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Game Changers in Education and Health Care: Report of the 2012-13 Argus Commission

Cynthia L. Raehl, PharmD,[a] Jeffrey N. Baldwin, PharmD,[b] Rodney A. Carter, PharmD,[c] Brian L. Crabtree, PharmD,[d] Victor A. Yanchick, PhD,[e] and Lucinda L. Maine, PhD[f]

[a]Texas Tech University Health Sciences Center School of Pharmacy, Amarillo, Texas
[b]University of Nebraska Medical Center College of Pharmacy, Omaha, Nebraska
[c]Regis University School of Pharmacy, Denver, Colorado
[d]Wayne State University Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, Michigan
[e]Virginia Commonwealth University School of Pharmacy, Richmond, Virginia
[f]American Association of Colleges of Pharmacy, Alexandria, Virginia

INTRODUCTION

The American Association of Colleges of Pharmacy Argus Commission is comprised of the five immediate past AACP presidents and is annually charged by the AACP President to examine one or more strategic questions related to pharmacy education, often in the context of environmental scanning. President J. Lyle Bootman charged the 2012-13 Argus Commission with a study of the "game changers" likely to influence AACP member institutions, faculty and learners.

Cynthia L. Raehl, Argus Commission Chair, initially identified five areas where significant changes are most likely in both the internal and external environment of pharmacy and health professions education. These included higher education, health care delivery, organizational management, information technology, and research and computational science. One or more reference texts were identified for each area and a member of the Commission accepted responsibility for reading source material, summarizing the contents and providing relevant interpretations on the significance of proposed changes on pharmacy education and practice.

This report will include a brief summary of these reports and then conclude with cross-cutting observations and recommendations for AACP and our members. Unequivocally, major game changing forces are in play that will influence pharmacy education and set the stage for what the Argus Commission came to appreciate may be a phase change rather than a slower and more evolutionary change process.

GAME CHANGER: THE COMPUTER REVOLUTION IN SCIENCE AND MATHEMATICS

In his book *Phase Change: The Computer Revolution in Science and Mathematics,*[1] Robertson describes a phase change as that point in time when a very large change occurs very quickly – essentially instantaneously– after a relatively long period of time when very little change has occurred. He states that in order for a phase change to occur a system must be in a "critical state" and any attempt to extrapolate the behavior of a system before the phase change occurs will not be successful. He further states that the phase changes in science and mathematics gave scientists the ability to "see" things that could not be seen prior to the phase change.

Examples that were used to describe earlier phase changes included the invention of the telescope that allowed scientists to see distant planets and galaxies that were not able to be seen without a telescope, as well as the invention of the microscope or the x-ray machine that allowed one to see things that were not able to be seen with the naked eye. These inventions created a number of paradigm shifts because many of the things that were seen for the first time did not fit well into earlier beliefs. However, the introduction of the computer to science and mathematics created a totally new phase change of infinitely greater importance than any of the earlier discoveries.

In the biological sciences, the computer produced a phase change that allowed scientists to function at a much more sophisticated level. Not only have computers allowed us to observe structures at the molecular level, they have given us the ability to analyze the vast quantity of information obtained from these instruments that could not have been accomplished by the unaided human mind. To illustrate the phase change brought about from the introduction of the computer to the biological sciences, the completion of the Human Genome Project could not have been accomplished without the high level of sophistication offered by the computer. Additionally, the information encoded into the genome would not have been understood if the computer was not available to

search out and analyze the functional components of the genome.

Many other fields in the biological sciences continue to accumulate larger and larger amounts of quantitative data that quite simply cannot be comprehended or analyzed effectively without the aid of the computer. The application of X-ray diffraction allowed scientists to study the structure of DNA. In 1953 Watson and Crick were the first to determine the structure of DNA; they received the Nobel Prize for describing the double helix molecule and for explaining how cells remember the correct sequence of amino acids in each of its protein chains. But without computer technology, the almost impossible task of reading the entire genome would have been virtually impossible and is one of the best examples of how computer technology initiated a phase change in the sciences. Computer applications into the genome have enabled us to better understand the structure and function of the proteins encoded in the genome and is of critical importance to the area of molecular biology. Without the development of increasingly sophisticated computers, it would be impossible to comprehend and apply the immense quantities of information needed to advance the field of proteomics.

