SUMMER TRAINING REPORT

MBA Hospital and Health Management (2019-2021)

Report On,

PART 1- 'Study on the Application of 3D Printing Technology to Combat Global Supply Chain Disruption in Hospitals during COVID-19 Pandemic.'

PART 2- Online Courses, 1) Patient Safety (I and II), 2) Healthcare IT: Challenges and Opportunities

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Dr. Asiya Murtaza

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PART- 1

SECONDARY RESEARCH

ABSTRACT

Background: Additive Manufacturing Technology or 3D printing technology has been used in healthcare previously for manufacturing prosthetics, implants, etc. 3D printing has been recognized as an innovative strategy to overcome supply chain shortage during the COVID-19 pandemic. However, there exist various strengths and shortcomings of the Personal Protective Equipments (PPEs) developed using this technology.

Methodology: In this research, we searched three online databases and included articles that provided proof of concept by developing prototypes of the PPEs and testing or evaluating them.

Results: From a total of 187 search results, 10 research articles met our inclusion criteria and were included in this research study. Most of these studies have been conducted in high-income countries and show that it is possible to use 3D printing to manufacture Personal Protective Equipments (PPEs) but there is a requirement of rigorous quality testing before implementation in clinical use.

Conclusion: This study has found various opportunities and obstacles of the 3D manufactured Personal Protective Equipments (PPEs) and the difficulties that low income, middle income and low-middle income countries might face in implementing this strategy to overcome supply chain shortage.

Keywords—3D printing, Additive manufacturing, Supply chain

STUDY ON THE APPLICATION OF 3D PRINTING TECHNOLOGY TO COMBAT GLOBAL SUPPLY CHAIN DISRUPTION IN HOSPITALS DURING COVID-19 PANDEMIC.

INTRODUCTION

Epidemic diseases that spread across a large region of the world, such as the 1918 influenza pandemic (Spanish flu), the 2009 flu pandemic (H1N1), and the current 2019 coronavirus disease (COVID-19),1, 2 can pose a challenge to healthcare resources worldwide. Basic measures such as personal hand cleaning and social distancing are crucial. However, according to World Health Organization (WHO) guidelines, protective material is essential for all healthcare providers.[1]

There is growing international concern regarding the shortage in supply chain of critical one-time-use personal and protective equipment (PPE). PPE are heat sensitive and are not, by their manufacturer's design, intended for reprocessing. Most conventional sterilization technologies used in hospitals, or in terminal medical device sterilization providers, cannot effectively reprocess PPE due to the nature and severity of sterilization modalities. Contingency planning for PPE stock shortage is important.[2]
Due to supply chain disruption, the COVID-19 pandemic has caused severe shortages in personal protective equipment (PPE) for health care professionals. Local fabrication based on 3D printing is one way to address this challenge, particularly in the case of simple products such as protective face shields.[3]

Additive manufacturing (AM) including 3-dimensional (3D) printing have gained popularity in manufacturing of medical devices. Advantages of AM technology includes ease in fabricating complex geometric structures, allowing the creation of engineered porous structures, tortuous internal channels, and internal support structures that would not be easily possible using traditional (non-additive) manufacturing approaches.[4] The reshaping of supply chains, as a result of increased use of 3D printing, is expected to bring important benefits within the main functions of the entire supply chain. Such benefits may include shorter time-to-market and speedy deliveries, reduced warehousing and transportation costs, reduced manufacturing costs and more efficient

packaging, minimizing stock-keeping, and faster response to customer demands through on-time and on-demand production. While such benefits may act as strong motives to businesses to adopt 3D printing technology approach, the use of this technology continues to face some challenges and difficulties associated with its implementation, particularly those related to the required materials, cost of acquiring the technology itself, cost of large production runs, slow production time for large production and, finally, the issues related to intellectual property protection.[12]

AIMS AND OBJECTIVES

1) To study the use of 3D printing technology to meet global supply chain demands during COVID-19 pandemic.
2) To study the strengths and shortcomings of products manufactured using 3D printing technology as an alternative during COVID-19 pandemic.

RESEARCH METHODOLOGY

A. Process of Collecting Literature

Online databases like ScienceDirect, Google Scholar, and Pubmed were used to search for articles and published literature using a set of keywords as in Table 1.

These keywords gave access to all the literature that represented the concept of this research study. The first set of keywords were used to identify with the different references to the COVID-19 pandemic. Secondly, 3D printing was also identified to be referred to as additive manufacturing in some articles hence the use of different keywords. Lastly, this research aims to study the use of 3D printing technology to overcome the supply chain shortage with respect to Personal Protective Equipments (PPEs) like masks, face shields, etc. for the frontline healthcare workers hence the use of the last set of keywords.

