Welcome to the 228th WDMS Oration

Susan George, MD, FRCP, MACP, SFHM

"The Evolution of Learning and Teaching in Medicine"

The Evolution of Learning & Teaching in Medicine

Susan George, MD, MACP, SFHM,FRCP

Disclosures

- None

Worcester District Medical Society

228th Annual ~~Oration~~ Narration
Wednesday, February 7, 2024, 5:30-8:00 pm
Beechwood Hotel, Worcester

"The Evolution of Learning and Teaching in Medicine"

ORATOR: **Susan V. George, MD, FRCP, MACP, SFHM**
Program Director, Internal Medicine Residency,
St. Vincent Hospital *and* Professor of Medicine,
University of Massachusetts Chan Medical School

Overview

Review of how the practice of medical education has evolved with recent changes and future impacts

Evolution over the centuries

- Ancient
- Modern

Effects of more recent paradigm shifts

- DEI
- Formalization including ACGME
- Generational changes
- COVID

Future changes

- AI
- Changing needs

If you don't know where you've come from, you don't know where you're going.

Maya Angelou

Ancient civilizations

Practice of Medicine

- Religious beliefs
- Mysticism
- Empirical Observations

Transmission of medical knowledge

- Oral tradition
- Written texts
- Apprenticeships
- Practical experiences

Mesopotamia
2900-1600 BCE

Physician

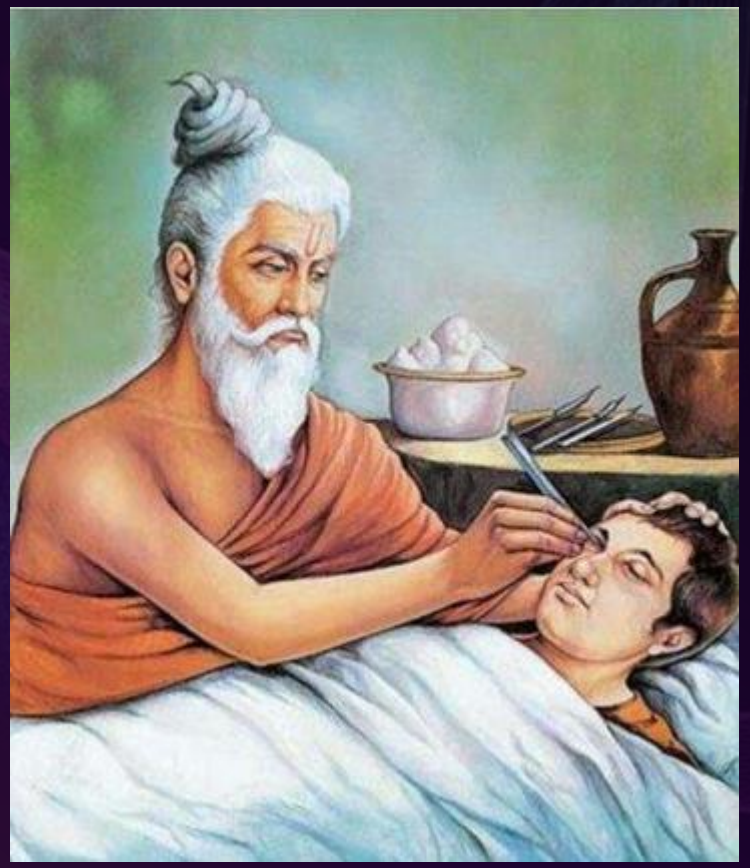
Physician Preparing an Elixir from De Materia Medica

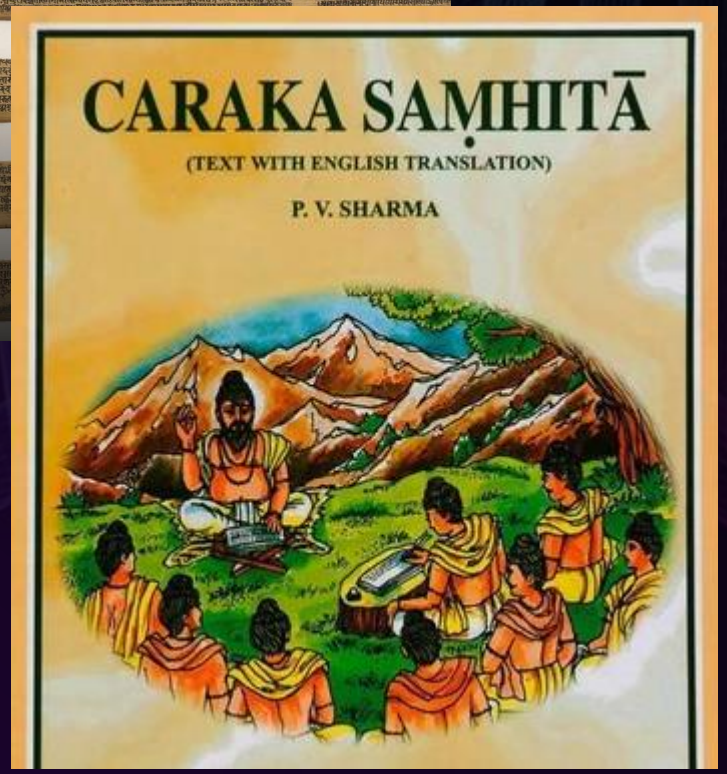
Physician's medical recipe

Ancient Egypt 2655 BCE

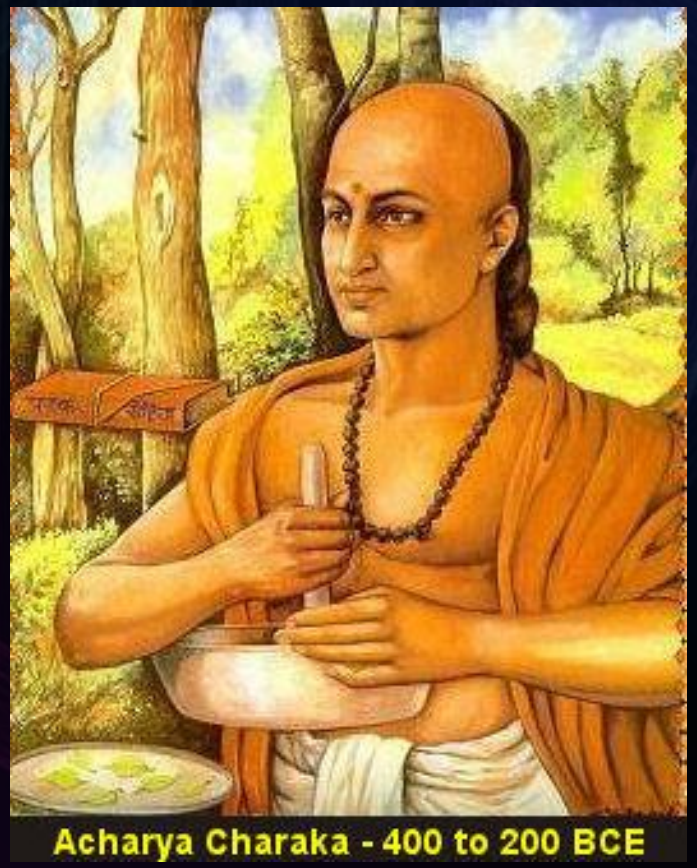
Ancient India 800 BCE

Susruta





Charaka

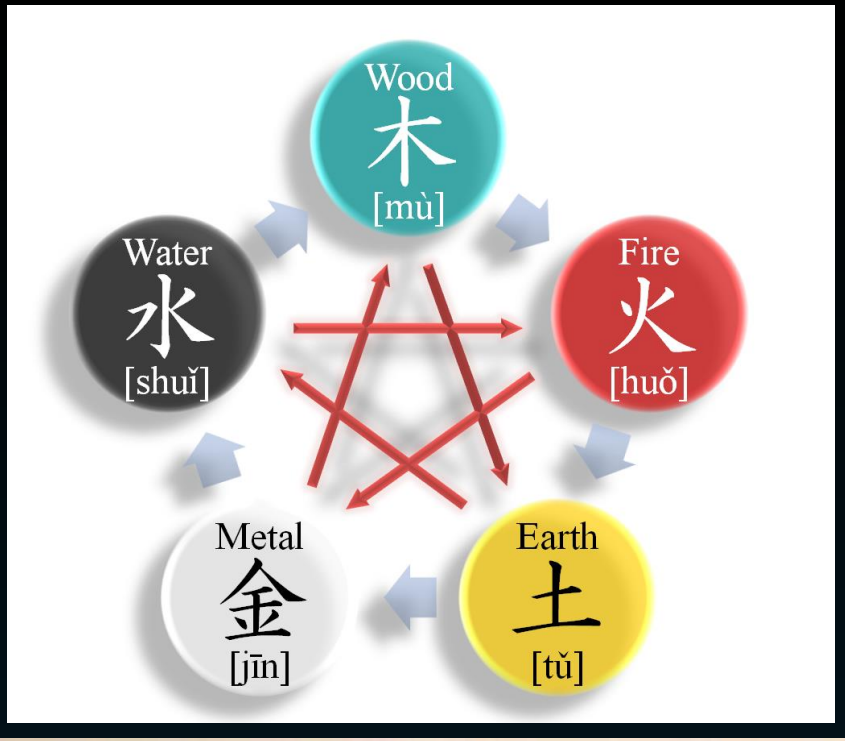


J Family Med Prim Care
v.5(2); Apr-Jun 2016

J Family Med Prim Care
v.5(2); Apr-Jun 2016
PMC5084543

Ancient China

- TCM believes human body is strongly connected with the environment, hence, the pathophysiology is based on yin-yang (dark-light) and five elements
- All organs in a body should form a balanced state. Any imbalance will cause disease
- Individualized treatment plan "See a person who is sick, not the disease a person has"
- Emphasize preventive medicine



Traditional Chinese Medicine

- Systemic theories- **“Yellow Emperor's Inner Canon”**
  - The first TCM textbook was created based on records of discussion between teacher and students
  - Introducing comprehensively the concepts and practices of preventive medicine and of preservation good health, which coincide with the bio-psycho-social model.
  - It documented details of diagnosis and treatment methods such as the theory of channels-collaterals and acupuncture-moxibustion therapy, and the principles in preserving good health through proper nutrition and harmony between human spirit and the environment.
  - A quote from this book: “A good doctor treats the disease; a superior doctor prevents it”

Development of TCM

Theory of differential diagnosis- *Expert opinion*

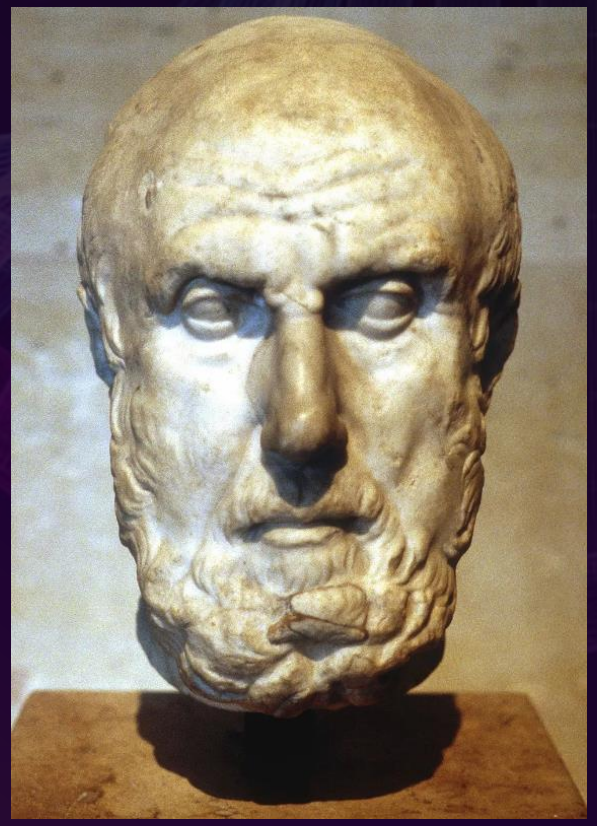
- Zhang Zhong Jing (150-219AD)

Surgery and antiseptics- *Innovations*

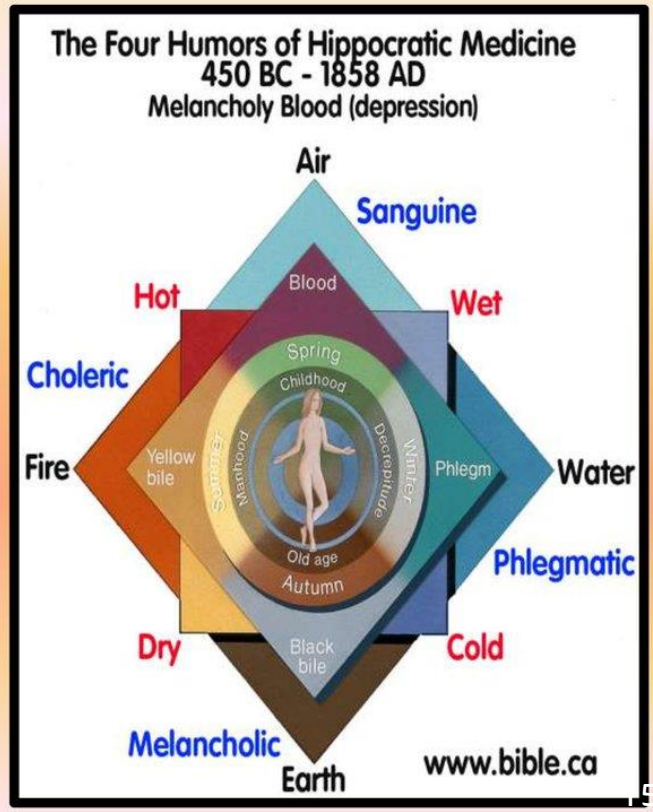
- Hua Tuo (145-209AD)

Ancient Greece
460-377 BCE

Hippocrates of Kos



- Idea that the human body consisted of the *four humours*, which had to be kept in balance. This theory survived until after AD 1700.



