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Research Article

Concepts, History of Quality in Medical Sciences with Special Reference to Neurosciences and Neurosurgery and World Giants of Quality and their Quality Theories and Philosophies

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Abstract

The quality has been in the consideration of mankind since the evolution of humanity. It was considered much more important when it comes to the human life, health and medical sciences. Although quality was consideration and practiced from ancient periods in health and medical sciences, but quality development was taken on front seat by Industrial development in late 19th century and early 20th century which is still continuing. Quality in health and medical science also developed parallel to this. Most of the methodology, theory and philosophy in quality development where proposed applied by management gurus of Industry which were applied simultaneously to the health and medical services quality management services.

Keywords: Quality; Assurance; Standards; Bench Marking; Medical; Health; Neurosciences; Neurosurgery

Introduction

Ellis and Whittington gave two convention s of quality to the world -1, Quality in Industry and 2, Quality in Health care.

With widespread use of Total quality management (TQM) and continuous quality improvement (CQI) health was going along Industrial type of quality improvement.

There is no clear time when quality started in health care but it appears to be as old as mankind itself.

Practice may be attributed to start in as old as times of Atreya (800BC), Sushutra, who is considered as father of Indian surgery, Hippocrates (460-370 BC) and Charak (in 200AD). They started and improved methods of managing sick patients across the world by simple and primitive methods targeted at improving quality of patient care.

Edwin Chadwick (1800-1890) and Dr Lemuel Shattuck (the father of American vital statistics), demonstrated that poor health is linked to poor sanitary condition to the shortage of qualified medical professional in the fields.

Florescence Nightingale found positive correlation between quality nursing care and death of soldiers in Crimean War (around 1954).

Dr Ernest Amory Codman introduces concept of end result as mortality and morbidity similar to present day "End result Cards".

Present concept of quality management in health care started in 1918 with American college of surgeons started hospital standardization program by providing criteria and standards for accreditation of the hospitals.

The joint commission on accreditation of hospitals (JCAH) started in 1952 and published standards and was made mandatory for all hospital to follow and comply for accreditation with JCAH.

ISO (international standard organization) was started in 1947 in industry sector to facilitate international coordination and understanding.

Dr Avedis Donabedian introduced three measures called the structure, process and outcome while monitoring and assessing the quality care in the health care system during that time.

In 1966 Government of USA started regulatory authority to regulate health care quality.

Management Guru Edward Deming introduced the concept of Total quality management (TQM) which was also applied to health-

care systems. This is a continuous effort by all health care management people to the requirement, expectation to satisfy the end user, the patients.

In early 1990s, there was an increasing concern for quality in health care and thus started the quality movement in health care.

The World health organization (WHO) organized an international conference on aspect like the quality in primary health care in China and quality assurance in district healthcare in Korea which helped to find quality in healthcare system a global and universal concern.

Patients have a basic need to live their lives with respect and dignity and are entitled with basic right and freedom and neurosurgery should also respect that and strive to ensure it.

The very common human right includes "right to equality" "before the law", life and liberty", freedom of thought and "freedom of expression". Apart from all these basic rights, Health is also declared as the "fundamental human right" that satisfies the need for physical and mental well-being.

The Universal Declaration of human right, adopted by the United Nations (UN) in 1948, proclaimed that "everyone has the right to a standard of living, adequate for health and well-being of oneself and one's family including food, clothing, housing and medical care". These too have to have some quality.

What is quality?

Quality is one of very important concept in Neurosurgical and delivery systems. Like other medical fields quality concepts were brought intentionally in neurosurgical field as well. Survival of fittest is the dictum of the all-time.

Quality is Degree of excellence achieved in the given field as perceived by the service provider. It means adherence to the already determined features in rendered services which patient gets every time when he/she visits hospital service. Which enthuses confidence that He/she will get same services this time as well and it decreases the anxiety and fills comfort in the patient and their attendants. So, there should be composite positive result and value in minds of patient or service takers (clients).

The emphasis may be client oriented, or the service rendered or even cost consideration. This is a high value task and high priority to be given and this may change upwards from time to time as this determines the success of the departments or services rendered due to client's loyalty by its reliability.

Good qualified and experienced staff and good design and good infra-structure with required services with sustained reliability, continuity and cost effectiveness. It must contain empathy and must be having basic human right factors as it is directed towards human beings.

Incorporated Design of the facility should be good and adequate depending upon Vision and mission of the institution and services.

There should be strict quality control in place. It must keep in view the patients visiting to the institution by continuously monitoring through supervisor monitoring cameras attached to monitor manned by personnel to ensure that the quality standards so set is applied to the system properly. Also that the delivery of the system is optimal at all the time.

