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Healthcare and Artificial Intelligence

Namaskar!

I convey greetings on behalf of Ambassador Navtej Sarna who couldn't be here today. I felicitate the Dr. Gautam Samadder and his leadership team for shepherding AAPI during the last year and I congratulate Dr. Naresh Parikh and his new leadership team who will take over today. We in the Consulate have a most productive and intense relationship with AAPI, both at the organizational level as well as personal level. Many of your members are my personal friends. I deeply value the organization as well its members. You are the torch bearers of the all that is good, nice, brilliant and positive that the Indian Community offer to the United States. We value your contributions to the United States, to India and to the betterment of India-US ties. Having said that I wish to know seek your indulgence on something which has set me thinking in the past several months. It is something which has gained intensity and presence very recently and is also

poised to disrupt the work of physicians like those gathered here.

Disruptive forces are at work. Whether it is the Economy, Politics, Geopolitics or Healthcare. The good old days are now gone, mostly for the better. One such disruptive force is now all set to hit the Healthcare industry and i.e. artificial intelligence or AI. It will affect both the qualitative and quantitative aspect of healthcare.

Healthcare today—not just in India but pretty much the world over—is riddled with inefficiencies, and it's easy to complain about them. However, we are poised for change, and technology has the potential to bridge the chasm between quality care and the many that need it but currently can't access or afford that care. Also AI may be the key to make healthcare more inclusive. Today despite all attempts healthcare seems to be the right of only the rich.

In India, the Government has announced this year the launch of Ayushman Bharat, National Health Protection Scheme which will cover 100 million poor and vulnerable families which means coverage to 500 million persons up to Rs 5 lakhs or around US\$ 8500 per year for secondary and tertiary care hospitalization. Benefits of the scheme are portable within the country. With such ambitions in place, how will we achieve the goals without resort to latest technologies. According to the *Indian Journal of Public Health*, September 2017, India had just 4.8 practising doctors per 10,000 population. While this is expected to grow to 6.9 doctors per 10,000 people by 2030, the minimum doctor-to-patient ratio recommended by the WHO is 1:1000. So even if the infrastructure is put in place

by Ayushman Bharat, what is the way to obtain the adequate number of personnel. Can we have more doctors? That is easier said than done. Even if we focus on quantity over quality, churning out doctors in droves will not guarantee better quality medical services in India. Besides, with most graduates preferring lucrative urban locations or migrating abroad such as to the US, many Indians still find themselves at great physical or economic distance from quality healthcare.

Essentially, what we need is to fill the gap between the needs of the plenty and the services of the few. AI has the capability to enable solutions that form the critical middle layer of access—making healthcare accessible and affordable to a large population base at the same quality level irrespective of people’s social standing. The key to success of Ayushman Bharat will be judicious use of AI to ensure efficiencies and channelize resources.

In reality, the biggest difference between physicians is not their level of intelligence, but (a) how they approach patient problems and (b) the health systems that support them. And because "a" and "b" combine to create wide variations in clinical outcomes nationwide, AI offers great hope for the future particularly in developing countries such as India where we do not lack intelligent doctors but the ecosystem supporting them is inadequate. With AI we can easily build a supporting ecosystem. Since technology can provide the middle layer bridge, AI-led systems have the potential to take healthcare to people irrespective of their location and affordability. People who live in rural or far-flung locations no longer have to be deprived of the up-

to-date care offered at the nerve-centres of medical research. The tech increases the accessibility manifold. We thus have an opportunity to democratize healthcare for our 1.3 billion people.

Not only in India, there is also crying need for healthcare innovation in the US. According to a recent study by Accenture, when combined, key clinical health AI applications can potentially create \$150 billion in annual savings for the United States healthcare economy by 2026. Growth in the AI health market is expected to reach \$6.6 billion by 2021—that's a compound annual growth rate of 40 %. In just the next 5 years, the health AI market will grow more than 10 times. Growth is already accelerating, as the number of healthcare-focused AI deals went up from less than 20 in 2012, to nearly 70 by mid-2016. Acquisitions of AI startups are rapidly increasing while the health AI market is set to register an explosive CAGR of 40% through 2021.

Though the field of artificial intelligence (AI) has been around since 1956, it has made precious few contributions to medical practice. Only recently has the hype of machine-based learning begun to merge with reality. Startups and tech firms have hopped all aboard the AI hype wagon, promising a host of sophisticated new solutions from nursebots to “AInsurance” (insurance powered by AI) to AI wearables for the elderly, to name a few. Most are interesting but not transformative. In general, they are algorithmic and not true machine-learning approaches. Nearly all have failed to move the needle on quality

outcomes or life expectancy. If computer speeds double another five times over the next 10 years, machine-learning tools and inexpensive diagnostic software could soon become as essential to physicians as the stethoscope was in the past.