Post-Hippocratic era

- Justice
- Secrecy
- Respect for teachers
- Solidarity with peers

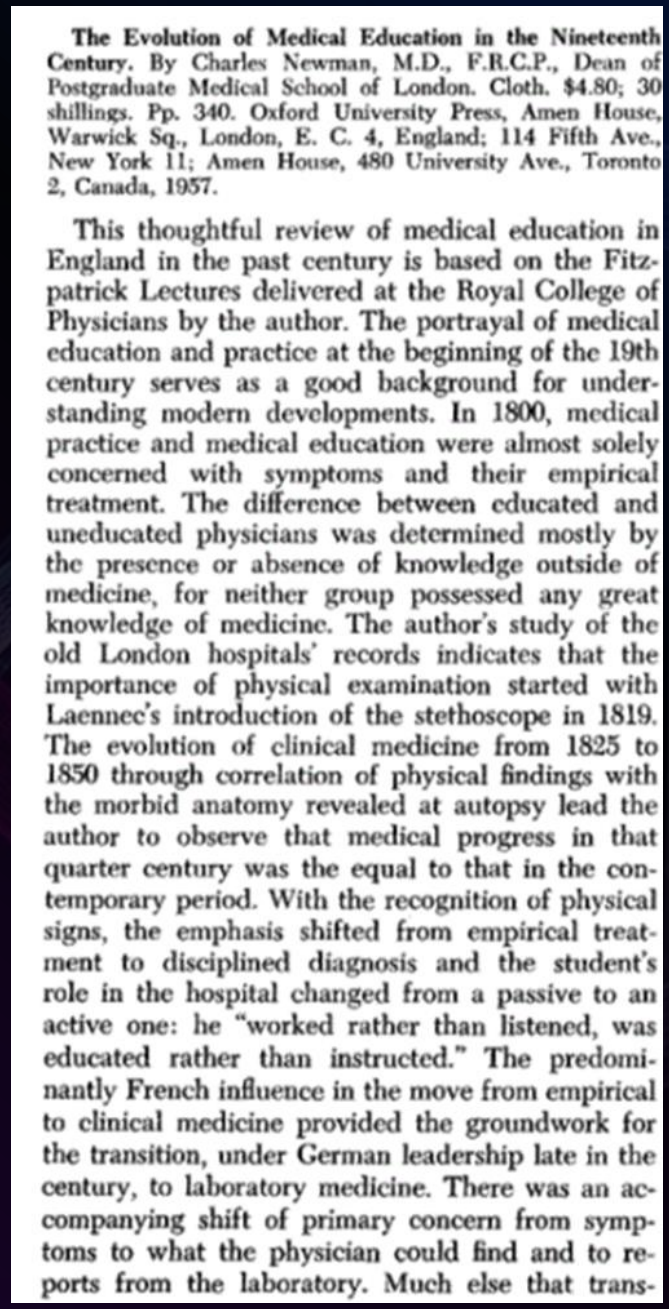
Detail from School of Athens, fresco by Raphael, 1508–11; in the Stanza della Segnatura, the Vatican. Plato is shown pointing to the heavens and the realm of forms, Aristotle to the earth and the realm of things.

Arabic Medicine

MEDICINE OF THE RENAISSANCE

Europe

- French influence:
  - Transition from empiric treatment based on symptoms to disciplined diagnosis based on physical examination (introduction of Laennec's stethoscope) and correlation with morbid anatomy (autopsies)
- German leadership (lab medicine):
  - Integration of lab data
- Students in medicine:
  - Worked rather than Listened
  - Educated rather than Instructed



The Evolution of Medical Education in the Nineteenth Century. By Charles Newman, M.D., F.R.C.P., Dean of Postgraduate Medical School of London. Cloth. $4.80; 30 shillings. Pp. 340. Oxford University Press, Amen House, Warwick Sq., London, E. C. 4, England; 114 Fifth Ave., New York 11; Amen House, 480 University Ave., Toronto 2, Canada, 1957.

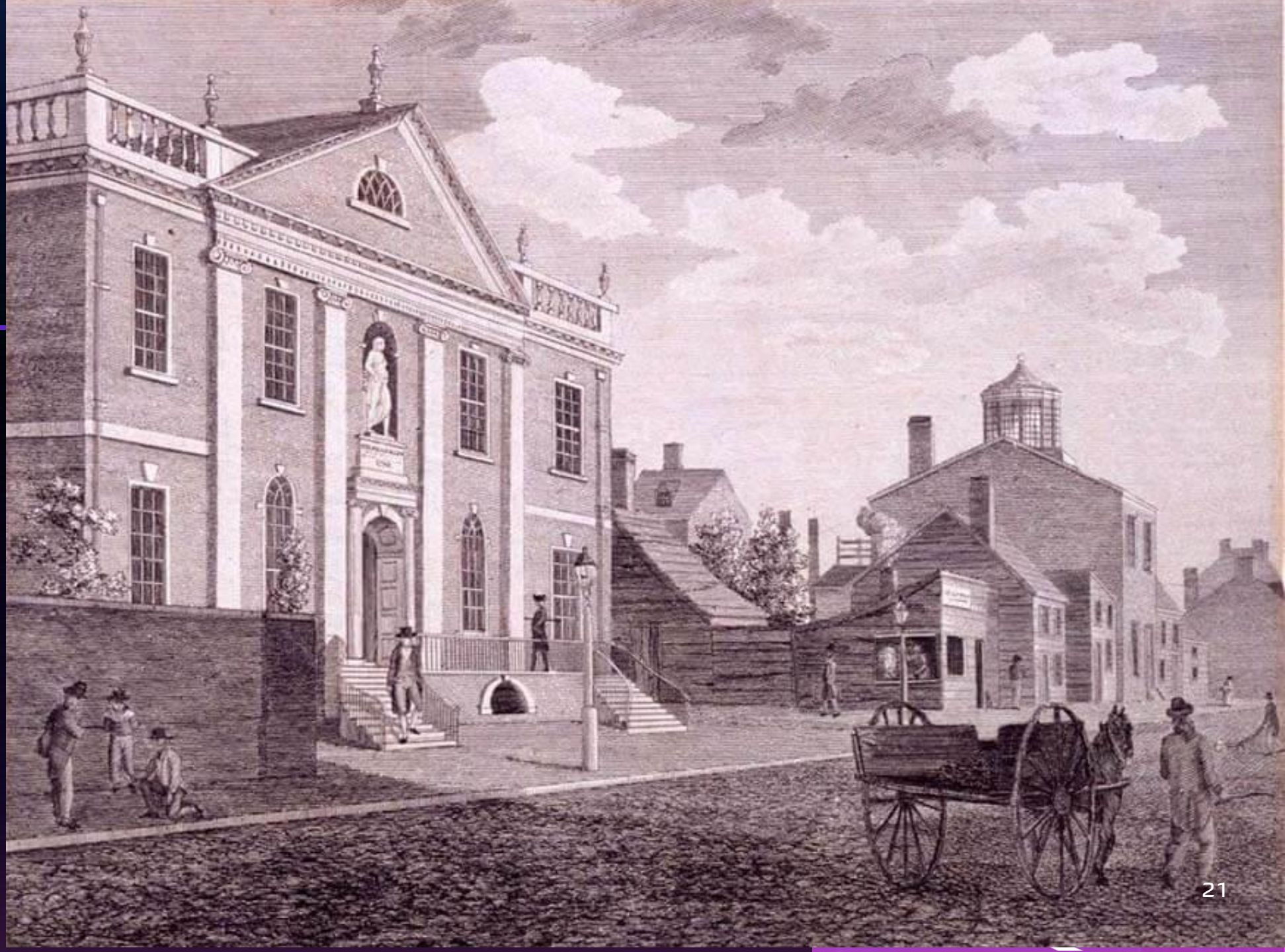
This thoughtful review of medical education in England in the past century is based on the Fitzpatrick Lectures delivered at the Royal College of Physicians by the author. The portrayal of medical education and practice at the beginning of the 19th century serves as a good background for understanding modern developments. In 1800, medical practice and medical education were almost solely concerned with symptoms and their empirical treatment. The difference between educated and uneducated physicians was determined mostly by the presence or absence of knowledge outside of medicine, for neither group possessed any great knowledge of medicine. The author's study of the old London hospitals' records indicates that the importance of physical examination started with Laennec's introduction of the stethoscope in 1819. The evolution of clinical medicine from 1825 to 1850 through correlation of physical findings with the morbid anatomy revealed at autopsy lead the author to observe that medical progress in that quarter century was the equal to that in the contemporary period. With the recognition of physical signs, the emphasis shifted from empirical treatment to disciplined diagnosis and the student's role in the hospital changed from a passive to an active one: he "worked rather than listened, was educated rather than instructed." The predominantly French influence in the move from empirical to clinical medicine provided the groundwork for the transition, under German leadership late in the century, to laboratory medicine. There was an accompanying shift of primary concern from symptoms to what the physician could find and to reports from the laboratory. Much else that trans-

Formalization Medical Education Late 19th Century

- Medical schools established
- Standardized curricula
- Classroom lectures
- Lab work
- Clinical training

America

- Pennsylvania – home to first medical school



www.thelancet.com Vol 385 May 16, 2015

- Bachelor of Medicine
- Doctor of Medicine

Hopkins Circle

William Welch founding dean of Hopkins

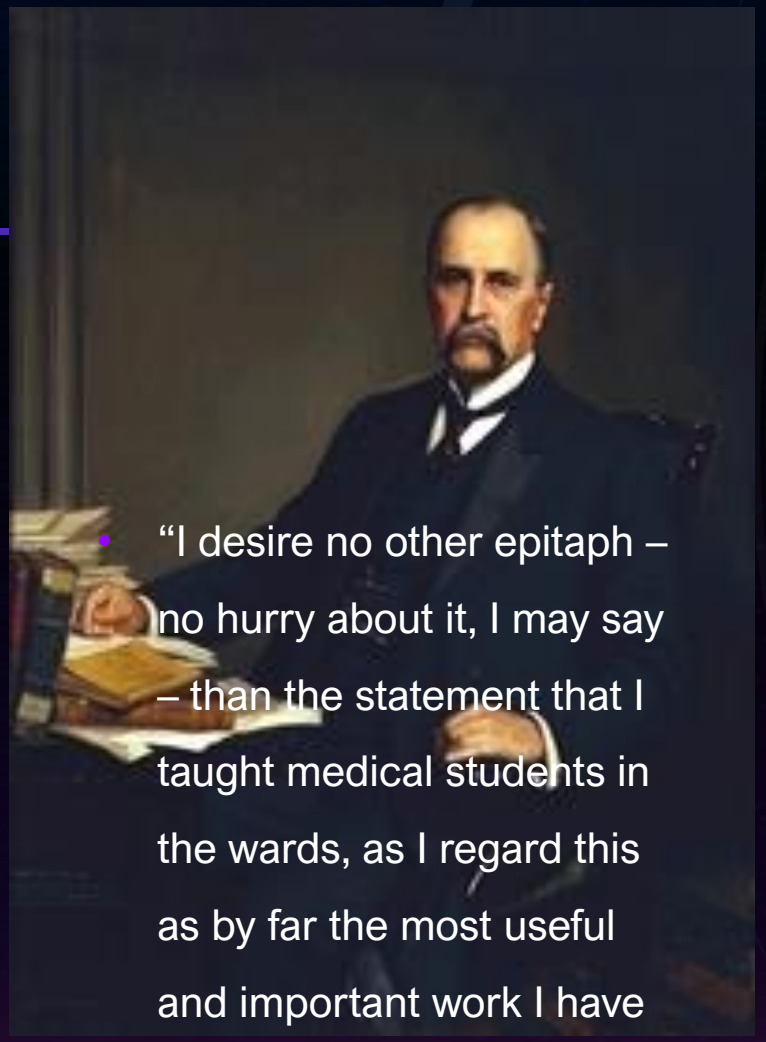
John Hopkins – a Quaker merchant

William Osler-the first chief of Medicine

- Osler's warning that the ideals of medicine would change as "teacher and student chased each other down the fascinating road of research, forgetful of those wider interests to which a hospital must minister"

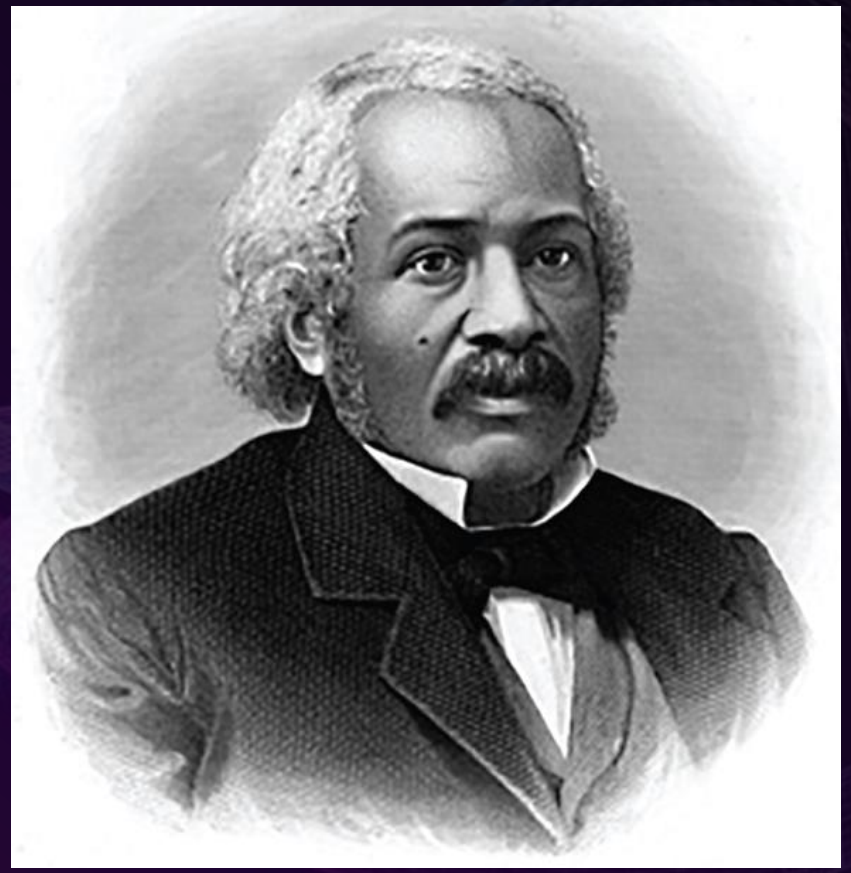
Yale J Biol Med. 2011 Sep; 84(3): 269–276.
Published online 2011 Sep.
PMCID: PMC3178858
PMID: 21966046
The Flexner Report — 100 Years Later
Thomas P. Duffy, MD

William Osler 1849-1918



- “I desire no other epitaph – no hurry about it, I may say – than the statement that I taught medical students in the wards, as I regard this as by far the most useful and important work I have been called upon to do.”

