

2014

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Recommended Citation

Sheingold, B. & Hahn, J. (2014) The History of Healthcare Quality: The First 100 Years 1860-1960. *International Journal of Africa Nursing Sciences*. 1(1), 18-22.

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Contents lists available at ScienceDirect

International Journal of Africa Nursing Sciences

journal homepage: www.elsevier.com/locate/ijans

The history of healthcare quality: The first 100 years 1860–1960



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ARTICLE INFO

Article history:

Received 17 July 2013

Received in revised form 15 April 2014

Accepted 23 May 2014

Available online 10 June 2014

Keywords:

International

History

Healthcare

Quality improvement

Nursing

ABSTRACT

In the 21st Century, health care systems across the world are focusing policy efforts on improving the quality of healthcare delivered to their population. In contrast, healthcare quality improvement in earlier time periods arose from a series of seemingly unrelated incidents and developments. In this paper, we sequentially review key international historical events that improved health care quality during the years 1860–1960, including innovation in health care financing, care delivery and workforce diversity. The modern nursing workforce of today continues to encounter many of these same challenges across the globe.

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1. Introduction

“Chance favors only the prepared mind” – Louis Pasteur

Healthcare quality measurement is the accepted criteria for assessing the effectiveness of health care delivery on a global scale (Kleinman & Dougherty, 2013). This article is Part one of the history of healthcare quality and will present the first 100 years of development.

The history of healthcare quality prior to 1960 is a fragmented collection of unrelated events rather than a streamlined organized effort. To appreciate how these events have evolved as the foundation for healthcare quality improvement, broad categories have been developed to identify global innovations in Europe, Asia and The United States (U.S.). Much of the history is so embedded in day-to-day medical-surgical practice and Quality Improvement Activities (QIA's) that it is taken for granted. Undoubtedly there will be familiarity with some, but not all of the events discussed.

Malcolm Gladwell's theory of Tipping Point (Gladwell, 2000) ideas, behaviors and messages is utilized to help navigate these events in an orderly fashion and provide structure and framework to the history of healthcare quality. Tipping Points are the phenomenon that precepts change before it becomes a norm. Gladwell identifies that Tipping Points depend heavily on people with a

set of rare social gifts. Florence Nightingale was such a person; therefore the history of healthcare quality begins with her. Table 1 provides a snapshot of these important events.

2. Quality improvement documentation

In 1854, British troops fought in Crimea and the surrounding area to force Russians to leave the Turkish territories of Moldavia and Wallachia. Cholera and diarrhea were responsible for a great deal of mortality among the British troops, and the British government sent a group of nurses to accompany Florence Nightingale to Turkey to help care for the soldiers. Within six months of the arrival of Florence Nightingale, the mortality rate from disease dropped from 42.7% to 2.2%.

Some of Nightingale's specific improvements were, the reduction of overcrowding (beds had to spaced three feet apart), provision of ventilation, the removal of Calvary horses that were being stabled in the hospital basement, assuring the sewers leading from the hospital were flushed several times a day and disinfecting the latrines/drains with peat charcoal (Nightingale, 1863).

She documented that if improvements had been implemented prior to admitting soldiers to the hospital, thousands of needless deaths would have been prevented. Her meticulous records were a key to present day statistical quality measurement, and she was an innovator in the collection, tabulation, interpretation, and graphical display of descriptive statistics. She named her graphical data display a “Coxcomb” which is known today as a pie-chart (Joint Commission Resources, 1999).

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Table 1
Chronological summary of key tipping points, individuals by year.

Year(s)	Key tipping points	Key individuals responsible	Country of origin
1854	Quality improvement documentation	Nightingale	England
1861	Sanitary commissions	Barton	USA
1862, 1918	Improvisation & innovation	Pasteur, Blue	France, USA
1879	Sterilization	Chamberland	France
1895, 1956, 1960	Technology	Rontgen, Safar, Laerdal	Germany, USA, France, Norway
1910	Education	Flexner	USA
1881–1955	Pharmaceuticals	Pasteur, von Behring, Kitasato, Descombey, Salk, Kendrick, Elderling, Pittman, Fleming	France, Germany, Japan, USA, England
1883–1945	Healthcare financing	Bismark, Beveridge, Kaiser	Germany, England, USA
1908	The role of industry and mass production	Ford	USA

Florence Nightingale was most likely influenced by evidence linking hand-washing and cleanliness to disease reduction discovered by Dr. Ignaz Semmelweis in Vienna's maternity wards during the 1840s ([Joint Commission Resources, 1999](#)).

3. Sanitary commissions

Approximately 7 years later and an ocean away, another pioneer was hard at work ministering to soldiers in a different war. As the American civil war formally began in 1861, the Sanitary Commission was founded as a partnership or alliance of relief organizations. It was based on lessons learned from the Crimean War with the purpose of promoting clean and healthy conditions in the Union Army camps and hospitals.

