Presidential address 2010

I would like to start by thanking Kim Burchiel for that kind introduction and all of his generous support. I would also like to thank all the members and guests of the Western Neurosurgical Society for attending this wonderful meeting in this spectacular location. I owe a special thanks to my wonderful wife Shirley for all of her help and support and our daughters Laura and Julia who could not be here today. This is a special meeting for Shirley since she grew up in New Mexico and still has many friends here.

I also wanted to take the opportunity to acknowledge Phil Carter for all the contributions that he made to the Western Neurosurgical over the years and more recently the contributions that he made during his presidency during a difficult illness for him and his family.

A number of individuals on the executive committee deserve special acknowledgement including our secretary Charlie and Debbie Nussbaum, Kim Burchiel, Randy Smith, Mark Linskey Austin and Darla Colohan, and others worked very hard to make this a smooth transition at a difficult time, which has made my job easier in assuming this great responsibility.

Here are my disclosures.

What I would like to do today is to share my thoughts with you on neurosurgical training and practice over three different eras, reflect on some personal experiences, and also comment on the rapid changes which are having a great impact on our profession and in the field of medicine in general.

I have divided training and practice of neurosurgery into three different eras based on great changes that took place in technology and organization which had major impacts on the field. I have termed the first era, the **foundation of neurosurgery**, as neurosurgery became recognized as a separate specialty field. The second era being the establishment of **mainstream neurosurgery,** as the specialty underwent widespread adoption with the introduction of microsurgery and modern neuroimaging leading to a number of vast improvements in the safety and practicality of neurosurgical procedures. The third era I would characterize as the **digital age**, which has led to multiple changes in all of our lives, but has been responsible for quantum leaps in research, knowledge, imaging, instrumentation, navigation and informatics which will continue to affect our specialty in profound ways.

I would like to pose a question; "how do we prepare for and deal with all of the rapid changes ahead while preserving our valuable heritage and continue to serve the public good?"

When I was preparing this lecture, I received a letter from the American Board of Neurological Surgery, which was sent to all board certified neurosurgeons and offered a newly crafted definition of our specialty. The reason I included this was to emphasize

that the document provided a framework to define what constituted the field of neurosurgery and also to make the statement that the board was dedicated to advance the science of neurological surgery and elevate standards, thereby serve the cause for public health.

Rather than reading it entirely, suffice it to say that it emphasizes a large expanded scope of neurosurgery, an increased knowledge base, and an increased number of skills needed to perform all the new procedures, and also emphasized that we must be responsible to maintain high standards of performance and keep the public trust in the profession.

Before I went to medical school, I read the book "The Making of a Surgeon" by William Nolan and this book had a profound effect on me. It was a story of a surgical resident who came from Minnesota and trained at Bellevue Hospital in New York City and described the surgical training at a time during the pyramid system, which was the traditional Halstead training system. Success was based on compassion and hard work, and the experience was a quest and rite of passage. There was a need to prove oneself with skills, stamina, and intellect, and it described the process of maturation and character building throughout the training. This residency was based on the Halsted training model after William Halsted who was the leading professor of surgery at Johns Hopkins Hospital at the beginning of the 20th century, and trained so many academic surgeons of time including the founders of our specialty in America, Harvey Cushing and Walter Dandy
Michael Bliss gave a superb talk at our meeting 2 years ago, based on his biography of Harvey Cushing "A Life in Surgery" describing Cushing's puritan background and hard work ethic, and describing the sacrifices that he made, and especially the toll it took on his wife and family, to advance the field and make great contributions to American neurosurgery. Walter Dandy was also trained Johns Hopkins, stayed there after Cushing went to the Peter Bent Brigham Hospital Boston, and the two of them trained many of the leaders in the first era of neurosurgery. The journal "Neurosurgery" in the November issue of 1999 recognized two individuals who made the biggest contributions to 20th neurosurgery. They included Harvey Cushing in the first part of the Century, 1900 to 1949, and Professor Gazi Yasargil from 1950 to 1999 because of his many contributions including micro neurosurgery.

Cushing succeeded by, careful attention to tissue handling antisepsis, and hemostasis according to Halstead's principles and providing round round-the-clock meticulous care to patients in the postoperative period. He was able to achieve huge successes in operating on brain tumors given the technology available at the time. Here is a picture of his nurse Miss Gerard, administering ether anesthesia to a patient. This is a picture of the completion of his 2000th verified brain tumor operation. He was able to decrease mortality to below 10% by 1930 compared to 30 of 45% for most other surgeons at the time. This illustrates a picture of a spinal cord tumor, during and after removal. This was at a time when there was no neuroimaging, and the tumor was suspected through neurologic examination. Large exposures and partial removal of the tumor are described using a spoon like instrument. The tumor recurred several years later and the patient had several subsequent operations.