US Black Physicians



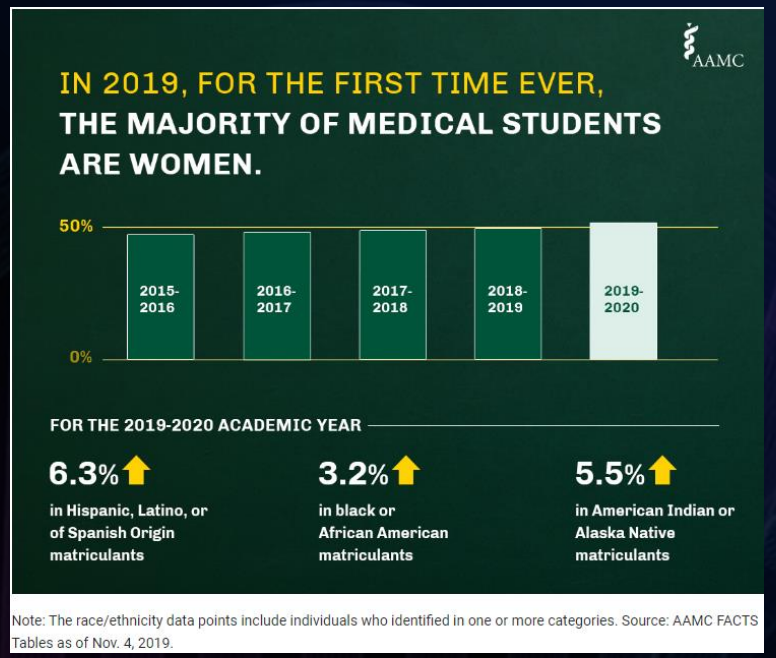
Dr James McCune Smith g. 1837

Dr David Jones Peck g. 1847

JAMA. 2021;326(22):2245-2246. doi:10.1001/jama.2021.18511

Elizabeth Blackwell

First woman to earn a medical degree in the US in 1849 after she was accepted to Geneva Medical College, NY

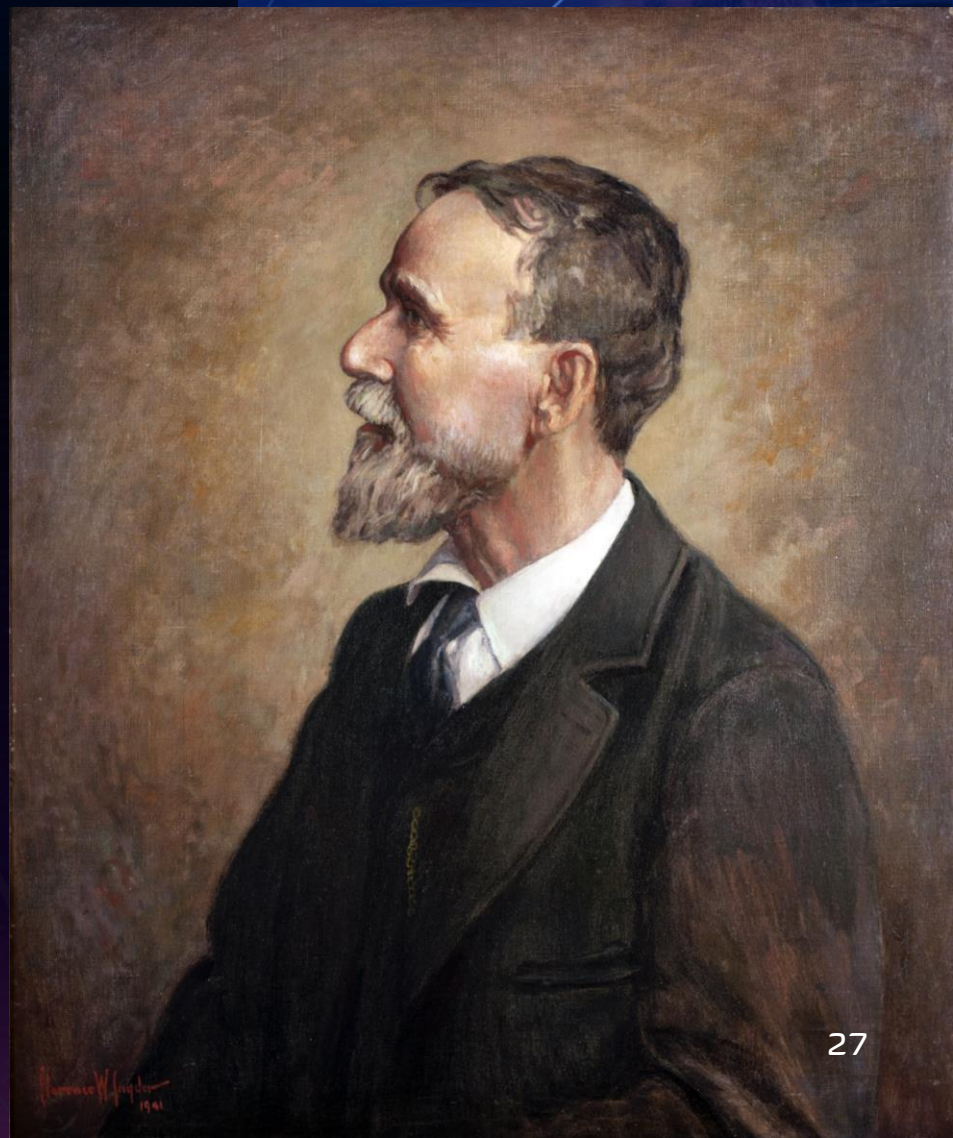


Note: The race/ethnicity data points include individuals who identified in one or more categories. Source: AAMC FACTS Tables as of Nov. 4, 2019.

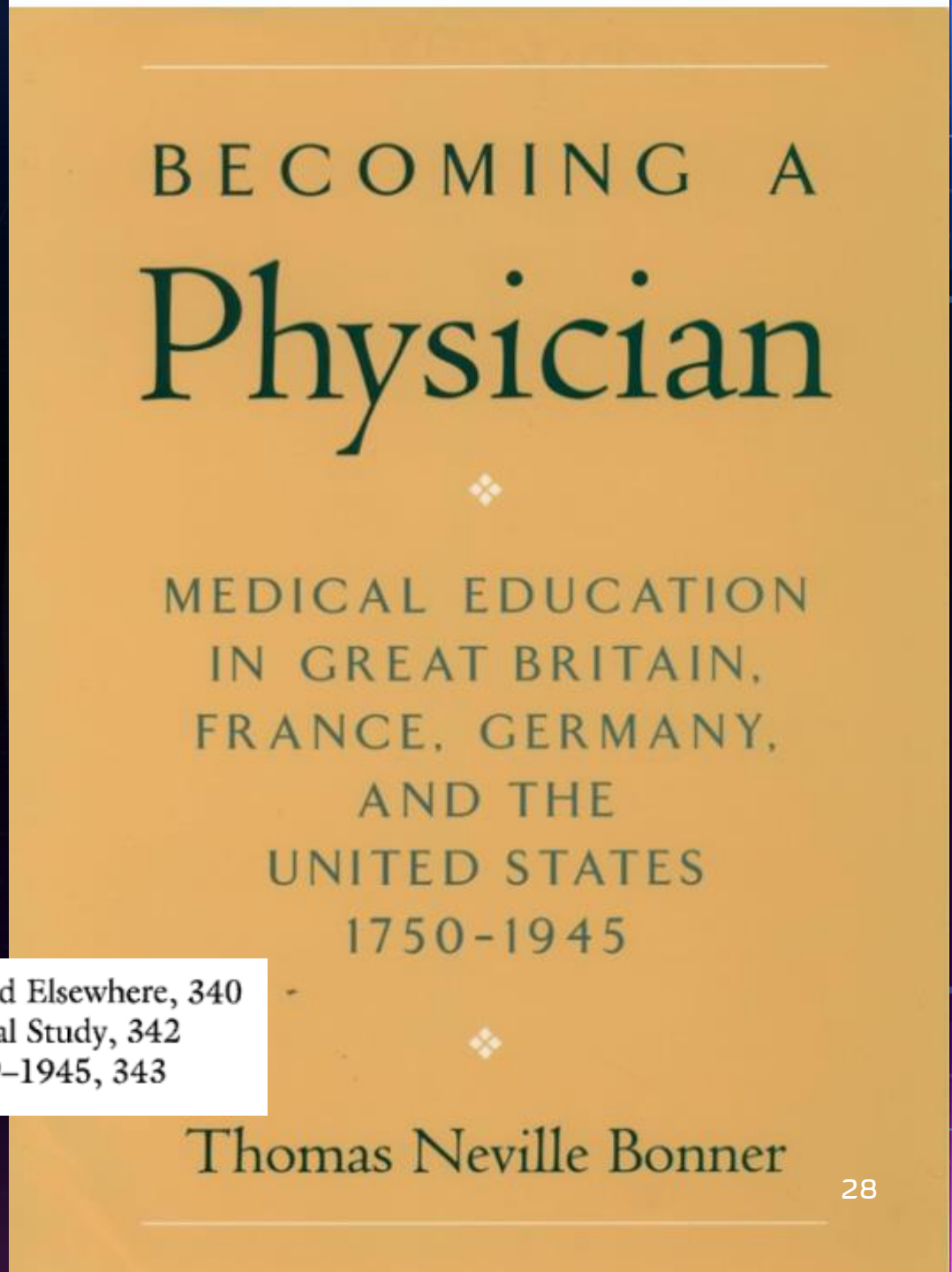
Osteopathic Medicine

1874: Dr. Andrew Taylor Still develops the osteopathic medical philosophy, pioneering the concept of "wellness" and recognizing the importance of treating illness within the context of the whole body.

1892: Dr. Still opens the first osteopathic medical school, the American School of Osteopathy, now known as A.T. Still University, in Kirksville, Missouri. The first class opened with 21 students, including six women.



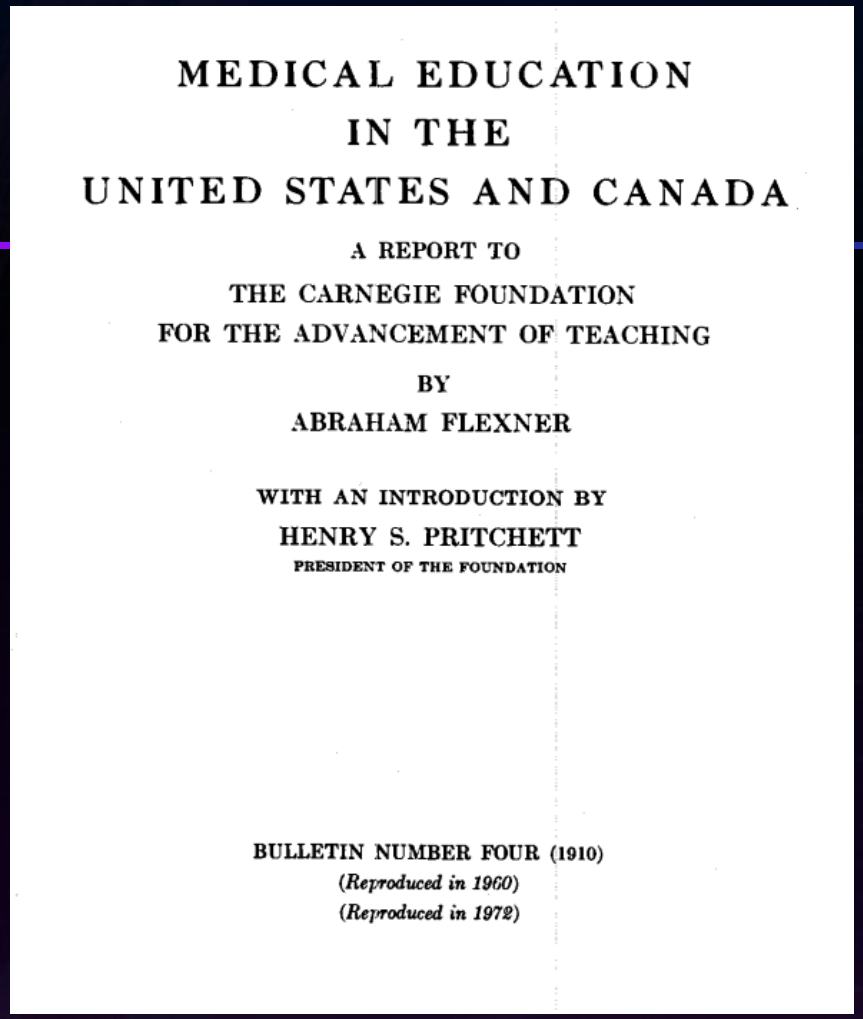
1750-1945



Bonner, 1996.Bonner TN
Becoming a physician: medical education in Great Britain, France, Germany, and the United States, 1750–1945.Oxford University Press, New York1996

19 th century

Flexner Report 1910



MEDICAL EDUCATION
IN THE
UNITED STATES AND CANADA

A REPORT TO
THE CARNEGIE FOUNDATION
FOR THE ADVANCEMENT OF TEACHING

BY
ABRAHAM FLEXNER

WITH AN INTRODUCTION BY
HENRY S. PRITCHETT
PRESIDENT OF THE FOUNDATION

BULLETIN NUMBER FOUR (1910)
(Reproduced in 1960)
(Reproduced in 1972)

(1) For twenty-five years past there has been an enormous over-production of uneducated and ill trained medical practitioners. This has been in absolute disregard of the public welfare and without any serious thought of the interests of the public. Taking the United States as a whole, physicians are four or five times as numerous in proportion to population as in older countries like Germany.