A total of 187 articles (ScienceDirect=105, Google Scholar=78, Pubmed=4) were found from the above-mentioned databases. The keywords were used in combination with the appropriate Boolean Operators which are OR and AND. All fields were searched which included titles, abstracts, subject headings like MeSH, and general keywords. To further

narrow down the search, the results were filtered to show only those during the time frame 2019-2020 as it was during this time that a global pandemic was declared, leading to the subsequent shortage in the supply chain in hospitals. No other filters were used to further narrow the results. The search includes all articles obtained from the databases up to May 10, 2020.

Query	Keywords (that searched All Fields i.e. within titles, abstracts, subject headings like MeSH, and general keywords)
1	“Novel Coronavirus” OR “Coronavirus” OR “nCoV” OR “COVID-19” OR “outbreak” OR “pandemic” OR “epidemic” OR “Wuhan Virus”
2	”3D printing" OR "3D printing technology" OR "Additive manufacturing"
3	"PPEs" OR "PPE" OR "Personal Protective Equipment" OR "masks" OR "N-95 Respirators" OR "N95 Respirators"
Final Search Query	**1 AND 2 AND 3**

B. Inclusion Criteria

1. The stage of publishing was not taken into account. Published, unpublished and pre-prints articles were included.
2. All articles written in the English language were included.
3. All articles that were available within the time frame of the search since 2019 were included.
4. All open access articles were included.
5. Articles giving proof of concept through development or testing of 3D printed Personal Protective Equipments (PPEs) prototypes were included.

C. Exclusion Criteria

1. Articles that did not fulfill any of the above-specified inclusion criteria were excluded.
2. All searches that were classified in categories other than full-text articles were excluded.