Clara Barton was a civilian volunteer who supervised nursing care to soldiers primarily in the state of Virginia to help meet the goals of the Sanitary Commission. She was assisted by Dr. Elizabeth Blackwell, who worked with Florence Nightingale in England and was the first female to graduate from medical school in the U.S. ([Oats, 1994](#)).

For every man wounded in battle during the Civil War, two died from dysentery, typhoid and malaria. Sanitary Commission Agents patrolled Union Army camps inspecting the living conditions and the hospitals, organized diet kitchens, made bandages, and in Cleveland, Ohio – conducted door to door “blanket raids” to prevent soldiers from sleeping on the ground at night. The Sanitation Agents were considered to be critical to the success of the Union Army during the Civil War ([Lewis, 2013](#)).

4. Improvisation and innovation

Historians identify Louis Pasteur as one of the “greatest benefactors to humanity of all time”. He was a French chemist who discovered that disease was caused by microorganisms or microbes, which later became known as germ theory ([Chamberland, 1904](#)). This evidence led to the wide-scale adoption of antiseptic practices by physicians and hospitals throughout Europe and eventually in the U.S.

Pasteur's research also led to the development of “pasteurization,” which utilizes heat to destroy harmful microbes in perishable food while leaving the food undamaged.

Another innovator was Surgeon General, Dr. Rupert Blue, who had the daunting responsibility of providing leadership in America during the worst outbreak of disease in U.S. history ([The United States Department of Health and Human Services, 2013a](#)). The Influenza Pandemic of 1918 killed fifty (50) million or 1/5 of the world's population, representing more people than died during World War I ([The United States Department of Health and Human Services, 2013b](#)).

Dr. Blue's extensive experience with healthcare improvement included eradicating rats in the turn-of-the-century San Francisco that were responsible for an outbreak of bubonic plague, and leading mosquito control during the opening of the Panama Canal ([The United States Department of Health and Human Services, 2013a](#)).

During the Influenza Pandemic, Dr. Blue's quality tools were, quarantine (including ships entering the country), mandatory medical exams for all immigrants entering the country, communication in the form of weekly newsletters that contained information about the latest outbreaks, and the results of influenza research conducted at the Hygienic Laboratory which continues to exist today. In addition to the pandemic, Dr. Blue was faced with outbreaks of polio, smallpox, and typhoid. He knew how disease was spread but science had not advanced enough to stop it. He also did not have antibiotics at his disposal which would have benefited approximately half of the influenza victims that died from secondary bacterial infections and sepsis ([Gernhart, 1999](#)).

In the United States, efforts to contain influenza in 1918 focused the use of quarantine and masks while in public, similar to the response by countries affected by the outbreak of SARS in 2003 ([Center for Disease Control, 2012](#)). The enforcement of Dr. Rupert Blue's healthcare quality plan fell to the police departments and public transportation employees.

Dr. Blue is viewed by many historians to represent the kind of visionary quality leader needed in the event of global disease pandemics of the future. The medical records kept during the 1918 influenza pandemic continue to be some of the most researched archival documents used by international scientists today. They serve to inform how we should respond to a similar widespread outbreak of biological disease, and provide data on the long term effects of the flu on pregnant woman.

5. Sterilization

An early prototype of the modern-day autoclave was invented in 1879 by Dr. Charles Chamberland, a French physician and biologist ([Chamberland, 1904](#)). His research was influenced by journal entries from the year 1679 by a British physicist, Dr. Denis Papin who invented the pressure cooker and research conducted by Louis Pasteur, with whom he frequently collaborated ([Encyclopedia Britannica Science and Technology, 2013](#)).

Chamberland's doctoral thesis, “Research Concerning the Origin and Development of Microscopic Organisms” led to the development of the Chamberland Filter, a piece of porous porcelain that filtered microorganisms from water ([Chamberland, 1904](#)). He then designed the Chamberland Autoclave to heat solutions above their boiling point, effectively destroying dangerous microorganisms. The first Chamberland Autoclave was manufactured for laboratory use in Paris, France by Wiesnegg Engineering ([Block, 2001](#)).

6. Technology

In 1895 Wilhelm Conrad Rontgen accidentally discovered X-rays in Germany by producing a fast stream of electrons that come to a sudden stop at a metal plate. His discovery revolutionized the ability to diagnose and musculo-skeletal disorders and injuries (Assmus, 1995). Advances in radiology primarily in France eventually led to the treatment of cancerous tumors and he won the Nobel Prize for Physics in 1901 (Nobel Prize Organization, 2013a).

