



## ENTERING THE IN SILICO ERA

**The healthcare industry needs solutions now. The world requires rapid-fire innovation to treat an aging population, reduce healthcare costs and ensure the reliability of treatments. Medical and pharmaceutical leaders are widely adopting engineering simulation to create significant opportunities from these challenges.**

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**I**nnovation in healthcare is not just a question of business; often it is a matter of life and death. Medical and pharmaceutical companies must turn a profit, but they also have an ethical duty to improve lives — addressing common chronic illnesses and providing effective treatments for rare conditions — no matter the lack of profitability. Healthcare companies, therefore, face the dilemma of how to minimize cost and maximize efficiency.

Good healthcare should be the right of every person on Earth, but, as consumers, we expect healthcare costs to be as low as possible. The combination of these expectations with the skyrocketing cost of healthcare places huge pressure on companies to quickly come up with affordable but reliable and safe solutions. A technology shift is needed to ramp up medical research while slashing costs.

Medical and pharmaceutical companies face another quandary: They could save or improve millions of lives with one device or drug, but if a single patient's life could be endangered, companies could face plummeting stocks, fines, potential litigation and bad press. This need for extreme safety — far beyond the tolerance in any other industry — requires organizations to perform a delicate balancing act to provide inexpensive solutions.

To provide safe, reliable and cost-effective medical solutions, consumers and the medical field alike are turning to treatments that are personalized, participative, predictive and preventive, called P4 medicine.

This approach recognizes human variability, distinctions between individual patients, and the need for each of us to listen to our bodies to detect early signs of disease or distress. It considers that researchers must predict how medical conditions and diseases evolve so they can prevent pathology; it incorporates the use of minimally invasive actions that reduce the impact and cost of treatment. P4 medicine won't be possible without huge sets of data and the ability to continually monitor key parameters for each patient. To compile, manage and interpret such big data, researchers need computer models and simulation (CM&S)

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that describe healthy and diseased states in humans, which is also known as in silico medicine. This groundbreaking technology properly captures the vital conditions within and surrounding implantable or wearable devices, including their sensors and monitors; shares data with other devices, doctors and/or patients; and suggests action plans that will bring the patient's body back to a more healthy state.

Combining fluid, structure and electrical physics that drive the human body — a body that now interacts more than ever with the connected devices that constitute the medical IoT — calls for advanced solutions in the healthcare field. At ANSYS, researchers progressively create and develop technologies to provide the medical and pharmaceutical worlds with a platform that allows development of a virtual physiological human (VPH).

New concepts now can be tested on large groups of virtual patients in very early stages of product and treatment development. By modeling the entire human body using a systems approach, healthcare companies can accurately predict the behavior of their solution for a wide range of human conditions and activities. The in silico revolution, in turn, will change the rules of the healthcare world, just like the in vivo and in vitro revolutions did centuries ago. ▲