The implications for pharmacy are enormous – both in the science and the practice of pharmacy. The pharmaceutical sciences have benefitted greatly as a result of the computer revolution. Pharmaceutical research is able to generate huge databases that could not have been analyzed to as great a depth before the advent of the computer. Personalized medicine would not have been possible without the aid of the computer. We are now able to create a genetic map or a profile of the patient's specific genetic variation which can be used to guide the proper selection of medications. The ability to profile gene sequencing and expression can redefine the process of classifying diseases such as diabetes, Alzheimer's disease, certain cancers, and heart disease. Computer generated genetic mapping can also indicate the likelihood for a patient to contract specific diseases before the patient shows recognizable symptoms. Results from these discoveries will allow pharmacists who are properly trained to be responsible for the selection and management of pharmacologic agents or other technologies that are specifically tailored to the patient's genomic profile.

Turning our attention to the field of mathematics, Robertson believes that this area may be the most difficult to explore how the computer facilitates a phase change. He believes that the application of computers to solve mathematical theories not only creates the largest phase change in the history of mathematics but could also be the most significant phase change in the entire field of science since mathematics is highly integrated into all aspects of science. The increasing complexity of computer power has given scientists the extraordinary ability to generate computer graphics. This increase in the power of computer graphics has created a new area of mathematics called, "experimental mathematics."

In summary, we live in a time where the capabilities of computer applications are increasing exponentially and where enormous amounts of data are generated and collected at rates never before imagined. This computer revolution is transforming the practice of pharmacy and the science of pharmacy to levels never before imagined. Pharmacists have at their practice sites the ability to retrieve data and to apply best practices to benefit their patients. Pharmaceutical scientists in all fields of research find the computer indispensable to their science. Computers allow pharmacy researchers to collect and analyze huge databases of information almost instantaneously. Truly, the computer has resulted in a phase change in both pharmacy practice and pharmaceutical research.

GAME CHANGER: EDUCATION

In examining *Game Changers,*[2] a book from Educause, two recent issues of *The Chronicle of Higher Education* (Oct. 5[3] and Oct. 19, 2012[4]), *The New Digital Shoreline*[5] by Roger McHaney, *The Innovative University*[6] by Clayton Christensen and Henry Eyring, and Teaching as *Community Property*[7] by Lee Shulman, one can identify five major themes or "game changers," which will affect higher education in the near future. These congruent ideas from the various publications include:

1. In the current economy and for the economy of the foreseeable future, there will be an increasing demand for higher education.

As we realize the emergence and maturation of Drucker's "knowledge economy," higher education becomes less elite as more people need education for their vocations. Nearly all job growth since 1973 has been in jobs filled by people with some post-secondary education (from 25.5 million in 1973 to 85.3 million in 2009, more than a 3-fold increase while the U.S. population grew only by 50%). While the demand for more participation in education (i.e., enrollment) could have implications for the quality of students and programs, it is clear that professional workers (e.g., pharmacists) must continually acquire new knowledge and skills to avoid occupational obsolescence.[2]

2. There is a need for higher productivity at a lower cost from higher education institutions.

The U.S. is disinvesting in higher education while the 21st century economy demands high levels of education

(see Idea #1 above). The Oct. 5, 2012 issue of *The Chronicle* detailed how 43 states have cut per-student funding for public research universities in the past 10 years.[3] This article also emphasizes that private universities do not constitute a large enough portion of higher education to meet an increasing demand for qualified graduates. In Chapter 18 of their book, Christensen and Eyring outlined a number of methods being implemented to lower the cost of higher education including utilization of on-line courses and peer instruction, serving more students in more ways with the same curricula, and minimizing graduation delays and "creeping majors."[6]

3. The majority of students are, or at least soon will be, nontraditional.

Chapter 16 of *Game Changers* outlines many of the characteristics of the new learner and how systems are and will be meeting their needs.[2] One of these ways is simply mixing on-line and on-campus offerings. Students want courses that meet their educational and personal needs, not being concerned with "main," "extended," or "distant" campus labels. The Sloan Foundation has defined "localness" for students: whatever the students' access is local to them. Students more and more are moving back and forth among on-campus, on-line and blended educational offerings. We are seeing an increasing number of students with an increasing diversity of background skills and knowledge coming to us with different educational goals.[5]

4. The use of instructional (information) technology needs to move from instructional delivery (where IT merely replaces the old delivery models with technology-delivered content) a) to developing better instruction through using technology to its fullest and b) to developing and using analytics for guiding and directing faculty and students.

