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Optimizing Phlebotomy Services Through Patient-Centred Scheduling: A Quality Improvement Initiative at District General Hospital Nawalapitiya

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Abstract: Phlebotomy services play a critical role in clinical diagnosis and patient management. Inefficient workflows, prolonged waiting times, and poor prioritization—particularly among fasting and paediatric patients—can compromise patient safety, satisfaction, and diagnostic accuracy.

To optimize the functioning of the phlebotomy unit by reducing waiting times, prioritizing vulnerable patient groups, improving patient flow, and enhancing overall service efficiency.

A quality improvement initiative was implemented at District General Hospital Nawalapitiya beginning in 2022 and continues as an ongoing project. Initial audits identified prolonged waiting times exceeding two hours, congestion during early morning hours, and inadequate patient prioritization. Interventions included implementation of an appointment-based system, prioritization of fasting and paediatric patients, staff reallocation, and improvement of waiting area facilities. Re-audit data were compared to baseline findings.

Post-intervention findings demonstrated a significant reduction in waiting times from >2 hours to approximately 20 minutes. Improvements were noted in patient satisfaction, staff workflow efficiency, and reduction in fasting-related complications.

[need to insert numerical data: patient satisfaction scores, number of patients per hour, incidence of fainting episodes if possible].

A structured, patient-centred scheduling system significantly improved phlebotomy unit efficiency, enhanced patient safety, and reduced unnecessary healthcare burden. This model provides a scalable framework for optimizing outpatient diagnostic services in similar healthcare settings.

Keywords: *Phlebotomy, Quality Improvement, Patient Flow, Waiting Time Reduction, Healthcare Efficiency*.

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I. INTRODUCTION

Efficient phlebotomy services are fundamental to the delivery of high-quality healthcare. Blood investigations guide a vast proportion of clinical decisions, influencing diagnosis, monitoring, and treatment planning. Consequently, delays or inefficiencies in phlebotomy services can have a direct and sometimes profound impact on patient outcomes [1].

In many healthcare settings, particularly in resource-constrained environments, phlebotomy units face challenges such as overcrowding, prolonged waiting times, and inadequate prioritization systems. These inefficiencies not only compromise patient satisfaction but may also pose clinical risks, especially for patients require [2,3]ing fasting investigations. Prolonged fasting can lead to hypoglycaemia, dehydration, and in some cases syncope, necessitating emergency care interventions [4].

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At District General Hospital Nawalapitiya, the phlebotomy unit—commonly referred to as the bleeding room—was identified as a critical bottleneck in patient flow. Patients requiring blood investigations tended to arrive early in the morning, resulting in severe congestion and extended waiting times. This pattern made it difficult for healthcare staff to prioritize patients appropriately, particularly those who had been fasting for prolonged periods.

Complaints from patients highlighted discomfort, distress, and dissatisfaction due to delays. In some instances, patients experienced fainting episodes after prolonged fasting, requiring admission to the Emergency Treatment Unit. Staff reported significant workflow challenges, including difficulty managing patient expectations and uneven workload distribution, with peak congestion in the morning and minimal activity later in the day. Laboratory staff also raised concerns regarding the impact of prolonged fasting on the accuracy of investigation results, which could lead to repeated tests and increased resource utilization [5].

These concerns underscored the need for a structured, patient-centred intervention to optimize the functioning of the phlebotomy unit.

II. AIM

This project aimed to improve the efficiency and patient-centredness of the phlebotomy unit by reducing waiting times, prioritizing vulnerable patient groups, improving patient flow, and enhancing overall service quality.

➢ *Specific Objectives Included:*

- To reduce patient waiting times for blood collection.
- To prioritize fasting patients to prevent prolonged fasting complications.
- To ensure timely and safe blood collection for paediatric patients.
- To Improve patient flow and reduce overcrowding.
- To enhance staff workflow and productivity.
- To reduce repeated investigations due to compromised sample quality.