This slide illustrates **clinical care, during the first era of training**, which was under a master surgeon with staff as apprentices, and little in the way of support services besides the nursing staff and hospital workers

Gazi Yasargil was picked to represent the second era of neurosurgery, which could be done more safely due to the many advances at the time including illumination and magnification. He is of Turkish descent and trained at the University of Zürich with Hugo Krayenbuhl, and spent a year abroad at the University of Vermont with Dr Peardon Donahey learning techniques of microsurgery which were being developed for vascular surgery at the time. He was able apply these techniques to neurosurgery and developed micro-instrumentation and technology available to perform of microsurgery and increase the safety of neurosurgery.

One of the other, significant development during this era was the introduction of neuroimaging during the 70s and 80s with CT and MRI being able to precisely localize lesions preoperatively in the brain and spinal cord. More recently functional imaging showing functional cortex in relation to a cavernous malformation has really improved the ability for us to operate safely in different areas of the brain.

The availability of microscopes have also allowed the widespread adoption of what Yasargil taught us, regarding how to operate on a tiny vessels using a micro-instruments and avoid the complications that to happen from injuring small vascular structures. Here is microsurgery of an epenymoma in the cervical spinal cord the same tumor that I showed that Cushing had removed only partially with a later recurrence. The use of an operating microscope with a laser, allowed us to completely removal of this tumor which can be curative in a high percentage of cases. Preoperative imaging, allowed precise localization. In the **second era of neurosurgery**, we witnessed expansion of neurosurgery departments as the new operative procedures were added to the field, the importance of the scientific foundation of neurosciences research with an emphasis on NIH funding and laboratory training, and increased pressures to increase clinical volume as managed care came into play and reduced reimbursement.

At the University Washington Arthur Ward was the first chairman of the Department of neurosurgery, and a previous president of this society. He was the first chair of neurosurgery to take NIH funding and was criticized at the time for that, by his colleagues, fearing government intrusion into the field. Prior to training with Wilder Penfield, he was trained as a scientist and emphasized scientific research as a basis for neurosurgery practice.

Bill Kelly pictured here with his wife Joan, hired me as a resident when he was interim chair and was a superb clinical surgeon, and past western president. Basil Harris also past president, George Ojemann, pictured here talking to Lindsey Simon, John Loeser, Kim Burchiel another past president, made great contributions, stayed on the faculty of hers early part of his career and has done a superb job at Oregon Health Sciences University.

Richard Winn of course energized the program tremendously to develop, in response to the changes happening at the time which were increased demand for clinical services, lengthened the training program to provide more comprehensive clinical training, and established a rotation abroad with a new emphasis on operative skills and higher clinical volumes. Research opportunities were provided for all residents and continued a strong clinician scientist model was present. Other faculty members joined the department including Ralph Dacey from the University of Virginia who then went on to be Chairman of neurosurgery at Washington University in St. Louis. Sean Grady, who has gone on to become chair of neurosurgery at University Pennsylvania and Mitch Berger who assumed Charlie Wilson's chair at UCSF and has done a terrific job with that program. Marc Mayberg, went on to rebuild the Cleveland Cinic program and returned to Seattle to co-found the Swedish Neuroscience institute with me. Dave Pitkethly and Ted Roberts (another past president of the Western), who joined us from the University Utah and made a number of important contributions. The program became a top neurosurgery program by any standards and received more NIH funding than any other program for over 10 consecutive years.

This is an example of the **clinical care and training in the second era** with larger neurosurgery departments larger house staff, pre-residency and post residency fellows and additional ancillary providers. There were more specialists, physician extenders with nurse practitioners and physician assistants as well as specialized intensivists and others to handle the increase in specialized knowledge and clinical load.

At the turn of the century we ushered in “The Decade of the Brain” which was proclaimed by President George H. Bush with increase in research to be directed to the neurosciences, which is the lead to many of the developments in the last few years.

A **third era** is now being heavily influenced by **the digital revolution**. Many rapid changes are taking place as a result of downstream changes that began as an inflection point at the time of the PC era. A number of people contributed to this including Bill Gates and Paul Allen, who were students at the Lakeside school in Seattle and had a strong interest in the computer lab which was funded by the women's auxiliary and was donated to the school. They logged in thousands of hours of computing time, exceeding the 10,000 hours that Malcolm Gladwell indicates in “Outliers” is a magic number to achieve superior proficiency.