Over the past few decades, IT has been used as an alternative means to deliver education while still using the same basic educational structure and not utilizing IT's fullest capacities (e.g., posting assignments on-line rather than handing them out v. creating interactive on-line assignments). Questions about the use of technology should focus on how technology increases student learning, NOT on how many students are served or for what lower cost.[2] A significant area where technology should move is into analytics – the same technology that supermarket loyalty programs use to track purchases or that some current on-line examinations use to track answers to previous questions to determine which subsequent questions are given. We have first generation tools for predictive modeling, adaptive learning, early warning of student difficulties and data visualization. We should use this technology to target student completion – successful achievement of learning objectives. There is also continued innovation in the uses of IT in education. Coursera[8] is experimenting with artificial intelligence as a teaching/learning tool. How can gaming technology or virtual environments (such as the Arizona-Live[9] visualization center also known as "The Cave" be used to enhance our students' learning? A quote from Chapter 2 of *Game Changers* defines the bottom line: "We can, as a sector or as institutions within the sector, take a strong stand on the quality of education as our touchstone – and all decisions related to technology or anything else will be measured by how much the quality of learning can be improved."[2]

5. New models of education need to be developed and/or utilized.

The sources reviewed describe many new models for delivering/providing higher education: Massive Open Online Courses (MOOCs) and other open educational resources, including the University of the People[10] which calls itself the first free, online degree granting university, are gaining both students and affirmation in higher education circles. Utilization of the Internet and electronic resources is a central component of most of these, although educational innovation also takes place in traditional classrooms. The 2013 AACP Institute modeled the "flipped classroom" approach in which students are expected to access course content prior to entering the learning environment so that more active and engaging teaching and learning can occur as opposed to more traditional models of faculty lectures for the bulk of class time.

Much of the resource material reviewed centered on open educational resources. From *Game Changers*, p. 82: "Open educational resources allow the full technical power of the Internet to be brought to bear on education."[2] This new approach to higher education introduces "open outcomes," each student being empowered to learn what they need/want. Section B of the October 5, 2012 edition of *The Chronicle* is devoted entirely to On-line Learning. In their article, "Ethics Go Digital," Seager and Selinger hit a key point: "To be truly innovative, digital pedagogy has to do a better job of giving students the very thing that makes brick-and-mortar schooling so special: It must foster immersive learning communities that connect students to both their instructors and each other."[3]

Many educators feel threatened by MOOCs, fearing reductions in faculty or even the end of smaller colleges which could have trouble competing with these free alternatives. With all the new models emerging, there is a need for new standards, new assessment mechanisms, new definitions of degree qualification, in other words, new definitions and standards of *quality*. Stimpson stated

in The Chronicle, "I feel more strongly than ever about the need for a lively, powerful faculty presence in the design and teaching of e-learning."[3]

GAME CHANGERS: HEALTH CARE

In his highly acclaimed 2012 book *The Creative Destruction of Medicine,*[11] Dr. Eric Topol creates a strong case for a vastly improved healthcare system achieved through the power of the digital revolution. Topol's characterization of a new super charged "data-driven, participatory culture" sets the stage for drastic change. Topol identifies these changes as the powerful "C's": constant connectivity to the data rich World Wide Web, collaboration and crowdsourcing in which consumers can easily access the minds and wisdom of thousands using social networking platforms, customized (highly personalized) consumption of information, and cloud computing. The digital revolution will soon create a much better, more cost effective healthcare system. A system in which the consumer, armed with knowledge, will drive their own healthcare decisions.

As Topol points out, smart phones already outnumber toothbrushes and toilets in today's world.[11(p.7)] Smart phones (and tablets) clearly are data drivers, data repositories, data clearinghouses, and soon one's own personal health assistant all in one compact package operated by the consumer. Smart phones will equalize access to information among healthcare practitioners and consumers, creating parity of information. Smart phones will emerge as the main port to personalized real time monitoring of one's own physiologic functions. Smart phones may enable detection of signals preceding depression and heart attack. Smart phones will warn consumers of impending health events such as a seizure or stroke. Smart phones will detect a new single circulating cancer cell through its protein production well before imaging detects small tumors. Smart phones, with technology advances unimaginable today, will bring the digital revolution to the fingertips of every consumer.

Through the marriage of smart phones and wireless sensors, consumers' abilities to monitor, track and treat their unique health concerns are unleashed. The front door to the medical home and treatment center of tomorrow is actually a person's smart phone. The new medical home will literally be based in the consumer's home and their iCloud. A new era of wireless healthcare will decrease the need for large hospitals and expansive clinics. Patients will no longer drive miles and wait in a pharmacy or doctor's office. For example, instead of sharing a blood glucose monitoring log with a pharmacist at their practice site, consumers will collect and analyze their own real time continuous blood glucose monitoring. The availability of low cost, reliable wireless sensors will revolutionize medicine and make self-monitoring as common as weighing oneself on an old fashioned bathroom scale. From heart rate to brain waves, from uterine contractions to fetal heart rate, from lung function to liver function, from UV sunlight exposure to lead exposure; remote wireless nanosensors open new worlds to consumers.