One can expect entrepreneurs and businesses will continue to invest in AI applications, and hype them more and more. Indeed, machine learning has the potential to take medicine far beyond what it's capable of today. Deep learning will catapult American healthcare into the future – helping to clarify the best care approaches, creating new approaches for diagnosing and treating hundreds of medical problems, and measuring doctor adherence without the faulty biases of the human mind. These kinds of advances will come sooner to medical organizations that are integrated, capitated and technology enabled. Organizations will move the curve from embracing algorithmic solutions on smartphones or tablets first, followed by pattern recognition software and, finally, machine-generated best practices for individual patients.

Unlike legacy technologies that are only algorithms / tools that complement a human, health AI today can truly augment human activity—taking over tasks that range from medical imaging to risk analysis to diagnosing health conditions.

AI is becoming the new Operating System in health. Let us see how AI is set to impact our health in the coming years. Machine learning relies on neural networks allowing computers to simulate and even expand on the way the

human mind processes data. As a result, not even the programmers can be sure how their computer programs will derive solutions. An AI variant, known as “deep learning,” allows software to recognize patterns in distinct layers. In healthcare, this mechanism is becoming increasingly useful. Because each neural-network layer operates both independently and in concert – separating aspects such as color, size and shape before integrating the outcomes – these newer visual tools hold the promise of transforming diagnostic medicine and can even search for cancer at the individual cell level.

In healthcare today, the most commonly used “AI” applications are algorithmic: evidence-based approaches programmed by researchers and clinicians. When humans embed known data into algorithms, computers can extract information and apply it to a problem. Take cancer treatment, for example. Using consensus algorithms from experts in the field, along with the data that oncologists enter into a medical record (i.e., a patient’s age, genetics, cancer staging and associated medical problems), a computer can review dozens, sometimes hundreds, of established treatment alternatives and recommend the most appropriate combination of chemotherapy drugs for a patient. A very good example is the work done by Dr. Gabriel Escobar and his colleagues in The Permanente Medical Group. The team’s research centered on one of the most important populations in any hospital: patients in a medical or surgical unit who will experience a deterioration in clinical status and be transferred to the ICU.

Though these patients receive intensive care for an acute event, and seemingly return to their prior health status, they are three to four times more likely to die than if a physician had intervened and prevented the deterioration in the first place. This team compiled data from 650,000 hospitalized patients, 20,000 of whom required this type of ICU transfer. The team then created a predictive analytic model to identify which hospitalized patients today are most likely to end up in the ICU tomorrow. They then embedded the algorithm into a computer system, which continuously monitors the health status of all hospitalized patients. Finally, they designed alerts to notify physicians whenever a patient is deemed “at risk.” With this information, the doctors can intervene in advance of a major complication and save hundreds more lives each year.

To appreciate the potential of visual pattern recognition in medical care, one must understand how often the human eye fails even the best clinicians. Studies show that 50% to 63% of U.S. women who get regular mammograms over 10 years will receive at least one test result that wrongly indicates the possibility of cancer, thus requiring additional testing and, sometimes, unnecessary procedures. As much as one-third of the time, two or more radiologists looking at the same mammography will disagree on their interpretation of the results. Visual pattern recognition software, which can store and compare tens of thousands of images while using the same heuristic techniques as humans, is estimated to be 5% to 10% more accurate than the average physician. The accuracy gap

between the human and digital eye is expected to widen further, and soon. As machines become more powerful and deep-learning approaches gain traction, they will continue to advance.

Another advantage of AI is the ability of natural-language processing. This allows review thousands of comprehensive electronic medical records and elucidate the best steps for evaluating and managing patients with multiple illnesses. All over the world 300 billion books of health care data are generated every year. And 60 trillion images are generated and shortage of 12.9 mn health care workers. Isn't the application of AI clear like water?

Yet another use of AI is using computers to watch (and learn from) doctors at work. In San Francisco, Adrian Aoun is using AI to explore how machines can learn from skilled clinicians in real-time. Rather than extracting and analyzing data retrospectively (after doctors populate their medical records), Aoun's primary care startup Forward is using AI to follow what doctors do, step-by-step. With touch-screen data entry and voice recognition, Forward's computers record and analyze how the best physicians achieve superior outcomes. The results benefit their colleagues and their patients.

If all physicians matched the performance of the top 20% nationwide, patient deaths from cancer, infection and cardiovascular disease would decrease by the hundreds of thousands each year.

Some say, the biggest barrier to AI in healthcare isn't mathematics. Rather, it's a medical culture that values doctor intuition over evidence-based solutions. Physicians, just like other professionals value their independence and hate being told what to do. Getting them comfortable with the idea of a machine looking over their shoulder as they practice will prove very difficult in years to come.

Over time, patients will be able to use a variety of AI tools to care for themselves, just as they manage so many other aspects of their lives today. But sometime in the future – AI will disrupt healthcare as we know it. Of that we can be sure. AI is not an innovation in the future. —it's here. It's in our call centers, our homes and now, in our healthcare. Those who seize the AI opportunity and embrace these applications to deliver high-quality, cost-effective care will be the ones to leapfrog competitors. As AI continues to become more prevalent and adoption flourishes, healthcare organizations must enhance their underlying structure to be positioned to take full advantage of new AI capabilities. I propose AAPI deal with AI and Healthcare more comprehensively in the next Convention.

Thanks for your patience. Jai Hind.