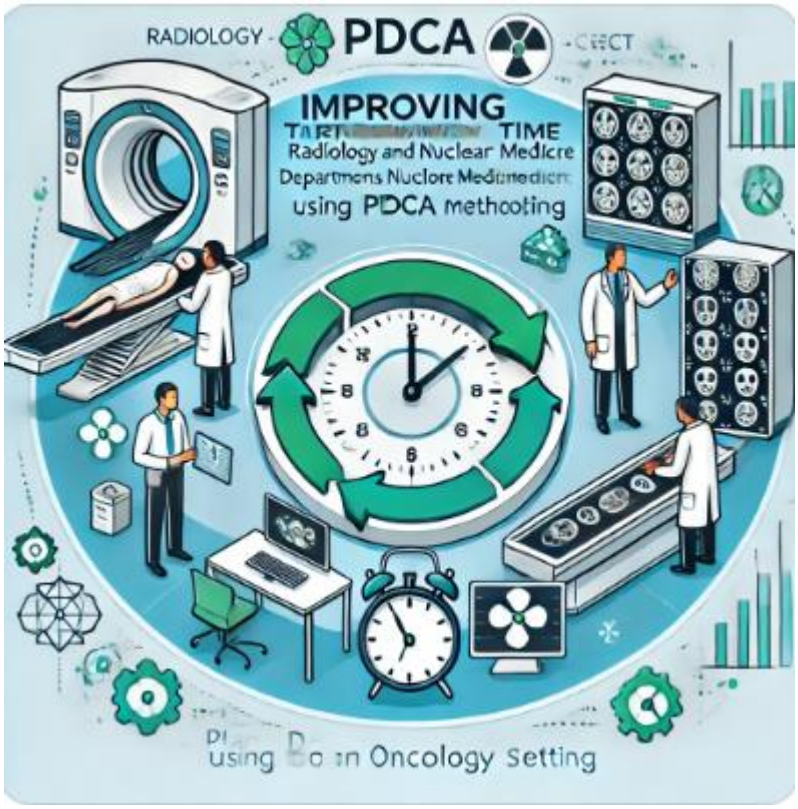
Chapter 8: Improving Turnaround Time in Radiology and Nuclear Medicine Department Using PDCA Methodology in an Oncology Setting



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Summary

The Radiology and Nuclear Medicine department at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) is critical in providing timely and accurate diagnostic services for cancer patients. However, inconsistent turnaround times (TAT) have been a persistent challenge, impacting patient care. This study aimed to improve TAT by employing the PDCA (Plan-Do-Check-Act) methodology to identify bottlenecks and implement targeted interventions, such as staff training, process optimization, and policy reinforcement. Results showed a substantial improvement in TAT, from 88% in June 2023 to 96% by May 2024. This initiative underscores the effectiveness of structured quality improvement methods in clinical settings, leading to enhanced patient care and departmental efficiency. Continuous monitoring and iterative refinements are recommended to sustain these gains.

Key Points

- The Radiology and Nuclear Medicine departments at SQCCCRC in Muscat, Oman, play a vital role in cancer diagnosis and treatment, where timely diagnostic turnaround times (TATs) are essential to avoid delays in treatment and adverse patient outcomes.
- The departments faced challenges in meeting their TAT target of 90% consistently, with delays caused by workflow bottlenecks, inadequate interdepartmental communication, and inconsistent staff adherence to protocols.
- To address these issues, the PDCA (Plan-Do-Check-Act) framework was implemented, focusing on process mapping, staff training, workflow optimization, scan triaging, and developing standardized operating procedures.
- The interventions led to a marked improvement in TAT, consistently achieving or exceeding the 90% target post-intervention, with a TAT increase from 88% in June 2023 to 96% by May 2024.