(2) Over-production of ill trained men is due in the main to the existence of a very large number of commercial schools, sustained in many cases by advertising methods through which a mass of unprepared youth is drawn out of industrial occupations into the study of medicine.

(3) Until recently the conduct of a medical school was a profitable business, for the methods of instruction were mainly didactic. As the need for laboratories has become more keenly felt, the expenses of an efficient medical school have been greatly increased. The inadequacy of many of these schools may be judged from the fact that nearly half of all our medical schools have incomes below $10,000, and these incomes determine the quality of instruction that they can and do offer.

the public hospital as in the private sanatorium. We have indeed in America medical practitioners not inferior to the best elsewhere; but there is probably no other country in the world in which there is so great a distance and so fatal a difference between the best, the average, and the worst.

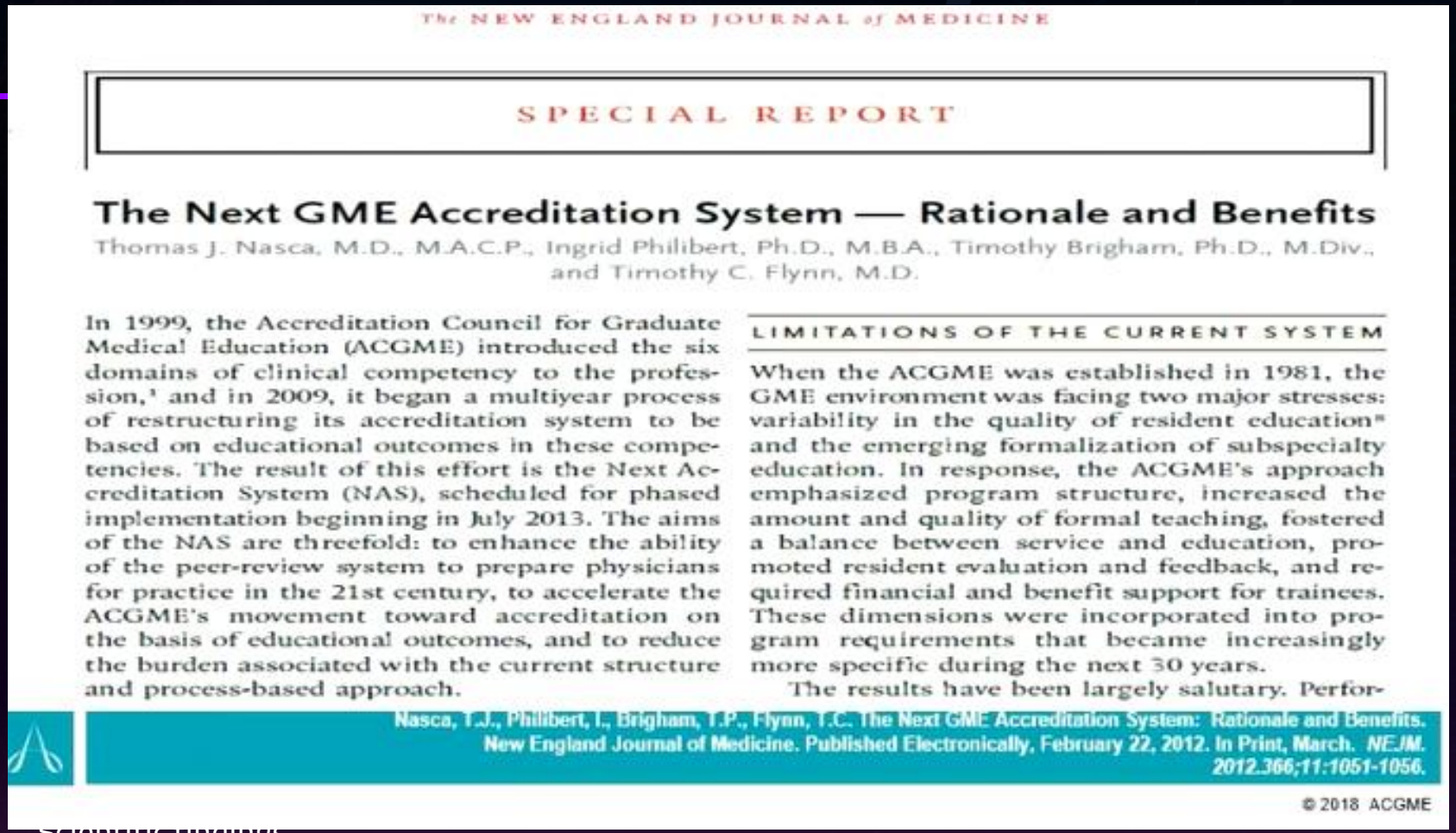
It appears, then, that the country needs fewer and better doctors; and that the way to get them better is to produce fewer. To support all or most present schools at the higher level would be wasteful, even if it were not impracticable; for they can-

Flexner, 1910.Flexner A
Medical education in the United States and Canada: a report to the Carnegie Foundation for the advancement of teaching. The Merrymount Press, Boston1910

Evolution

- **1914** AMA Council on Medical Education sets standards for hospital internship programs and publishes the first list of approved hospitals offering such programs which included 603 hospitals offering 3095 positions
- **1952** National Internship Matching Program is formally established which later becomes the National Residency Matching Program
- **1954** AMA Council on Medical Education convenes discussion that lead to the formation of the Educational Council for Foreign Medical Graduates (ECFMG)
- **1981** Accreditation Council on Graduate Medical Education (ACGME) is established from a consensus in the academic medical community for an independent organization
- **1995** Electronic Residency Application Service (ERAS) is launched by the AAMC as the standard on-line residency application service

ACGME 1981



The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL REPORT

The Next GME Accreditation System — Rationale and Benefits

Thomas J. Nasca, M.D., M.A.C.P., Ingrid Philibert, Ph.D., M.B.A., Timothy Brigham, Ph.D., M.Div., and Timothy C. Flynn, M.D.

In 1999, the Accreditation Council for Graduate Medical Education (ACGME) introduced the six domains of clinical competency to the profession,[1] and in 2009, it began a multiyear process of restructuring its accreditation system to be based on educational outcomes in these competencies. The result of this effort is the Next Accreditation System (NAS), scheduled for phased implementation beginning in July 2013. The aims of the NAS are threefold: to enhance the ability of the peer-review system to prepare physicians for practice in the 21st century, to accelerate the ACGME's movement toward accreditation on the basis of educational outcomes, and to reduce the burden associated with the current structure and process-based approach.

LIMITATIONS OF THE CURRENT SYSTEM

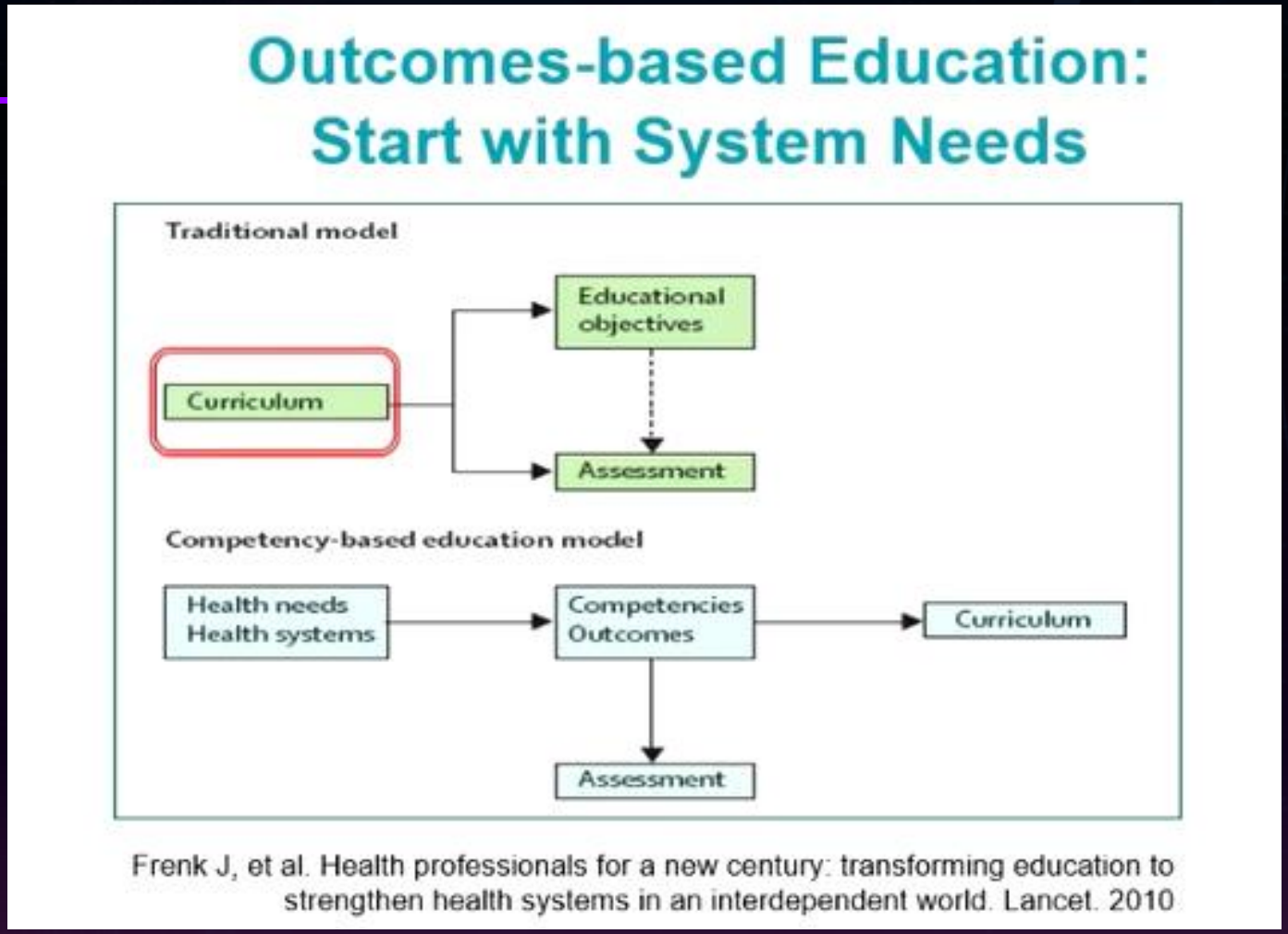
When the ACGME was established in 1981, the GME environment was facing two major stresses: variability in the quality of resident education[2] and the emerging formalization of subspecialty education. In response, the ACGME's approach emphasized program structure, increased the amount and quality of formal teaching, fostered a balance between service and education, promoted resident evaluation and feedback, and required financial and benefit support for trainees. These dimensions were incorporated into program requirements that became increasingly more specific during the next 30 years.

The results have been largely salutary. Perfor-

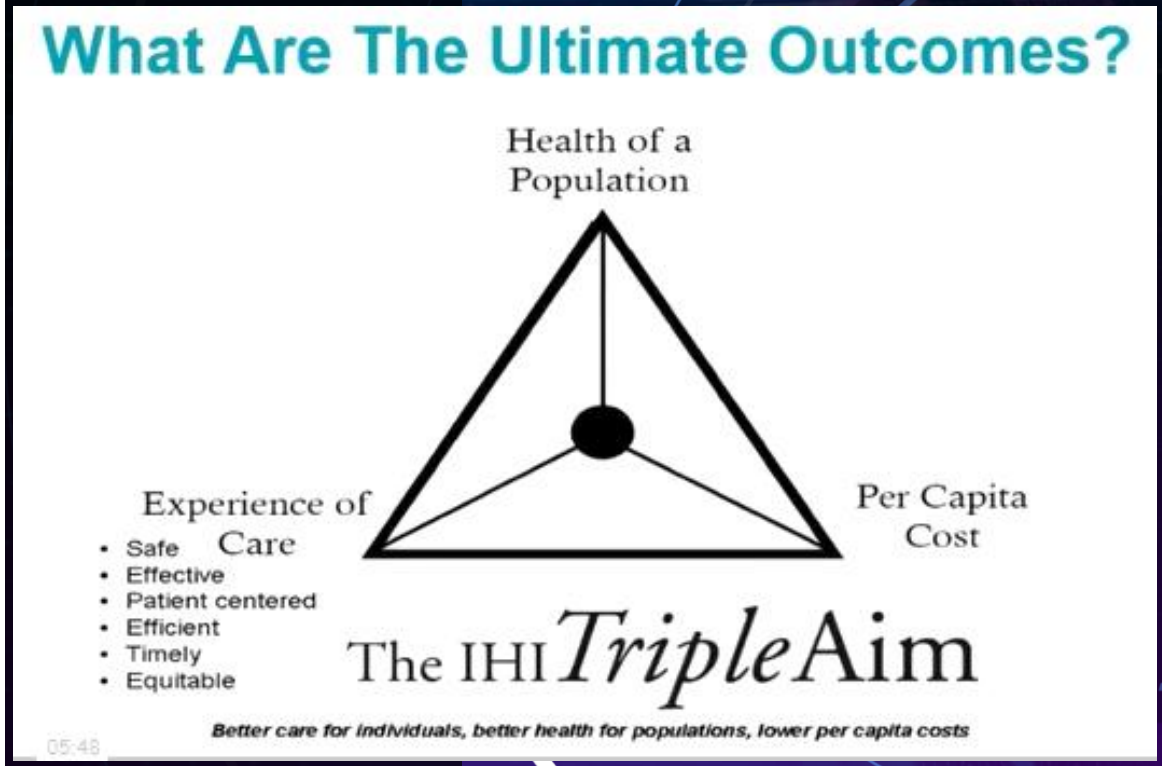
Nasca, T.J., Philibert, I., Brigham, T.P., Flynn, T.C. The Next GME Accreditation System: Rationale and Benefits. New England Journal of Medicine. Published Electronically, February 22, 2012. In Print, March. NEJM. 2012.366;11:1051-1056.