There must be persistent effort to continuously improve the quality by understanding the places of deficiency and places where effort can improve the quality leading to continuous quality improvement.

The Joint commission on accreditation of Health care Organization (JCAHO) Quality is defined as "the degree to which health services for consumers increases the likelihood of the desired health out come and are consistent with the current professional knowledge".

In view of service consumer/patients may think best possible treatment in least affordable price. Which should be safe and provided in time according to patient need.

The International Organization for standardization (ISO) defines quality as "the totality of features and characteristically of the service that bear on its ability to satisfy the stated and implied need of the patients".

Therefore, it's the totality of services or its combined effect on the consumer which matters as quality and the total ability of ser-

vices to satisfy the need of patient by curing of disease and causative factors to restore the health to normal leading to satisfaction of patient and patient's attendant.

According to Philip B Crossby Quality is the conformance to requirement of the given specification.

According to Joseph M Juran Quality is the fitness for use.

According to Armand V Feigenbaum Quality is what consumer say it is.

Development of super specialty hospitals and popularity of neurosurgical centres in international market has brought high competition in India. The current neurosurgical scenario emphasize on quality care rather than traditional holistic care only.

Public are more aware of health care and now demanding high quality in neurosurgery as in any other field of Medical sciences.

Influence of medical insurance also emphasizes the very need of quality in neurosurgery as in other fields of medical science necessitating significant change in Neurosurgical practice.

Management Guru Deming has further taken the standard from quality management to the extreme of concept of total quality management which is being applied to all the fields of medicine including Neurosurgery.

Definitions

- **Standards**: A statement of expectation that defines the structure and process that must be substantially in place in an organization to enhance the quality of Neurosurgical care.
- **Quality**: The degree of adherence to pre-established criteria or standards.
- **Quality assurance:** Part of quality management focused on providing confidence that quality requirements will be fulfilled.
- **Quality improvement**: Ongoing response to quality assessment data about a service in ways that improve the process by which are provided to Neurosurgical
- Consumers/patients.
- Quality assurance programs are tools used by neurosurgical and health organization to establish a quality management system and to improve continually on quality of neurosurgical services increasing neurosurgical/surgical expenditure and disease burden also demands quality control in neurosurgical care.
- **Definition**: Quality assurance (QA) is an activity where the primary objective is to monitor, evaluate or improve the quality of neurosurgical care delivered by neurosurgical care providers.

Quality Assurance should be integral part of all neurosurgical delivery systems including the operation theatres.

Organizations spends huge amount of money, time and man power, to get into quality system process. Many national and international organizations are available for accreditation or certification of hospitals and services in term of quality. Quality is never an accident; but is result of dedicated and intelligent efforts. All humans are entitled with basic right and freedom there by to live our lives with respect and dignity. The very common human right includes "right to equality" before the law, "life and liberty", "freedom of thought" and "freedom of expression". Apart from all these basic rights, health are also declared as the "fundamental human right" that satisfies the need for physical and mental well-being.

The Universal Declaration of human right, adopted by the United Nations (UN) in 1948, proclaimed that "everyone has the right to a standard of living, adequate for health and well-being of oneself and one's family including food, clothing, housing and medical care".

Today hospitals practice various quality management systems [1,2] through accreditation. Several accreditation bodies at national and international level have been established quality management systems through various standards specific to patient care and safety.

History of quality

Growth of quality dates back to Europe, where people started grouping themselves as GUILDS in 13th century AD. They devel-

oped rigorous techniques of inspection and marking good and unflawed product with a special as mark as token for good product and service.

From 17th century to early 19th century industry followed craftsmanship techniques. Here young boys became well versed in skilled trade by serving as an apprentice for many years with other skilled person called master craftsman. Here contact with the customer was prime and product or services was centred towards need of the specific consumer.

This further advanced into Factory system with development of industries where craftsman specialized to work a specific specialized task in industry and became factory worker and their shopkeeper became production supervisors. Quality was assured through skill of labourers (craftsman), inspection and regular audits of inspection results. Faulty product nor conforming to need were reformed to require level or scraped all together if can't be reformed.

In 19th century In United states Taylor system replaced factory system of European tradition by introducing Engineer above craftsman. There by production was immensely increased without increasing the man power. Here crafts man and supervisor acted as inspectors and mangers under engineer.

The Industry started inspection in factories in UK during industrial revolution in 1800th centuries.

In early 20th century, started the process to include quality processes in quality practices. Latter quality became an important factor in World War II, as equipment part made in one place needs to assimilate adapt, incorporated properly in other part made somewhere else. These were needed to be inspected to be so well made.