Project Charter

Project Charter	Details
Project Title	Improving Turnaround Time (TAT) in the Radiology and Nuclear Medicine Departments at Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC)
Project Sponsor	Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC), Muscat, Oman
Project Start Date	June 2023
Project End Date	May 2024
Project Purpose	To improve the turnaround time (TAT) for diagnostic services in the Radiology and Nuclear Medicine departments, achieving a consistent TAT of 90% or higher, thereby enhancing patient care, safety, and departmental efficiency.
Problem Statement	The Radiology and Nuclear Medicine departments at SQCCCRC were unable to consistently meet the target TAT of 90%, with performance as low as 88% in June 2023. Prolonged TATs posed a risk to patient safety and hindered timely decision-making in oncology care. A structured approach was needed to identify the root causes of delays and implement targeted interventions to improve TAT.
Project Goals and Objectives	1. Achieve and sustain a TAT of 90% or higher by May 2024. 2. Implement targeted interventions, including staff training, process optimization, and policy reinforcement, to address identified bottlenecks. 3. Foster a culture of continuous improvement and collaboration among staff.
Scope	Includes all diagnostic processes within the Radiology and Nuclear Medicine departments, focusing on interventions to improve TAT, such as staff training, workflow optimization, triaging of scans, and policy development. Excludes diagnostic processes outside these departments.
Key Stakeholders	Radiologists, Nuclear Medicine Physicians, Radiology Technicians, Nurses, Quality Assurance Team, Hospital Management, IT Specialists
Resources Required	Budget for staff training sessions, workflow optimization tools, policy development, and IT support; personnel from relevant departments; data analysis tools.
Risks and Assumptions	**Risks:** Resistance to new workflows, technical challenges with implementing new systems, limited resources for training. **Assumptions:** Full support from management, availability of necessary resources, and engagement of all stakeholders in the process.
Success Criteria	Achieving and sustaining the target TAT of 90% or higher, confirmed by data analysis; demonstrating improved patient care and departmental efficiency through continuous monitoring and feedback.

Introduction

The Radiology and Nuclear Medicine departments at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) in Muscat, Oman, play a vital role in the timely diagnosis and treatment of cancer. These departments are integral in detecting, diagnosing, and monitoring disease progression and treatment responses. A critical measure of their efficiency is the turnaround time (TAT), defined as the period between when a diagnostic test is ordered and when the results are reported. Short TATs are essential in oncology, where delayed diagnostics can lead to postponed treatment decisions, patient anxiety, and adverse clinical outcomes (Papp, 2018).

Despite the importance of rapid TAT, both the Radiology and Nuclear Medicine departments at SQCCCRC have faced challenges in consistently meeting the target of 90%. Factors contributing to delays include bottlenecks in workflow, inadequate communication between departments, and variability in staff adherence to protocols (Thornton et al., 2011). Such inefficiencies can hinder timely decision-making, compromise patient safety, and reduce overall hospital efficiency. Given the complexity and multidisciplinary nature of radiological and nuclear medicine services, a structured and comprehensive approach is necessary to address these issues effectively (Higgins, 2012).

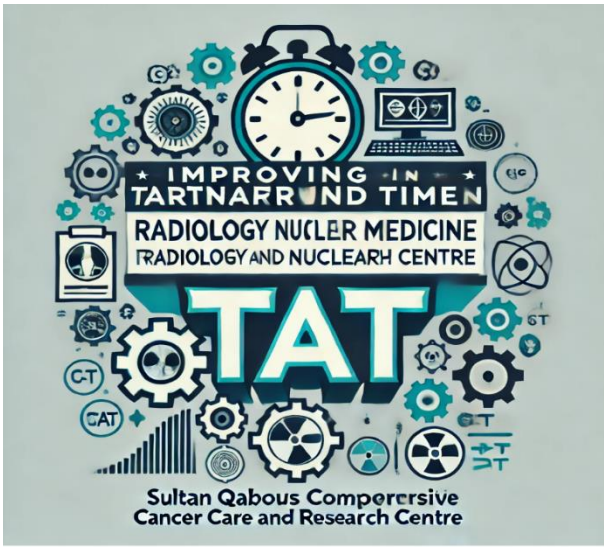
The PDCA (Plan-Do-Check-Act) cycle is a well-established quality improvement framework that offers a systematic approach to problem-solving in healthcare settings. It enables continuous assessment and refinement of processes, ensuring that improvements are data-driven and sustainable. Previous studies have demonstrated the efficacy of the PDCA cycle in reducing TAT

and enhancing overall departmental performance by identifying inefficiencies, implementing targeted interventions, and monitoring outcomes (Thornton et al., 2011).