- Program structure
- Balance between service and education
- Increase quality and amount of formal teaching
- Resident evaluation and feedback

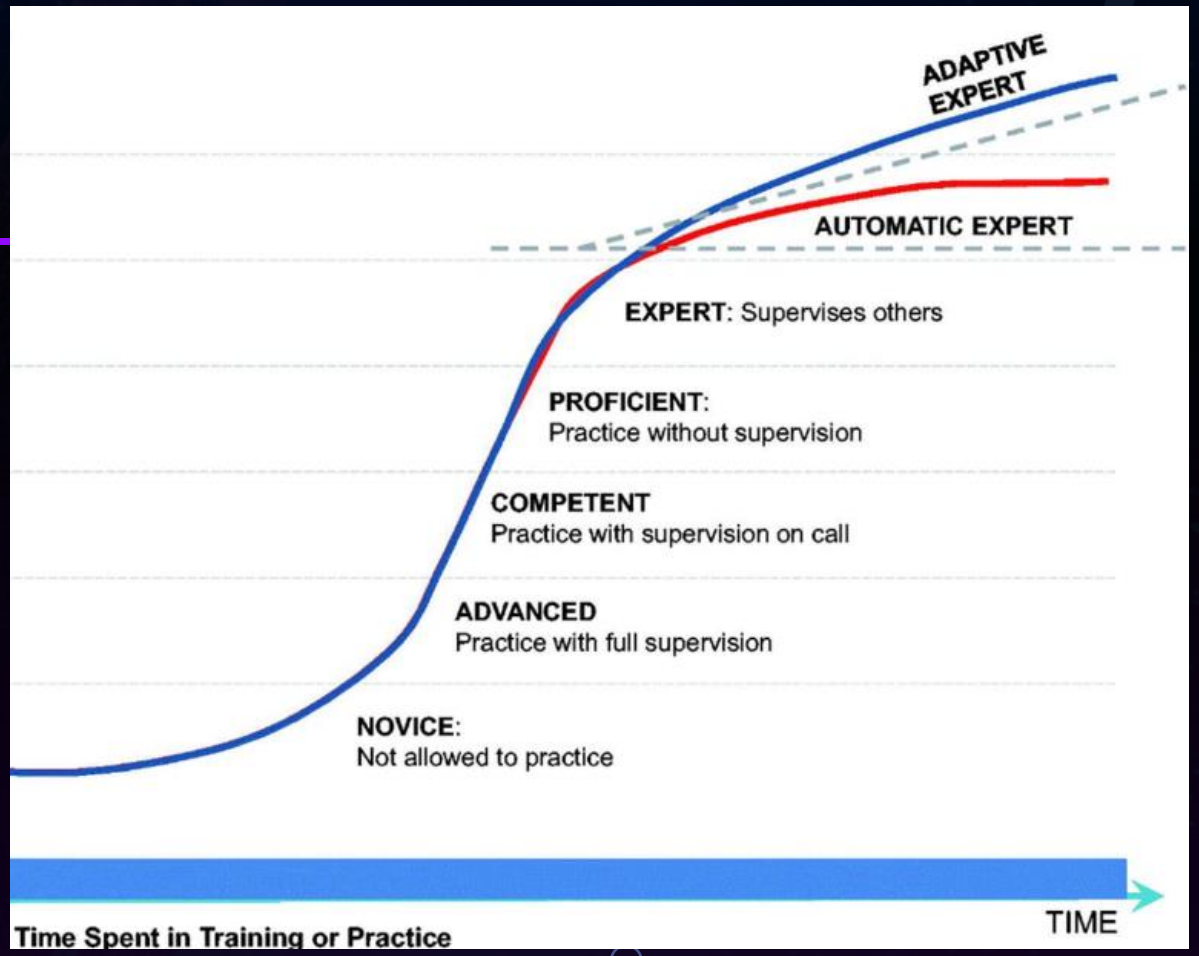
Outcomes based



Frenk J, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010



Milestones



Dreyfus Model of Skill Acquisition

Table 6: Common Assessment Methods for the Six Core Competencies

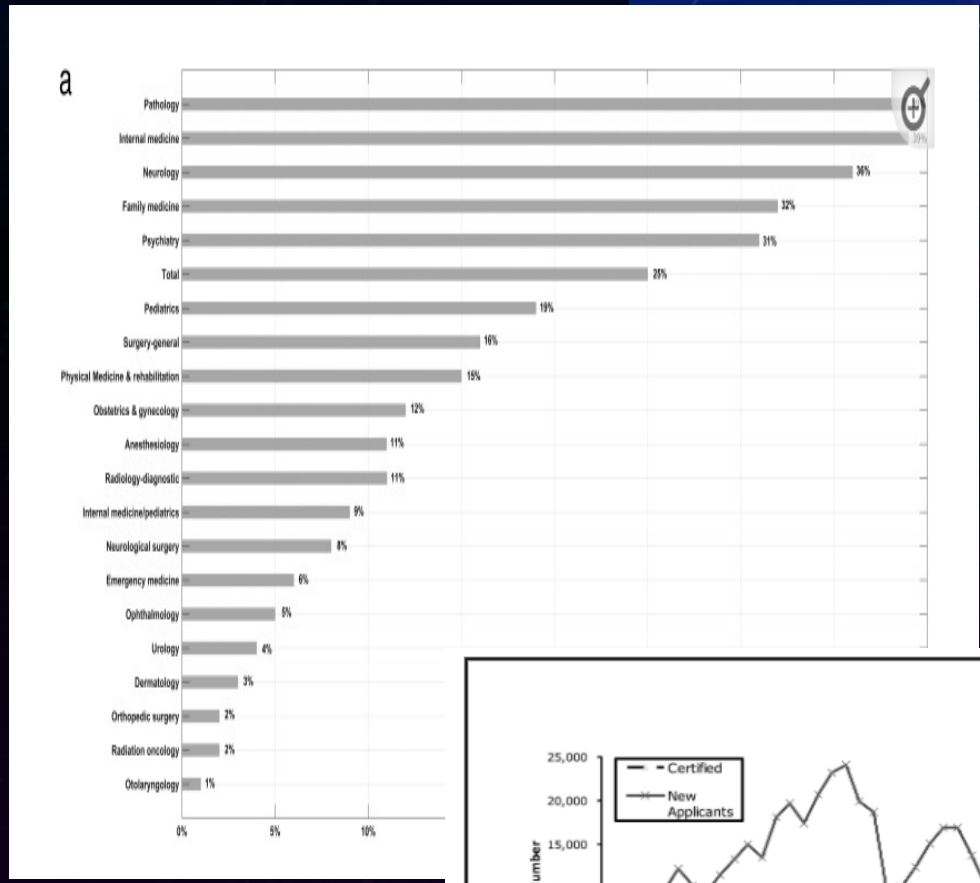
Core Competency	Common Assessment Methods
Patient Care	• Direct observation (live or video) • Rating scales/evaluation forms • Audit of clinical practice (e.g., quality performance measures) • Simulation (including standardized patients) • Case logs/registries
Medical Knowledge	• In-training examinations • Oral questioning methods (e.g., SNAPPS) • Direct observation (live or video) • Assessment of Reasoning Tool
Professionalism	• Multi-source feedback • Patient surveys (can be part of multi-source feedback) • Direct observation
Interpersonal and Communication Skills	• Multi-source feedback • Patient surveys (can be part of multi-source feedback) • Direct observation (live or video) • Simulation (including standardized patients)
Practice-based Learning and Improvement	• Audit of clinical practice (e.g., quality performance measures) • Evidence-based medicine logs • Case logs • Rating scales/evaluation forms • Reflective practice rubrics
Systems-based practice	• Quality improvement knowledge assessment test • Audit of clinical practice (e.g., quality performance measures) • Multi-source feedback • Rating scales/evaluation forms

International Medical Graduates

25% of licensed U.S. doctors are IMGs. That share has grown by half a percentage point since 2010, but what the figure means in raw terms is even more impressive.

The number of IMGs in practice has grown by nearly 18% since 2010. That figure is bigger than the 15% rise in U.S. medical graduates over that same time period.

The largest number of licensed IMGs have graduated from schools in India (23%)—per the FSMB census—followed by the Caribbean (18%), Pakistan (6%), the Philippines (6%) and Mexico (5%).



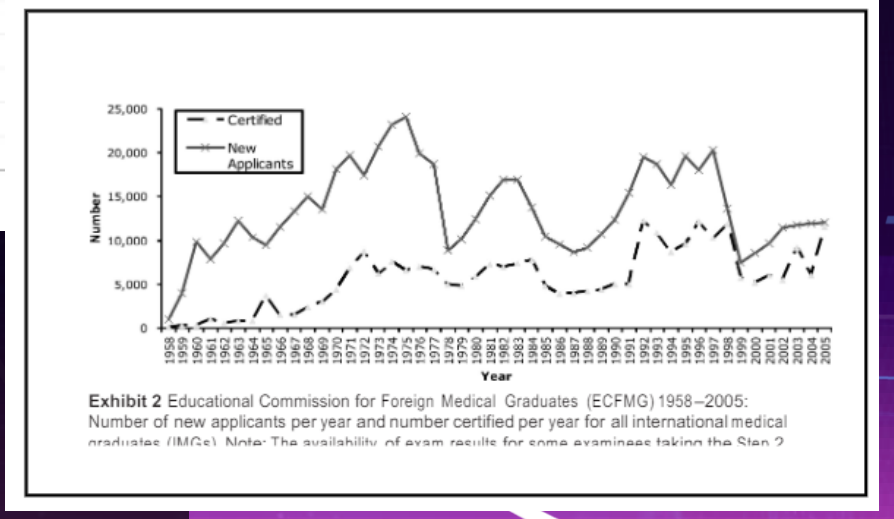


Exhibit 2 Educational Commission for Foreign Medical Graduates (ECFMG) 1958–2005: Number of new applicants per year and number certified per year for all international medical graduates (IMGs). Note: The availability of exam results for some examinees taking the Step 2

AMA data

Generational differences

Characteristics	Maturists (pre-1945)	Baby Boomers (1945-1960)	Generation X (1961-1980)	Generation Y (1981-1995)	Generation Z (Born after 1995)
Formative experiences	Second World War Rationing Fixed-gender roles Rock 'n' Roll Nuclear families Defined gender roles — particularly for women	Cold War Post-War boom "Swinging Sixties" Apollo Moon landings Youth culture Woodstock Family-orientated Rise of the teenager	End of Cold War Fall of Berlin Wall Reagan / Corbachev Thatcherism Live Aid Introduction of first PC Early mobile technology Latch-key kids; rising levels of divorce	9/11 terrorist attacks PlayStation Social media Invasion of Iraq Reality TV Google Earth Glastonbury	Economic downturn Global warming Global focus Mobile devices Energy crisis Arab Spring Produce own media Cloud computing Wiki-leaks
Percentage in U.K. workforce*	3%	33%	35%	29%	Currently employed in either part-time jobs or new apprenticeships
Aspiration	Home ownership	Job security	Work-life balance	Freedom and flexibility	Security and stability
Attitude toward technology	Largely disengaged	Early information technology (IT) adaptors	Digital Immigrants	Digital Natives	"Technoholics" – entirely dependent on IT; limited grasp of alternatives
Attitude toward career	Jobs are for life	Organisational — careers are defined by employers	Early "portfolio" careers — loyal to profession, not necessarily to employer	Digital entrepreneurs — work "with" organisations not "for"	Career multitaskers — will move seamlessly between organisations and "pop-up" businesses
Signature product	Automobile	Television	Personal Computer	Tablet/Smart Phone	Google glass, graphene, nano-computing, 3-D printing, driverless cars
Communication media	Formal letter	Telephone	E-mail and text message	Text or social media	Hand-held (or integrated into clothing) communication devices
Communication preference	Face-to-face	Face-to-face ideally, but telephone or e-mail if required	Text messaging or e-mail	Online and mobile (text messaging)	Facetime
Preference when making financial decisions	Face-to-face meetings	Face-to-face ideally, but increasingly will go online	Online — would prefer face-to-face if time permitting	Face-to-face	Solutions will be digitally crowd-sourced