III. METHODOLOGY

This initiative was designed as a continuous quality improvement project, initiated in 2022 and sustained as an ongoing intervention. The approach was guided by the Plan–Do–Check–Act (PDCA) cycle, a well-established framework for healthcare quality improvement [2].

The need for intervention was identified through multiple sources, including patient complaints, staff feedback, and laboratory concerns. An initial audit conducted by the Quality Management Unit revealed that waiting times for blood collection frequently exceeded two hours. Additionally, patient satisfaction surveys indicated dissatisfaction with both waiting times and the physical environment of the phlebotomy unit.

A root cause analysis was undertaken using structured problem-solving tools, including brainstorming and problem tree analysis. This process identified several key issues: the absence of a structured appointment system, uncontrolled patient arrival patterns, inadequate prioritization mechanisms, insufficient staff allocation during peak hours, and suboptimal waiting area conditions.

In response to these findings, a multifaceted intervention was implemented. Central to this intervention was the introduction of an appointment-based scheduling system. Patients requiring fasting investigations were allocated early morning time slots, ensuring that blood collection could be completed promptly after the fasting period. This approach minimized the risk of complications associated with prolonged fasting.

In addition, dedicated time slots were introduced for paediatric patients, typically scheduled after 11:00 AM, to reduce waiting times and improve patient comfort. Staff roles were reorganized, with the establishment of an appointment counter and the allocation of a dedicated nursing officer to manage scheduling and patient flow.

To ensure effective implementation, a strict policy was introduced whereby blood collection was performed only according to the assigned appointment time. This measure helped regulate patient flow and prevent overcrowding.

Simultaneously, improvements were made to the physical environment of the phlebotomy unit. The waiting area was renovated to enhance patient comfort, including improved seating arrangements and ventilation.

Data collection and analysis were conducted using information technology tools. Baseline data from audits and patient satisfaction surveys were compared with post-intervention data obtained through re-audits conducted approximately three months after implementation.

➢ *Study Design*

A continuous quality improvement project initiated in 2022 and maintained as an ongoing intervention, using a pre-post audit framework [2].

➢ *Problem Identification*

The need for intervention was identified through:

- Patient complaints regarding prolonged waiting times
- Direct reports to hospital administration
- Staff feedback on workflow challenges
- Laboratory concerns regarding sample quality

An initial audit conducted by the Quality Management Unit revealed:

- Average waiting times exceeding [Insert baseline time, e.g., >120 minutes]

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- Early morning overcrowding in the phlebotomy unit
- Lack of prioritization for fasting and paediatric patients
- Inadequate waiting area facilities

➢ *Root Cause Analysis*

Key contributing factors identified included:

- Absence of a structured appointment system
- Uncontrolled patient arrival patterns
- Lack of prioritization protocols
- Insufficient staff allocation during peak hours
- Poor infrastructure in patient waiting areas

➢ *Intervention*

A comprehensive set of interventions was implemented:

- *Appointment-Based Scheduling System*

✓ Introduction of structured appointment slots to regulate patient flow and reduce overcrowding [3].
✓ Prioritization of fasting patients during early morning hours (first 2 hours) to prevent complications associated with prolonged fasting [4].
✓ Allocation of specific time slots for non-fasting investigations

- *Paediatric Prioritization*

✓ Dedicated time slots for paediatric patients (post-11:00 AM)
✓ Reduced waiting times and improved patient comfort

- *Staff Reallocation*

✓ Appointment counter established
✓ Dedicated nursing officer assigned for scheduling and coordination
✓ Improved distribution of workload throughout the day

- *Strict Appointment Policy*

✓ Blood collection performed strictly according to appointment time
✓ Controlled patient flow and reduced congestion

- *Infrastructure Improvement*

✓ Renovation of waiting area
✓ Improved seating, ventilation, and patient comfort

IV. RESULTS

The implementation of the intervention resulted in a marked improvement in the functioning of the phlebotomy unit.

