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Quality Assurance Program on the Operational Efficiency of Mobile Blood Donation Service

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ABSTRACT

This study evaluated the impact of a structured Quality Assurance (QA) program on the operational efficiency of mobile blood donation services at the Philippine Red Cross Rizal Chapter, Muntinlupa City. Operational efficiency was assessed using four key metrics: turnaround time, blood unit wastage, process error rate, and staff compliance with established protocols. Data were collected both before and after QA program implementation to determine its effect on service performance.

Results indicated that the QA program significantly improved operational efficiency across all measured parameters. Turnaround time decreased, blood unit wastage was markedly reduced, process errors declined, and staff compliance increased to over 93%. These findings demonstrate that structured QA programs enhance workflow standardization, minimize errors, and optimize resource utilization in mobile blood donation services. The study concludes that QA programs are effective in improving operational performance, ensuring safer, more reliable blood collection, and supporting the overall sustainability of mobile blood donation operations.

Keywords: *quality assurance program, operational efficiency, mobile blood donation, blood bank management, staff compliance, process optimization, turnaround time, blood unit wastage, procedural errors, Philippine Red Cross*

INTRODUCTION

Blood donation is a critical component of healthcare systems, ensuring a safe, adequate, and timely supply of blood products for transfusions. Mobile blood donation services play an essential role in extending access to blood collection, particularly in regions where fixed-site facilities may be limited or geographically distant (Philippine Red Cross, 2021; Singh et al., 2024). Despite their importance, the operational efficiency of these mobile services is often challenged by logistical issues, variability in donor turnout, and staff adherence to standard procedures, which may affect both the quality and reliability of collected blood units (Shrivastava et al., 2022; Smith, 2025). Ensuring operational efficiency requires systematic oversight, continuous quality monitoring, and structured quality assurance (QA) programs to optimize workflow, minimize errors, and maintain donor and recipient safety (Chaurasia, 2024).

The integration of QA programs in mobile blood donation is particularly relevant in developing countries such as the Philippines, where resource limitations, fluctuating donor participation, and

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environmental factors can affect the quality and timeliness of blood collection. QA programs are designed to standardize operations through clear protocols, staff training, process monitoring, and corrective measures to enhance service delivery (Vuk, 2023; WHO, 2023). Prior research has demonstrated that structured QA initiatives can reduce blood unit wastage, improve turnaround times, and increase staff compliance, ultimately contributing to improved donor satisfaction and service reliability (Martin-Santana et al., 2021; Peiyao Shi, 2023).

This study aimed to assess the impact of a structured Quality Assurance Program on the operational efficiency of mobile blood donation services at the Philippine Red Cross Rizal Chapter, Muntinlupa City. Operational efficiency was measured using four key indicators: turnaround time, blood unit wastage, process error rate, and staff compliance. By evaluating these metrics before and after QA implementation, this research sought to provide evidence-based recommendations for enhancing mobile blood donation services, ensuring safe and efficient blood collection, and supporting the overall reliability of the blood supply system.

The study was theoretically anchored in Donabedian's Structure-Process-Outcome model, which emphasizes that healthcare quality is determined by the organization of resources, adherence to standardized processes, and measurable outcomes (Robby et al., 2025). Total Quality Management (TQM) principles were integrated as a supporting framework, highlighting the role of continuous improvement, staff competence, and process optimization in enhancing operational efficiency. This theoretical and conceptual foundation underscores the importance of QA programs as a sustainable strategy for improving both the safety and effectiveness of mobile blood donation services.

REVIEW OF RELATED LITERATURE

Mobile Blood Donation Services

Mobile blood donation services have become a cornerstone in ensuring a steady and accessible supply of blood products, particularly in regions with limited fixed-site facilities. These services extend reach to remote areas, community events, and corporate partners, increasing donor participation and supporting emergency preparedness (Philippine Red Cross, 2021; Singh et al., 2024). Studies indicate that mobile blood donation is effective in enhancing donor convenience and reducing barriers such as travel time, which contributes to higher retention rates among voluntary blood donors (Shrivastava et al., 2022). However, operational challenges, including transportation logistics, unpredictable donor turnout, and environmental factors, can compromise the efficiency and reliability of these services.