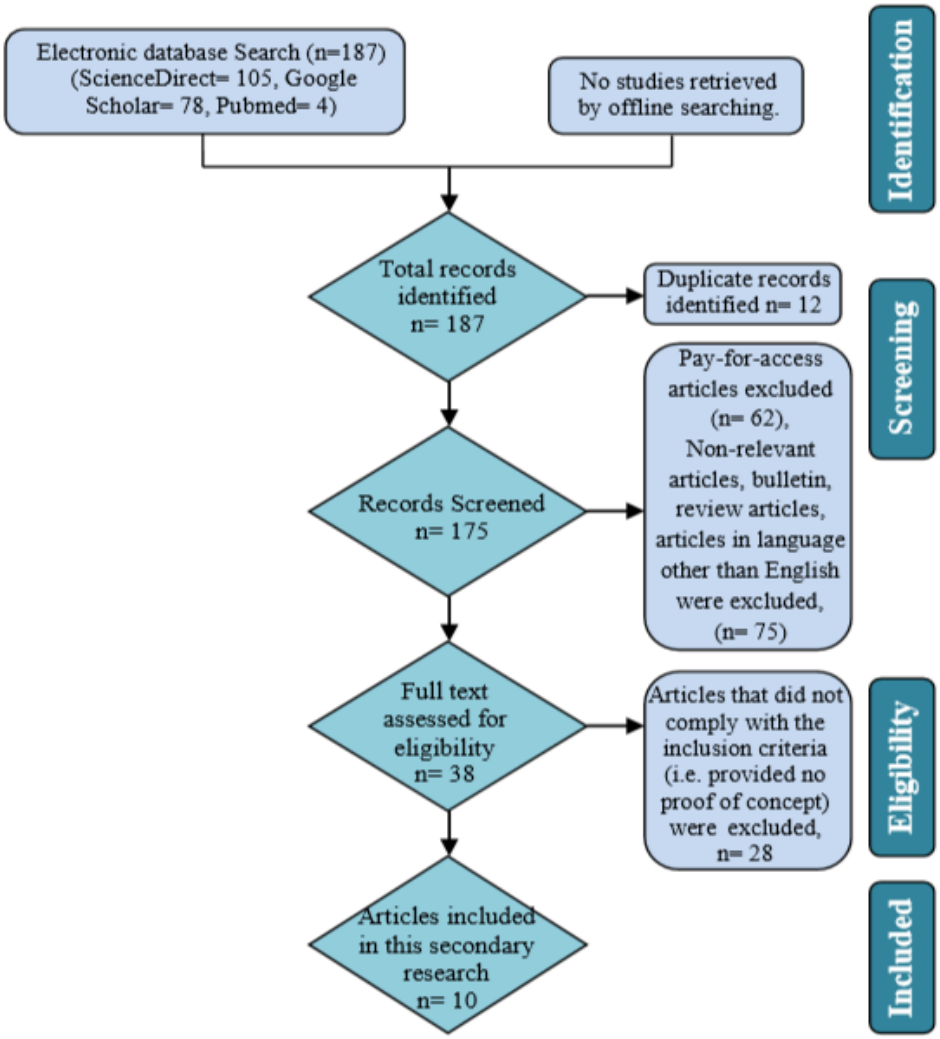
D. Screening of Literature

Citations of all the search results were found and uploaded to EndNote online citation manager. The duplicate results were found and excluded. Further, the search included some results which were not relevant to the study and were excluded along with results that were categorized as review articles and bulletin. Articles in languages other than English were also excluded. Further, the articles were screened to check for compliance with the inclusion criteria, and those that did not provide any proof of concept by developing a 3D printed prototype of a Personal Protective Equipments (PPEs) were excluded.

E. Data Extraction

Information was extracted from 10 articles that were related to the topic of research obtained from 3 different databases (Pubmed, ScienceDirect, and Google Scholar). Due to the difference in approaches in the different studies, a narrative synthesis was done to determine the overall role of 3D technology to overcome the supply chain shortage in hospitals during the COVID-19 pandemic and to find out about their strengths and shortcomings as compared to non-additively manufactured Personal Protective Equipments (PPEs).

The articles were searched for the type of Personal Protective Equipment (PPE) that was being manufactured using additive manufacturing technology, to understand the role of 3D printing technology during the COVID-19 pandemic which fulfills the first objective of the study. The benefits and shortcomings that these articles specified with respect to the additively manufactured Personal Protective Equipments (PPEs) were also taken into account to fulfill the second objective of the research study and results were obtained using the information gathered from the selected 10 articles.



Flow Chart 1

RESULTS

S.No	Authors/ Sources	What is the 3D printing technology being used for?	Any Advantages or Disadvantages w.r.t the materials developed using this technology.
1	Swennen GR, Pottel L, Haers PE. [1] Pubmed	A custom-made 3D protective face mask was developed, consisting of two reusable 3D-printed components (a face mask and a filter membrane support) and two disposable components (a head fixation band and a filter membrane).	1) The performance of a protective face mask depends on the efficiency of the filter membrane and on its individual fit to prevent leakage around the perimeter. 2) Allergic and decubitus lesions due to specific contacts, especially at the nasal bridge, might occur after prolonged application of the

S.No	Authors/ Sources	What is the 3D printing technology being used for?	Any Advantages or Disadvantages w.r.t the materials developed using this technology.
			individual 3D face mask in humid and warm infected virological units. Thus, additional skin unguents need to be used.
2	Sarah T. Flanagan, MD; David H. Ballard, MD[5] ScienceDirect	This paper discusses the role of 3D printing particularly in the production of face shields, examine its feasibility and adherence under new CDC and FDA pandemic guidelines, and recommend a focused effort by 3D printing hobbyists and industries alike.	Ford Motor company has facilities all over the country working on 3D printed PPE, including a plant in Plymouth, Michigan producing roughly 1,000,000 face shields per week.
3	Erickson MM, Richardson ES, Hernandez NM, Bobbert II DW, Gall K, Fearis P[6] ScienceDirect	Helmet modification, assembly, and quality testing. The manifold is a single new component that sits over the (previously open) intake fan and creates a sealed air path directly to the two mounted filters. The manifold is created from a Duke design that is then 3D printed (additive manufacturing) along with other modifications in the helmet.	The design team has engaged with healthcare workers in anesthesiology, surgery, and respiratory therapy to get feedback on the proposed design. Their collective thoughts are positive. They expressed that the design is comfortable.
4	Luiz Maracaja MD , Daina Blitz MD, Danielle L.V. Maracaja MD , Caroline A.[7] ScienceDirect	These authors propose a novel alternative PPE device that unites proven technology with an innovative system: the 3D-printed Oxyframe- it allows inflow of oxygen or compressed air behind the ear and outflow above the nose-bridge.	The paper specifies, there are no studies about the efficacy or safety of this method. In any environment with a high oxygen atmosphere, fire risk is certainly a concern and should be discussed and mitigated especially in the setting of electrocautery use. Some 3D printing processes require various chemical reagents, and skin allergies or reactions are possible.