The most significant outcome was the reduction in patient waiting times. Baseline measurements indicated waiting times exceeding > 2 hours, whereas post-intervention measurements demonstrated a reduction to approximately 20 minutes. This substantial decrease reflects improved efficiency and better patient flow management.

In addition to reduced waiting times, there was a noticeable improvement in patient distribution throughout the day. Early morning congestion was significantly reduced, with patient arrivals more evenly spread across available time slots. This redistribution of workload contributed to improved staff efficiency and reduced burnout.

Patient safety outcomes also improved. The number of fainting episodes related to prolonged fasting decreased following the introduction of prioritized scheduling for fasting patients. This highlights the clinical significance of timely phlebotomy services.

Patient satisfaction showed a positive trend, with feedback indicating greater comfort, reduced waiting times, and improved overall experience.

From a laboratory perspective, the optimization of fasting durations contributed to improved sample quality and reduced the need for repeat investigations. This not only enhanced diagnostic accuracy but also reduced unnecessary resource utilization.

Table 1 Number of Fainting Incidents Before & After the Intervention

Month	Number of fainting incidents before intervention	Month	Number of fainting incidents after intervention
January	01	June	00
February	00	July	00
March	02	August	00
April	01	September	00
May	01	October	00

Table 2 Patient Satisfaction Before the Intervention

	Satisfied	Average	Not Satisfied
No of patients	78 (52%)	56 (37%)	16 (11%)

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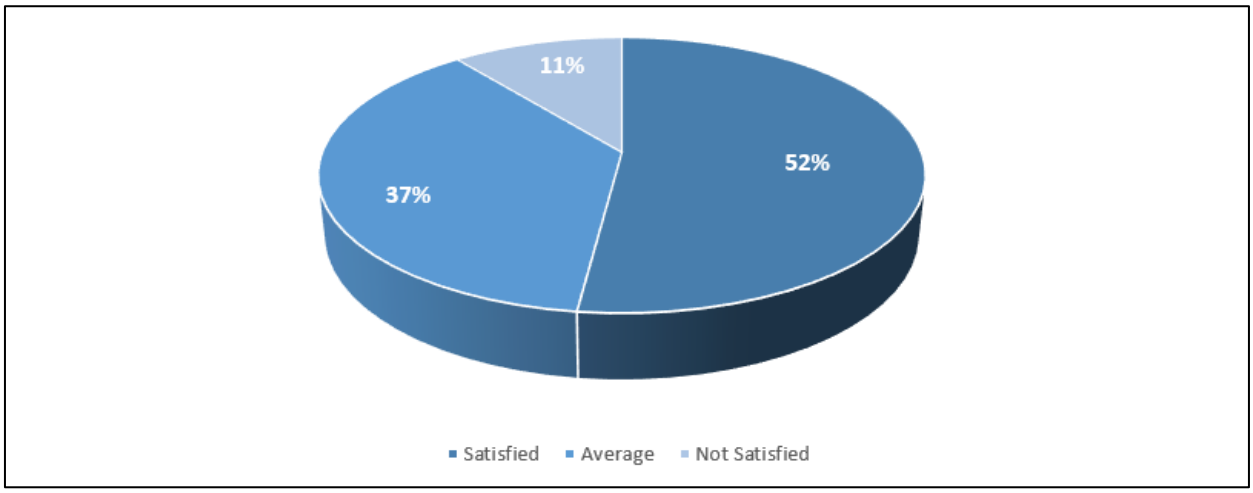

Fig 1 Patient Satisfaction Results Before the Intervention

Table 2 Patient Satisfaction After the Intervention

	Satisfied	Average	Not Satisfied
No of patients	92 (61%)	37 (25%)	21 (14%)