This initiative aimed to apply the PDCA methodology to improve TAT in the Radiology and Nuclear Medicine departments at SQCCCRC. The project sought to identify specific process inefficiencies, develop and implement targeted interventions, and measure the impact of these changes on TAT. The ultimate goal was to ensure that this department consistently meets or exceeds the target TAT, thereby maintaining high standards of patient care and departmental efficiency (Papp, 2018).

By employing a data-driven, structured approach, the initiative aimed to foster a culture of continuous improvement, enhance communication and collaboration among staff, and ultimately improve patient outcomes. The findings from this study contribute to the growing body of evidence supporting the use of quality improvement methodologies like PDCA in healthcare, particularly in complex and high-stakes environments such as oncology (Higgins, 2012).

Problem Statement



The Radiology and Nuclear Medicine department at SQCCCRC were struggling to consistently meet the target TAT of 90%. Prolonged TATs were observed, with some months recording significantly lower performance, such as 88% in June 2023. This inconsistency in TAT was not only a source of frustration for healthcare providers but also posed a risk to patient safety and outcomes, particularly in the context of oncology where timely diagnosis and treatment are critical.

Addressing these challenges required a systematic and structured approach to identify the root causes of delays and implement targeted interventions. The objective of this initiative was to improve TAT in these departments to meet or exceed the 90% target consistently, thus enhancing patient care and aligning with international best practices for radiology and nuclear medicine services.

Methods

Setting and Design:

The study was conducted at the Sultan Qaboos Comprehensive Cancer Care and Research Centre (SQCCCRC) in Muscat, Oman, utilizing a one-group pretest-posttest quasi-experimental design. This design allowed for the direct observation of changes in TAT before and after the implementation of targeted interventions, without the use of a control group.

PDCA Approach:

The PDCA methodology was employed to drive continuous quality improvement in the Radiology and Nuclear Medicine departments. The approach included the following phases:

1. **Plan:**

   The initial phase involved identifying inefficiencies in the TAT process. Detailed process mapping and data analysis were conducted to pinpoint bottlenecks and areas of delay. Objectives were set to improve TAT to consistently meet or exceed the 90% target, with specific performance metrics defined for monitoring progress.

2. **Do:**

   Interventions were implemented based on the findings from the planning phase. These included comprehensive staff training sessions to enhance awareness and adherence to new protocols, optimization of workflow through regular case discussions and prioritization of scans, and the development of a detailed policy to standardize procedures. Regular meetings were held to foster communication and collaboration among staff.

3. **Check:**

   The effectiveness of the interventions was evaluated by collecting and analyzing TAT data monthly. This phase involved comparing pre- and post-intervention performance to assess the impact of the changes made. Key performance indicators (KPIs) were monitored to determine whether the objectives were met and to identify any areas requiring further improvement.

4. **Act:**

   Based on the evaluation, necessary adjustments were made to refine the interventions.

Feedback from staff was solicited to identify challenges and opportunities for further improvement. The successful elements of the interventions were standardized, and plans for further PDCA cycles were developed to sustain and build upon the gains achieved.

Interventions:

1. **Comprehensive Staff Training:** Staff training sessions were conducted to ensure all team members understood the importance of TAT and were equipped with the knowledge to optimize workflows. Training covered best practices in scheduling, reporting, and interdepartmental communication.
2. **Process Optimization through Regular Case Discussions:** Regular meetings were established to review ongoing cases, prioritize urgent scans, and resolve issues promptly. These discussions helped streamline operations, reduce delays, and foster a culture of open communication and collaboration among staff.
3. **Triaging of Scans Based on Clinical Urgency:** A triage system was introduced to prioritize scans according to clinical needs, ensuring that the most urgent cases were handled first. This approach prevented backlogs and minimized delays in processing high-priority cases.
4. **Improving Completion of Radiology Requests:** Training was provided to all staff involved in submitting radiology requests to reduce errors and omissions. This intervention focused on ensuring that all relevant clinical information was provided upfront, reducing the need for follow-up queries and streamlining the request process.
5. **Development of a Detailed Policy for Standardized Operations:** A comprehensive policy was developed to outline standard operating procedures (SOPs) for various aspects of the

radiology workflow. The policy aimed to standardize practices, reduce variability, and enhance consistency in TAT.