Noninvasive monitoring of breath, tears and skin function will create the remote laboratory on a chip perhaps envisioned by Star Trek's Mr. Spock. How much consumers will partner with a healthcare practitioner or bypass the healthcare practitioner is unknown. However, it is abundantly clear that new expectations will be placed on healthcare practitioners to bring true value and relevance to a consumer who owns their own health data and is armed with knowledge on how to make healthcare decisions in their own best interest.

While consumers are processing their biosensor data, their own personal genome sequencing will be available. A personal genome, like fingerprints, will create the new scientific base upon which to apply the hyperpersonalized data obtained through a vast array of wireless sensors. Treatment will be prescribed based on this n of 1 clinical trial instead of the old n of thousands clinical trial. Double-blind randomized clinical trials will give way to targeted trials based on similarity of disease genomes. Drug responses will be linked to specific proteins linked with specific DNA sequences. Thus, genomics, proteomics, metabolomics, epigenomics, and pharmacogenomics must emerge as hallmark sciences of pharmacists. As Topol illustrates in the development of personal consumer genomics, particularly in the cancer fields, consumers will take charge of their own health armed with their own genome.

Both consumers and healthcare practitioners will likely be equally skilled at navigating electronic health records. Consumers will own access to their electronic health record and routinely share it with trusted friends as they seek answers to their own specific problems. Health systems will no longer be the only repository for electronic health records although the system need for data integration and quality improvement will demand access. Although issues of privacy and data security are formidable, healthcare will likely follow advances in the banking and financial industry to minimize such concerns. Electronic communication among consumer and healthcare provider will emerge as the primary care model, with face-to-face encounters limited to acute health crisis and upgrading of remote wireless sensors.

The convergence of genomics with its wireless sensors, new advanced and often remote imaging technique and a powerful new, secure health information technology network are upon us. These developments will

revolutionize the pharmaceutical industry and its current slow, laborious and expensive drug discovery methods. New partnerships among the health information and healthcare industries will emerge as will greater acceptance of academic-industry partnerships. At the same time, such partnerships will be under public scrutiny with greater attention devoted to drug safety, open sharing of science and consumer access to all data – not just published data. Indeed, the movement to open sharing and open journals may stimulate the demise of the medical journal industry as we know it today. Post marketing monitoring of all drugs will be coordinated centrally with global networks detecting safety signal well before tragic stories like Vioxx unfold.

The curriculum changes demanded by this digital revolution are obvious today. Courses in digital healthcare, remote imaging, behavioral health and wireless health must be central to education of pharmacists and physicians alike. All healthcare practitioners must learn to use current and new social networking platforms to assist consumers in directing their own care. New professions, such as personal healthcare advocates or navigators, will emerge akin to the financial advisors employed by today's investors.

Topol asserts that Internet and its power will create parity in knowledge between the consumer (public or patient) and healthcare professionals. The personalization of each person's genomics linked with their own biosensor data and advanced imaging suggests that power will indeed reside with individuals, not their healthcare team. With this power to make appropriate decisions on health and prevention of illness, it seems that society will place more responsibility on individuals. Each person will be held accountable for their actions. The physiology and behavioral aspects of disease prevention will be the responsibility of each person. Penalties for poor decisions will likely be enacted as surcharges, greater co-payments or even denial of treatments. Individuals will relish controlling their own healthcare data. Will they equally relish responsibility for eating a healthy diet, exercising and avoiding drugs of abuse? Remote monitors are likely to signal poor health habits to government or insurers.

GAME CHANGERS: LEADERSHIP/ ORGANIZATIONAL CULTURE

Daniel Pink is known at AACP; he was the keynote speaker at the 2007 AACP Annual Meeting following the publication of *A Whole New Mind.*[12] In *Drive,*[13] he summarizes research indicating that traditional notions or beliefs about what motivates us no longer apply in modern society. He contextualizes motivational theory into a terminology that has become part of contemporary lexicon. . .operating systems. Computers run on operating systems, but so does every part of our lives, including how we behave in response to motivating factors around us.