Due to large amount of manufacturing, they developed sample technique that to inspect few products of a large amount made in one lot. By that they deceased the time and manpower taken in the inspection process and still got the right product of same quality.

United States developed Total quality concept in direct competition to quality revolution in Japan after World War II. Thereafter only inspection was replaced by improving all aspect of manufacturing by improving all the organizational process by the people who actually used them.

Around 1970s industrial sectors like automobile and electronics sector in united states if America were inspired by the quality revolution going on in japan and as a sportman like competitors US not only focused on statistics but processes to include whole organization. That was latter on well-known by the name of "total Quality management (TQM)".

In 20th century Total quality management was in vogue all where but its emphasis was reduced in United States of America where people started working 'beyond" Total quality management based on the principles of management gurus like Deming and Juran and other Japanese practitioners of quality.

In beginning of 20th century statistician like Walter A Shewhart marked addition of processes in quality management leads to a lot of data. He laid foundation for the modern-day quality tools known as control charts or Process-behaviour charts. These are statistical process control tool used to determine if a manufacturing or business process is in a state of control. It is more appropriate to say that the control charts are the graphical device statistical process monitoring (SPM).

Quality assurance in India started to gain momentum in a structured manner after 2000.

In 2005 Academy of Hospital administration (AHA) developed and prepared a detailed Manual for the hospital to get accreditation.

In 2006 The National accreditation Board for hospitals and health care providers (NABH) was established.

It has a patient –focused approach to improve the process of delivery of care to improve quality.

It has laid down quality standards and provides certification of accreditation based on quality assessment if complied in conformity to the standards.

Credit rating by Information services of India limited (CRISIL) and Ananth's Directory of health care services started rating hospital based on the specialty or location.

The quality improvement- Future trends

- The field oh quality in health care is continuing to evolve rapidly. This is very rapid due the obsession of quality by patients and public as well as private sector.
- This is called Third revolution in health care.
- The government accounting office (GAO) has estimated that it takes 1-5 year for Service Company to recognize the advantage of total quality management.
- TQM may finally be accepted based on the end user suggestion and self-regulation can be achieved and so quality will evolve from the external punitive methods of inspection to the internal and the self-regulatory approaches for institutional growth and development.

Scope of quality assurance in health care

There are three pillars in healthcare services called as quality, access and cost. The quality service is patient oriented and easily accessible, available, affordable and effective which is satisfactory to the patients.

It minimizes morbidity and mortality. This means rather spending on curative therapy, the focus should be on preventive services. And treatment of common ailment that are relatively economical and also benefit to the large masses. The service should be easily available and easily approachable and assessable. With all above it should be affordable as well [3,4].

Many other factors also play a vital role in determining the quality of services.

Giants of quality of world

The field of quality assurance and management has been achieved by many giants and, pioneers in field of quality development.

S No	Country name	Quality Giants/Pioneerr
1	USA	Philip B Crosby W.Edward Deming Armand V Feigenbaum Josef M Juran Walter a Shewhart Abraham Flexnor Dr Lamuel Shattuck
2	Japan	Kaoru Ishikawa Shigeo Shigo GenichiTaguchi
3	Europe	John Groocock David Hutchins John Oakland Frank Price Lionel Stebbing Sir Edwin Chadwick Florence Nightingale
4	India	(Quality in Health and Medical services) Jacob Chandy B Ramamurthy P K Upadhyay

Table 1

In recent times most of quality related works were done in America, Japan and Europe.

Dr Walter. A Shewhart: An American Dr Walter. A Shewhart, engineer worked at Western electric and bell telephones laboratories. He popularized:

- Statistical processes and control (SPC).
- He also formulated quality control charts theory.
- He authored "Economic Control of quality" of manufactured product in 1931.

This considered as a complete and thorough work on basic principles of quality control. Control chart is ment for determining whether a process should undergo a qualityrelated problems.

He developed famous Shewhart cycle also known as – Plan – do – Check- act/adjust (PDCA cycle) for learning and improvement. He thus introduced "Trial and Error Methodology". Some people add Observation before PDCA and so it may be called as OPDCA. PDCA cycle is also sometimes called as Deming circle/cycle/wheel.

PDCA, sometimes called PDSA, the "Deming Wheel", or "Deming Cycle", was developed by renowned management consultant Dr William Edwards Deming in the 1950s. Deming himself called it the "Shewhart Cycle", as his model was based on an idea from his mentor, Walter Shewhart (Figure 1).

Figure 1: The Plan-Do-Check-Act cycle.

Here in PDSA, "S" stands for study.

All these worked as foundation for future works on quality issues implemented by Dr W Edward Deming and Dr Joseph Juran.

However in 21st century where incoming data streaming can be monitored even without any knowledge of the underlying process distributions. Distribution–free control charts are becoming increasingly popular.