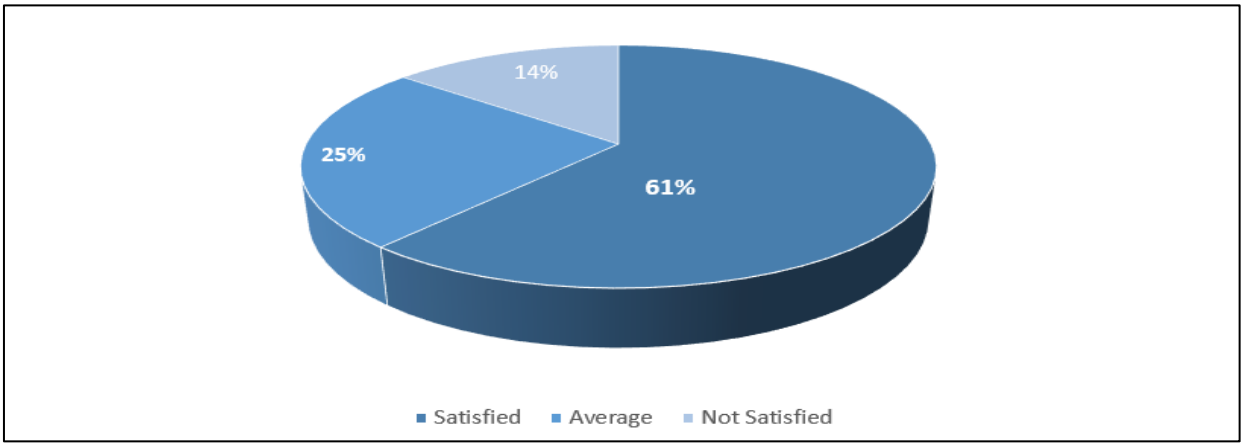

Fig 2 Patient Satisfaction Results After the Intervention

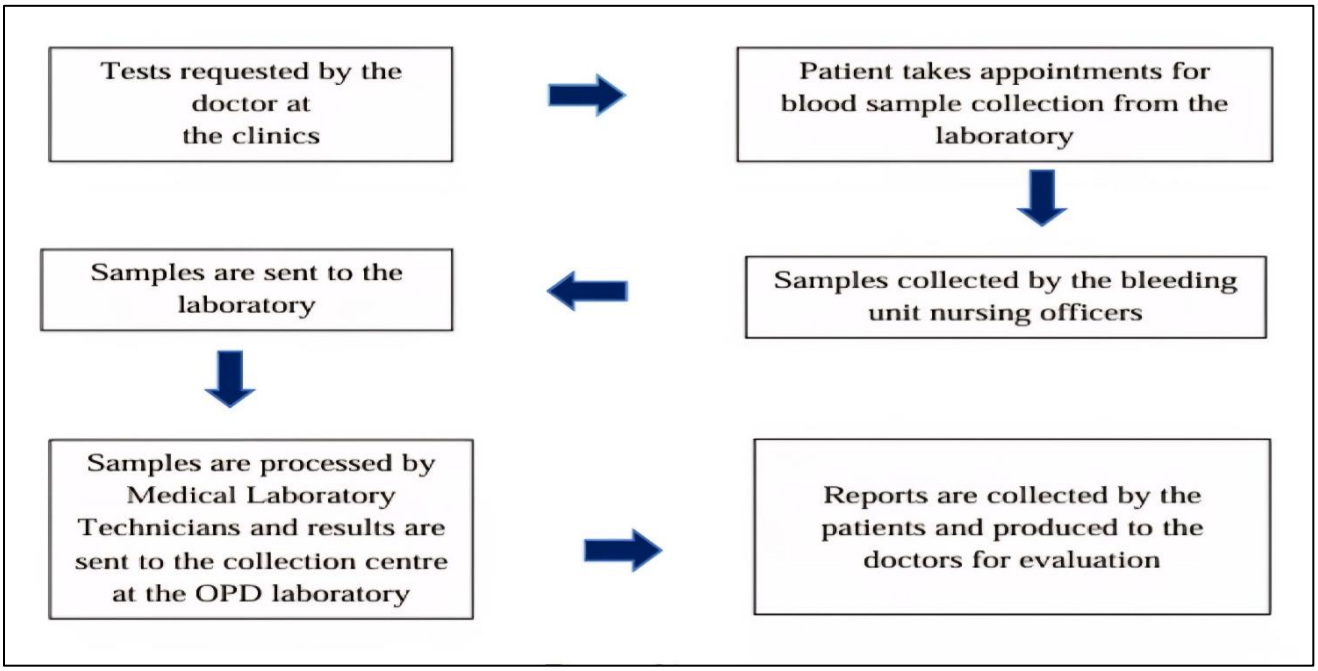

Fig 3 Workflow Diagram – Pre-Intervention

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