Motivation 1.0 characterizes primitive human history. Factors that predicted behavior under Motivation 1.0 were survival and defense instincts. . .food, evading predators, biological motivators. Motivation 2.0 superseded the previous version as humans formed complex societies that required cooperative interaction. Factors driving behavior in Motivation 2.0 are based on concepts of reward and punishment. Pink describes this approach as basic carrots and sticks. During the 20th century, research in human psychology led managers and leaders to believe factors that motivated people were far more complex than simply seeking reward and avoiding punishment. They relate to how we organize, think about and carry out our daily activities, including our work.

He suggests that economics is not the study of money; it is the study of behavior. Yet, people don't always act in ways that are directly in their own economic self-interest. An example is that most people don't save enough for retirement, even though it is in their economic interests to save. Complex motivations are relevant to pharmacy education and pharmacy practice. We know that salaries for faculty members are generally below practice or pharmaceutical industry research salaries, even after additional years of study and training. Historically, salaries for institutional or health-system pharmacists are below community pharmacy practice salaries. People choose academia and certain pharmacy practice careers for reasons other than pure economic self-interest. Contemporary economists believe economic theory has placed too much emphasis on economics and not enough on behavior.

In contemporary society, work has become more complex, less repetitive and requires more self-direction than in the industrial past. Motivation 2.0 theory does not readily accommodate the new reality. Work rewards are more than "extrinsic motivators," but they remain a dominant management and leadership model in many organizations.

Pink refers to items such as salary, fringe benefits and similar extrinsic factors as "baseline rewards." If baseline rewards are not equitable in relation to co-workers or peers with similar duties, a worker's focus may become placed on perceived unfairness. The extrinsic rewards become demotivating. An academic pharmacy illustration is salary compression among mid-career and advanced faculty members. It is not uncommon that younger and less experienced colleagues are hired at a salary as high, or higher, than those of experienced faculty members. However, beyond baseline rewards, other factors have greater effect on motivation.

Pink lists the "seven deadly flaws" of carrots and sticks (Motivation 2.0), which make this model of leadership and organizational culture inadequate:

1. They can extinguish intrinsic motivation.
2. They can diminish performance.
3. They can crush creativity.
4. They can crowd out good behavior.
5. They can encourage cheating, shortcuts, and unethical behavior.
6. They can become addictive.
7. They can foster short-term thinking.

Motivation 3.0: The Three Elements of Motivation (Autonomy, Mastery and Purpose)

Autonomy means giving people control over their work. Pink states that the essential features of autonomy are what people do, when they do it, how they do it, and with whom they do it. One company highlighted in the book discusses the concept of a "ROWE," which is a Results-Only Work Environment.

Empowering faculty members to approach their tasks in their own way is a long-standing cultural tradition in academia, fundamental to academic freedom and creativity. Yet, our curricula in pharmacy and our accreditation standards are sometimes regarded as rigid, prescriptive, proceeding in lock-step and stifling of creativity and innovation. They may foster "teach to the test" or "regression to the norm" behavior.

In healthcare practice, as we move from volume to value, from service to outcomes as the basis for reward, Motivation 3.0 makes more sense. Getting out of silos and working in interprofessional teams is now expected across healthcare disciplines.

Creating curricula and learning environments in which students are in charge of their own learning and control their resources, e.g., problem-based learning and other student-centered learning strategies, is more consistent with Motivation 3.0.

Mastery asserts that the experience is its own reward. Mastery resonates strongly with the academic experience, certainly with faculty members, but also with high-performing students, residents and graduate students. We crave expertise as a natural element of our roles as educators, scholars, students and practitioners.

A predictor of success in achieving mastery is "grit" – perseverance and passion for long-term goals. Although the process may be painful, in Pink's words, "the joy is in the pursuit more than the realization. Mastery attracts precisely because mastery eludes."

Purpose means we want to create something that outlasts ourselves and leaves the world a better place. A profit motive, financial or otherwise, does not satisfy this need on its own. We need to feel part of a team and that our team is conducting meaningful work. This is certainly true in universities. An indication of how we feel about our institution is whether we describe it as "we" or "they." Pink cites research that indicates that satisfaction depends not only on having goals, but having the "right" goals.

As technology advances, as learners and healthcare professionals work in teams and integrate more seamlessly, as efficient data access and analysis becomes more vital, the organizational climate and culture must adapt quickly. Have we moved sufficiently toward empowerment of faculty members, students and curricular design to recognize and reinforce intrinsic motivators? What internal and external factors encourage or inhibit a "Motivation 3.0" culture? Do we continue to rely on extrinsic rewards that may actually demotivate our people and reduce creativity? How do we address factors that lead to extrinsic demotivation and take energy away from autonomy, mastery, and purpose?