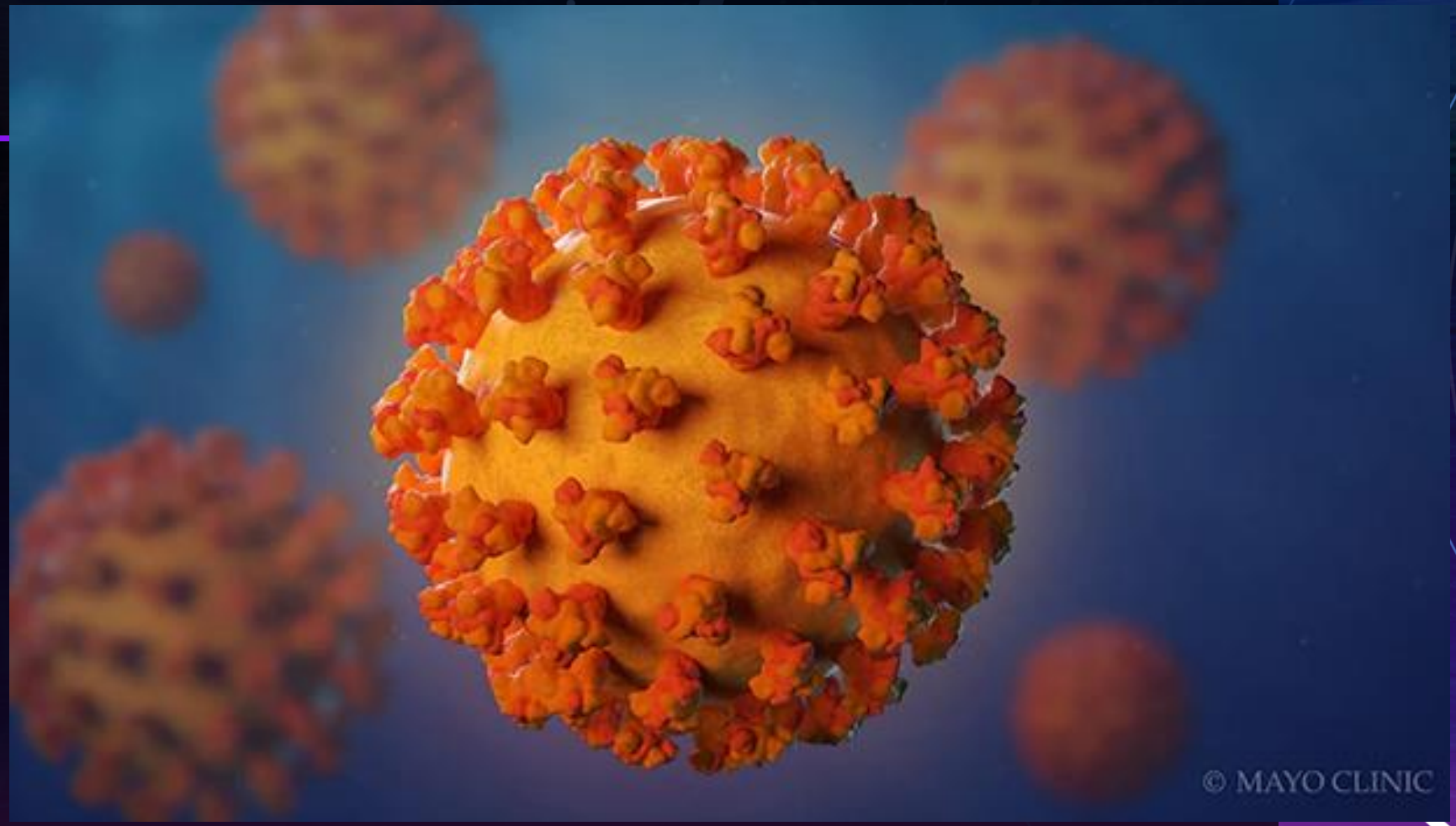
Mind the Generational Gap…..

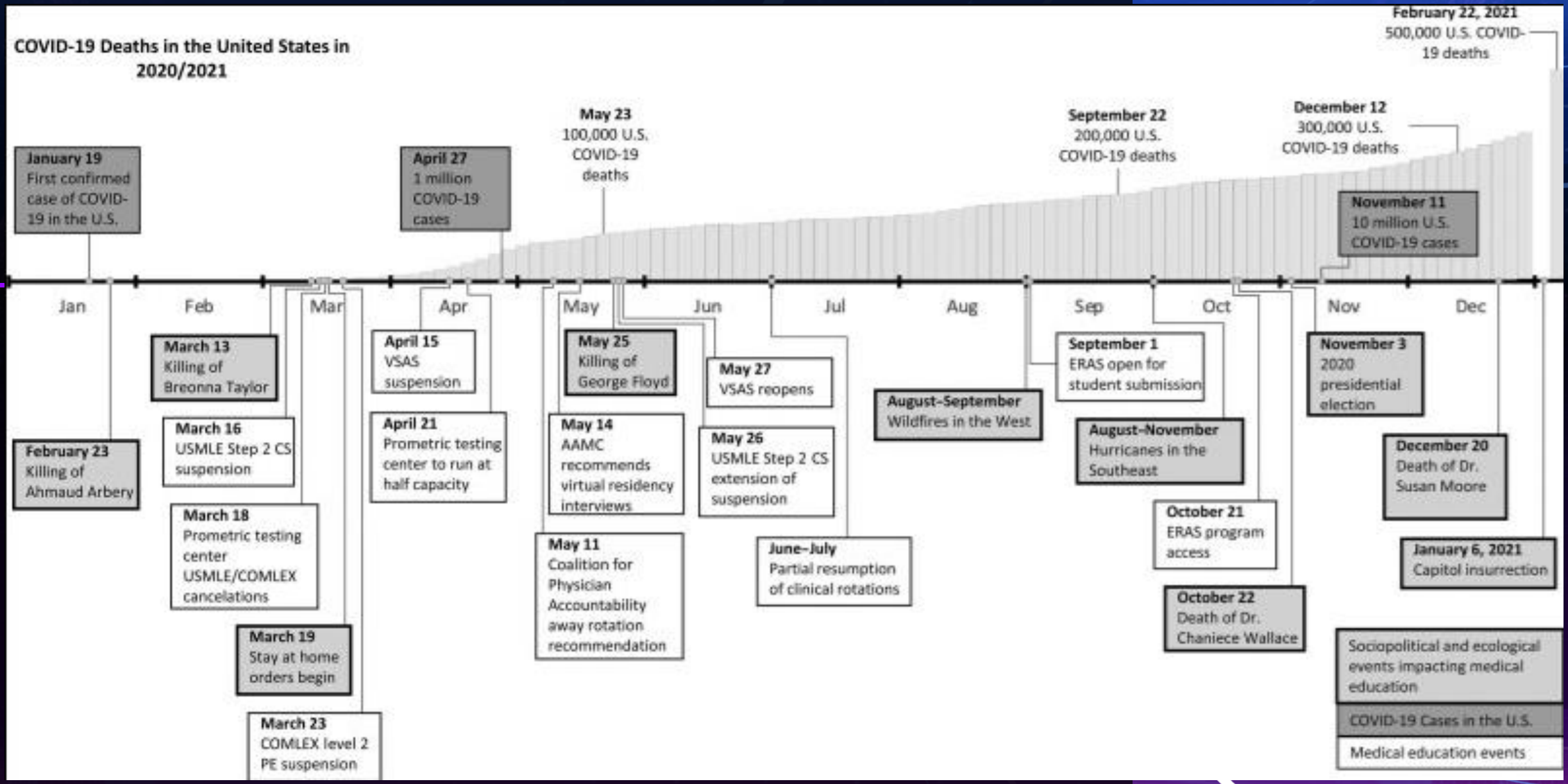
	Traditionalist	Boomer	Gen X	Gen Yers
Training	The hard way	Too much and I'll leave	Required to keep me	Continuous and expected
Learning style	Classroom	Facilitated	Independent	Collaborative & networked
Communications style	Top down	Guarded	Hub & Spoke	Collaborative
Problem-solving	Hierarchical	Horizontal	Independent	Collaborative
Decision-making	Seeks approval	Team informed	Team included	Team decided
Leadership style	Command & control	Get out of the way	Coach	Partner
Feedback	No news is good news	Once per year	Weekly/Daily	On demand
Technology use	Uncomfortable	Unsure	Unable to work without it	Unfathomable if not provided
Job changing	Sets me back	Sets me back	Necessary	Part of my daily routine

Source: Lynne C. Lancaster and David Stillman. When Generations Collide: Who They Are. Why They Clash. How To Solve the Generational Puzzle at Work (HarperBusiness, 2002)

Millennials	Generation Z
Don't just work for a paycheck, they want a purpose.	Money and job security are their top motivators. They want to make a difference but surviving and thriving are more important.
They aren't pursuing job satisfaction, they are pursuing their own development.	They want to accumulate rewarding experiences. Gen Z tend towards being impatient and often experience FOMO (Fear Of Missing Out), so instant feedback and satisfaction are key.
They don't want bosses, they want coaches.	They want to be mentored in an environment where they can advance quickly. They want to look their leader in the eye and experience honesty and transparency.
They don't want annual reviews, they want ongoing conversations.	They don't want an annual work assessment, they want to be mentored and given feedback on an ongoing frequent (daily) basis.
They don't want to fix their weaknesses, they want to develop their strengths.	They were raised during the Great Recession and believe that there are winners and losers--and more people fall into the losing category. They want to have the tools to win, either through developing weaknesses or strengths.
They have a collaborative mentality where everyone pitches in and works together.	They are competitive. 72% of Gen Z said they are competitive with doing the same job. They are independent and want to be judged on their own merits and showcase their individual talents.
It's not just their job, it's their life.	Salary and benefits and how they can advance are pivotal. They are a DIY generation and they feel that other generations have overcomplicated the workplace.

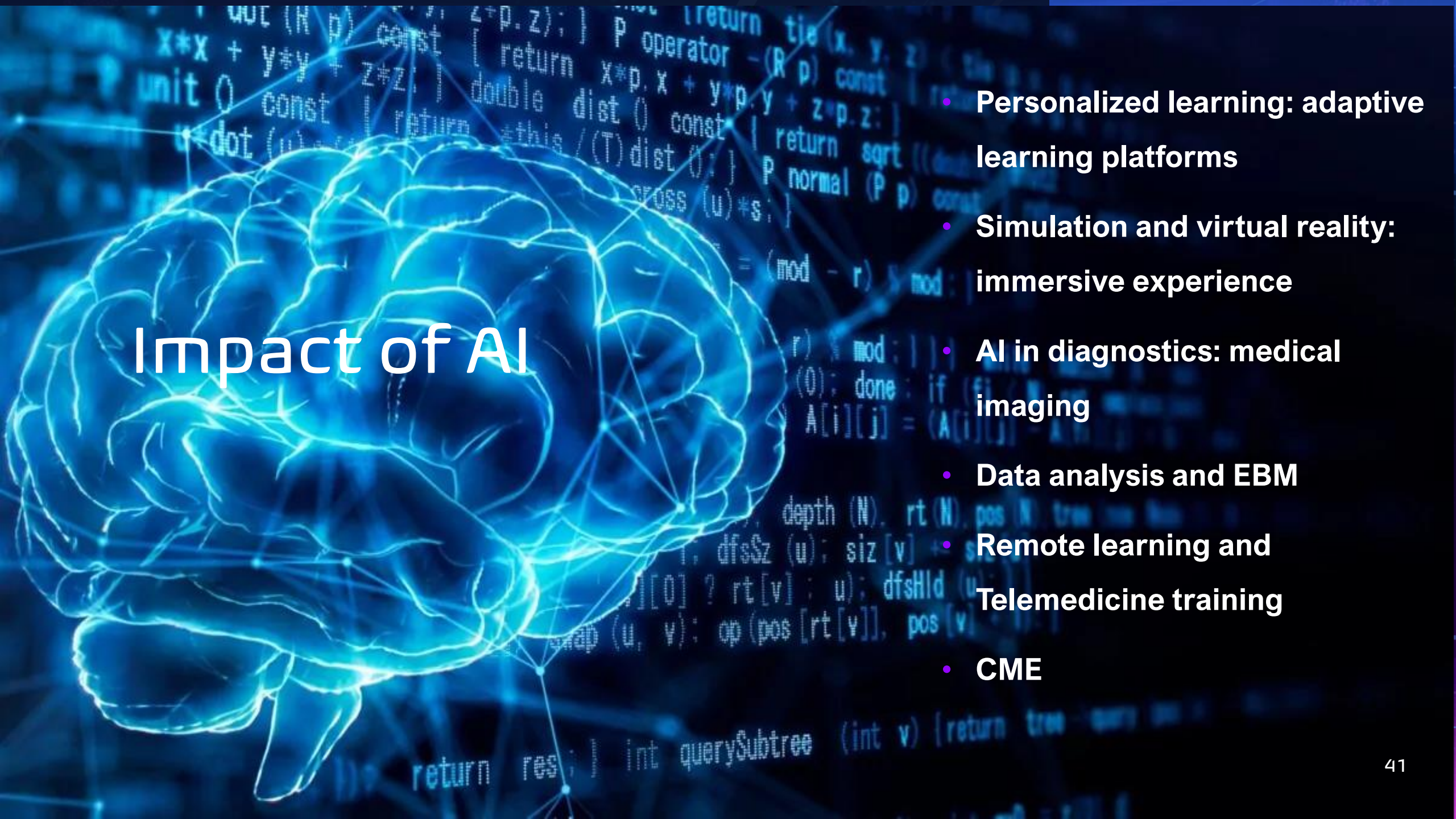
Impact of COVID




COVID-19 Deaths in the United States in 2020/2021
January 19
First confirmed case of COVID-19 in the U.S.
February 23
Killing of Ahmaud Arbery
March 13
Killing of Breonna Taylor
March 16
USMLE Step 2 CS suspension
March 18
Prometric testing center USMLE/COMLEX cancelations
March 19
Stay at home orders begin
March 23
COMLEX level 2 PE suspension
April 15
VSAS suspension
April 21
Prometric testing center to run at half capacity
April 27
1 million COVID-19 cases
May 11
Coalition for Physician Accountability away rotation recommendation
May 14
AAMC recommends virtual residency interviews
May 23
100,000 U.S. COVID-19 deaths
May 25
Killing of George Floyd
May 26
USMLE Step 2 CS extension of suspension
May 27
VSAS reopens
June–July
Partial resumption of clinical rotations
August–September
Wildfires in the West
September 1
ERAS open for student submission
September 22
200,000 U.S. COVID-19 deaths
August–November
Hurricanes in the Southeast
October 21
ERAS program access
October 22
Death of Dr. Chaniece Wallace
November 3
2020 presidential election
November 11
10 million U.S. COVID-19 cases
December 12
300,000 U.S. COVID-19 deaths
December 20
Death of Dr. Susan Moore
January 6, 2021
Capitol insurrection
February 22, 2021
500,000 U.S. COVID-19 deaths
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Sociopolitical and ecological events impacting medical education
COVID-19 Cases in the U.S.
Medical education events

POCUS

The new stethoscope?



Impact of AI

- Personalized learning: adaptive learning platforms
- Simulation and virtual reality: immersive experience
- AI in diagnostics: medical imaging
- Data analysis and EBM
- Remote learning and Telemedicine training
- CME

Significant transformation

Pedagogical

- No longer Transfer of information but Transformation of learning
- Engage adult learners about what they are learning
- Learn by working through problems _the how and why
- Develop a higher level of critical thinking

Structural

traditional 2+2

Scholarly activity

Dr Edward Hundert, former Dean for Medical education, Harvard

John Shaw Billings

The education of the doctor which goes on after he has his degree is, after all, the most important part of his education.

