

Knowledge Management in Healthcare and Life Sciences

IN THE AGE OF OBSERVATIONAL OUTCOMES,
SKYROCKETING HEALTHCARE COSTS AND PERSONALIZED
MEDICINE, APPLIED KNOWLEDGE IMPACTS EVERY ASPECT
OF THE INDUSTRY.

LIFE IS BETTER TODAY THAN ANY TIME IN HISTORY

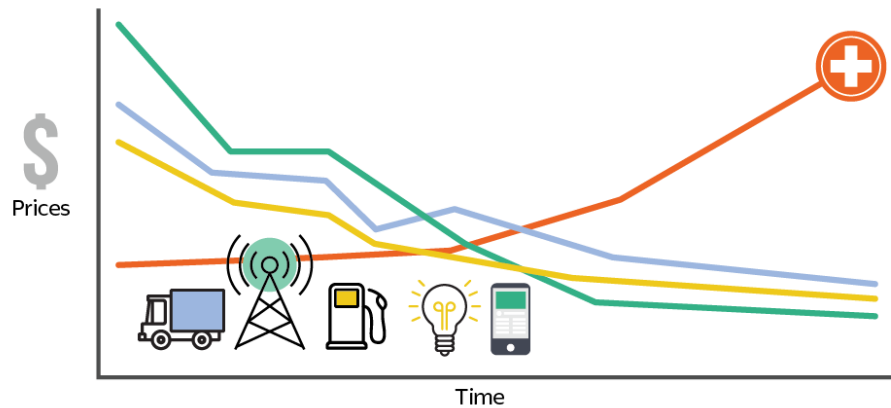
“Even allowing for the hundreds of millions of people who still live in abject poverty, disease and want, this generation of human beings has access to more calories, watts, lumen -hours, square feet, gigabytes, megahertz, light-years, nanometers, bushels per acre, miles per gallon, food miles, air miles, and of course dollars than any that went before.”ⁱ Life expectancy in England in 1800 was a mere 40 years, a number that has nearly doubled. Of today’s Americans designated as poor, 99% have electricity, running water, flush toilets, and a refrigerator. Moreover, 95% have a television, 88% a telephone, 71% a car, and 70% air conditioning. Cornelius Vanderbilt, one of the wealthiest Americans of the 19th century had none of these .

AND NECESSITIES ARE LESS COSTLY...

Another way to look at the evolution of prosperity is to consider the amount of labor required to pay for a resource; for example, an hour of reading light (at average wages producing the light of an 18 watt compact fluorescent bulb). In the 1800’s, it took six hours of work to pay for an hour’s light from a tallow candle. Today, it requires only one half a second’s worth of wages. In ancient Babylon in 1750 BC it would have required 50 hours of labor. The change from 6 hours of labor to ½ second works out to a 43,200-fold improvement.

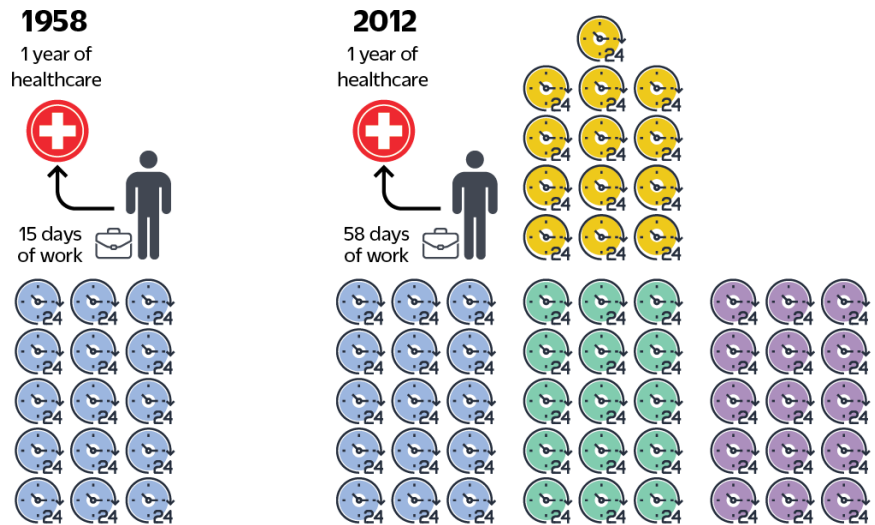
From the variety of manufactured goods available in a major city (10 billion in London or New York) to the cost of transportation and telecommunications (a 3-minute call from NY to Los Angeles cost 90 hours of work in 1910 versus less than 2 minutes in 2011 – today the marginal costs are near zero with internet calls). The price of the computing capacity in a pocket calculator in 2000 would have cost a lifetime of wages in 1975. Electricity, clothing, food, transportation and goods of all sorts are cheaper and of better quality today.