GAME CHANGERS: CULTURE AND SOCIETY IN THE ERA OF UBIQUITOUS INFORMATION

Vaidhyanathan's book, *The Googlization of Everything: (and Why We Should Worry)*[14] provides a compelling admonition that "Google is fast becoming the chief lens through which we see the world." We trust Google's search program to provide us with prioritized search results that are accurate, relevant and salient. Much of the popularity of Google search relates to its speed and perceived accuracy; it gives us the answers we are willing to accept while providing us with a level of confidence that spam and potentially offensive or dangerous websites will be suppressed. Since our search histories are tracked by Google, the author suggests this "is not unlike confessing your desires to a mysterious power . . . . . We make a grave mistake by relying on technologies to change societies. Technologies are embedded in societies and cultures. They are not distinct and independent drivers."

Google searches trigger commercial ventures related to our search terms to participate in an instant auction to determine which companies get priority placement at the top or along the sides of our search results. While some can differentiate the advertisement links from the search results, it is noted that "o(O)nly one in six search users could testify that they can always tell the difference between the sponsored links and the generated results."[15] ". . .W(w)e are not Google's customers: we are its product. We—our fancies, fetishes, predilections, and preferences—are what Google sells to advertisers."[14] Google is the Web's most successful advertiser; it has been consistently able to produce substantial profits even during the depths of the

recent recession. In 2008, Google's advertising revenue was $21 billion.

Google began at Stanford University as what seemed to be a neutral, democratic search engine that prioritized results based on numbers of "hits" and relevance. Its mission is "to organize the world's information and make it universally accessible and useful." Its motto is a less reassuring "don't be evil."

We may think that Google searches provide us with a prioritized global view of the subject of the inquiry based on frequency of accessing those Websites as a result of searches. Unfortunately, a predominant determinant of the prioritization of the information is the location of the person making the inquiry. Thus, rather than getting a global perspective, the results have a local geographic bias and may, therefore, not represent the expanded works of mankind. Vaidhyanathan's basic position is that we would be better served by developing an "online ecosystem that can benefit the whole world over the long term, not one that serves the short-term interests of one powerful company, no matter how brilliant."

"Googlization affects three large areas of human concern and conduct: 'us' (through Google's effects on our personal information, habits, opinions, and judgments); 'the world' (through the globalization of a strange kind of surveillance and what [may be called] *infrastructural imperialism*); and 'knowledge' (through its effects on the use of the great bodies of knowledge accumulated in books, online databases and the Web). Google is not just a search engine; Google-branded services include products such as YouTube, Gmail, Google Chrome, Google Docs, Google Scholar, Google Maps, GoogleMaps with Street View, Google Earth, and Google Books. The author suggests that "Google is on the verge of becoming indistinguishable from the Web itself." YouTube has had major involvement in recent "Arab spring" and other Middle Eastern conflicts as well as serving as a political tool in the 2008 presidential election. "YouTube is where politics and culture happen online." "YouTube has become the central battlefield in the struggle to define the terms and norms of digital communication."

Governmental involvement is viewed societally as implausible in the U.S. and Western Europe in a model which favors market forces to drive the development of the Internet. This model is based on techno-fundamentalism (trusting technology to solve problems) and market fundamentalism (believing that private rather than public resources can more efficiently drive solving most problems). Does blind dependence on a tool such as Google interfere with our abilities to deliberate and critically think? The present privatization of processes traditionally based on public support such as schools, military operations, space exploration, prisons, healthcare coverage and even disaster assistance programs, such as those following Hurricane Katrina, are examples of public failure and the public's acceptance of this model. The logic here goes "p(P)ublic institutions can fail; public institutions need tax revenue; therefore we must reduce the support for public institutions."

SYNTHESIZING THE GAME CHANGING FORCES

As the members of the Argus Commission shared the lessons gleaned from their analyses of the compelling forces of change at work in healthcare, education and society, it was challenging not to become overwhelmed by the magnitude of the potential change. Clearly, technological advances and the application of powerful informatics capability are influencing diagnostics, therapeutics and learning in the United States and around the globe. The potential for these changes to dramatically influence what pharmacists contribute to patient care was quite obvious, though the exact dimensions of the change in roles are hard to explicitly project.

Some key questions surfaced during the discussions that warrant further consideration by the academy. These relate to issues of activating patients and learners, the need for a trusted source of information and information interpretation, and, ultimately, the anticipated pace of changes in health and education.