AZ QUOTES

Native American Medicine

- Unlike western cultures, where people choose whether or not they want to become doctors, a person **receives a calling** to become a Holy Person or medicine person. Sometimes this ability runs in families, and other times one naturally feels summoned to enter into this work.

FIND YOUR PURPOSE

FIND YOUR JOY

FIND YOUR TRIBE

Thank you

Susan George

Susan.George@stvincenthospital.com

Upcoming Events

1. Annual Music Worcester Performance and WDMS Open House, March 3, 3:00pm, Mechanics Hall, from Canada, "*The Orchestre Metropolitain*"

2. 28th Annual Women in Medicine Leadership Forum, March 27, 5:30 pm, Mechanics Hall; Drs. Michelle Dalal and Harikirin Khalsa will discuss: "*The Power of Food, The Power of the Pause: How Lifestyle Medicine, plant-based nutrition, and biological self-awareness build stronger selves, and help us empower our patients*"

3. WDMS Annual Business Meeting, April 10, 5:30 pm, Beechwood Hotel; Keynote Speaker is Richard Baron who will be discussing "*Protecting the Legitimacy of Medical Expertise: Combating Misinformation in Medicine*"

4. MMS Annual Business Meeting and HOD proceedings April 24 – May 11

5. Meet the Author May date TBD, UMass ASC – Dr. Sunita Puri, *"The Good Night"*

Worcester District Medical Society

228th Annual Oration

February 7, 2024

Susan George, MD

Good evening. Thank you everyone who has joined us today. My sincere thanks to Dr Rapose for his generously kind words and to the WDMS Nominating committee for this honor. I also at the outset want to thank all of my teachers present in the room, who have guided me on my journey of learning (Dr Popkin, Dr Lochrie, Dr Esposito, Dr Karlin, Dr Bessette), all my friends and colleagues whose support I depend on every day and all of my students who continue to inspire me.

I have no disclosures. It hit me hard as to how "ancient " I am when I calculated that I have been learning medicine for about 40 years and teaching for about the same duration. I entered medical school at the age of 18 at the National University of Singapore, went on to do my advanced training from the Royal College of Edinburgh, UK. I was able to briefly witness the practice of medicine for 1.5 years in North India and started my residency training in the US in 1997. I am grateful for the opportunity to share what I have learnt over the years, having worked and trained in three continents. I am not a pundit of history or education like many in this room and look forward to all of your insights at the end of this talk.

I hope to take you on this journey of discovery and introspection with me. The experience may feel more like a narration rather than an oration, as there are many stories to share.

Over the course of the next 45 minutes, I wish to review how learning and teaching in the field of medicine have evolved over centuries. We will then touch on more recent changes that have influenced medical education and end off with what the future of our field looks like.

Maya Angelou said, “If you don’t know where you’ve come from, you don’t know where you’re going”. As we journey through the centuries, we will see the origin of many of our current practices and perhaps notice that we may be repeating some past mistakes. I will point out some interesting associations as we travel through time. So buckle up, as we dial back the time machine and go back to the future.

A commonality amongst most ancient civilizations was that the practice of medicine and healing were deeply steeped in religion and mysticism and based purely on empiric observation. The transmission of knowledge from teacher to student was mostly oral and entirely through apprenticeship for practical experiences. As the body of knowledge accumulated, written texts were developed.

Let us start in ancient Mesopotamia. It is believed that Gula the Sumerian goddess of healing guided doctors and dentists in the treatment of health problems, which were usually attributed to supernatural causes. Physicians in Mesopotamia were believed to be agents through which deities worked and were highly educated and respected.

They had to learn the cuneiform script and master the curriculum of the scribal book for about 12 years before they could devote to the study of medicine. Illness was attributed to sin and therefore healing started with confession. Medical training was in the temple because physicians were priests. In early Sumeria, there were as many female physicians as male but this unfortunately changed with time as rulers changed.

We move next to ancient Egypt: Imhotep (2655-2600 BCE), who was an Egyptian high priest and polymath (an expert in many fields) was **the first physician in recorded history**. He was also a brilliant architect who designed the pyramids and

an engineer. He was revered as a philosopher and attained divine status after his death. In fact, Imhotep was deified by the Greeks as Asclepius, the God of healing.

Medical treatment in ancient Egypt included dressings, procedures such as suturing and I&D as well as anatomic observations that were passed through apprenticeship. Physicians in training were priests of the Per-Ankh or "House of Life" and studied in libraries, which were attached to temples.

The earliest reliable information about medicine in ancient India and medical practitioners (known as Vaidyas) is available beginning 1500 BCE. During the pre-Vedic period, bodily ailments were attributed to divine factors. The role of priests was to establish contact between God and humans and used their power for healing purposes. The priest who was therefore also the healer who worked through prayers, plants, ointments etc. In the later Vedic era, disease was felt to be due to derangement of phlegm, wind or bile due to seasonal changes, infection with germs or worms and contaminated food. (There we have the beginnings of Infectious disease and epidemiology).

Notable in history were Susruta the first surgeon (who may have been the first physician to perform cataract surgery) and Charaka who worked in the King's court and was the father of Ayurvedic medicine. Ayurveda integrates the balance of the body, mind, and spirit to promote wellness, and treat health problems. Their teachings were scribed and texts handed down.

Vaidyas (or physicians) underwent medical training in Ashramas (religious retreats). They belonged to different castes and classes since they believed it was training not birth that makes a Vaidya. I loved the enlightenment on equity except that women were usually not admitted to medical training at that time.

The admission process was stringent. A medical student was expected to be honest, humble, temperate, generous and hardworking. Medical training was over 7 years. The medical student was admitted via a proper ceremony (like our white coat ceremony). He was expected to follow a strict code of conduct and behavior

(no womanizing or gambling). Rote learning was an integral part of medical education and students were expected to memorize the classical texts and their commentaries. Practical training was also an important part of Ayurvedic studies where they observed their teachers curing the ill and assisted in the preparation of drugs.

As part of their surgical training, Sushruta advised Ayurvedic students to practice surgical procedures on vegetables, fruits, and body parts of animals (the predecessor our simulation training). For anatomical knowledge, Sushruta recommended careful observation of a dead body (dissection was not allowed as the body was considered sacred). Charaka suggested learning how to identify herbs.

A vaidya was supposed to involve himself in an exclusive study of philosophical topics, participate in debates, and become proficient in the art of public speaking. The Vedic text also advised on the doctor-patient relationship. Charaka says the goal of the *Vaidya was*, "Not for self, not for the fulfillment of any earthly desire or gain, but solely for the good of suffering, should you treat your patients."

There were many checks on the *vaidyas*. License from the state was a prerequisite for taking up medical practice. Fines were imposed for the incorrect treatment of patients (the predecessor of the Board of Medicine licensure).

Traditional Chinese medicine worked on the premise that imbalance caused disease. There was a lot of emphasis on individualized treatment –"**To see a person who is sick, not the disease the person has**" as well as the emphasis on preventive medicine.

Education was based on the master-apprentice model and the first textbook was scribed based on discussion between teacher and students. TCM emphasized the principles of preserving good health through proper nutrition and harmony between human spirit and the environment.

“A good doctor treats the disease, a superior doctor prevents it”. Thank you - another plug for preventive medicine and the under-recognized work of our primary care physicians.

Two famous physicians were Zhang Zhong Jing who mastered and taught pattern recognition and differential diagnosis. He also introduced pulse diagnosis. Hua Tuo was known to be the first physician using a mixture of herbs to create anesthesia as well as utilizing heat and alcohol for sterilization of his instruments. Due to Chinese philosophy of keeping the body intact, surgery and dissecting was not popular, hence, there was not much development in this field.

Hippocrates is regarded as the Father of Rational Medicine in Greece. Hippocrates believed that a body became ill when there was an imbalance in the four senses of humor: blood, black bile, yellow bile and phlegm. Medicine therefore aimed to restore this balance. He usually did not use drugs, except if they were natural balms and extracts. He gave emphasis to the sterilization and used clean water and wine to heal wounds.

The Hippocratic School taught physicians to be strictly professional and to follow certain procedures. They had to be calm, honest, understanding and, smart. The most important innovation of the Hippocratic School was that he made physicians keep detailed records of all observations and treatment methods for every case because he believed that these records would be very helpful for later generations. In this way, Hippocrates founded clinical medicine. After many observations, he came to believe that diseases could be a matter of family inheritance, natural environment, lifestyle and food habits. I love it –the start of Lifestyle and preventive medicine again!

The division between medicine as a "science" and medicine as an "art" is an ancient one. Plato believed the art and science of medicine was identical and that you had to see your patient as a whole -body and soul. According to Plato, there were two types of medical apprenticeships: One that was based only on observation and experience versus a theoretically grounded physician philosopher

who worked to make the understanding of nature fundamental to their art and teaching. The majority of medical practitioners at that time did not pursue biological theories and philosophy. However, the few that did care about the nature of health and the underlying anatomic and physiological changes behind a particular disease, were considered the leaders of their profession.

The passing on of knowledge through mentoring was highly regarded in ancient Greece from as early as Homer's time. Accordingly, medical knowledge was bequeathed from father to son or to the physician's assistant via a master-apprentice relationship: the apprentice learned by observing and assisting his master curing patients. Such medical education was fundamentally practical. The student learned to take detailed medical history from the patient, catalogue observations, and accordingly formulate hypotheses, explanations and treatments. He was trained to properly use his senses of observation from hearing, smelling, palpating and carefully examining the patient's pains, mental state, position in bed, fever, breathing, and excretions (urine, feces and sweats).

There were also tenets in the study of medicine: justice for patients , secrecy of patient information (our first HIPAA rules), respect for teachers and solidarity with peers.

The master-apprentice model was gradually replaced by that of professor-student. Due to this notable change in the character of medical education, large numbers of students were tutored by fewer professors.

This introduced a new direction for medical education where some students studied biology and medicine not for the purposes of professional practice but as part of scientific and philosophic exploration. This division of studies depended on each student's social status, with the more wealthy protégées generally preferring to focus on an academic approach to medicine. The tripartite division of medical education can be seen from as early as Aristotle's time described as **"the physician who is a craftsman, the scientific physician, or the man who has studied medicine as part of his education".**

Early Arabic medicine was built on the legacies left behind by Greek and Roman physicians, and was strongly influenced by Galen and Hippocrates. Most medical

literature from both Greece and Rome was translated into Arabic, and later adapted to include their own findings and conclusions. Their major contribution was the development of pharmacy.

The Renaissance period in Europe saw a revival of learning. Universities established schools where experiments were conducted, observations recorded, and conclusions shared which led them to question the knowledge of the Greeks and Romans.

The Renaissance period artists, such as Michelangelo and Leonardo da Vinci revolutionized painting and the understanding and appreciation of the human body. This led to an improved knowledge of anatomy. It was in the late 13th and early 14th century that some European countries began to legalize the dissection of executed criminals for educational purposes. Prior to this, the human body was considered sacred and dissection considered desecration.

This explosion of knowledge along with the invention of the printing press by Gutenberg allowed new ideas to spread more quickly around Europe. It was during this period, we had greats like Vesalius, William Harvey and Edward Jenner.

In 1800, medical practice and education were mostly based on symptoms and their empiric treatment. The difference between the educated and uneducated physician was actually knowledge outside of medicine (such as art, music, history), since neither group possessed any major knowledge of medicine.

Laennec's introduction of the stethoscope revolutionized medicine with the emphasis on physical examination and correlation with anatomy. From Germany around this time, came the integration of lab data.

During this period, learning was hands-on. Students in Medicine **WORKED RATHER THAN LISTENED AND WERE EDUCATED RATHER THAN INSTRUCTED.**

In Europe during the 18th and 19th centuries, small groups of physicians came together to create proprietary medical schools, offering lectures and collecting

fees from the students. For the professors, these fees helped supplement their incomes from their private practice. In addition, a young man (no women allowed) seeking a career in medicine could serve as an apprentice, working with an established physician, until he was regarded as sufficiently competent to set up his own practice. At the best medical schools in London, Edinburgh, and Paris, students could also experience practical bedside teaching in hospitals. Curriculum had therefore become more standardized with a mix of classroom lectures, lab work and bedside learning.

Before the American Revolution, practitioners were trained chiefly by apprenticeship and a few who could afford the time and expense, usually traveled abroad (mostly to England, Scotland, France and Germany) for medical education. In 1765, John Morgan and William Shippen of Philadelphia, both graduates of the University of Edinburgh, founded the first medical school in America, now part of the University of Pennsylvania. (I will not have time to go into the tale of betrayal between these two men). Students were admitted to "anatomical lectures" and a course on "the theory and practice of physik" at the College of Philadelphia.

Additional medical schools were founded at King's College (now Columbia University) in 1768 and at Harvard in 1783.

The Medical College of Philadelphia offered two degrees, Bachelor of Medicine and Doctor of Medicine. For a **Bachelor of Medicine degree**, the student had to take a course of lectures in anatomy, materia medica, chemistry, the theory and practice of physic, as well as attend clinical lectures, attend the practice of the Pennsylvania Hospital for a year, serve an apprenticeship to "some reputable practitioner in Physic", show his knowledge of Latin and mathematics, and pass a public examination.

For a doctorate degree, the student had to be 24 years old and already acquired a bachelor's degree in medicine at least 3 years earlier, as well as write and publicly defend a thesis (to be published at his own expense).

In 1893, the Johns Hopkins medical school was started as part of the university and closely integrated with the Johns Hopkins Hospital. In addition to upgrading undergraduate medical education with an increased emphasis on research, the Hopkins school originated the residency training system.

Johns Hopkins was a Baltimore merchant and banker who funded the school and Dr William Welch, the dean brought on Dr William Osler, the first Chief of Medicine.

Sir Osler warned at that time that the ideals of medicine would change as "teacher and student chased each other down the fascinating road of research, forgetful of those wider interests to which a hospital must minister."

