

Quality improvement management system in hospitals through DMAIC structure

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ABSTRACT

World Health Organisation (WHO) defines quality care as “the extent to which health care services provided to individuals and patient populations improve desired health outcomes. In order to achieve this, health care must be safe, effective, timely, efficient, equitable and people-centred.” Quality of care ensures the patient’s right to assess quality health services. Health facilities often struggle to provide quality care. Improving quality of care is therefore critical if we want to reduce patient mortality. Healthcare industry can benefit greatly from Total quality management (TQM). Healthcare industry in general, and the hospital sector in particular, is going through a paradigm shift in the way total quality management (TQM) concepts are being implemented. Unlike in the past, where quality was defined from the perspective of healthcare providers, patient satisfaction has now become the central theme for every quality improvement initiative. The design, measure, improve, control (DMAIC) methodology of six sigma technique is an excellent tool for bringing in patient centric quality consciousness in the healthcare organizations.¹ The present study was undertaken to understand the gaps in service delivery related to six processes of healthcare delivery system in a tertiary care hospital of Haryana. An in depth analysis was done with the help of DMAIC methodology.^{2,3} The gaps in patient discharge process, call management system, ambulance management system, medical records management, patient feedback analysis, and hospital infection control system were identified, and policy recommendations for quality improvement were suggested.

Keywords: Six Sigma, DMAIC, total quality management, gap analysis, healthcare, quality improvement

INTRODUCTION


Six sigma is a methodology that has been derived from the philosophy of quality management, with reduction in variation and defects in processes as its main focus. When applied to healthcare delivery processes, it helps in improving the quality of healthcare services.⁴ This methodology was originally established to counter the challenges being faced in product quality, by Motorola Corporation in the late 1980s. In the late 1990s, the General Electric Company further developed this methodology to its present form. This methodology follows a highly structured and scientific approach in managing the projects so that the processes move towards a state of minimum variation. Six sigma includes a Define-Measure-Analyse-Improve-Control (DMAIC) structure.²

Although six sigma has been present for about thirty years, it has recently experienced an exponential growth in the healthcare sector. Literature has several examples that tackle numerous problems, including reducing medical errors,⁵ improving pharmacist dispensing errors, lessening medication dispensing time, identifying variables affecting the risk of healthcare associated infections and decreasing the percentage of patients with healthcare associated infections,⁶ and decreasing the length of stay, just to mention a few. The biggest challenge for the healthcare sector right now is how to improve and sustain patient satisfaction and the greatest way to optimise work forces with a zero (minimum) error strategy is to use DMAIC methodology of the Six- Sigma concept in hospitals.^{7,8}

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In this research paper, we present the quality improvement that happened in various hospital processes by adopting DMAIC (Define, Measure, Analyse, Improve, and Control) approach of six sigma. For this study, Gap analysis framework was prepared and various quality parameters were chosen which were observed and measured for a period of 1 month. The data was collected and analysed with the help of PDCA, fish bone diagrams, FMEA, pareto, waste walk, statistical tools etc. and after analysis various protocols and policies were prepared for the improvement. Within two weeks of implementing the departmental policies & protocols, there was a significant improvement in terms of quality care being provided to the patients. By conducting regular audits and plotting process data with control charts any deviation was easily monitored.⁹

MATERIAL AND METHODS

DMAIC is a five-step method for improving existing process problems with unknown causes and it was applied in various processes of the hospital.¹⁰ In this study, multiple hospital departments applied the Six Sigma DMAIC (Define, Measure, Analysis, Improve and Control) approach to reach the Six Sigma level of patient satisfaction and hence, achieved an overall quality improvement in their tertiary healthcare setting.^{10,11} A total of six quality parameters were chosen for this study as follows:

1. Discharge Process^{2,3}
2. Call Centre Management System¹²
3. Ambulance Management System¹²
4. Medical Record Management System⁸
5. Patient Feedback Analysis⁸
6. Hospital Infection Control^{6,13}

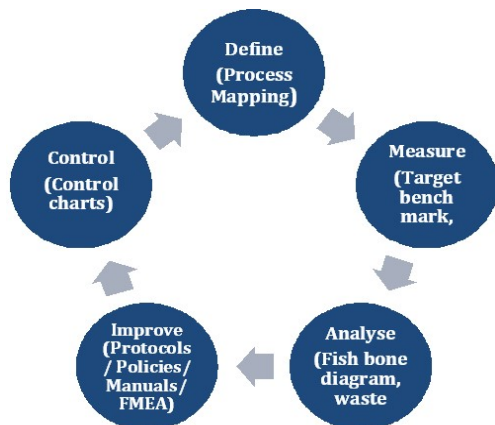


Figure 1 DMAIC methodology used for quality improvement in a tertiary care hospital