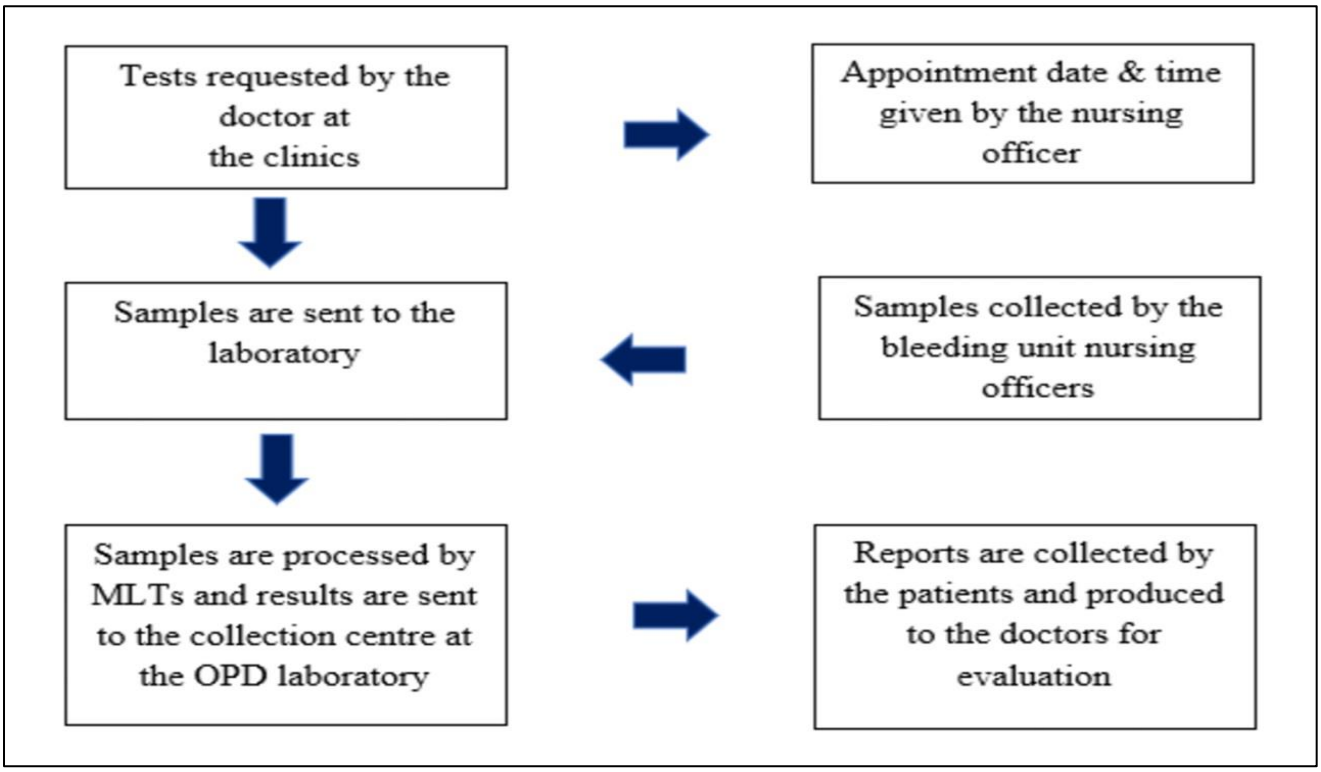

Fig 4 Workflow Diagram – Post-Intervention

V. DISCUSSION

This project demonstrates that patient-centred scheduling and workflow optimization can significantly improve healthcare service delivery.