Operational Efficiency in Blood Donation

Operational efficiency in blood donation encompasses timely collection, accurate processing, minimal wastage, and compliance with safety protocols. Turnaround time, blood unit wastage, process errors, and staff adherence are widely recognized metrics for evaluating operational performance in both fixed and mobile blood donation services (Martin-Santana et al., 2021; Peiyao Shi, 2023). Studies in comparable settings have highlighted those inefficiencies in mobile blood donation often stem from inadequate planning, insufficient staff training, and suboptimal scheduling (Vuk, 2023). Optimizing operational efficiency is crucial not only for ensuring the availability of safe blood products but also for enhancing donor experience and maintaining regulatory compliance.

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Quality Assurance Programs in Healthcare Operations

Quality Assurance (QA) programs are systematic frameworks aimed at maintaining and improving service standards in healthcare operations. QA initiatives focus on establishing protocols, monitoring compliance, identifying errors, and implementing corrective measures to ensure consistent and reliable outcomes (WHO, 2023; Chaurasia, 2024). In blood banking, QA programs include rigorous training for staff, adherence to blood collection protocols, proper handling and storage of blood units, and regular evaluation of operational performance (Robby et al., 2025). Literature suggests that well-implemented QA programs reduce process errors, minimize wastage, and improve overall service efficiency, thereby safeguarding both donors and recipients (Martin-Santana et al., 2021).

Impact of QA Programs on Operational Efficiency

Empirical studies have demonstrated that QA programs significantly improve operational efficiency in blood donation services. Implementation of structured QA measures, such as standardized workflow checklists, process monitoring, and staff performance evaluation, has been shown to reduce blood unit wastage, shorten turnaround times, and enhance adherence to safety protocols (Shrivastava et al., 2022; Peiyao Shi, 2023). Moreover, QA initiatives foster a culture of continuous improvement, encouraging staff to proactively identify inefficiencies and implement corrective actions. In mobile blood donation settings, these programs are particularly valuable, as they address the unique logistical and operational challenges associated with off-site collections (Vuk, 2023).

Theoretical Foundations

The study is grounded in Donabedian's Structure-Process-Outcome (SPO) model, which emphasizes that healthcare quality is determined by the configuration of resources (structure), adherence to operational procedures (process), and measurable results (outcomes) (Robby et al., 2025). QA programs are consistent with the SPO model, as they enhance the structural and procedural components of mobile blood donation services, ultimately improving efficiency and safety. Additionally, Total Quality Management (TQM) principles provide a framework for continuous process improvement, emphasizing staff competence, standardized procedures, and outcome monitoring (Chaurasia, 2024). These theoretical foundations support the rationale for integrating QA programs into mobile blood donation operations.

Research Gap

Although prior research underscores the importance of QA programs in improving operational efficiency, limited studies have focused specifically on mobile blood donation services in the Philippine context. Few studies have systematically assessed the impact of QA implementation on performance metrics such as turnaround time, blood unit wastage, process errors, and staff compliance in mobile blood collection settings. This study addresses this gap by evaluating the effects of a structured QA program on operational efficiency at the Philippine Red Cross Rizal Chapter, Muntinlupa City, providing evidence-based recommendations for improving service delivery, donor satisfaction, and transfusion safety.

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METHODOLOGY

Research Design

This study utilized a descriptive-correlational research design to evaluate the impact of a Quality Assurance (QA) program on the operational efficiency of mobile blood donation services at the Philippine Red Cross Rizal Chapter, Muntinlupa City. The descriptive component involved documenting current operational procedures and measuring efficiency indicators such as turnaround time, blood unit wastage, process error rates, and staff compliance before and after QA implementation. The correlational component examined the relationships between QA program implementation and changes in these operational performance metrics. This design allowed for systematic analysis of real-world operational data and provided empirical evidence of the effectiveness of QA interventions in mobile blood donation services.

Research Locale

The study was conducted at the mobile blood donation units of the Philippine Red Cross Rizal Chapter, Muntinlupa City, which serve multiple community locations and special events. These mobile units were selected due to their high frequency of collection activities and accessibility to a large pool of voluntary donors. Administrative approval was obtained from the Ancillary Director, Chief Medical Technologist, and Head of the Blood Bank, granting permission to observe operations, collect operational data, and assess staff adherence to protocols. All collected data were anonymized, and no donor-identifiable information was used. Operational procedures, including blood collection, processing, storage, and transportation, were observed under existing institutional guidelines to ensure safety and compliance.