DMAIC Framework

Table I Tools and Techniques used in DMAIC Methodology

| Phase | Statement | Tools Used |
|-----------------------|--|---|
| (D) Define | Areas/processes for quality improvement | Benchmarking, process flow mapping |
| (M) Measure | Observe the processes, collect data, identify the waste/misses/errors by comparing to best practices ¹³ | Target benchmark, collect baseline performance |
| (A) Analyse | Identify the barriers, analyse the data, define the initiative to remove the barrier | Fish bone analysis, Pareto, Waste walk, Statistical tools |
| (I) Improve | Continue to observe gaps and initiate action to remove them | FMEA, Brainstorming, Ergonomics, Policies ⁹ |
| (C) Control | Continuous monitoring through various audit mechanisms | Pareto, check sheets, control charts |

The team responsible for introducing the quality improvement initiatives was advised to follow the DMAIC approach of Six Sigma (Define, Measure, Analyse, Improve, Control). The tables charted in the following text have been made on the basis of:

1. Observation of processes over 1 month
2. Interviews with Consultants, Nursing staff, Administrative staff, and ancillary staff
3. Scrutiny of records being maintained at various nodes
4. Run through of the HMIS¹⁴

After completion of the implementation of DMAIC methodology, a report was prepared as a facilitating document for the Hospital administration, so that the gaps observed can be removed. This methodology offered an insight into the differences between current practices and best practice of the Hospital.^{1,7,9}

Moreover, an assessment of the barriers that need to be addressed before successful implementation of best practices was also done. So, this can be used as a base for planning the training schedule of the medical, nursing, paramedical and ancillary staff of the hospital.⁷

RESULTS

The findings are presented in a table organized under the headings: define, measure, analyse, improve, and control. This structured approach ensures a comprehensive evaluation and continuous enhancement of best practices.

| Process | Best Practice | Define | Measure | Analyse | Improve | Control |
|--|--|--|---|--|--|--|
| Discharge Process ^{1,2,3} | Discharge Time ≤ 2 Hours | Discharges are delayed till late evening and patients discharge takes more than 4 hours most of the time | Discharge TAT monitoring register and checklist. Admission/Discharge register at Nursing station | Discharge policy not present. Orders are given late. Pharmacy returns are done at the time of discharge. Discharge summary is delayed & Discharge folder not present. Mismatch in manual & online activity chart leading to delay in billing clearance | Discharge policy made as per NABH standards & implemented. Planned discharges are ordered a day before. Pharmacy returns are done daily. Draft discharge summaries are prepared a day before. Patient activity charts are updated daily & Discharge folders are prepared at night itself. | Regular audits are conducted to monitor same. Manpower & time wastage reduced & better patient satisfaction achieved. Prompt billing & pharmacy clearance leading to prompt discharges. Best practice discharge time ≤ 2 hours achieved. |
| Call Centre Management System ⁷ | Each call taken/answered /correct/with appropriate response | Most of the calls not answered promptly. No information available to person handling calls. | Dedicated Call centre with landline, intercom and mobile phone to be made available. Training to be initiated. IT team to enable real time doctor schedule/ contact details/patient status availability in HMIS. Standardised format to be made available to consultants to convey changes. | No policy and formats available, staff shortage, Equipment not available and no training done. No real time doctor schedule/ Contact details/patient status being shown in HMIS subschema at help desk. | Each call is answered within 3 rings. The message conveyed is clear, correct and appropriate. Any change in availability of doctors is conveyed promptly. Updated Doctor's roster, contact numbers and scope of services are readily available. Real time In Patient admission/discharge status is present. | Regular audits are conducted to monitor. Staff oriented to all services. Staff satisfaction. Patient satisfaction. Improved overall development. |
| Ambulance Management System ¹² | Each external call for ambulance answered and handled with appropriate response. Inventory for Ambulance organized, maintained and replenished in time. Staff for AMS duly trained for BLS and ACLS. | Most of calls not answered promptly, as they get re-circulated through multiple channels. No information available to person handling calls, so message lost in interpretation. Optimal inventory not being charted/ checked/ replenished. | Draft policy for AMS initiated. Dedicated mobile phone with (catchy) number for ambulance to be issued to emergency department. Training to be initiated. Checklist for inventory management. | No policy and formats available, staff shortage, Equipment not available and no training done. No real time doctor schedule/ Contact details/patient status being shown in HMIS subschema at help desk. AMS policy not available. | Each external call is answered with in first three rings. The message recorded is clear, correct, and complete. In Patient admission/discharge status is available. The equipment, medicines and consumable item inventory is charted, checked and replenished regularly. Policy prepared and BLS/ACLS training conducted for staff. | Improvement in patient safety & quality care. Improves staff satisfaction due to continuous learning, leadership & ownership of clinical processes. |