I want to take a minute to tell you about Sir William Osler, described as the Father of Modern Medicine. He was the 8th of nine children, the son of a priest. He had enrolled in Trinity College for divinity studies to follow his father's footsteps but switched instead to Medicine at McGil after 1 year. He went to Europe to further his medical studies; he initially planned to train in Ophthalmology but thankfully for humanity, he switched to General Medicine. His journey took him to U. of Penn and subsequently to Johns Hopkins as chief of medicine. **Osler helped introduce a new emphasis on bedside clinical instruction.** His best-known saying was "**Listen to your patient, he is telling you the diagnosis**". He started a system of organized postgraduate training and education that is still the standard for the western world.

Around this time, we had our first black physicians. James McCune Smith was born a slave. Even though he was at the top of his class, he was denied admission to medical school in the US but was accepted in the University of Glasgow. Dr Smith graduated with an MD degree in 1837.

Dr Peck was the first Black person to earn a medical degree from an American medical school- Rush Medical College in 1847.

Dr Elizabeth Blackwell's greatest wish was to be accepted into a Philadelphia medical school but she was turned away because she was a woman. She applied to 12 country schools before she was finally accepted to Geneva Medical College, NY. She continued her training in Europe before she returned here to practice. Many more women followed her in the years after. In 2019, women comprised 50.5% of first year medical students, when for the first time, we became the majority.

In 1892, Dr Andrew Taylor Still opened the first osteopathic medical school to train its pioneer class of 21 students which included 6 women. He believed in the concept of wellness rather than disease and treating illness within the context of the whole body.

A ground-breaking book written by Dr Bobber showing the growth of medicine in the US. It is interesting that they faced many of the same challenges that currently exist and that we continue to fight for.

The bloody Civil War created an urgent national demand for more medical personnel and hospitals. In the 19th century, things became complicated when groups of physicians throughout the country began founding small proprietary medical colleges. They divided amongst themselves, the lectures and “the spoils” of student fees. Entrance and graduation requirements were sufficiently low to ensure a steady income for “professors”. Laboratory and clinical facilities were very inadequate and large numbers of poorly trained physicians were released to practice on the public. **Doctors were seen as tradesmen rather than professionals**.

In 1850, there were 52 medical schools in the United States, as opposed to only three in France. This however did not indicate superiority in the quality of American medical education. American medical schools of the early and mid-

nineteenth century were generally doctor-owned institutions that varied widely in their standards and methods of education.

As a result, the abler and more ambitious students continued going to Europe to pursue medical training. Early in the 19th century, Paris hospitals were the major attraction; after the Civil War, Americans flocked to Austrian and German universities, some to learn a clinical specialty and others the basic sciences.

Dr Nathan Davis believed that medicine, so crucial to society, must rise above these inconsistencies and become a standardized, respected profession. He went on to found the AMA in 1847. It is sad to note that there was bigotry amongst some of our pillars in medicine. Dr Davis worked to stop the admission of black physicians to the AMA; in fact it took another 100 years to change that.

Harvard was the first major school to adopt reform. In 1870, Harvard President Dr Charles Eliot said, "**The ignorance and general incompetency of the average graduate of American medical schools at the time when he receives the degree which turns him loose upon the community, is something horrible to contemplate. The whole system of medical education in this country needs thorough reformation."** Harvard introduced a graded curriculum into the medical school, lengthened the course from two to three years, elevated the entrance requirements, and **instituted part-time salaries paid by the university for professors rather than dependance on direct payment from student fees**. This allowed professors protected time to teach. This is a practice we must continue to safeguard so that faculty can dedicate time to teaching and mentoring without worrying about how to pay their bills.

Focus shifted to laboratory work rather than lectures. The curriculum was redefined to focus on the practical sciences of histology, pathology and chemistry. This transformed Harvard from a regional institution into a world-class university.

Dr Abraham Flexner under the auspices of the AMA Council on Medical Education and the Carnegie Foundation for the Advancement of Teaching reported his survey on Medical Education in the United States and Canada (1910) which had immediate and far-reaching impact.

Please allow me a minute to share with you the Introduction to the Flexner report as it eloquently gives you an idea of what training was like then.

“The American medical school is now well along in the second century of its history’ It began, and for many years continued to exist, as a supplement to the apprenticeship system still in vogue during the seventeenth and eighteenth centuries. The likely youth of that period, destined to a medical career, was at an early age indentured to some reputable practitioner, to whom his service was successively menial, pharmaceutical, and professional: he ran his master's errands, washed the bottles, mixed the drugs, spread the plasters, and finally, as the stipulated term drew towards its close, actually took part in the daily practice of his preceptor,-bleeding his patients, pulling their teeth, and obeying a hurried: summons in the night. The quality of the training varied within large limits with the capacity and conscientiousness of the master. Ambitious spirits sought, therefore, a more assured and inspiring discipline. Beginning early in the eighteenth century, having served their time at home, they resorted in rapidly increasing numbers to the hospitals and lecture-halls of Leyden, Paris, London, and Edinburgh. The difficulty of the undertaking proved admirably selective; for the students who crossed the Atlantic gave a good account of themselves. Returning to their native land, they sought opportunities to share with their less fortunate or less adventurous fellows the rich experience gained as they "walked the hospitals" of the old world in the footsteps of Cullen, Munro, and the Hunters. The voices of the great masters of that day thus reechoed in the recent western wilderness. High scientific and professional ideals impelled the youthful enthusiasts, who bore their lighted torches safely back across the waters.”

Flexner’s findings and recommendations were:

Their findings were: 1. There was an over-production of undertrained practitioners with a fatal difference between the best, average and the worst. 2. There were too many commercial schools 3. The country needs fewer and better doctors and the way to get them better is to produce fewer. The report recommended a ratio of 1 physician: 760 patients and 1 more physician for every gain of 1500 in total population.

There were about 131 medical schools in the United States, most of them proprietary. By 1920, 46 had closed or were absorbed by stronger institutions.

Others were strengthened by merger, by university affiliation, and by the infusion of support from private foundations and state governments. By the 1920s the four years of medical school were compartmentalized into two years of basic sciences taught by discipline and two years of clinical training.

There were several criticisms of the Flexner's 1910 report, which recommended closing all but two historically Black medical colleges, despite acknowledging that two colleges could not train enough physicians to serve 9.8 million Black people in the US. The question also arises whether they got their math wrong and if that explains some of our current shortage of doctors.

Over the 20th century, several of the agencies that have become familiar to us came into existence from NRMP to ECFMG in 1954 to ACGME in 1981. They were introduced to ensure quality of trainees and regularity of process of admission.

- The purpose of ACGME was to enhance program structure and maintain balance between service and education as well as increasing the quality and amount of formal education. Resident evaluation and feedback was also given greater emphasis.
- In 2002 ACGME required implementation of the six core competencies as a framework for the educational programs in GME
- In 2003 Duty hour standards are implemented as a common program requirement

Education transitioned from curriculum-centric to outcomes-based with needs of the health system driving competencies outcomes and curriculum rather than the other way around. The outcomes are encapsulated in the IHI Triple Aim of better care for individuals, better health care for populations and lower per capita cost. A quadruple aim was added which is improving physician wellbeing. Curriculum as it should be must be driven by the needs of society. Our curriculum has adapted and now includes: opioid management, addressing healthcare disparities and recognizing social determinants of health, LGBTQ needs /needs of the aging

population. We will also need to more earnestly address the need for more primary care physicians in communities by making the learning more practical and attractive.

Residents were evaluated on milestones progression in the measured competencies and given feedback so that they advance from novice to expert by the time they graduate. The six core competencies are: Patient care, medical knowledge, Professionalism, Interpersonal and communication skills, Practice-based learning and improvement and Systems-based practice.

International medical graduates starting entering the physician workforce during the 1950 expansion of the US healthcare system. Medical education became more globalized with students of diverse cultural backgrounds and from diverse healthcare systems working together. ECFMG was put in place to ensure the clinical and communication skills requirement of foreign medical graduates was met. Currently, 25% of licensed US doctors are IMG's. The number had grown by 18% since 2010. The majority go into Pathology, Internal Medicine, Neurology, Family Medicine and Psychiatry, making up the shortfall of US graduates going into these fields.

Another major impact on teaching and learning has been the generational differences between our teachers and learners. The aspiration, attitude to career and communication preferences of millennials and GenZer's are different. It is therefore imperative that we get to know our learners so that we can connect before we can start to mentor.

Their style of learning has changed and this resulted in several major changes:

1. We are seeing more integration of Technology with simulation technology and virtual reality
2. There was a shift from traditional didactic to Problem-based learning

3. There was also an emphasis on team-based work and interdisciplinary education
4. The focus is on how to improve Patient-centered care and communication

This has in part contributed to some of the changes we see in undergraduate training with early incorporation of clinical medicine along with the basic sciences.

> The majority of our students are no longer millennials (1980-1994) but Gen Z'ers (born 1995-2012). Some unique characteristics different from millenials is they want instant feedback, they want honesty and transparency. They want to be mentored and given feedback on an ongoing frequent basis. Their attention span is shorter as is their patience. They are team players. Salary and benefits and how they can advance are pivotal.

Another seismic impact on medical education came out of the blue in 2020 with the unannounced arrival of the COVID pandemic. There was sudden disruption to in-person learning and time-based curricula. When learning went virtual due to the need for social distancing, bedside teaching took a beating. Schools and programs scrambled to put in place virtual learning which revealed inequity in availability of technology. Trainees felt increased isolation. Recruitment interviews went virtual. The upside was: lectures went remote and faculty from out of state were more generous with their time since they did not have to travel. Trainees became adept at telemedicine. Residents got really comfortable with ICU level care. These dark days brought out the best in many, when they were looking out and supporting their peers.

There were other major disruptions during the same time period including racial trauma, medical student activism and increased conversations surrounding race, racism and gender identity. Trainees and faculty were more sensitive and vocal about these issues and that of inequity.

POCUS enhances education by reinforcing didactic concepts in a clinical setting. Ultrasound simulations help students visualize anatomy, physiology, and pathology. The stethoscope is a listening device, while POCUS gives medical providers eyes into the unknown. Seeing is believing, after all. The impact of the handheld ultrasound device on clinical medicine is likened to what Laennec did in transforming medicine with the stethoscope. This is a picture of Laennec-style stethoscopes on display at the Royal College of Medicine in London

The advent of AI looms in the foreground. It will positively impact learning by providing a more personalized and adaptive learning platform. It will allow for an immersive experience for simulation learning and virtual reality. AI in diagnostics and medical imaging is already in use. Data analysis and access of EBM will be much faster. It will open up opportunities for remote learning and Telemedicine training. This will also open up resources for CME.

There is fear of how it will impact the teacher-student relationship. The role of a human teacher remains crucial despite advancements in technology and cannot be replaced for the following reasons:

1. We can give guidance and mentorship, sharing clinical wisdom in reasoning
2. We improve clinical skills with bedside teaching
3. We can model emotional intelligence and empathy
4. Our students learn critical thinking and ethical decision-making from us
5. We provide supervision and feedback
6. Only humans can be role models

Dr Edward Hundert, the former Dean of Medical Education, Harvard very eloquently stated that our role as medical educators is not the Transfer of information but the Transformation of learning. For us to be able to effectively do that, we have to be in a transformative relationship with our learner because we cannot tell a stranger an important truth.

The learners now learn the “what” at home; our role is to show them the “how and why” at the bedside. Medical information is advancing so quickly that half of what they learn will become irrelevant by the time they graduate.

Dr John Shaw Billings of Johns Hopkins said “The education of the doctor which goes on after he has his degree, is after all, the most important part of his education.” At the end of our efforts to train and mentor, we must remember that we are giving them the tools to succeed. To the teachers and mentors in the room, we are molding KNOWLEDGE, SKILLS, ATTITUDE and HABIT that will take them into their future careers.

In Native American culture, the medicine man does not choose to become a healer but responds to a calling. It is important for all of us including our learners to remember that we are in the field of medicine with purpose and must find fulfillment in our work.

So going back to the future again, what would I tell the younger me as I embarked on my journey in Medicine 40 years ago? It would be the same advise to trainees as they launch into the world beyond.

1. Find your Purpose

Each of us must know our purpose or calling. It is an existential question of why we are here. Some of us stay in the game because our patients need us. Others feel they want to make an impact on the next generation of physicians through education. Your purpose may be research and finding that next great truth that will change the way we care for our patients.

Whatever it is, when you are drowning in your buckets or your email inbox, you need to hold on to your purpose.

2. Find your Joy

Again, you need to figure out what floats your boat. For me, it is the hug from my patients when I have made an emotional connection, or the joy of learning something new with my residents. Be self-compassionate and take time to enjoy matters outside of medicine –whether it is music, travel, hiking, volunteering. You will come back refreshed.

3. Find your tribe

The healthcare scene has changed and continues to change drastically post-COVID. You do not have to travel alone. As Mugli from the Jungle Book would say "For the strength of the pack is the wolf, and the strength of the wolf is the pack." Get involved in societies like the WDMS, MMS and ACP where we have a common voice, for there is much to speak up and speak out for during these times. We have to protect the future of our field.

I am thankful for the amazing tribe I work with every day since it does take a village to raise a child and we have 75 of them. I am blessed to work closely with Drs Trivedi, Hoag, Martin, Sargent and Abraham as well as my chief residents Drs Mehra, Jacob and Teo. The team is brilliant and selfless and we have weathered many storms and achieved much to be proud about. A program can achieve much despite hurdles but it is always a plus to have a supportive GME and that we do under the helm of Dr Hadley. I am of course most fortunate to interact and learn daily from my trainees. I come to work every day for them.

I will never be able to adequately express my gratitude to my children who have been so generous and graciously share me with my patients and residents. They have kept me honest with how to handle the Gen Z'ers. Where would I be without my husband, Dr George Abraham, who has inspired and mentored me and has been the wind beneath my wings.

Thank you to Dr Magee and Martha for coordinating and organizing this evening. Thank you all for your attention. I look forward to an open discussion.