Respondents of the Study

The participants of this study included the staff members of the mobile blood donation units, including nurses, medical technologists, and volunteer coordinators, responsible for implementing operational procedures. Additionally, operational data from collected blood units were used as part of the efficiency assessment. Participants were selected based on their direct involvement in mobile blood collection and adherence to QA protocols. Their compliance with established procedures and contributions to process execution were monitored and analyzed to evaluate the effect of the QA program on operational performance.

Research Instrument

Data were collected using structured observation checklists, operational logs, and standardized QA evaluation forms. The observation checklists captured staff adherence to protocols, handling procedures, and procedural errors. Operational logs provided quantitative data on turnaround times, number of units collected, and wastage rates. QA evaluation forms were used to assess staff compliance with the program, identify procedural gaps, and record corrective actions taken. All instruments were validated by experts in blood banking operations and quality management to ensure reliability, accuracy, and alignment with international and institutional standards.

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Data Gathering Procedure

The study followed a systematic procedure. Baseline data on operational efficiency were collected prior to QA program implementation, documenting turnaround times, unit wastage, process errors, and staff compliance. Following the introduction of the QA program—which included staff training, workflow standardization, and continuous monitoring—data were collected for the post-intervention period. Observations were conducted discreetly to avoid interference with routine operations. Collected data were organized, tabulated, and coded for statistical analysis. Anonymity and confidentiality of both staff and donors were maintained throughout the data gathering process.

Statistical Treatment of Data

Data were analyzed using descriptive and inferential statistics. Descriptive statistics, including mean, standard deviation, frequency, and percentage, summarized operational performance metrics before and after QA implementation. Paired sample t-tests were employed to determine whether the QA program led to statistically significant improvements in turnaround time, blood unit wastage, process errors, and staff compliance. A significance level of $p < 0.05$ was used for all inferential analyses. This statistical approach allowed the researchers to quantify the impact of the QA program on operational efficiency and evaluate correlations between QA adherence and performance outcomes.

Ethical Considerations

The study was conducted in accordance with ethical standards for research involving human-derived operational data. Administrative and ethical approvals were obtained from the Philippine Red Cross Rizal Chapter. All staff participants provided informed consent to allow observation of their operational practices. No personal donor information was used or disclosed. The QA program evaluation was conducted in a manner that did not disrupt routine operations or compromise donor safety. Confidentiality and anonymity were strictly maintained to protect staff identity and operational data.

RESULTS AND DISCUSSION

This section presents the results of the study on the impact of a Quality Assurance (QA) program on the operational efficiency of mobile blood donation services at the Philippine Red Cross Rizal Chapter, Muntinlupa City. Operational efficiency was measured using four key indicators: turnaround time, blood unit wastage, process error rate, and staff compliance with standard protocols. Data were collected both prior to and following the implementation of the QA program, allowing a comparative analysis of changes in performance metrics.

Turnaround Time

Analysis of turnaround times revealed a significant reduction following the QA program implementation. Prior to QA, the average turnaround time for mobile blood donation activities was 3.8 hours per collection session, primarily due to procedural inconsistencies, delayed staff coordination, and documentation errors. Post-QA, the mean turnaround time decreased to 2.9 hours, reflecting a 23.7% improvement. Observations indicated that the standardized workflow, staff training, and structured

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monitoring introduced through the QA program contributed directly to faster processing and more efficient donor handling. These findings are consistent with prior studies indicating that systematic QA interventions enhance operational speed and workflow efficiency in mobile blood collection services (Shrivastava et al., 2022; Singh et al., 2024).

Blood Unit Wastage

The implementation of the QA program also resulted in a notable reduction in blood unit wastage. Baseline data showed an average wastage rate of 5.2% due to improper handling, labeling errors, and suboptimal storage practices. Following QA implementation, wastage decreased to 2.1%, representing a 59.6% reduction. The decrease in wastage was attributed to improved staff adherence to standardized protocols, careful handling, and continuous monitoring of storage conditions. These results align with global best practices emphasizing the role of QA in minimizing resource loss and ensuring that collected blood units remain safe and viable for transfusion (Martin-Santana et al., 2021; Peiyao Shi, 2023).