W Adward Deming

- W Adward Deming was an American statistician, is considered to be the father of Quality control in Japan. He was a famous worldwide management consultant for almost 40 years and helped in revitalizing the Japanese Economy during the 1950s.
- He has done Ph.D in Physics from Yale University. He also worked with Walter Shewhart at Bell Laboratories and the Hawthorne plants.
- He was hero to Japanese industries yet all Americans have not accepted his philosophy. Although many relate his name with the "statistical process control".
- Application of his philosophies resulted and led to numerous successful companies. He has given definition to quality as" a predictable degree of uniformity and dependability at reduced cost and suited to the market".
- In 1986 Deming proposed a 14-point plan to improve productivity and competitiveness and also help the Top level management to stay in business which ultimately led to development of Total quality management (TQM).

Joseph M. Juran

- Joseph M. Juran was an American Engineer known as the "Quality GURU", was one of most potent and important thinkers of 20th century in quality management.
- Dr Joseph M Juran is attributed as many contributions to Japanese quality revolution.

The "Juran's Trilogy" (Figure-2) defined the three management principles for improvement of quality those are:

- Quality Control
- Quality planning and
- Quality Improvement.

He was a lecturer and also worked with Walter Shewhart in Hawthone plant in 1924. His concept of quality was universal called "fitness for use".

Figure 2: Jurans Triology.

In recognition of his contribution "Juran Institute was founded in 1979.

Jurans enlightened the world on the concept of the "vital few and trivial many" which is the basis of parieto charts.

Phillip b. Crosby

Phillip b. Crosby is a highly acknowledged, recognized as quality consultant and was advocate of quality and author of many quality books such as" quality without tears" and "Quality is free". In 1980, he took many high profile initiatives and believed that quality goods and service result in no additional cost to companies but poor-quality goods and services results in loss to companies. He believed in standard of Performance and product with zero defect. He also believed in inspection and shift that attitude towards prevention and communicated that it is achievable.

He also developed quality building tools like "management Maturity Grid" to find out areas of potential improvement.

His four absolutes of quality are as follows:

- Quality is defined by its conformance to requirement.
- System for achieving quality is Prevention and not appraisal.
- Performance standard of zero defect which are not close enough.
- Measurement of quality is the cost of non – conformance.

Dr Armand V. Feigenbaum

Dr Armand V. Feigenbaum believed in total quality control is necessary to achieve productivity, market penetration and competitive advantage. Here quality starts with identifying the customer requirements and ends with a product or service to the satisfaction of customer.

- His quality tips included
- Management participation
- Employee's involvement
- Oversight leadership
- Quality control across the organization Customer satisfaction.
- He wrote the Book" Total quality Control" in 1951.

Kaoru Ishikawa

Kaoru Ishikawa was a student of Deming, Juran and Feigenbaum.

He developed the problem –solving tool for quality management.

And developed the following concept –

- Quality control circle and
- The fish bone diagram (cause and effect diagram or Ishikawa diagram). The fishbone diagram (Figure 3) or Ishikawa diagram is a cause-and-effect diagram that helps managers to track down the reasons for imperfections, variations, defects, or failures.

The diagram looks just like a fish's skeleton with the problem at its head and the causes for the problem feeding into the spine. Once all the causes that underlie the problem have been identified, managers can start looking for solutions to ensure that the problem doesn't become a recurring one.

It can also be used in product development. Having a problem-solving product will ensure that your new development will be

popular – provided people care about the problem you're trying to solve. The fishbone diagram strives to pinpoint everything that's wrong with current market offerings so that you can develop an innovation that doesn't have these problems.

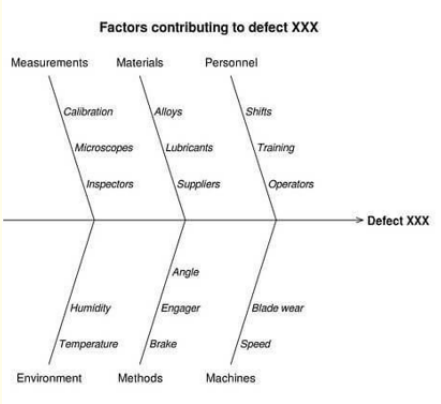

Figure 3: Fish bone or Ishikawa diagram.

Finally, the fishbone diagram is also a great way to look for and prevent quality problems before they ever arise. Use it to troubleshoot before there is trouble, and you can overcome all or most of your teething troubles when introducing something new.

Ishikawa adopted total quality concept for the Japanese.

Ishikawa developed quality circle, which included 7-10 people group who met to identify and solve quality problem.