| Process | Best Practice | Define | Measure | Analyse | Improve | Control |
|---|---|---|--|---|--|---|
| Medical Records Management System ¹⁵ | The OP & IP active & passive medical record is well documented, filed in defined order, and recorded in HMIS. | The OP & IP record lacks completeness, not filed in uniform order, forms not according to standard requirements and there is delayed transfer to MRD. | MRD audit checklist. MRD file submission TAT monitoring register. Staff interviews & discussion. Active & passive file audits. | IT support not available. Equipment not available. MRD policies and manual not present. Training of MRD staff not done. | The OP & IP medical record is filed as per the defined format, and recorded in the OP & IP module of HMIS for continuity of care. The IP passive medical record of the patient is complete, filed in order defined in checklist, transferred to MRD within 48 hours, and stored according to policy. | Regular MRD audits are conducted to monitor same. Prescription audits helped in overall improvement of prescription & patient safety. Deficiencies observed in the active file audits are improved & any discrepancies are discussed in committee meetings. |
| Patient Feedback Analysis ⁸ | The OP & IP Feedback is actively sought, is well documented and recorded in standard format. | No feedback is sought actively. The OPD & IPD feedback format is not standardised. | PWD audit checklist. OPD patient feedback forms to be printed and feedback to be taken from patients. OPD satisfaction indicators implemented. Suggestion box & in complaint register also kept at Front office. | No policy and forms available. No dedicated staff for taking patient feedbacks. | The patients reporting to OPD and IPD fill the feedback form, and either submit it to designated staff, or post it to Hospital address, or deposit it in the post box put at OP reception counter. And IP nursing stations. | Regular audits are conducted to monitor same. Patient satisfaction indicators are monitored regularly. Constant measurement & Analysis. |
| Hospital Infection Control ⁶ | Periodic surveillance of hospital environment. Infection control team is there for regular HAI monitoring. Implementation of Infection control programme. | HAI rates are high. Environmental surveillance not done regularly. Poor practices of hand hygiene. Staff unaware about BMW/NSI/PEP/PPE & personal grooming. | ICN daily round checklist. BMW area & trolley checklist. Vaccination record. Hand hygiene audit. CAUTI/CLABSI/VAP/SSI register. Laundry & kitchen surveillance checklist. Hazmat checklist. | No policy and formats available, staff shortage. Staff not vaccinated. Infection control team not present. Infection control committee not formed. Staff unaware about infection control practices. | Infection control programme implemented. Infection control team & committee formed. Environmental surveillance of critical & non-critical areas. Daily carbolization of areas. Hand hygiene trainings & audits started. Regular trainings conducted for staff. HIC indicators are monitored monthly. | Regular audits are conducted. HIC committee meetings. HAI rates minimized. Hand hygiene compliance rate improved. Patient length of stay decreased. Patient satisfaction improved. |

DISCUSSION

DMAIC methodology of six sigma aims to improve process efficiency, cut down on waste, lessen variation in the process, and boost profitability. In healthcare industry, patient satisfaction is of utmost priority. Hence, hospitals are constantly working towards quality improvement by applying PDCA, 5S & Kaizen, Fish bone analysis and other quality improvement tools.^{7,9} By understanding patient needs and streamlining of processes by adopting DMAIC methodology hospitals can improve patient satisfaction ultimately leading to satisfied patient outcomes. For the healthcare sector, where different departments and processes are used, focusing on eliminating process variation is crucial. Initially six-sigma was limited to manufacturing and other industries but, since few years many hospitals have started to use six sigma as part of their quality improvement process.¹⁶

This study report was prepared to serve as a facilitating document for the administration, so that the gaps observed can be removed. The initial gap analysis framework helped in identifying various process gaps. Based on the gap analysis, barriers to best practice strategies were identified and recommendations were given. Initiatives to remove the barriers based on the DMAIC methodology of six sigma were taken and then implemented. Over a period of 1 month barriers in best practices were removed leading to improved patient care and thus, quality improvement.

CONCLUSION

To conclude, this study helped the tertiary hospital under study to achieve improved patient experience and clinical outcomes. Additionally, it helped them to achieve robust process adherence, benchmarking and providing better quality of care to their patients. Moreover, there was decreased length of stay, better efficiency of hospital operations and empowering of employees due to process alignment leading to continuous quality improvement. Hospital was also able to attain National Accreditation Board of Hospitals & healthcare providers (NABH) accreditation from Quality council of India (QCI) which is the highest healthcare accreditation available in India.^{1,6} Hence, this study would definitely recommend implementing the DMAIC methodology for better patient outcomes.

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