Health care costs have skyrocketed to nearly one-fifth of GDP...



1 ...EXCEPT FOR HEALTHCARE (AND EDUCATION)

But not every resource for consumers has followed this trajectory. Healthcare and education are among the few things that cost more in terms of hours worked today than they did in the 1950's. Health care has skyrocketed to nearly one-fifth of GDP, according to the Centers for Medicare and Medicaid--roughly equal the GDP accounted for by housing. To continue the comparison with work time required to pay for a resource, according to an article in Forbes, "In 1958, per capita health expenditures were \$134 which included government or private health insurers. A worker earning the average wage in 1958 (\$1.98) would



have had to work 118 hours—nearly 15 days—to cover this expense. By 2012, per capita health spending had climbed to \$8,953. At the average wage, a typical worker would have to work 467 hours—about 58 days” .

WHY IS HEALTHCARE DIFFERENT?

There are many reasons for this increase. Healthcare is vastly different today than it was in the 1950’s, of course. Back then, the tools available to the medical profession were much more limited, and getting cancer often amounted to a death sentence. Now, enormous numbers of new tools, treatments, drugs, procedures, technologies and specializations are available to the disciplines that comprise modern healthcare. Outcomes for virtually every disease are greatly improved. Still, all of society has similarly evolved in complexity and capabilities, so why is health care different?

Several key factors have worked against health care following the same dramatic cost-benefit improvement as have other areas of society:

Factors affecting health care management and costs

1. Healthcare is more complex than providing services such as telecommunications or products developed with advanced manufacturing techniques, because it involves the intersection of many different disciplines, technologies and specialties. For example, drug research requires immense resources over many

years and once those drugs reach the market, the costs are recovered as added healthcare costs. The financial side of health care has introduced many new costs, with mind bogglingly complex payment and reimbursement structures. Technical complexities have exacerbated the challenges. Inefficiencies stemming from inconsistent data formats, incompatible system architectures, and complex scientific terminology and standards become magnified as these inefficiencies build on one another.

2. Alongside medical treatments from advances in pharmaceuticals, are the surgical methods and technologies combined with imaging, testing and diagnostic tools. The explosion of testing and diagnostic capabilities and tools with medical and surgical treatments means added costs and more complex diagnoses and protocols.
3. In comparison to other industries that are highly competitive, the cost of managing healthcare transactions has not dropped as far and as fast as other industries such as motor vehicle policies and claims or retail transactions.
4. Many social and emotional issues arise regarding one's health and the health of loved ones. The greatest costs are incurred in the final stages of illness – in many cases only delaying the inevitable by a matter of days. But who can deny life saving treatment to a loved one? Personalization of medicine is not just about matching the treatment to your DNA, but also to your personality and emotional needs. Some people feel strongly about seeing the same doctor every time. Others would go to a walk-in clinic and be perfectly happy. Poor health habits that lead to chronic conditions (drinking, smoking, lack of exercise, unhealthy diet) are primarily driven by emotional and behavioral factors (with social and economic components) and lack of compliance with treatment for chronic conditions leads to costs that cascade throughout society.
5. Finally, people place a high priority on their health, and to the extent that they are able, they prioritize medical care. Witness the emergence of “concierge care” and places like David Drew Clinic that offer high octane screening and recommendations. The upside of the explosion in testing and diagnostic technologies lies in the enormous amounts of data that these technologies produce. The potential for using big data and machine learning to analyze outcomes is a powerful tool for evidence-based medicine.



THE ROLE OF KNOWLEDGE MANAGEMENT

THE ROLE OF KNOWLEDGE MANAGEMENT (KM)

Science is knowledge: Facilitating the access, sharing, dissemination and processing of scientific and clinical knowledge is core to effectively using resources to make progress in the field. Healthcare is applied life sciences. KM approaches can reduce the organizational friction to knowledge flows and speed discovery, application and widespread implementation of new approaches for preventing and treating disease.