Results

The interventions led to a substantial improvement in TAT in the Radiology and Nuclear Medicine departments. Before the interventions, TAT was inconsistent and often below the target of 90%, with a notable low of 88% in June 2023. After implementing the PDCA cycle and the targeted interventions, a steady improvement in TAT was observed:

- **June 2023:** Pre-intervention TAT at 88%.
- **Post-intervention Trends:** TAT showed a steady increase, reaching 96% by May 2024.
- **Overall Improvement:** The trend line indicated a consistent upward trajectory, reflecting the positive impact of the interventions on departmental performance.

Table 1: ***Turnaround Time (TAT) Performance Before and After Interventions (June 2023 - May 2024)***

Month	TAT (%) Pre-Intervention	TAT (%) Post-intervention
June 2023	88	-
July 2023	-	90
August 2023	-	92
September 2023	-	91
October 2023	-	93
November 2023	-	94
December 2023	-	95
January 2024	-	95
February 2024	-	95
March 2024	-	96
April 2024	-	96
May 2024	-	96

Discussion

The application of the PDCA methodology in the Radiology and Nuclear Medicine departments at SQCCCRC resulted in significant improvements in TAT. The structured approach allowed for the identification and resolution of key inefficiencies, leading to sustained enhancements in departmental performance. These findings align with other studies that have demonstrated the

effectiveness of PDCA in reducing turnaround times and improving overall process efficiency in healthcare settings (Thornton et al., 2011; Papp, 2018).

The comprehensive staff training sessions were crucial in achieving these results. By ensuring that all staff members were aware of the importance of TAT and equipped with the necessary knowledge and skills, the department was able to create a culture of continuous improvement and accountability. Previous studies have highlighted the role of staff training in fostering a culture of quality and safety in healthcare, and this initiative further supports those findings (Higgins, 2012).

Additionally, the implementation of regular case discussions and triaging of scans helped to streamline operations and prioritize urgent cases effectively. This approach prevented backlogs, reduced delays, and ensured that high-priority cases received the attention they required. The use of triage systems has been shown to improve patient outcomes by ensuring timely diagnosis and treatment, and this initiative reinforces the value of such systems in high-stakes environments like oncology (Thornton et al., 2011).

The development of a detailed policy to standardize operations within the Radiology and Nuclear Medicine departments also contributed to the observed improvements. Clear, standardized procedures help reduce variability and enhance consistency, which is critical in maintaining high standards of patient care. This finding is consistent with the broader literature on the importance of standardization in healthcare processes to reduce errors and improve efficiency (Papp, 2018).

Finally, the use of continuous monitoring and feedback mechanisms was essential in sustaining the improvements achieved. By regularly reviewing performance data and soliciting feedback from

staff, the department was able to make iterative adjustments to the interventions, ensuring their continued effectiveness over time. This iterative approach to quality improvement is a key component of successful PDCA cycles and is supported by previous research on quality management in healthcare (Higgins, 2012).

Conclusion

The PDCA cycle's application in the Radiology and Nuclear Medicine departments at SQCCCRC effectively improved turnaround time, enhancing the efficiency and reliability of diagnostic services. The structured approach allowed for the identification of key issues and the implementation of targeted interventions, leading to significant and sustained improvements in TAT. The success of this initiative underscores the importance of continuous quality improvement in clinical settings and demonstrates the value of staff training, process optimization, and adherence to clear policies. Moving forward, it is recommended that the departments continue to monitor their performance closely and make further refinements as needed to maintain these improvements and adapt to any new challenges that may arise.

References

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