Now that we are solidly into 2015, we should take some time to reflect on a recent special silver anniversary and contemplate what this means for health and healthcare in the next few years. The birthday of the Web is often cited as March 12, 1989.1 On that date, Sir Tim Berners-Lee produced a document that became the foundation for the Web.

Back then, Berners-Lee was “a young software consultant for CERN, a large physics lab in Geneva with over 5,000 scientists, many working in remote offices around the world.”1 Berners-Lee was hampered in his research by the challenges posed by the company’s multiple global offices. “He wrote a proposal for ‘an information management’ system to efficiently link research and documents across countries” and time zones.1 He set about to write the code for the World Wide Web and released it on Christmas Day 19901 (in my view, the real anniversary!), thereby launching his creation—the Web—which was originally called Mesh.1

(Please note that experts, even those at the Pew Research Center’s Internet and American Life Project, use the terms Web and Internet interchangeably, but these are not the same.1 The Internet facilitates the exchange of information, serving as the transport mechanism for content. Web content is one way to make information available for viewing.)

Although we can all extol the virtues of Amazon, Google, Facebook, and the like, what may be some of the important medically related advances that we can tie to the anniversary of the Internet in the next few years?

Many experts believe that the $3-billion effort to decode the human genome could not have taken place without the existence of the Internet, which enabled scientists to share gigantic data sets as they attempted to sequence the entire genome. Without that instant capability to compare their progress worldwide, it might have taken many more decades.

Gene sequencing is becoming routine; it can be done quickly, in large numbers, and relatively inexpensively. As reported in the Economist in January 1, 2015, “a new gene-sequencing machine developed by Illumina, a San Diego–based company, can mint a genome every 25 minutes.”2 According to Illumina President Francis de-Souza, “the number of whole genomes sequenced will double in 2015.”2 In 2014, 229,000 whole genomes were sequenced; in 2015, we will exceed 422,000, and are predicted to reach 952,000 by 2016.2

This silver anniversary is, therefore, directly connected to some science fiction–like benefits in the next 2 years. For example, “the earliest beneficiaries of cheap, fast sequencing will be pregnant women. Prenatal diagnosis is about to undergo a dramatic change, as sequencing can detect fetal abnormalities in maternal blood samples. This does away with the need for invasive (and potentially harmful) tests for disorders such as Down’s Syndrome. Mr deSouza says that in two to three years non-invasive tests will become the norm for pregnancies of average risk, and within two to three years babies will be sequenced at birth.”2

He further claims that “it will also become routine to sequence the genomes of tumours,” and that within a decade such sequencing will make cancer a chronic disease.2

Lee Rainie, Director of the Pew Internet Project, contends that “in the next 10 years, we’ll wear the Internet. We’ll walk into rooms that are connected rooms. We’ll walk down streets that are full of connected devices. We’ll drive in the Internet. It will be so embedded in our lives that we’ll be less and less aware of it. Like electricity, we’ll only notice it when it’s not working.”1 This notion of the “Internet of Things” is now widely regarded as the most likely scenario to describe the maturation of the Web.1

From a healthcare perspective, this “Internet of Things” will enable us to personally tailor our diet and exercise regimens, test our urine and feces through Web-enabled laboratory devices, and enable physicians to target drugs with a laser beam–like focus, having fully analyzed a patient-specific genome.

Some experts also believe we will see an explosion in wearable devices that will provide early detection for disease risks, not just the disease itself. “We may literally be able to adjust both medications and lifestyle changes on a day-to-day basis, thus enormously magnifying the effectiveness of an ever more understaffed medical delivery system.”1

More than 1600 experts participate regularly in the
Pew research regarding the influence of the Internet on the life of Americans. These prognosticators also believe that dramatic advances in robotics and telemedicine are just around the corner. For example, they see that some chronically ill or elderly patients will be released from healthcare institutions back to their home with a kit of sensors that home nurses can use. Others believe that the drugstore and other cliniclike settings will house “booths that function as remote examining, treatment and simple surgery rooms,” all because of the “Internet of Things.”

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The Pew researchers also note that tests are under way, in our country and around the world, “to achieve network speeds that are 50-100 times faster than today’s average high-speed connection.” This speed, and its increase in bandwidth, “will play the same kind of transformational role in reshaping society that railroads and freeways played in our past.”

I am fascinated by the possibilities beyond the silver anniversary of the Internet. Imagine what practicing medicine will be like for one of my twin daughters, now an intern in a Medicine training program, 25 years from now! Her silver anniversary is hard to visualize today. Increasing bandwidth, genome sequencing in 25 minutes for less than $1000, targeted drug therapy, the Internet of Things, and complete patient engagement in their personal care, are well under way right now.

To learn more about the Pew study, I recommend that you visit pewresearch.org/web25. Take a look at some of the reports at this site, including the Web25, Digital Life in 2025, and the Internet of Things. I am curious as to how you may view digital life in 2015 and beyond, and as always, I am interested in your views. You can reach me at david.nash@jefferson.edu.

References