They established Microsoft Corporation in Albuquerque, New Mexico and then moved to Seattle and were able to develop an operating system for the IBM personal computer. The increased processing speed, enabled many of the tasks which formerly needed a mainframe computer, to be done at the desktop, which opened up the era of desktop computing.

In Silicon Valley Steve Job's and Steve Wozniak developed the Apple Computer and focused on a graphical user interface. These first computers were not reliable enough for many medical applications other than simple data management. The subsequent growth and popularity of personal computers allowed a large number of people to access the

internet and the establishment of e-commerce, business, retail and finance. Search engines were developed for people to search the Internet for content which anybody was free to post, and led to a lot of early non-useful information. Platforms and content have become more refined and more carefully developed. The digital age has gone from hobbyist to mainstream and has affected everyday life and commerce.

Health care information is now becoming easily obtainable in digital form, and the effects on medical publishing and access to information are too numerous to recount with all our major journals now online. At first, some of the devices were clumsy and not useful, like this initial attempt at a portable device by John Scully, who took over Apple Computer, but more recently handheld devices provide an astounding access to information.

There were high hopes that the tablet PC would be useful to health care providers, however the devices were too clumsy and slow with long boot up times, poor wireless connectivity, password barriers which led to most abandoning this technology. This has changed with 2 new developments. The first is better device applications for viewing with faster network access. The second development is the use of the tablet as an end user device with the computing and storage done in the cloud. How will this be done?

The title of this picture says, one runs the biggest tech company in the world the other is a global leader in fighting poverty. This refers to the fact that Apple through a lot of innovative product development in the consumer markets has recently gained value and surpassed Microsoft in market capitalization recent months. Bill Gates has turned over running Microsoft to Steve Balmer and has gone on to focus on his foundation which supports global health care and education. The deal that was struck with Warren Buffet was that Warren Buffet would turn over the majority of his fortune to the Bill and Melinda Gates Foundation to disseminate provided that Bill Gates would step away from running Microsoft and devote his full attention to it.
This is the new headquarters for foundation, which is just about to open in Seattle, and they are doing a tremendous amount for a global health.

So what's next for the digital revolution and how will affect healthcare? Nicholas Carr makes a point in his book "The Big Switch" that there is an analogy to the beginning of the last century concerning the delivery of electricity. This is our building that was has been refurbished but was originally built in 1910 in showing the power plant, which burned fossil fuels to provide power for the building complex which many large buildings did at the time.

Electric utilities switched over to delivery through the grid, and this book makes the point that the same thing is happening with the complex computing services. The current model where there is a PC on every desk with a separate operating system and software collection that is bought and paid for has given way to the concept were complex computing needs and the need for accessibility will favor that many of the computing tasks will become centralized and delivered to the end-user to desktop or mobile devices. Google and Microsoft are betting large portions of the companies that cloud computing will be indeed adopted, pushing content to multiple devices.

So what is cloud computing? Cloud computing is a paradigm in which information is permanently stored on servers on the Internet and cached temporarily on clients that include laptops, computers and handhelds, sensors. Another definition is scalable IT that is available is as a service over the Internet to multiple users.

This is Apple's the cloud computing platform where you can store all of your information and purchases in a cloud account and access it from a number of their devices. Microsoft is makes a point and they been in cloud computing for 15 years with the services that can automatically delivered to your PC and this effort is increasing with their new office suite. The three largest providers of cloud services are Google, Microsoft and Amazon and huge revenues are projected in the near future from cloud services.

So if your computer malfunctions in the future here is one alternative to cursing the computer on your desk. One of the advantages for Washington State is that they have a cheap hydroelectric power from the Columbia River so it's big business to build large server farms for all the anticipated data needs.

What does the public need for health care? Ideally the public should have instant access to information on health-related topics, particularly about their condition. Instant access to medical records for patients and providers with strong security system is needed, which is already there for financial matters. A timely medical imaging and diagnostics system which can be shared with those need to provide answers, and possibly in the future personalized medicine with the more extensive genomic information stored about each individual in order to help make medical decisions. Can cloud computing help fix health care?

A number of startup companies are in the beta testing phase. One that I recently became aware of is setting up a system for physicians and users to sign up with an account in the cloud. If a patient would like to send you their imaging they can load them onto your account, which is in the cloud. The computing in the cloud will manage the viewer with a 3-D capability, as well as store the data so they're accessible at any time to be able to share those images with other providers, or researchers, etc. The bulk of actual data will never be transferred back to your own computer, but will remain in the cloud and the computing and image analysis will also be done in the cloud, and just viewed on your home computer, tablet or smart phone.