Abraham Flexner

- Abraham Flexner has made many contributions in the medical field.
- In 1910 through a study on medical education system, he pointed out the vital linkage between the quality of medical education of physician and quality of patient care.
- He also outlined the quality criteria for medical schools which lead to the revolutionary reforms in medical education in America.

Dr Lemuel Shattuck

- Dr Lemuel Shattuck is the father of American Vital statistics system, started the concept of quality in the field of health care.
- Through study he linked the poor sanitary condition to the lack of qualified professionals in the health fields.

Florence Nightangle

- Florence Nightangle is also known as the "lady with lamp" because she used to search injured soldier in the war field in night holding lamp in one hand. She played vital role in Crimean war and established positive correlation between the quality of nursing care and the mortality rate among the wounded.
- She established direct relationship between the resource utilized and the quality of outcome.
- The quality criteria laid down by her for nursing care was the first scientific and historical step in the evolution of the concept of quality in health care.

Sir Edwin Chadwick [5]

- Sir Edwin Chadwick was a social reformer and was noted for his work to reform the poor laws and also improve the sanitary condition and public health. Edwin Chadwick believed in improvement to the public health. Sir Edwin Chadwick encourage the government to involve the health promotions and thereby gain place in history of medicine. He sponsored the legislation which needed the government to registration of the births, deaths and marriages. That helped tracking epidemics in study of vital statistics for possible factors involved in disease causation.
- In 1889, The Queen Victoria recognized his contribution to public healthcare and knighted him the First civilian knight commanders of the most honorable order of the country.

Dr P K Upadhyay

Dr P K Upadhyay has qualified from G B Pant hospital, Maulana Azad Medical College, University of Delhi, in Neurosurgery. Devel-

oped Departments of neurosurgery in many medical institutions of India, including Delhi's prestigious Institute of Human behaviour and allied sciences. He was instrumental in getting the department of neurosurgery the quality accreditation from NABH, QCI of India. It was 1st Government Neurosurgery department of Delhi and North India to get such accreditation. He has authored more than 130 scientific publications. He editor of member of editorial board of more than 10 international and national publication platforms and journals. This includes more than 15 publications on quality in health and medical sciences. He authored many books on quality and standards in health sciences and Neurosurgery, some of which are as follows "Text Book of quality assurance in Neuro and Medical sciences", published in USA (1st edition, 2018 and 2nd edition 2020) and "Text book of quality assurance and standards in Neurosurgery and Surgical sciences" in 2020 and Interesting topics in Neurosciences (under process of being published) Text Book of quality assurance in Neuro and Medical sciences (3rd edition, in press).

Material and Methods

Quality concepts and Methods in health care in general and neurosurgical specialties in particular are very useful in understanding and solving the issues related to healthcare services which is assisted by our knowledge of quality philosophies.

Concept of quality in neurosurgical sciences and also medical sciences help in proper functioning of the system leading to effective services to patients of surgical as well as medical specialties in general and super specialties like neurosurgery in particular.

Multiple models have been developed to understand and apply the concept of quality in health services.

Maxwell's concept of quality and Donabedian's structure– process–out come models are very prominent.

Maxwell's concept of quality [6]

Maxwell in1984 formulated six-dimensional quality model to healthcare applicable surgical as well as medical specialties in general and super specialties like neurosurgery in particular. They are as follows:

- **Access:** The accessibility of service to patient. These includes in term of infrastructure, paperwork, treatment, language, and social assistance. Can people get service when they need? Is there identifiable barrier when they try to take the services? Few of which may be the distance from patient's residence, excessive fees, extraordinary long waiting list, queue, breakdown in services.

- **Equity:** health care services must be available to patients irrespective of their social, culture, and racial background. There should not be barrier of caste creed religion. Difference of poor and rich. All patients treated fairly. There should be no discrimination between patients.

- **Relevance to need:** the services must meet the need of whole community. The overall pattern and balance of services could achieve, taking the account of need and want of the population/community as a whole. For example, the services must have good doctors, technicians, qualified nurses, medical and surgical equipment, and other facilities to provide best services to the population.

- **Social acceptability**: In use of services the social and religious value of the community must be taken and as such it should be acceptable to the community. The medical care and treatment must meet the expectation and satisfaction of the patients. It should be provided with humility, considerately and with compassion. Privacy and confidentiality must be safe guarded. What does the third party think and rate about the services? That's mean the services should be adequate so that clinical staff of the hospital responds immediately to a service to the patient and services must be acceptable to him/her and his/her family members.

- **Efficiency:** The services should be cost –effective to the patient and must be provided within the resources available.