At the heart of assumptions regarding change in both healthcare and education is the construct of "engagement." Major health reforms assume that the consumer of health services is prepared to become an active and engaged participant in decision-making about their care and that they will collaborate in implementation of a plan to achieve specific health goals. Historically, our health system has not been geared toward patient engagement and the health literacy of the average patient often does not permit them to act in such an informed fashion.[16]

According to work summarized by Hibbard and Greene[17] in a recent themed issue of *Health Affairs*, there is evidence that more activated patients have better health outcomes and experiences than less activated patients. Further, research demonstrates that the level of patient activation can be increased over time, including in populations traditionally thought least likely to be activated (e.g., medically indigent patients). The authors call for a systematic approach in encouraging patients to play a more active role.

Such an approach was outlined in the same themed issue by leaders in the U.S. Department of Health and Human Services who called for a new Health Literate Care Model.[18] Drawing upon the well-established Care Model

(formerly referenced as Wagner's Chronic Care Model) and recent work by the Institute of Medicine, the authors describe the potential relationships between a set of health literacy improvement strategies and components of the Care Model. Substantial resources for healthcare providers and systems are accessible from the Agency for Healthcare Research and Quality.[19]

While much more is to be learned regarding patient engagement in the reforming health system, there is a logic model emerging. A better informed and engaged health consumer is best served by a health literate delivery system organized to achieve better individual health and an overall healthier community while lowering healthcare costs. A variety of initiatives, be they medical homes or accountable care organizations, are moving at a reasonably rapid pace in this direction. The increasing availability of "big data" on patterns of illness, response to treatment, and "hot spot patients" also support these trends.

How might healthcare providers respond to more informed and activated patients? A recent editorial in the *Journal of the American Medical Association*[20] provided a real case scenario of an activated patient meeting his primary care physician. This healthy young man has, out of curiosity, obtained his genetic profile from a direct-to-consumer laboratory. It revealed an above average risk of developing Type 2 diabetes and other health risks. Armed with the information, this individual changed his diet and exercise to mitigate the newly discovered risks.

His physician "brushed the report aside and went on with business as usual." The editorial went on to identify how traditional medical education and practice norms would be at odds with interaction with a healthy individual/patient armed with new insights about how his genes may affect his health and well-being, not just today but for many years to come. The editorial also presupposes that the physician's training simply did not equip him with the knowledge of how to effectively engage with this activated patient and his self-created genetic map.

Are there pharmacy implications in these trends? Would this individual's pharmacist be any more prepared to engage in a discussion about the implications of the genetic findings? Among the things disclosed in the analysis is that he did have variations in drug-metabolizing liver enzymes which could influence the disposition of current or future drug therapy. Logically, he might engage in a query with the pharmacist each time a new medication is prescribed.

In a more traditional context it is interesting to note that the AHRQ toolkit noted above includes three of the 20 tools that are explicitly medication focused: Tool 8 relates to brown bag medication reviews; Tool 16 relates to improving medication adherence and accuracy; and Tool 19 is simply listed as medication resources. These clearly indicate that medication use is central to more effective models of care and patients at all literacy levels need more support to use them effectively. As diagnostic tools allow for more precision and customization in therapeutic decision making, both patients and those involved in diagnosis and treatment planning should require the unique body of pharmacy knowledge today's and tomorrow's practitioners must obtain and maintain.

These are actually relatively simple projections of pharmacists' current roles in patient care. Alternatively, could pharmacists serve as a primary resource for patients and providers attempting to understand, apply and assimilate the many sources of data and information that bombards them in any care encounter? Does the pharmacist, alone and in concert with others, serve as a navigator and interpreter of patient-specific and population health information and trends? Again, the centrality of medication management in prevention as well as acute and chronic health delivery supports a stronger role for pharmacists as an information integrator.

Just as clear as the mandate for patient activation is becoming, the need for activated learners at all levels of education is also becoming clear. Our current and future students have grown up with amazing tools that allow them to access more information in seconds than one used to be able to access through hours of searching in libraries or drug information centers. The primary challenge for health professions educators is to ensure that our students are proficient in the critical appraisal of available information and the effective application of knowledge in the care of patients. Their ability to form and maintain relationships with colleagues on teams, as well as with patients and their extended network of family and community support, is essential.

Technology assures that learning will increasingly become student-centered. Massive Open Online Courses will continue to make education accessible to far more learners than traditional models permit. The acquisition of knowledge will be left to the individual and may be largely self-paced. This challenges many, if not most, aspects of pharmacy education as it has been delivered for over a century. The emergence of courseware from a wide variety of sources guarantees that before long our applicants will present transcripts containing certified course completion from both traditional and emerging education providers. These educational units could be prerequisites as well as required and elective Pharm.D. courses.