Process Error Rate

Evaluation of process errors, including deviations from standard operating procedures, revealed a decline from a pre-QA mean of 8.7 errors per collection session to 3.4 errors post-QA, representing a 60.9% reduction. Errors were reduced across multiple domains, including donor registration, sample labeling, and handling procedures. Staff adherence to documented protocols improved markedly due to QA program training and supervision. The data indicate that the QA program enhanced operational reliability and consistency, minimizing procedural risks and improving service quality.

Staff Compliance

Staff compliance with operational procedures improved substantially after the QA program was implemented. Pre-QA compliance rates averaged 72.3%, while post-QA compliance increased to 93.5%. The QA program's structured approach, which included standardized checklists, continuous monitoring, and feedback mechanisms, reinforced adherence to best practices. High compliance was observed across critical operational tasks, including donor screening, sample collection, and equipment handling. These results underscore the importance of systematic QA interventions in fostering a culture of accountability and excellence among operational staff (Chaurasia, 2024; Vuk, 2023).

Discussion of Findings

The findings of this study demonstrate that implementing a structured QA program significantly enhances the operational efficiency of mobile blood donation services. Reductions in turnaround time and blood unit wastage, coupled with decreased process errors and increased staff compliance, indicate that the QA program effectively improved workflow management and operational reliability. These outcomes are consistent with the theoretical frameworks underpinning the study, including Donabedian's Structure-Process-Outcome model and Total Quality Management principles, which emphasize that structured processes, well-trained personnel, and continuous monitoring lead to improved service outcomes (Robby et al., 2025; Chaurasia, 2024).

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The study highlights that mobile blood donation services, while critical in expanding blood supply, face unique operational challenges due to variable donor turnout, environmental factors, and limited on-site resources. QA programs address these challenges by standardizing procedures, enhancing staff training, and instituting ongoing performance monitoring. By systematically addressing inefficiencies, QA initiatives not only improve operational outcomes but also enhance donor satisfaction and the reliability of collected blood units for clinical use.

In conclusion, the results underscore the importance of QA programs in optimizing mobile blood donation operations. The observed improvements across all operational metrics validate the effectiveness of structured quality management strategies and provide evidence-based guidance for the implementation of QA initiatives in similar healthcare service settings.

Conclusion

This study demonstrated that the implementation of a structured Quality Assurance (QA) program significantly improved the operational efficiency of mobile blood donation services at the Philippine Red Cross Rizal Chapter, Muntinlupa City. Key operational metrics—including turnaround time, blood unit wastage, process error rate, and staff compliance—showed marked improvement after QA implementation. Turnaround time decreased by approximately 23.7%, blood unit wastage was reduced by 59.6%, process errors declined by 60.9%, and staff compliance increased to over 93%. These results indicate that QA programs are effective in standardizing operations, enhancing staff adherence to protocols, minimizing procedural errors, and optimizing resource utilization.

Implications of the Study

The findings have several practical implications for blood banks, healthcare administrators, and policymakers. First, structured QA programs can significantly enhance the efficiency and reliability of mobile blood donation services, contributing to a safer and more consistent blood supply. Second, the improvements in staff compliance and error reduction highlight the value of training, standardized workflows, and continuous monitoring in promoting quality outcomes. Finally, the study underscores the potential for QA programs to support sustainability in mobile blood donation operations by reducing resource wastage and optimizing staff performance.

Recommendations

Based on the study's findings, it is recommended that mobile blood donation services incorporate structured QA programs as a core component of operational management. Blood bank administrators should implement standardized workflows, utilize monitoring and feedback mechanisms, and provide continuous staff training to ensure adherence to protocols. Regular performance evaluations should be conducted to identify operational bottlenecks and implement corrective measures promptly. Additionally, the design and implementation of QA programs should consider local operational contexts, resource availability, and donor population characteristics to maximize effectiveness.

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Future Research Directions

Future research could expand on this study by evaluating QA program effectiveness across multiple mobile blood donation sites, regions, or countries to establish broader generalizability. Studies may also explore the long-term sustainability of QA interventions and their impact on donor satisfaction, retention, and blood collection volume. Furthermore, research could examine the integration of technological tools, such as digital workflow monitoring and automated quality tracking systems, to enhance QA implementation and further improve operational efficiency in mobile blood donation services. Comparative studies assessing different QA models and their impact on operational performance may also provide insights for best practices in blood collection management.

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