Fostering collaboration: Discovery of new approaches is an act of knowledge creation. Knowledge creation is an output of collaboration. KM tools and techniques foster collaboration and discovery. Patient care is increasingly holistic and multi-disciplinary requiring mechanisms and infrastructure to break down silos and enable application of approaches that are discovered by other specialists.

Managing complexity and volume of information: Scientific and clinical research produce massive amounts of data. Thousands of clinical trials are in flight at any given time and patient data contains troves of structured and unstructured data that need to be processed, managed and abstracted to reveal insights that can be applied at the point of care. KM is at the intersection of structured and unstructured data and allows for making sense of large amounts of data and content

Personalization of treatment: Pharmacogenomics and proteomics will add complexity but once understood will improve outcomes and reduce costs in treatment of acute and chronic conditions and make difficult to treat diseases more manageable by taking into consideration the unique biochemical make up of individuals. Processing and managing this data and making results widely known so they can be applied is core knowledge management. KM has a role in personalizing the clinical delivery of healthcare as well as providing people with the right

emotional tone and approach to service with just in time education, messaging, motivators, reminders and information.

Proactive care: New virtual assistant applications are increasingly playing a role in reminding people to do everything from drink more water to prepare for procedures and to adhere to medication schedules. Measuring progress and compliance and gamifying exercise and diet programs has been shown to increase adherence. These are information and knowledge applications.



THE PATH FORWARD

Value from innovation arises from solving problems (applying knowledge) in creative ways.

Innovation and discovery are the sources of progress in life sciences and healthcare. As previously articulated, this is the purpose and purview of KM. The improvements in living standards are generally attributed to the collective intelligence, knowledge, innovation and work output of humankind. At one level, this is the value of knowledge applied to the physical world. (There is also the wealth of natural resources, the work of individuals and the collective infrastructure of society.) Value from innovation arises from solving problems (applying knowledge) in creative ways.

The explosion of knowledge and complexity in all areas of science based on advances in technology will have significant impact on life sciences and applications to healthcare – particularly in personalized medicine. Unraveling the human genome has allowed for a new level of understanding of how differences in individual genetic makeup influences how drugs are metabolized and how well diseases respond to treatments.

Pharmacogenomics is the subspecialty of research that allows individualized treatment regimens to be established for things like cancer, where genetic mutations are at the root cause of illness. Since cancers of a particular type can vary with the individual’s genetic make-up along with metabolic pathways, an enormous amount of data needs to be analyzed in order to understand complex relationships and interactions.

Research tools and technologies produce gigabytes of data from experiments and clinical assessments. This data needs to be collated with clinical trial results and observational data (the “real world evidence” information that is collected from patient records and treatment results). Real world evidence, combined with research and clinical trial data are produced at such a high volume and velocity that it is not possible for a human to keep up with all of it. Instead, knowledge abstraction and synthesis tools need to take the heavy lifting out of the task of understanding and applying the insights from the tsunami of data.

KM IS ADVANCING BUT MANY PROGRAMS LACK THE BASICS

Even organizations that are relatively mature in KM complain that their users cannot find what they need.

Knowledge management is advancing on many fronts, but many organizations have neglected the foundational systems that help people collaborate. Intranets and knowledge bases do not receive adequate funding, and technology vendors are promising that the next generation of tools will make the basics unnecessary. Even organizations that are relatively mature in KM complain that their users cannot find what they need. These organizations are therefore missing key elements in their programs.

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Cognitive computing tools are emerging that will address some of the issues in managing and accessing critical knowledge, but they are still not practical for day to day processes in patient care. Instead, organizations need to revisit the basics and deploy the current tools with greater levels of precision and excellence. For example, there are many established KM practices in enterprises that forego **user research**, **use cases** and **user testing**. They have rudimentary **governance** in place. **Metrics programs** do not provide prescriptive feedback to course correct. Validation of **taxonomies** and **tagging** approaches is rudimentary. They are checking the boxes but not being effective.

All of these issues present some great opportunities for KM, with corresponding benefits to pharmaceutical forms, health care providers and insurance companies in terms of efficiencies, and ultimately to those in need of health care products and services.

ABOUT US

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ⁱ The Rational Optimist by Matt Ridley