S.No	Authors/ Sources	What is the 3D printing technology being used for?	Any Advantages or Disadvantages w.r.t the materials developed using this technology.
5	Rowan NJ, Laffey JG.[2] ScienceDirect	Irish researchers in University College Dublin and IT Sligo made easy-to-assemble ventilators using 3D printers and off-the-shelf components that will be validated by Ireland's HSE. Facial visors were also made using 3-D printers for use in regional hospitals and nursing homes.	The article does not reflect upon the testing or use of these PPEs made using 3D printed technology.
6	Bhanu Bhakta Neupane and Basant Giri[8] Google Scholar	This review discusses on current development in materials used for filtering device, effectiveness of face mask and respirator, emerging technologies for better filtering device, and finally provide a general guideline for proper use and future prospective of face mask and respirator. The research paper specifies, 3D printing has been used to make mask components such as mask structure or frame, cover, filter fix, seal etc.	Advantages of AM technology includes ease in fabricating complex geometric structures, allowing the creation of engineered porous structures, tortuous internal channels, and internal support structures that would not be easily possible using traditional (non-additive) manufacturing approaches. But, they may not provide the same level of barrier protection, fluid resistance, filtration, and infection control. The new designs are not approved by any regulatory agencies yet and performance may have been compromised.
7	Brohi SN, Jhanjhi NZ, Brohi NN, Brohi MN. [9] Google Scholar	Using 3DPT, companies can produce items such as face shields, face masks, ventilators, oxygen masks, test kit swabs and reusable filter masks in a short timeframe. Simple creations of 3DPT, such as Hands-Free Door Openers and Press Knobs, could prevent the spread of infectious diseases such as COVID-19.	3D-printed PPE may provide a physical barrier, but 3D-printed PPE are unlikely to provide the same fluid barrier and air filtration protection as FDA-cleared surgical masks and N95 respirators.

S.No	Authors/ Sources	What is the 3D printing technology being used for?	Any Advantages or Disadvantages w.r.t the materials developed using this technology.
8	Liu, D. C. Y., Koo, T.H., Wong, J. K. K., Wong, Y.H., Fung, K. S. C., Chan, Y., & Lim, H. S. [10] Google Scholar	They designed 3D printed adaptors that allowed elastomeric respirators to utilize breathing system filters and made simple modifications to the respirators to filter exhaled breaths. Performance and safety of the modified elastomeric respirators were evaluated with quantitative fit tests.	The polylactic acid material used for 3D printing is airtight when subjected to pressures encountered during normal breathing no leak was detected. According to the manufacturer, bleach and alcohol can be used to disinfect these 3D printed adaptors. Increase in air resistance during exhalation through the filters was noticed. Wearing these well fitted, tightly sealed respirators affects communication when exhalation valve is sealed.
9	Mostaghimi A, Antonini MJ, et al[3] Google Scholar	This paper describes the production and implementation of a 3D printed face shield (modified from the Prusa design6 developed in the Czech Republic). Its introduction into the Brigham and Women's Hospital (BWH), a major US academic medical center is described. The final face shield with all the required modifications was called the PanFab face shield.	The PanFab face shield after being developed was tested in a clinical setting. Results showed the following: 1) No respondents reported that the face shield was worse than the hospital standard-issue model in splash protection, durability, ease of use, or comfort; in fact, many preferred it over the hospital-issued model. 2) Other feedback included concerns that the Velcro strap might be a problem for some users with longer hair and that the shield length could be an issue for shorter users. These are issues will be addressed with additional design improvements.
10	Provenzano, D.; Rao, Y.J.; Mitic, K.; Obaid, S.N.; Pierce, D.; Huckenpahler, J.; Berger, J.; Goyal, S.; Loew, M.H. [11] Google Scholar	This study discusses the rapid prototyping of a reusable 3D printable N95 equivalent respirator for the hospital. And details about the preliminary trials that produced a reusable mask that passed a qualitative hospital Bitrix fit test.	Advantages of the 3D printed respirators are that they are easy to produce, easy to clean, can be individually fit to an individual, and can be cleaned with UV, light heat, alcohol, or soap and water between each use. Disadvantages of this method are the masks, similar to the N95 mask, have to be individually fit. Difficultly in fitting the mask around

S.No	Authors/ Sources	What is the 3D printing technology being used for?	Any Advantages or Disadvantages w.r.t the materials developed using this technology.
			the nose and cheeks was reported. Filtration qualities of the MERV material as stated by the manufacturer have not been independently validated in the research.

Table 3: SWOT Analysis of 3D Technology manufactured products.