It should be efficient to provide services to the poor at cost available at nearest health care facility. In India the health is government subject therefore its responsibility of the organization to make sure that all such facility be made available, which included

(A) manpower which should well qualified and adequate in numbers, (B) infrastructure commensurate to the services intended to be provided, like well-equipped operation theatre with standard infrastructure if operative services is to be provided, and finally (C) Logistics which includes other things than manpower and infrastructure that is equipment, machinery, air conditioning, water supply, drainage, waste disposal etc.

The effectiveness

The services thus provided should be effective and have impact in society. Efficiency is ability to provide cost– effective services. Effectiveness is the result or outcome of health care services to patients. This must result in benefit to the patient. Effectiveness should also lead to benefit to the society and population which is being served. Inappropriate care and harmful treatment are considered as ineffective. Are there any decrease in the average length of stay at the hospital due the services? And that may be causing increase output of the health services thereof due to increased turn over.

Donabedian's quality concept of structure – process–out come model (SPO) [7]

In 1970 Donabedian's model was used to examine the quality of healthcare.

This is used to examine usefulness of health care services and the outcomes of delivery systems. They use three sets of criteria for quality and standard. They are:

- **Structure:** This factor discusses about the structure of a health care delivery system in terms of human resource, material resource and organization infrastructure.

The model examines the access to healthcare for patient and evaluates the services provider and organization that delivers the service. Its studies need of staff with appropriate skills and qualifications in sufficient numbers to reach certain service standards.

Other resources involved are equipment, buildings, the resources and documentation guiding staff that are necessary for the delivery of health care services.

Process

- Process is what is actually performed to achieve quality in health care services.
- It examines the amount of care delivered to the patients and thus outcome of the care. Health care professionals should follow the process in work setting.

Out come

- Outcome determines the extent to which the delivered care results in an improvement in the patients social and psychological functioning.

Patient satisfaction is considered as an important measure of outcome.

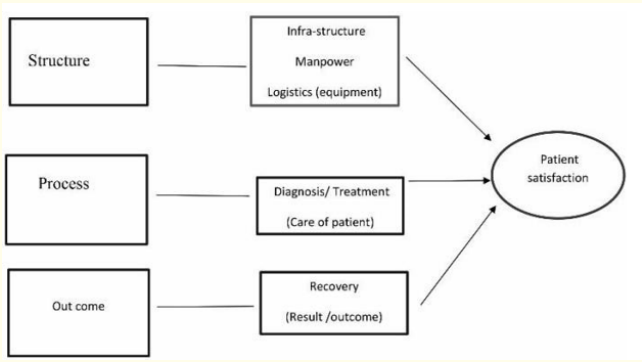

Figure 4

Donabedian's quality concept of structure – process –out come model (S. P. O).

Manson's Standards and standard –setting

- In 1994 Manson described standard as a valid definition of the quality of healthcare.
- Every service to the patient in healthcare that is delivered in accordance to a standard will result in positive outcome for a patient.

- In this a standard is set and is followed diligently which results in positive outcome. The standard so set should be measurable and called criteria. If standard is not measurable it is divided into measurable part which is called criteria.
- In standard setting these are audited sufficient to achieve, maintain, and evaluate quality. The goals are identified and is achieved through team work. It encourages team work in delivering services and maintaining quality standards.

Results

The quality improvement has started since start of humanity but it took fast pace in late nineteenth century and 20th century and most of development in industry and has been applied simultaneously to health and medical field as well.

Discussion

Quality philosophies

- There are various quality philosophies throughout the history have culminated and gave birth to the idea of modern neurosurgical health care systems quality assurance at its core.
- These healthcare systems should have a patient centric philosophy which has a definite vision, mission and value in the task of delivering services to patients.
- The health care system must function in accordance to that philosophy and must care and respect patient rights.
- There should be commitment to consistent service delivery and quality measures.
- There multiple philosophies to deliver the best and standardized quality seduces in health care system.
- One of the most important one was postulated by W Edward Deming that will be discussed here.

W. Edward Deming philosophy of quality [8,9]

- W Edward Deming philosophy of quality was proposed in 1986.
- Deming was quality Guru who was one of the stalwarts mainly responsible for significant ideas in post-world war industrial revolution in Japan.
- Deming believed that the quality is responsible for the success of the health care institution, hospital and medical centres.
- According to his believe this is applicable to both small size and big size health care Centre.
- He also advocated that not only medical or health care organization but it will benefit manufacturing sector, industry or in any company as well.

He thus devised his philosophy which can be divided into 14 points.