Here's an example of how it would work with an MRI scan of a patient that's on a cloud-based account with a 3-D capability viewer to manipulate the images. The viewing and manipulation is the only thing that is done it at the end user site. This is the cerebral vasculature looking for an aneurysm or other abnormality. The images will be stored, and can be viewed by anybody who is granted access.

Other applications include social networking technology including a face book for physicians which is a restricted community of physicians. Private restricted access,

allows you to share medical information including videos pictures text, with the other providers, or consult with them in a HIPPA compliant environment.
Other technologies include enhanced teleconferencing, allowing telemedicine and tele-health care. This is our E- ICU, which is utilized in our facility. At 7 p.m. the routine medical care including handling standard medical issues get signed over to the E- ICU There is one on-call doctor that stays in a in a room on a shift and is responsible for a number of ICU beds in the system and is able to instantly access real-time imaging of the patient. All the relevant vital signs enable resolution of most of the medical issues by using the system.

This recently had been employed in a greater than 35 health systems. The statistics are listed here. The company was founded in 1998, and first implemented in June 2000 publicly traded since April 2006 and then acquired by Philips in 2008.
Other developments include the ability to videoconference on handheld devices, which may have significant applications and if health care delivery in a patient follow-up patients with long distances or a certain consultations that can take place

I predict that the system for healthcare IT will be assembled in pieces and that the core technology that allows this to be accomplished will be driven by consumer and business markets. The system will be influenced by government and payers who have stated that healthcare is 10 years behind on IT. There's $18 billion in the new healthcare act for hospitals and doctors to develop better IT systems. Small companies will grow from healthcare consumers and providers needs and this represents an opportunity for our specialty and others to design systems that will their most beneficial to our patients and our types of workflow which are unique for each specialty. Aggregation will take place in stages through mergers and acquisitions.

This will likely follow the cycle of capitalism and industrial revolutions, namely invention, propagation, adoption, and control. In the 1920s there were 186 major railroads. Today there are seven in existence as a regulated oligopoly. When the open standard allowed interconnection and AT&T patents expired 6000 independent phone companies developed. In 1939 AT&T controlled nearly all the long-distance lines and 4/5 of the telephones. Hundreds of small electric utility companies and by the late 1920s 16 controlled 75% of the electricity.

Future drivers for change in neurosurgery include population growth, demographics expanded scope of the neurosciences, scarcity of well trained providers, and demand for public safety, and industry and government demand for reduced costs.
One of the large drivers will be demographics of the world population. Growth since 1954 of the world population has increased numbers from 3 to almost 7 billion and most of these people are in the younger age groups and will reached the healthcare consumer ages over the next 10 to 30 years. In the United States the baby boomers are just reaching the peak years of healthcare consuming, which is destined to put a large strain on the entitlement programs.

The digital revolution has changed things such that the public everywhere now can search for answers, describe symptoms, establish diagnoses online, and send photos of videos. People with rare diseases can connect with other groups of patients through social networking groups and support forums, which was never possible in the past.
One phenomenon that was described in the E-business world is called long tail by Chris Anderson, who is the editor of wired magazine. In simple terms, it describes the tail of a curve where the popular products are sold in large numbers at central locations. However, through e-commerce companies like Amazon.com and eBay can take a small fee from a large number of transactions, a large amount of the profit can be made in extending the distribution system for and matching the customer to the seller over long distances without the need for a physical shelf space.
Is the same going to happen in healthcare, where people with rare conditions will seek expert advice and opinions across long distances?
It is already happening to a large extent and will continue to happen more in the future. There is a demand for increased safety that comes from the transparency about hospital and provider performance created by digital technology allowing easier public access. Culture safety, handoffs, safety pauses, checklists are the current mantra.
Digital communications also means increased scrutiny.
Work hour restrictions, increased supervision requirements, and increased need for documentation of the educational experience and larger scope of the specialty will force decisions on whether longer training is needed, or refocus on a core curriculum with infolded or external fellowships or early sub specialization takes place.
The third era of clinical care and training has taken on an increased level of complexity with disease management teams and interacting with the computerized decision support. Online support for education, training, a social networking and increased complexity of the hospitalized patients requires a large number of practitioners with restricted work hours requiring an increased number of handoffs and other requirements that may affect safety.

Change is happening quickly and there are many opportunities to improve results for patients. It is important to preserve our great traditions integrate the best of the new technologies to shape our future. Preserve in our training a sense of responsibility to the patient and keep the public trust that we do will do the right thing for the patients.

What would Harvey Cushing say?
He would say don't take for granted all that has come of what I worked so hard to create almost 100 years ago
Maintain a leadership role, see this as an opportunity, and set the proper direction so that the best years for neurosurgery are yet to come.