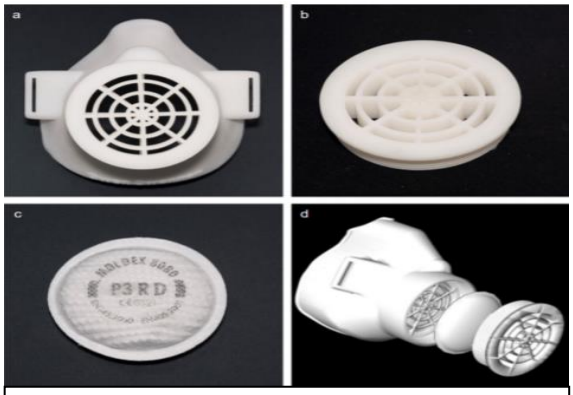
Strength	Weakness
1. Addresses the emerging need of PPE requirement to combat COVID-19, 2. Easy to manufacture and produce, 3. Helps in the fabrication of complicated equipments, 4. Gives design flexibility, 5. Re-usability.	1. Some studies report discomfort and possibility of developing skin lesions due to long term use thus requiring skin unguents, 2. Requirement of individual fit modifications, 3. Lack of research on effectiveness, safety and quality control, 4. Less suited for mass production, 5. High cost of capital, 6. Afforded mainly by first world countries.
Opportunities	**Threats**
1. Provide an opportunity to manufacture unique and specialized products on demand, 2. Provide opportunity to local designers and manufacturers to get into the field of 3D printing technology, 3. Enhancing PPE design and development, 4. Research and development for production of other 3D manufactured products useful for post-COVID scenario.	1. Regional and country approval on the use of products manufactured using this technology, 2. Risk of unregulated products with a lack of rigorous testing for critical healthcare situations, 3. Environmental impact, 4. Cost of material outsourcing and manufacture in countries where the technology is still in a premature stage.

DISCUSSION

According to the articles included in this study, the 3D printing technology could have a major impact on the supply chains in hospitals but requires further research and modifications to overcome the issues mentioned w.r.t the products manufactured using additive manufacturing. The advantages mentioned about 3D printing technology include a reduction in costs and greater speed of manufacturing which is the prime requirement as to the current need during the COVID-19 pandemic. However, the literatures mention that there are certain disadvantages of using products manufactured using this technology, those of which are mentioned in the above tables. It is advised that the disadvantages must be weighed against the advantages to establish whether the technology should be used for the protection of the frontline healthcare workers during such unprecedented times. The innovations in the healthcare industry are usually forms of incremental innovation but few like, 3D printing technology when introduced into the healthcare industry caused disruptive innovation. Today, due to the arising shortage of personal protective equipments and medical devices there is a newfound use for this technology in healthcare. However, we must also keep in mind that most of the studies that have been included in this research have been conducted in developed countries where the 3D printing industry might be very evolved as compared to that in the developing countries. The development of this technology may still be in its premature stage in the developing countries as a result of which cost of manufacturing these Personal Protective Equipments (PPEs) will increase. Additive manufacturing also requires a certain level of expertise in the field, to maintain the quality standards of the Personal Protective Equipments (PPEs).

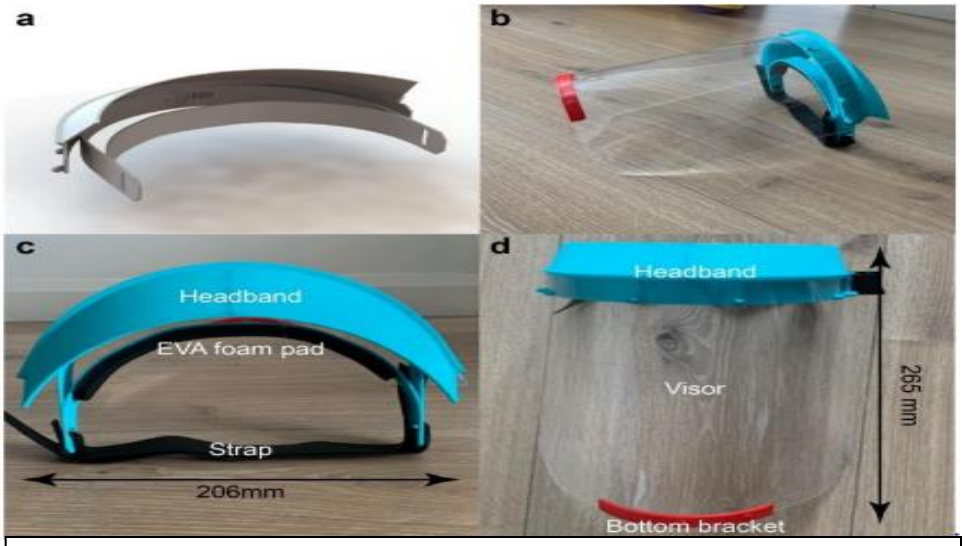
Places like Kenya are making use of 3D printed face shields and 3D printed ventilator adaptors[14]. China has used this technology to make 3D printed isolation homes to reduce the burden on hospitals[15]. Other innovations that make use of additive manufacturing technology are hands-free door handle attachment and 3D printed oxygen valves[16]. Below are some pictures of a few Personal Protective Equipments (PPEs) that have been developed by researchers.

