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Highmark's 'EQ Brain Performance' Leverages FDA Clearance and Game-Based Testing for a Wide Range of Markets

Dr. Sanjeev Sharma
Co-founder & CEO

Highmark Interactive

Contact:
CEOCFO Magazine
570-851-1745

Interview conducted by:
Lynn Fosse, Senior Editor
CEOCFO Magazine

CEOCFO: *Dr. Sharma, would you give us a little background on Highmark Interactive and EQ Brain Performance?*

Dr. Sharma: Highmark Interactive was founded in early 2017 with the goal of building technology that enabled individuals to assess their neurologic functional performance while being mobile, without having to apply any additional hardware (ie. wearable tech like helmets etc). When I went through my medical training, we were taught that we had a limited number or a set number of brain cells, and if you lost those cells they were gone. We now know that neuroplasticity, and the concepts around neuroplasticity, support that the brain is dynamic and continues to evolve and grow through life. We wanted to build a diagnostic tool that allowed individuals to see how their brain performed at a functional level. We wanted that testing to be engaging. We wanted it to be easy, so that all they needed was their mobile device and we wanted it to have the standard and credibility that comes with the device having an FDA clearance or a CE Mark. So all we had to do was fuse mobile gaming, advanced mathematics developing our algorithm, and information brain surgeons and neurologists can utilize to manage patients. If it was going to be easy, somebody would have already completed the task.

CEOCFO: *How did you go about creating your technology?*

Dr. Sharma: We wanted the interface to be engaging. We wanted it to be gamified, so we acquired a mobile gaming studio that had had success in building mobile games. We then interfaced with the different specialists; neurosurgeons, neurologists both nearby and internationally. Some of our experts were from Harvard and some from UCLA, and as far away as Queensland, Australia. Finally, we partnered with one of Canada's leading computer science universities, the University of Waterloo, to help build the algorithm to put all of this together. Therefore, it was a fusing of mobile game developers with high-end brain surgeons and neurologists, coupled with PhDs in mathematics and AI and algorithm design. It was not a natural fit for those three groups to be together, but it worked and we were able to build the algorithm, gamify the medical testing and eventually build the platform so that we could study it, prove that it works and take that data to the FDA.

CEOCFO: *How does it work? How does a patient use it?*

Dr. Sharma: We have six different product modules, so it depends on why the patient is using the particular module. If we focus on, for example, *EQ At Work*, the focus there is for the employer to ensure that the individual who is starting the day is fit for work; that there is no residual psychoactives or substances that might be lingering in a person's system, such as cannabis or opioids or all the other things that are either increasingly legal or we are dealing with them at an

epidemic level. The way the patient interface works with testing is they are playing different games. Although the games are fun and easy to play, such as swinging to hit a pitch for a homerun, the science behind that particular game is testing reaction time. In another game, you are moving a hockey player through pilons on skates, but what we are actually testing is executive function. There is another game where you are trying to throw a football through a tire while the individual is actually standing, holding their mobile device in different balance poses; hence an assessment of balance. The more stable their balance is, the tighter the spiral is on that ball that is thrown through the tire. That whole process takes about 3-4 minutes, and it allows employers, from line managers to senior HR admin to the occupational health and safety reps, to ensure all their workers, especially in safety sensitive roles, are "fit" mentally for work. The goal is not to use the testing as a punitive tool; but to ensure that workers get home safely to their families and the employers deliver the services they've committed to, while not placing the public in harm's way inadvertently. It also ensures enhanced employee performance and productivity at work. Perhaps on the day your company is switching to a new platform, the lead IT worker is "off". Instead of losing millions of dollars in a failed go-live, the lead IT worker is pulled off the project for a day, until he/she is back to themselves the next day.