The introduction of an appointment-based system was instrumental in addressing the issue of overcrowding. By regulating patient arrival times, the intervention ensured a more balanced distribution of workload throughout the day. Similar approaches have been shown to improve efficiency and reduce waiting times in outpatient settings [3].

Prioritizing fasting patients was a critical component of the intervention. Prolonged fasting is associated with adverse clinical outcomes, particularly in vulnerable populations. By ensuring timely blood collection, the project reduced the risk of complications and improved patient safety [4].

The inclusion of paediatric prioritization further enhanced the patient-centred nature of the intervention. Children often experience anxiety and discomfort during medical procedures, and reducing waiting times can significantly improve their overall experience.

Staff engagement was another key factor in the success of the project. By involving healthcare workers in the design and implementation of the intervention, the project fostered a sense of ownership and accountability. Improved workflow efficiency also contributed to increased staff satisfaction and reduced burnout.

The project also demonstrated the importance of environmental factors in healthcare delivery. Improvements to the waiting area contributed to patient comfort and satisfaction, highlighting the need for holistic approaches to quality improvement.

Phlebotomy services are an essential component of modern healthcare systems, forming the foundation for diagnostic decision-making. Efficient functioning of phlebotomy units ensures timely diagnosis, appropriate treatment, and improved patient outcomes [1]. However, inefficiencies in patient flow, prolonged waiting times, and poor prioritization can negatively impact both clinical outcomes and patient experience [3].

At District General Hospital Nawalapitiya, the phlebotomy unit—commonly referred to as the bleeding room—experienced significant operational challenges. Patients requiring fasting blood investigations frequently presented early in the morning, resulting in overcrowding, prolonged waiting times, and difficulty prioritizing urgent or vulnerable patients.

Complaints from patients highlighted distress due to extended fasting periods, with some cases resulting in fainting episodes, syncope requiring emergency care [4]. Staff reported workflow inefficiencies and burnout due to uneven patient distribution, with peak congestion in the morning and minimal workload in the afternoon. Laboratory personnel also raised concerns regarding the impact of prolonged fasting on investigation accuracy [5], leading to potential diagnostic errors and repeated testing. Timely laboratory investigations are crucial for clinical decision making and improving patient outcomes [2].

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- *Staff Workflow Efficiency*

The optimization of the phlebotomy service had a notable impact not only on patient experience but also on staff workflow and laboratory performance. Prior to the intervention, staff faced significant pressure during peak morning hours due to overcrowding and unstructured patient flow. This often resulted in fatigue, reduced efficiency, and difficulty in prioritizing patients appropriately. Following the introduction of a structured appointment system and improved patient distribution, there was a marked reduction in workload stress during peak periods. Staff were able to manage their duties in a more organized manner, leading to improved productivity and better time management. The balanced workflow throughout the day also contributed to enhanced staff satisfaction, as the burden of intense early-hour congestion was alleviated.

From a laboratory perspective, the improvements were equally significant. By ensuring that fasting patients were attended to promptly and avoiding prolonged fasting periods, the quality and accuracy of laboratory results improved. Previously, delayed sample collection due to long waiting times could compromise test results, necessitating repeat investigations. With the new system in place, such occurrences were minimized. The reduction in repeated investigations not only enhanced diagnostic reliability but also contributed to more efficient use of resources, reinforcing both clinical effectiveness and operational sustainability.

VI. CONCLUSION

The phlebotomy room optimization project demonstrates that simple, patient-centred innovations can significantly improve healthcare delivery.

By implementing an appointment-based system, prioritizing vulnerable patients, and improving infrastructure, the project successfully reduced waiting times, enhanced patient safety, and improved staff efficiency.

This initiative provides a scalable, sustainable model for optimizing outpatient services and strengthening healthcare systems.

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