Clinical images of the 3D-printed face mask, in combination with protection glasses and a face shield.



Custom-made individualized 3D-printed protective face mask: (a) reusable 3D-printed face mask and (b) filter membrane support; (c) polypropylene (PP) non-woven melt-blown particle filter and (d) 3D image of the prototype.

Fig 1: Swennen, G. R., Pottel, L., & Haers, P. E. (2020).[1]



A) Headband CAD image B) final face shield prototype C) headband, foam pad, and strap image with dimensions D) headband, visor, and bottom bracket image with dimensions.

Fig 2: Mostaghimi, A., Antonini, M. J., Plana, D., Anderson, P. D., Beller, B., Boyer, E. W., Fannin, A., Freake, J., Oakley, R., Sinha, M.S., & Smith, L. (2020).[3]

CONCLUSION

The studies included in this research have emphasized that the designs of the 3D printed PPEs have been made publically available to combat COVID-19 globally but the lack of rigorous quantitative research to implement their clinical use has also been acknowledged in the studies. Only two of the reviewed articles mention the production

as well as the implementation of the 3D technology manufactured Personal Protective Equipments (PPEs) on the clinical front. Although, COVID-19 pandemic has allowed innovation using additive manufacturing technology, but it also raises concern about the biocompatibility of the products manufactured using this technology and the ability to sterilize the Personal Protective Equipments (PPEs) if used in the hospitals. Regulation, standardization, and certification also need to be addressed.

The additive manufacturing industry is more evolved in the high-income and middle-income countries whereas it remains in nascent stages in the low-middle income countries like India. Besides, 3D printing companies alone cannot suffice for the increasing demand for Personal Protective Equipments (PPEs) and require support, participation, and investment from IT hardware and software companies. Most of the hardware, software, and materials (resin) required for 3D printing are outsourced from countries like the United States, China, and Europe. This supply chain dependency poses constraints for 3D printing technology in India to scale. Adoption of a 3D printing department by hospitals in countries like India could be farfetched but the future growth of this industry in the post COVID-19 scenario depends on the response by the Indian 3D printing players to cope up with the supply chain shortage.

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PART: 2

ONLINE COURSE LEARNINGS

PATIENT SAFETY

COURSE DESCRIPTION:

Preventable patient harms, including medical errors and healthcare-associated complications, are a global public health threat. Moreover, patients frequently do not receive treatments and interventions known to improve their outcomes. These shortcomings typically result not from individual clinicians' mistakes, but from systemic problems -- communication breakdowns, poor teamwork, and poorly designed care processes, to name a few.

This course covers the concepts and methodologies used in process improvement within healthcare. Successful participants will develop a system's view of safety and quality challenges and will learn strategies for improving culture, enhancing teamwork, managing change and measuring success.

Patient Safety and Quality Improvement: Developing a Systems View (Patient Safety I)

COURSE DESCRIPTION:

In this course, one will be able develop a systems view for patient safety and quality improvement in healthcare.

COURSE OBJECTIVES:

By the end of this course, would be able to: 1) Describe a minimum of four key events in the history of patient safety and quality improvement, 2) Define the key characteristics of high reliability organizations, and 3) Explain the benefits of having strategies for both proactive and reactive systems thinking.

COURSE METHODOLOGY: Videos and Reading Material

COURSE CONTENTS

I. The History of Patient Safety and Quality Improvement.

1. The Scope of the Problem
2. History of Quality Improvement and Patient Safety: 1854 - 1966
3. History of Quality Improvement and Patient Safety: 1966 - Present
4. Mitigable or Preventable Harm: Crimean War, 1854-1856
5. "To Err is Human": Building a Safer Health System
6. "Crossing the Quality Chasm": A New Health System for the 21st Century
7. "Free From Harm": Accelerating Patient Safety Improvement Fifteen Years After "To Err is Human"

II. Definitions in Patient Safety and Quality Improvement: An Overview

1. Definitions and Intersection of Quality and Safety
2. Harm
3. Sentinel Event
4. Error
5. Hazard
6. Risk
7. Root Cause Analysis (RCA)
8. Failure Mode and Effects Analysis (FMEA)
9. Quality
10. Safety
11. Culture