- Create constancy of purpose for improvement of delivery of service.
- Adopt a value-based philosophy to deliver services.
- Cease independence on mass inspection.
- End the practice of awarding business on the basis of price.
- Improve the system of service constantly and forever.
- Institute training.
- Adopt the institute leadership for supervising staff.
- Drive out fear.
- Break down barrier between staff and patients.
- Eliminates slogans, exhortations and targets for staff.
- Eliminate numerical quotas.
- Satisfaction of patient clients in delivery of service.
- Encourage education and self –improvement for patient.
- Take action to accomplish the transformation.

Now it will be discussed, each one in some detail to understand the concepts of Deming better.

Create constancy of purpose for improvement of delivery of service

- It focusses on the need for continued improvement of health care services to the community and going for long term goal and sanction financial grant for long term improvement and should not only go for short term goals.

- The top management should create a mission statement and the same be known to all employees.
- One should know the challenges of modern era and be awakened and prepared for the challenge.
- Poor facilities, lack of proper man power, lack or defective or lower quality biomedical equipment or bad services are not acceptable in modern era in present century.

Adopt a value-based philosophy to deliver services

- The medical healthcare facilities should not accept commonly acceptable level of mistakes. It should not use defective methods of treatment procedures or method to treat patients. It should use value added quality service to have and increase patient satisfaction.

Cease independence on mass inspection

- Health care hospitals and medical institutions must establish quality in service so that dependence on inspection and ultimately remove the need for inspection.
- Therefore, need of inspection team to ensure quality services to patients. Emphasis should be on result oriented quality services to each patient and not few selected once.

End the practice of awarding business on the basis of price.

- Price of service must not be the sole criteria when contracting or empanelling service providers. Emphasis should be on mutual benefit supplier and host relationship.

Improve the system of service constantly and forever.

- The improvement of service is an ongoing and continuous process. The Deming cycle includes a four step process of plan, do, check, and act (PDCA).
- This is also called as Shewhart cycle as has been discussed in last chapter.
- At the planning stage opportunities and chances for improvement are identified. Plan is implemented and the result of the plan are verified at the check stage. The results are so measured, analysed and improved in the act stage by continuous improvement cycle process.

Institute training.

- On the job training must be provided for all the clinical and non-clinical employees and staff in ensuring competency at all levels. They must be encouraged to implement the knowledge and skill thus achieved through training. For instances proper use of equipment, Billing and administrative practices.

Adopt the institute leadership for supervising staff.

- The aim of supervision by leadership must be to help the staff to do better in their functions and jobs.
- This must create an atmosphere where staff takes leadership roles in doing their own job.
- Management must ensure corrective and preventive actions are taken in timely manner for all adverse condition which may be damaging or detrimental to health care services.

Drive out fear

- The top management must encourage an effective communication process with all stake holders in the health care organization so as to drive out any fear across organization, resulting in good and conducive atmosphere to work in organization and good feeling over all resulting ultimately in productive work and a satisfied customer and patients.

Break down barrier between staff and patients.

- The health care organization must treat its patients with equity, irrespective of their social, cultural and racial considerations.
- The flow of information and work between departments must be smooth without hurdles and should be seamless. They should not work in isolation as this will create barrier between staff and patients.

Eliminates slogans, exhortations and targets for staff.

- The management and top leadership should not resort to sloganeering without proving methods to work.

- The services related to targets without providing proper method will results in low yield of service and will lead to poor patient satisfaction. The focus of staff should be on the need of the patient and not on the target to be achieved.

Eliminate numerical quotas

- There should not be numerical quotas in the standard of work desired for staff for incentive in pay while delivering services. The medical staff should focus on patient need and provide the services in available resources. To achieve that the organization must provide necessary resources and effective leadership to deliver consistently good services to patients.

Satisfaction of patient, clients in delivery of service

- The quality is achieved in a health care organization by increasing patient's satisfaction so that all the patient satisfied and motivated.
- The leadership drive out fear from minds of patients so that they feel free to can ask questions without fear and their doubts must be cleared.

Encourage education and self –improvement for patient

- The health care organization must educate their patients about treatment, facilities and other health disciplines that it can provide.
- Empower the staff to fix the problem in the process as they know the shortcoming and problem of their processes and once given an opportunity can fix them as well.
- The deficiency or defect prevention should be developed as habit in day today jobs of every staff.

Take action to accomplish the transformation

- Thus, the services should be transformed and it should be every one's Job. The leader ship should transform the organization through continuous improvement process.

To achieve that the services should be patient centric and patient family centric services that focusses on patient physiological, psychological, safety and self-esteem needs.

The organization must provide health care education to the patient, patient family and community.

Application of Quality concept to the neurosurgery, Health care systems.

Improving quality in the system is very challenging as most of them have failed to provide quality of service to the patients and community.

There is need to provide continuous quality improvement in the health care systems including neurosurgery.