Another three time Nobel Prize nominee was, Dr. Peter Safar, known as the architect of Intensive Care. Developed an A–B–C technique (which stood for airway/breathing/circulation) for cardiopulmonary resuscitation in 1956 at Baltimore City Hospital, noting that the best results were achieved by tilting the head back and pulling the jaw forward. His research was published in the Journal of the American Medical Association in 1958 (Srikameswaran, 2003).

The evidence provided by his research helped CPR gain worldwide acceptance. He approached a Norwegian toymaker; Asmund Laerdal to develop a realistic mannequin for CPR training, the resulting prototype became the life-size Resusci-Anne doll. This prototype was the basis for much of the emergency simulation training that is now a standard part of healthcare education (Srikameswaran, 2003).

In the late 1950s Dr. Safar revolutionized the quality of pre-hospital care by convincing the Baltimore City Fire Department to improve the transport of patients to hospitals utilizing fully equipped ambulances staffed with emergency medical technicians rather than the ordinary station wagons or hearses that were being used. He is also credited for establishing the first 24-hour Intensive Care Unit in the United States and is considered a giant in the field of resuscitation research (Sullivan, 2003).

7. Education

The first medical school in the United States was established in 1765 at the College of Philadelphia (now known as the University of Pennsylvania). The faculty was trained in Scotland and England, and it was located a few blocks from Pennsylvania Hospital co-founded by Benjamin Franklin. After the War of 1812, there was a rapid increase in medical schools across the country, but the quality was inconsistent (Porter, 2002).

In 1910, Abraham Flexner presented research on the state of medical education in the United States, which was sponsored by the Carnegie Foundation (Flexner, 2010).

His results revealed that there was often no formal tuition, no prerequisite academic preparation, and written exams were not mandatory (Beck, 2004). There were too many medical schools, 155 to be exact and only 16 of those required 2 years of college courses prior to admission – the remaining 139 may or may not have required a high school diploma (Flexner, 2010).

Flexner proposed a four-year medical school curriculum – two years of basic science education followed by two years of clinical training. He also proposed the requirements for admission to include a high school diploma and a minimum of two years of college science. The report resulted in the closure of many medical schools that were not incorporated within a university. In 1935 there were only 66 medical schools that survived the reform (Flexner, 2010).

These improvements in medical education were followed by standardized testing for medical school admissions and the Medical College Admission Test (MCAT) was developed in 1928 (McGaghie, 2002). The MCAT was a major step in the beginning of the quality journey for medicine.

Abraham Flexner continues to be honored today by the Association of American Medical Colleges, who confers a \$10,000.00 award annually upon a physician that recognizes the highest standards in U.S. medical education (Association of American Medical Colleges, 2010).

8. Pharmaceuticals

It is courage based on confidence, not daring, and it is confidence based on experience.

[Jonas Salk]

Of all the advances in healthcare quality, few can rival the discovery of vaccines. Some of the more well-known vaccines discovered between 1881 and 1955 are:

- Anthrax – discovered in 1881 by Louis Pasteur who also discovered the Rabies vaccine in 1885.
- Diphtheria – discovered by Emil von Behring and Shibasaburo Kitasato in 1891.
- Tetanus – discovered in 1924 by Pierre Descombey.
- Polio – discovered by Jonas Salk in 1955.
- Pertussis – discovered by Pearl Kendrick, Grace Eldering and Margaret Pittman in 1949.

In 1928, the “Wonder Drug” penicillin was discovered by Sir Alexander Fleming in England. Early in his medical life, Fleming became interested in the natural bacterial action of the blood and in antiseptics (Nobel Prize Organization, 2013b).

He was known as a “sloppy scientist,” cultures that he worked on were constantly forgotten, and his lab, was normally in a state of great disorder. After returning from a month long vacation, He observed that mold had developed accidentally on a staphylococcus culture plate and that the mold had created a bacteria-free circle around itself. His experiments led to the discovery of penicillin in 1928 (Nobel Prize Organization, 2013b).

Prior to the discovery of penicillin, death could occur with minor injuries, such as scrapes and from diseases such as strep throat, syphilis and gonorrhea. The mortality rate for soldiers from pneumonia was 18% during WWI. Interestingly the death rate today from penicillin resistant pneumonia is 19.4% (Nobel Prize Organization, 2013b).

Alexander Fleming was elected Fellow of the Royal Society in 1943, Knighted in 1944 and in 1945 won the Nobel Prize for Physiology and Medicine (Nobel Prize Organization, 2013b).

9. Healthcare financing

During the 19th and 20th centuries, payment for healthcare emerged in three different countries. Each went about this in a different way, produced different results and has different quality outcomes as a result.

9.1. Germany

Chancellor Otto Von Bismarck who designed a state run medical insurance program in 1883. The years between 1871 and 1890 are known as The Bismarck Era and Otto is affectionately known as the father of healthcare in Germany (Sawicki & Bastian, 2008).