III. High Reliability Organizing and Why it Matters

1. Overview of High Reliability
2. A Model for Understanding High Reliability
3. Analyzing Healthcare as a High Reliability Organization
4. High Reliability Organization Sociocultural Norms
5. Five Principles for High Reliability and Mindful Organizing
6. High Reliability Organization Behaviors and Habits
7. Patient Safety Tools of Mindful Organizing

IV. Applying a Systems Lens to Healthcare

1. Definition of a System
2. Definition of Systems Thinking
3. Reductionistic Thinking vs. Holistic Thinking
4. Swiss Cheese Model
5. First Order and Second Order Problem Solving
6. Whose Problem Is It?
7. Oncology Infusion Clinic: Case Study
8. Proactive and Reactive Systems Thinking Strategies
9. Conclusions

COURSE LEARNINGS

The course describes certain strategies for improving patient safety which are as follows:

1. In order to enhance knowledge base about safety, it is necessary to establish a National focus to create leadership, research tools and protocols.
2. By developing a nationwide public mandatory reporting system and by encouraging healthcare organizations and practitioners to develop and participate in voluntary reporting system, one can identify and learn from errors.
3. With the help of actions of oversight organizations, professional groups and group of purchasers of healthcare, one can raise performance standards and expectations for improvement in patient safety.
4. In order to ensure safe practices at delivery level, it is essential to implement safety systems in healthcare organizations.

In order to redesign the Healthcare delivery system, (1) Apply evidence to healthcare delivery; (2) Maximize use of Information Technology; (3) Align payment models with quality improvement and (4) Prepare the workforce.

Two types of organizations are described,

HIGH RISK ORGANIZATIONS- These organizations operate technologies sufficiently complex to be subjected to catastrophic accidents.

HIGH RELIABILITY ORGANIZATIONS- These organizations are a subset of high risk organizations designed to manage and avoid catastrophic accidents.

The Model of High Reliability Organizations depend on:

1. Leadership
2. Safety Culture
3. Robust Process Improvement

Principles of High Reliability Organizations are:

1. Preoccupation with Failure,
2. Reluctance to Simplify,
3. Sensitivity to Operations,
4. Commitment to Resilience,
5. Deference to Expertise.

Setting the Stage for Success: An Eye on Safety Culture and Teamwork (Patient Safety II)

COURSE DESCRIPTION:

Safety culture is a facet of organizational culture that captures attitudes, beliefs, perceptions, and values about safety. A culture of safety is essential in high reliability organizations and is a critical mechanism for the delivery of safe and high-quality care. It requires a strong commitment from leadership and staff. In this course, a safe culture is promoted through the use of identifying and reporting patient safety hazards, accountability and transparency, involvement with patients and families, and effective teamwork.

COURSE OBJECTIVES:

1. Reviewing essential elements of a safety culture.
2. Describing how healthcare organizations identify and mitigate safety hazards.
3. Identifying how patients and family members contribute to developing a safety culture.
4. Identifying strategies for improving communication and team work.

COURSE METHODOLOGY: Videos and Reading Material

COURSE CONTENTS

I. Patient Safety Culture and Just Culture

1. Introduction to Patient Safety Culture
2. Defining Safety Culture
3. The Influence of Safety Culture on Patient and Provider Outcomes
4. Measuring Culture
5. Just Culture
6. Application of Just Culture

II. Patient Safety, Quality, and the Patient Experience

1. Definitions: Satisfaction, Experience, Engagement, Patient and Family Centered Care
2. How Do We Measure the Patient Experience?
3. Patient and Family Centered Care and Engagement
4. Patient and Family Advisory Council: Definition and Roles
5. Engaging the Heart of the Caregiver
6. Using Improvement Science to Create a Positive Sustainable Patient Experience

III. Event Reporting and Second Victims

1. How to Submit an Event Report
2. Journey of an Event Report
3. Event Reporting and High Reliability
4. Using Event Reports to Improve Safety and Culture
5. Reporting Culture
6. Using Event Reports to Design Safer Systems: Part
7. Using Event Reports to Design Safer Systems: Part II
8. A Sample Event Review Meeting
9. Introduction to the Learning from Defects Tool
10. Disclosure of Medical Errors
11. Second Victims
12. Peer Support: Making a Difference for Second Victims

IV. Strengthening Safety Culture Through Teamwork

1. Becoming an Expert Team
2. Teamwork and the Science of Safety
3. Team Training
4. Communication
5. Leadership
6. Briefings and Debriefings
7. Measuring Teamwork for Improvement
8. Cross-unit Collaboration

COURSE LEARNINGS

This course focuses on promoting safety in organizations through Just culture framework. It begins with describing three types of behaviors.