Application of quality concept in health care organizations consists of the degree to which healthcare service for individuals and population has met the following.

- Doctor, specialist and health care worker skill must be consistent with present status of education, knowledge and training.
- The principles aim must be adhered to promote quality in health care.
- These must be aimed to increase the desired health outcome (e.g. quality principles).
- These services must meet the expectation of consumers and clients (the patients and community).

The health care services must provide quality services to the population and all other accessary services should aim the same to achieve desired health out come and patient satisfaction.

This should be done using monitoring systems to safe guard against

- Underutilization of services.
- Unnecessary diagnostic and treatment procedures.
- Irrational use of Drugs to patients.
- Use of fake unregistered drugs.
- Bad response of clinical or non-clinical staff to patient's needs.

All successful healthcare organizations must understand, identify, and implement the following essential principles into practice.

- Leadership and its ability to bring change.
- Measurement.
- Reliability.
- Practitioner's skill.
- Market place.

Leadership and its ability to bring change.

There should be leaders which can influence behaviour. These behavioural changes are required to achieve specific goals in the organization.

Often there is challenge for a leadership to bring competent people through the organization to do challenging job.

Clinical and non-clinical staff in health care must normally be resistant to change. The rapid rate of change in organization requires and leads to a constant update of skill for all health care workers including administrators, medical staff and non-clinical staff.

The important role of leadership is to set organizational goals through proper communication and guide the organization to accomplish the needed change in service.

Kotter explained eight stages to cope such changes which are brought in an organization.

- To create a sense of urgency in delivery of service.
- To build a guiding relationship with patient and family members.
- To state a vision and strategy for the delivery of service.
- To communicate the change of vision and strategy for delivery of service.
- To implement broad based delivery actions while delivering the service.
- Adopt short term wins to reach patient expectations and satisfaction.
- Review gains and produce further more changes in service as required.
- Make new approaches in the method of service if required like remedial measures or new methods.

Thus, it helps the health care organization to have process improvement, risk awareness, communication and innovation to achieve the level of service and clinical performance.

Measurements

The quality of healthcare system and service is measured in terms of (a) outcome, which is the change in health care status of the patient that is a direct result of clinical care or (b) processes that is providers do to and for patients.

Those finally leads to ultimate result that is found as patient satisfaction.

Reliability

Every identified problem in a health care organization is the problem of a reliable process. In evaluating highly reliable service, five principles are found to be universal. They are:

- Command and control.
- Risk appreciation.
- Quality.
- Metrics (Measurements).
- Rewards.

Command and control: Healthcare service must be delivered according to the standard agreed in advance.

There must be a control over the quality of services delivered to patients to ensure improvement and so to provide high quality of service.

- **Risk appreciation:** There should be pre knowledge of risk during delivery. Therefore, it is necessary to take appropriate steps to minimize the risk.
- **Quality:** Policies and procedures for promoting high quality service are essential to give reliable and satisfactory service to patients.
- **Metrics (Measurements):** A system of ongoing checks to monitor hazardous conditions is essential for accountability and also to keep a track on number of patients who receives the healthcare service.

- **Rewards:** The clinical and non-clinical staff must be given a warning or punishment for behaving badly with patients and also those who achieve patient's satisfaction must be rewarded.

Practitioners skill

High quality service in healthcare can be achieved in a reliable way and with right skills.

That is doing right thing right. They must take right decisions and appropriateness of service and care for each patient.

The threat to quality is

- **Over use:** That is giving treatment of no value to patient
- **Under use:** Failure in giving needed treatment to the patient
- **Misuse:** Making errors and defect in treatments.

Both over use and under use limit the clinicians' decision making ability. Both areas focus on the competence of the clinician and their ability to utilize resources appropriately.

The clinicians must ask the following questions and evaluate himself/herself to avoid the overuse or under use of service.

- Do they utilize the resources appropriately?
- Are they ordering too many treatment methods and tests?
- Are they ordering too few treatment methods and tests?
- Is the treatment appropriate and consistent with patient's risk benefit calculus?

Market place

Market place has a great effect in motivating quality services and it is essential to understand the role of quality of care in the current environment.

Transparency, promise of improved payments and patient flow to the health care organization improves health metrics thereby improves business of the organization.

Conclusion

Therefore it very clear that although quality revolution started in Industrial developments in USA, Europe and Japan this was closely followed in almost parallel fashion in Medical and Health field on almost same principles with little variations. This has greatly succeeded in bringing quality and quality assurance and development of quality standards all over the world by quality giants and pioneers with their hard devoted work and crystal clear quality principles and philosophies**.**

Conflict of Interests and Declaration

There is neither any conflict of interest nor any financial help has been taken from any institution, company or person for completing the project/study.

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