"On the back of the FDA clearance, we have begun commercializing all six modules. *EQ at Work* is about to be piloted by a number of large corporations. *EQ Active* is being used by athletes, schools, leagues and clinicians. People have been very excited to be able to use their mobile device, whether it is an Android or Apple phone or tablet, and have the power of a medical device capturing information and sharing that information with the people that need to know, whether it is their coaches, trainers, clinicians, family members or employers."- Dr. Sanjeev Sharma

CEOFCO: *Is there a set measurement for these different aspects, like range or size? Is there a time factor? How do you measure? Is it different for different people or age groups?*

Dr. Sharma: There definitely is. We call it normative data. If you are a thirteen-year-old female, your balance scores will be different than if you are a seventy-five-year-old male, so we absolutely have reference ranges as far as where you are with respect to age-related controls. If you are a fifteen-year-old male doing the test, we will compare your scores to other fifteen to sixteen-year-old males and see where you are on the bell curve. Are you at the fiftieth percentile, are you at the ninety-fifth percentile, or are you in the lowest tenth percentile? That is on a single test. What we believe is that the best understanding of any one individual is in doing a number of tests over time. That is because we all have good days and bad days; days where we feel like our brains are clearer and sharper and we are able to really be on the mark, and other days where we are jet lagged, or we did not sleep well because we have a cough or a cold, or we are a little bit sluggish. That variability is what we call your normal healthy equilibrium. That is where EQ comes from, because we realize that everyone has a normal healthy equilibrium as far as their mental status and their cognitive status. However, when those scores change materially for that particular individual, we know suspect something is wrong with the individual.

Once an individual has done three check-ins, we have the ability, with high precision, to predict where their next scores should be within a range on the fourth check-in. That is where the algorithm comes in. If there is a marked change, that is a red flag for the individual to give them notice that something is changing. *EQ Vitality*, for example, is designed for the seniors market. That might be the first tip-off that the bad hip that individual has been complaining about is now impacting their ability to walk and their ability to balance and, if we do not intervene now, in three or six or nine months that bad hip is going to lead to a fall. We know that seniors fall almost once every twenty minutes. We know that once they have a fall there is significant morbidity and mortality over the next twelve months. Therefore, we are trying to give people information that is functional about their neurologic status such that they can compare themselves to themselves. That really is the best way to compare.

CEOFCO: *Do people want this information?*

Dr. Sharma: Yes.

CEOFCO: *Do they have to be nudged into wanting it?*

Dr. Sharma: No. The hardest thing about medical testing is that it is usually anxiety provoking, which could cause people to be sort of reluctant to review the testing. Much of that seems to get dissipated when they realize that all they are doing is playing games and they are collecting information about themselves. Children of parents who are older

absolutely want to know, at least in my experience. They wonder, "is everything okay with my mother or father's memory, is their memory stable, is their memory changing? It seems like they are more forgetful than they used to be." We now can answer those questions, even if the parent and child live on opposite sides of the planet. For the seniors market, *EQ Vitality* provides both qualitative and quantitative data to the patient, their families, and the caregivers. How better to optimize positive outcomes, and detect early issues, with the requirements being a mobile phone or tablet?

Mental health issues can be detected because scores change. If you have a family member or a friend or an employee who suffers some mental health issues, as their scores change that might be early warnings sign that, "Uh oh, this might be another relapse of their mental health condition." Therefore, there are many different individuals who want this information, either for themselves or for their families or for their employees, so they can be proactive.

CEOFCO: *What has been the interest from the medical community?*

Dr. Sharma: The medical community has struggled to have a clear tool to diagnose concussion, in particular. Right now, it is still fairly subjective and there is not a single diagnostic test that is available to be utilized. When we built EQ, we looked at the market and we saw that there were other vendors that were doing neurologic testing, but they were only testing one aspect of what the brain manages. Or, to do the testing, the individual has to buy a whole bunch of peripherals, ranging from expensive balance plates to stand on, to clipping electrodes to a person's scalp etc.

We wanted this to be as easy as possible for the individual. That would give the clinician, when the person showed up at the doctor's office, both qualitative information and quantitative objective information. The more information you have about your patient and how your patient is functioning day to day, the easier it is for the clinician to either design a treatment plan, a rehab plan or come up with a diagnostic decision. Therefore, we have been working with some of the top functional neurologists. For the first time, clinicians have insight into how a particular patient functions day to day.

Clinicians do not have visibility about how that patient functions other than the fifteen or thirty minutes that they are in their office. That is what EQ gives the clinician. It gives them more information to make decisions around treatments or rehab, or return to play or return to work, and all of the other issues that might happen around neurologic injury or neurologic impairment. Currently EQ modules are being used by hundreds of clinics in 30 countries, translated into a dozen languages.