1. Reckless Behavior- behavioral choice to consciously disregard a substantial and unjustifiable risk.
2. At Risk Behavior- behavioral choice that increase risk, where risk is not recognized or mistakenly believed to be justified.
3. Human Error- Inadvertent action, slip, lapse or mistake.

WHY JUST CULTURE FRAMEWORK?

1. It promotes patient safety and quality improvement that examine behavioral choices, not outcome of events.
2. Balances individual accountability with system accountability.
3. Holds leaders accountable for designing safe systems.
4. Promotes learning from errors.
5. Differentiates incidents resulting from human error.

Managing of various Behaviors is done by the following:

1. Managing human error → CONSOLE
2. Managing reckless behavior → DISCIPLINARY ACTION
3. Managing At-Risk behavior → FORCING FUNCTIONS (Example: Use of Barcodes)

Healthcare organizations must focus on providing patient and family centered care (PFCC). Patient Satisfaction is a subjective concept which is related to expectation and Patient Experience is meant to elicit factual data that can be easy to interpret.

Principles of patient and family centered care (PFCC) are:

1. Respect and Dignity
2. Information Sharing
3. Participation
4. Collaboration

Two types of Team training methods were described,

SHOTGUN TRAINING- training a large number of teamwork skills at once.
Benefit- Simplicity, strong organizational message of value.
Challenges- Limitation of human attention

DOSING TRAINING- distributing the training of the team over a time period.
Benefit- Logistic flexibility, adaptive to changing needs and no over saturation.
Challenges- Complexity

HEALTH IT: CHALLENGES AND OPPORTUNITIES

COURSE DESCRIPTION:

This course covers the modern application of information technology that is critical to supporting the vision and operational knowledge of the health care leaders in managing the health care organization. Heath care decision-makers have to meet head-on the dynamic challenges of health care delivery quality, cost, access, and regulatory control. Additionally, this course integrates the Healthcare Information System as integral to the Quality Assurance Tracking Programs including measurement of systems inputs, processes, and outputs with special emphasis on systems outcomes research and organizational accountability to its various stakeholders, not the least of which are government regulators.

COURSE OBJECTIVES:

1. To understand what is Health IT
2. To understand the challenges behind adoption of advanced technology in healthcare
3. To understand various forms of Health IT that exist

COURSE METHODOLOGY: Videos and Reading Material

COURSE CONTENTS

I. **Where are we today and how did we get here? The legal and regulatory framework of Health IT**

II. **A Patient's Perspective to Health IT**

III. **A Patient's guide to the Doctors' Secret World of technology**

IV. **A Focus on Digital Medicine**

V. **The rise of the electronic medical record - Beyond EHRs**

COURSE LEARNINGS

In this course we can look at the drivers of health IT from three different perspectives.

1. The perspective of what patients need technology to provide them.
2. What clinicians, doctors, nurses, and other clinicians need IT to provide for them.
3. What either the payers, insurance companies or regulators would need to get out of health information technology.

PATIENT PERSPECTIVE

1. Easy access to health information,
2. Easy access to their clinician,
3. They want clinicians to be able to share information with one another,
4. Use their technology to find out more about their health conditions.

CLINICIANS PERSPECTIVE

1. Want their patients to be informed,
2. Want to use technology to make their practices work better,
3. Want to be able to coordinate by communicating with one another,
4. Want to meet their patients expectations.

PAYERS PERSPECTIVE

1. They need to measure clinician effectiveness,
2. Want to ensure patient safety,
3. Want to ensure value and identify variation.

IT spending is categorized into three categories:

1. There's run, which you need to run the business on a day-to-day basis.
2. What we need to grow the business from a scale perspective, so if we want to increase volume what we need to do for that.
3. And then transform i.e. what do we need to transform the business.

And typically that run piece of the budget is the biggest, followed by grow and then transform.

VARIOUS FORMS OF HEALTH IT

1. Apps, mhealth or mobile application.
2. Fitness wearable's, step counters, some are equipped with heart rate monitors, and also even GPS positioning devices. So that you can actually really track how far you run or bicycle. This in the form of the Fitbit, the Jawbone, the old Nike FuelBand and the new Apple Watch.
3. There are also posture detectors, like the Lumo Lift that will vibrate, if you're slouching.
4. A spire is clipped onto our shirt, and it can possibly measure how we are breathing.

Accuracy is how close to gold standard or true value readout gives us and precision is about reproducibility and whether running the same device, the same sensing over and over is giving us similar results. When we talk about devices, there's a lot of signal and noise and signal to noise ratio. And filtering can lead to inaccuracy in interpretation.