Between 1883 and 1889, health insurance in Germany was defined as treatment & sick pay for up to 13 weeks. The Bismarck vision was a centrally administered and government financed healthcare system. Germany continues to have a healthcare system grounded in the Bismarck Era. (European Observatory on Health Care Systems, 2000; Sawicki & Bastian, 2008).

9.2. England

William Beveridge, is responsible for the 'Beveridge Report' published in 1942 following after the end of World War II in the United Kingdom. The report offered options on how the British healthcare system should be rebuilt. This included the establishment of a

National Health Service in 1948 with free medical treatment for all as priority ([British Broadcasting Company Historic Figures, 2013](#)).

The Beveridge Model of a National Health Service remains in existence today and both the Beveridge and Bismarck style of Healthcare Systems served as the models for universal coverage across the rest of Europe.

9.3. The United States

While German and British healthcare models were flourishing in Europe, healthcare in the U.S. was a jumble of voluntary, religious and charitable initiatives, such as relief for the elderly or the poverty stricken. The exception was for those who had money and could pay for medicine and care. It remained this way until the 20th century.

Henry Kaiser, was an American industrialist who owned steel mills, shipyards and pioneered construction with heavy equipment. In the 1930s and 40s, he wanted to provide a health plan for construction workers in his employ and designed a prepaid program. Following the model he established for his own employees, these pre-paid programs evolved into Kaiser Permanente which opened to the public in 1945, in Oakland, California. Today it exists as the largest HMO in the world ([Kaiser Permanente History, 2006](#)).

The predominantly employer based health insurance system in the United States developed in a fragmented, decentralized manner, with private insurers and the government eventually filling some, but not all of the gaps.

The overall quality of the German system today is currently ranked 25th best in the world by the World Health Organization, the United Kingdom is ranked 18th and the United States is ranked 37th ([The World Health Organization., 2000](#)).

10. The role of industry and mass production

Meanwhile... something interesting was happening outside the world of healthcare.

Deliberate quality improvement efforts were finding a foothold in industries other than health care between 1860 and 1960.

For example, in 1908, Henry Ford's assembly lines were employing, efficient management systems that reduced waste and increased productivity. Today those same techniques are transforming quality culture. You may be familiar with Henry Ford's process as the "six-sigma lean method" which has been adopted by the Toyota manufacturing firm in Japan, the National Health Service in the United Kingdom and General Electric in the United States and has recently begun to find a place in American healthcare quality improvement ([Zarbo & D'Angelo, 2006](#)).

Henry Ford is credited with saying, "we are charged with discovering the best way of doing everything", a motto that could easily apply to healthcare even though it was meant for automobiles ([Zarbo & D'Angelo, 2006](#)).

11. Conclusion

Florence Nightingale couldn't have predicted how far into the future her sense of quality assessment would reach. In 1858, Florence Nightingale created a remarkable and original morbidity and mortality graphical display to show the British Secretary of War just what had really happened to his troops in Crimea She named this method of displaying data as a Coxcomb and it immediately resulted in the allocation of British funds to provide sweeping modernization of the hospitals in Crimea which ultimately improved the quality of healthcare they delivered ([Dossey, Beck, Selanders, & Attewell, 2004](#)).

Florence Nightingale received many public honors. For her contribution to Army statistics and comparative hospital statistics, she became the first woman to be elected a fellow of the Statistical Society (1860). In 1883, Queen Victoria awarded her the Royal Red Cross. In 1907, she became the first woman to be given the British Order of Merit ([Dossey et al., 2004](#)).

In Part 2 of the history of health care quality, 1970–2013, nurses will begin to take the lead in nursing care quality data collection to measure patient care outcomes and patient satisfaction. Nurses will develop The National Database of Nursing Quality Indicators® ([The American Nurses Association National Database of Nursing Quality Indicators®, 2013](#)), the Nursing Sensitive Care Measures will be developed by the National Quality Forum, and quality education will become a cornerstone of nursing education with the Quality and Safety Education for Nurses (QSEN) initiative ([Quality and Safety Education for Nurses Initiative, 2013](#)). US healthcare reform will require quality outcomes for reimbursement of medical and nursing billable care. The Royal College of Nursing will develop a dashboard of nursing quality metrics and transparency ([Maben, Morrow, Ball, Robert, & Griffiths, 2012](#)).

Based upon our historical research, Florence Nightingale's three key contributions are (a) the measurement of quality improvement in all of healthcare, which is the foundation upon which current international benchmarks for excellence are identified today; (b) the importance of proper documentation and presentation of measurement results and (c) the value of generating buy-in from others to support healthcare quality intervention.

It is the legacy of Florence Nightingale that stirs the sense of quality assessment in what we have come to know as modern nursing.

Conflict of interest

None.

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