CEOFCO: *Is there consensus on the scale? Is what you would expect in balance for someone seventy different from that of a fourteen-year-old? Are there other industry standards or have you come up with them based on your research?*

Dr. Sharma: Many of our tests have been used for years but were used in a 'paper and pencil' format and used in a way that painted a 'static picture' of an individual. Our testing, because of its gamification, enables us to gather more test data points, which now gives us more of a 'streaming video' understanding of the patient. Therefore, for those tests that have tremendous amounts of consensus supporting the scale of results. For other tests, such as how we calculate someone's balance, we reviewed what was happening in the industry and thought that there was a potentially better way of assessing an individual's balance and that is what we brought forth.

CEOFCO: *Is EQ Performance available today? Where do you stand in commercialization?*

Dr. Sharma: We started commercialization after receiving the FDA clearance. We had been laying the groundwork hoping that we would receive that, throughout the end of summer/fall in 2019, which is what happened. On the back of the FDA clearance, we have begun commercializing all six modules. *EQ at Work* is about to be piloted by a number of large corporations. *EQ Active* is being used by athletes, schools, leagues and clinicians. People have been very excited to be able to use their mobile device, whether it is an Android or Apple phone or tablet, and have the power of a medical device capturing information and sharing that information with the people that need to know, whether it is their coaches, trainers, clinicians, family members or employers. Thus far, six months into commercialization, we have had very positive feedback and a very robust uptake.

CEOFCO: *Are you seeking funding, investment or partnerships as you move forward?*

Dr. Sharma: The short answer is yes. We are about to announce a partnership with a very large software company. We are in the midst of finalizing a partnership with another large insurance company. Therefore, we are looking to work with different channel partners. The software is like Lego, enabling us to create powerfully focused modules for very specific

verticals. We're waiting on IRB approval, which all studies require, to follow our announcement late last year that we are beginning to formally study whether EQ has not just diagnostic value, but also a therapeutic benefit. Anecdotally, we have some evidence for that, but we want to actually do studies to see that if that in fact is the case.

CEO CFO: *How do you stay focused when there is so much possibility and so many different areas where EQ can be effective?*

Dr. Sharma: That is a great question! I have a great leadership team that is always focused on their milestones, which dovetail into corporate requirements. Hence, many of the opportunities we knew were coming. I have great partners and we sort of laid all the opportunities out in front of us as we finished 2019 and started 2020. Then it is a discussion and a debate around which ones have the greatest return for effort, which ones have the lowest cost of customer acquisition, and where are we truly differentiating ourselves along each vertical. Once we had that discussion finalized and we had made decisions, then it is the function of being disciplined, ensuring that you are following up on one or two top priorities initially, because if you do not do those right you will not get to your third and fourth priority. Therefore, we have clarity internally with respect to where we want our focus to be for the first quarter and the second quarter. As that happens, then it is easy to migrate into what we would like to do in our third and fourth quarters, based on all of these different opportunities and competing interests, if you will.

CEO CFO: *What has changed in your approach over time? What have you realized as you have been through this development phase?*

Dr. Sharma: That is a great question. When we started we were very much focused on concussions. Part of that was that I was still working clinically in the Emergency Room and I struggled personally with the lack of clear diagnostic criteria or the lack of a clear diagnostic test. I have kids in sports and different athletics, so you worry when they get injured. That was the initial driver. The more we built the tech, the more we realized that what we have actually built is a tool to measure the brain and how it translates into real world functions; how you walk, do you remember where you parked your car, is your reaction time, and executive function quick enough that you could actually work as an air traffic controller etc.

It was bit of an "a-ha" moment when we realized we could leverage the core technology while still offering modules for very specific patients and use cases. We realized that we have the ability to create different modules that are required in different verticals. *EQ at Work* is very much about ensuring that the employer has something objective that they can use to ensure that employees are fit for work, both from a mental health perspective and from a potential exposure to psychoactives or substances, especially given the opioid epidemic that we are dealing with and the increasing legalization of cannabis. That shift from being focused on concussion to being focused on, "let us look at the brain and measure performance and function". It was the realization that this could actually impact a much greater market and a much greater population, and the use cases were not just limited to someone who had suffered head trauma. The use cases now entail anything to do with what impacts of affects the brain.