. Chaiken, MD, MPH

With men on second and third and two outs in the top of the ninth inning of game 7 of the 2017 World Series, Mike Trout of the Los Angeles Angels of Anaheim, arguably the best hitter in Major League baseball, walks to the plate at Citi Field to face Addison Reed, the Mets closer. A base hit scores two and puts the Angels up by one run. An out clinches the championship for the New York Metropolitan, something its fan base has yearned for since Buckner, the Red Sox, and 1986.

In a short 400 milliseconds, the time it takes an average pitch to leave the pitcher's hand and cross the plate, a batter must:

1. Use the first 75–100 milliseconds to process the windup and release of the pitch (in this time, the ball has traveled about 1/6 of the way towards the batter),

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2. At 175 milliseconds since pitch release, begin assessing the pitch to extract meaningful information from its velocity, spin, and trajectory, and
3. At 225 milliseconds since pitch release, decide to swing the bat, as it takes 25 milliseconds for

the brain to send a signal to the muscles, and the remaining 150 milliseconds for the muscles to move the bat as instructed.

A miscalculation by just seven milliseconds is the difference between hitting a ball fair or foul. For comparison, a blink of the eye takes about 150 milliseconds.

How does a Major League batter, no matter how athletically gifted, teach his body to hit a sphere just nine inches in circumference traveling at an initial velocity of over 95 miles per hour? And how does he learn to make a decision to swing in a time frame slightly longer than the blink of an eye?

Review, analysis, practice

To be a great hitter requires constant review, analysis, and practice to recognize, in the literal blink of an eye, the

characteristics of a pitch. Although the study of pitcher tendencies—types of pitches thrown and in what situations—can help a hitter anticipate what a pitch might be, it is seeing the pitch and reacting to it that overwhelmingly determines whether a batter swings successfully.

Very few reach the Major Leagues, and even fewer thrive for long on this professional stage. Success requires constant work to maintain the high, competitive level of functioning the sport demands.

Similarly, only through hard work does a hitter learn to recognize a pitch and have it fire neurons to swing the bat at the proper moment, speed, and location to make contact with the ball.

The decision to swing is quite different from what is considered normal decision-making, a thoughtful and methodical review of the facts and options. Hitters recognize a pattern—velocity, spin, and trajectory—and react to that pattern. Providing more information about the pitch (for example, “the pitch is thrown at 95 miles per hour, with a left-right spin, and a downward movement of 12 degrees from a point six feet off the ground”) is of no value, and in fact would only distract the hitter while at the plate. The hitting process occurs in the subconscious—this is the only way the decision can be made so quickly. Typical decision-making occurs in the conscious mind, therefore taking much more time.

Clinicians are hitters

Clinical decisions made by physicians mimic, in many ways, the processes batters use to hit a baseball. Everyday clinical care requires a high level of pattern recognition. Physicians use a patient's history, physical exam, and current diagnosis, combined with laboratory values and other tests, to determine the final diagnoses that paint a patient's condition.

From this clinical pattern, physicians use quick decision-making—much longer than baseball's 225 milliseconds, but usually just minutes—to decide the



proper next treatment steps for patients. The typical 10- to 15-minute patient visit does not allow for thorough review of all of a patient's medical data, so physicians seek the most easily accessible and valuable data, and react accordingly.

Like hitters, physicians develop their pattern recognition skills through hard work, including study and practice that gets honed through experience and its associated feedback of outcomes.

Decisions that deliver good outcomes for patients get reinforced, while bad outcomes drive physicians to reevaluate their pattern recognition and its resulting treatment plan. The competency exhibited by experienced clinicians stems from the gradual refinement of their pattern recognition ability, and how they link that pattern to an effective treatment plan.

Training pattern recognition

The length of time it takes to train a physician is directly correlated to the time it takes for that physician to experience enough clinical cases to learn how to quickly and accurately recognize the clinical pattern of a patient. While it may take a medical student one hour to complete a thorough review of systems, an experienced physician may be able to complete it in just 15 minutes.

Experienced physicians recognize a clinical pattern in the presenting patient and therefore know where to focus their efforts. Medical students, inexperienced and unable to understand what is important, complete their work in an unfocused and inefficient manner, thus taking more time to complete a review.

Lost in a sea

The advent of healthcare information technology, particularly electronic medical records (EMR), dramatically increased the amount of patient data presented to physicians. Yet, rather than focus on patient care, EMRs were originally designed to drive billing. This strongly incented all contributors to a patient's digital record to maximize documentation to optimize reimbursement.

A patient's EMR "chart" includes a large amount of data that provides little if any value to clinicians delivering care. In addition, the use of "copy and paste" functions bloats electronic records to such a degree that useful patient data often becomes lost in a sea of irrelevant or duplicative information.

With EMRs now widespread throughout care settings, attention is needed to modify how these systems deliver patient information to clinicians.

Flooding physicians with patient data only masks the important information they use with their well-developed pattern recognition capabilities to direct patient care.

The next generation of EMRs must synthesize the vast amount of medical data available on each patient and present to the physician the appropriate clinical pattern from which to determine the proper care plan.

This effort does not imply an expert system or artificial intelligence per se, but a reasonable methodology to identify key patient data elements for effective construction of representative clinical patterns. Additionally, these patterns must be presented efficiently to physicians so they can act effectively in treating patients. UX/UI (user experience/user interface) experts could provide much value in designing such a format.

Major League baseball uses multiple techniques to refine the skills of hitters so they can succeed when faced with a 95-mile-per-hour baseball. Informaticists must use the data contributed to EMRs and deliver it to clinicians so they can leverage it to provide more effective care. Today, EMRs do too much to disrupt patient care processes rather than enhance them. It's time for this to change. **I**

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