This reality challenges at least three elements of the traditional educational model: assessment practices, quality assurance through accreditation and faculty development. Existing tools for assessment of applicant

knowledge and ability and for evaluating the progress of learners throughout the professional degree program are inadequate. More engaged learning will require development of new learning resources, including simulation and gaming technologies, not just for use in pharmacy but for use by multiple disciplines in support of interprofessional education and team-based care. Where will the leadership and resources to develop such resources come from?

A second key issue is quality assurance and accreditation. The U.S. Department of Education is highly supportive of new learning models while at the same time expressing great concerns about accountability in higher education. Assuring that students receive quality education from whatever sources and that they progress toward achievement of degrees (or other credentials) that match the needs of employers today and in the future places new expectations on accrediting bodies and educational institutions alike. Certainly stronger assessment tools and practices will address some of the quality assurance needs. A strong dialogue between educators and accreditors is essential during this period of significant change in our models of teaching, learning and assessment.

Finally, virtually all current faculty members learned in traditional academic models and have carried forward the established teaching practices of imparting a body of knowledge to learners in classes and classrooms of defined length using fairly passive learning techniques. Certainly in pharmacy we have implemented some degree of active learning using cases and simulation, but the Argus Commission believes that a true revolution in learning is unfolding. Rather than guaranteeing that our students acquire a certain body of knowledge, the job of future faculty is to create an environment in which our students can learn how to acquire and apply information accurately and efficiently while growing in the skills of communication, compassion and human interaction.

Perhaps the learning and patient care environments of the future are ripe for the context of motivation described by Dan Pink in *Drive*. Offering people autonomy in learning and in the use of exciting new learning and assessment tools replaces rote memorization of too many facts that become outdated too quickly. Encouraging our learners toward mastery in the application of information in the infinite permutations of complex human systems and helping them recognize their own advancement over the course of a degree program and the rest of their professional lives become a self-perpetuating reward model. Helping consumers achieve their own mastery over their health, wellness and experiences of illness in a health system that rewards value over units of production provides a sense of purpose and a commitment to continuous improvement. The ingredients for a shift in work environment consistent with Pink's Motivation 3.0 seem plentiful in both the academic and healthcare contexts.

How rapidly will this all occur? As noted in *Phase Change*, author Robertson points out that a phase change is that point in time when a very large change occurs almost instantaneously after a relatively long period of time when very little change has occurred. Are both healthcare and education ripe for phase change? The Argus Commission believes they are and appreciated the following quote from Bill Gates, the creator of so much of the technology that likely will enable the phase change: "We always overestimate the change that can occur in two years and underestimate the change that can occur in the next ten. Don't let yourself be lulled into inaction."[21]

PROPOSED POLICY STATEMENTS

Policy Statement #1

AACP supports the advancement of research that examines consumer needs and behaviors that are required to engage them as active participants in their own and others' healthcare as well as research that characterizes how the practice activities of pharmacists should be adapted to meet the needs of activated consumers.

Policy Statement #2

AACP encourages rapid curricular change to advance learner-centered education models and advocates for accreditation standards that are responsive, flexible and support effective assessment of the impact on students and faculty.

Policy Statement #3

AACP supports innovative faculty development that facilitates adoption and appropriate utilization of new models of teaching and learning.

ARGUS COMMISSION RECOMMENDATIONS

Recommendation #1

AACP should identify opportunities through programming and publications to increase member awareness of trends and successful practices related to creating and serving engaged and activated patients and explore the curricular implications of this aspect of health reform.

Recommendation #2

Pharmacy education should actively contribute to the national dialogue related to quality assurance of technology-enabled methods of teaching and learning, such as open course work, including the policies for awarding and recognizing credit for such educational activities.

Recommendation #3

AACP, in partnership with other organizations (e.g. health professions education, computer science and technology partners), should create an independent entity that will facilitate the development and use of technology-enabled resources to advance student-centered learning.

Recommendation #4

AACP should critically assess trends in technology-enabled education to better understand the motivations and needs of learners and the implications of such trends on pharmacy and interprofessional education, assessment and accreditation.

Recommendation #5

AACP and colleges/schools should examine the use of technology (e.g. avatars, simulation, virtual preceptors) as part of experiential learning, both intra and interprofessional, and include recommendations on the effective integration of such technology into the pharmacy curriculum with supporting accreditation standards development.

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