AUDIT

A quality improvement re-audit on incomplete microbiology laboratory request forms at a University Hospital in Sri Lanka: Targeted interventions and five-year outcomes

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Abstract

Introduction: The clinical laboratory plays a vital role in patient care, yet preanalytical errors, especially incomplete request forms, can compromise diagnostic accuracy. This study assesses the impact of targeted interventions over five years on achieving measurable improvements in the completeness of microbiology request forms at a university hospital in Sri Lanka.

Methods: A retrospective cross-sectional re-audit was conducted following interventions from October to December 2024. A total of 1,176 blood and urine culture request forms during this period were assessed for incompleteness and compared with 2,087 forms from a 2019 audit. Interventions included disseminating 2019 audit results, developing and distributing guidelines, unit-level pocket meetings for interns and nurses, mandatory intern training, and individual feedback. Incomplete forms were added to the rejection criteria, and laboratory staff were trained to ensure compliance.

Results: Between 2019 and 2024, significant improvements were observed in laboratory form completion. Incompletion of patient age decreased from 1.8% to 0.9% ($p=0.043$), gender from 18.2% to 5.1% ($p < 0.001$), and Bed Head Ticket (BHT) number from 1.8% to 0.17% ($p<0.001$). Clinical history omissions dropped from 40.2% to 25.4% ($p< 0.001$), and test request fields improved from 0.6% to 0% ($p< 0.001$). However, specimen time (96.4% to 100%, $p< 0.001$) and type (55.2% to 66.7%, $p<0.001$) documentation worsened.

Conclusions: The audit shows marked improvement in form completeness following targeted interventions. Continued education, regular audits, and feedback are essential. Understanding and completing the clinical audit loop is an efficient way of quality improvement in clinical laboratory processes. Future focus for more sustainable digital transformations would also ensure accuracy and efficiency of laboratory diagnostics and patient safety.

Keywords: Incomplete microbiology request forms, pre-analytical errors, quality improvement, digital integration

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Introduction

Clinical laboratories play an essential role in healthcare, contributing to 60-70% of medical decisions and guiding diagnosis, treatment, monitoring, and infection control measures.[1] The reliability of results depends not only on analytical precision but also on the integrity of the entire process, from test request to final interpretation.[2]

Laboratory testing involves preanalytical, analytical, and postanalytical phases. The preanalytical phase, covering patient preparation, specimen collection, labeling, transport, and completion of request forms, is the most error-prone[3]. Manually filled forms often lack key information,[4-6] causing diagnostic delays, unnecessary retesting, interpretation errors, compromised patient safety, and increased healthcare costs.

In microbiology, culture and antimicrobial susceptibility testing require complete request form data, including demographics, clinical history, specimen details, collection date/time, antibiotic history, and clinician identification.[4] This information enables correct patient identification, appropriate test selection, timely reporting, and accurate interpretation. Missing data can delay or prevent accurate reporting, waste resources, and reduce patient satisfaction.

In Sri Lanka, most state-sector microbiology laboratories still rely on manual request forms, increasing risks from illegible handwriting, incomplete fields, and misplacement. A study done at the same teaching hospital five years ago found frequent omissions, particularly clinical history, antibiotic information, collection time/date, and clinician details.[4] Interventions such as staff education, reinforcing documentation practices, and improved clinical and laboratory communication were recommended.

The present follow-up study evaluates whether these measures have improved the completeness of microbiology request forms. By comparing current and previous data on patient identification, specimen details, clinical history, and clinician information, this study aims to identify persistent gaps, assess intervention effectiveness, and recommend strategies to enhance documentation, reporting quality, and patient safety in microbiological diagnostics.

Methods

A retrospective cross-sectional re-audit was conducted following targeted interventions at the University Hospital of Kotelawala Defence University (UHKDU) from October 2024 to December 2024. A total of 1176 blood and urine culture request forms received from inpatients and outpatients during the study period were assessed for incompleteness of components in the request form. The standard for the audit was set at 100% completion of each component of the laboratory request form. Results were compared with the results of the previously conducted audit in 2019. This clinical audit followed standard components of the clinical audit cycle as outlined by the National Institute for Health and Care Excellence.[7]

Interventions

Targeted interventions were implemented among clinical and laboratory staff to address the deficiencies identified in the previous 2019 audit.

Results of the 2019 audit were shared with hospital administration and clinical staff, accompanied by constructive feedback. The findings and gaps were discussed extensively in consultant meetings, infection control meetings, laboratory meetings, and antimicrobial stewardship meetings, with the participation of hospital directors to emphasize opportunities for improvement.

A Guideline for Completing Microbiology Laboratory Test Request Forms was developed by the consultant microbiologist and authorized by the Director of Medical Services. This guideline was distributed to all medical doctors and nurses and made readily accessible for ongoing reference.

Pocket meetings were conducted by the medical officer of microbiology for intern doctors in each unit to review and discuss the guidelines. A mandatory training session on the collection and transport of microbiology specimens, covering all pre-analytical requirements, was incorporated into the annual intern medical officer orientation program. Additionally, one-on-one education and awareness sessions were provided whenever significant deviations in request form completion were identified in any unit.

Incomplete request forms, missing patient identification, or proper specimen details were formally included in the microbiology specimen rejection criteria. Laboratory staff stationed at the specimen receiving bay were trained and made aware of the critical importance of receiving fully completed request forms to ensure specimen acceptance.

Data collection checklist

The parameters that were identified in the request forms for the analysis were the patient's identification and demographic information, including their name, age, gender, clinic or bed head ticket number, and the location (the ward/unit). Further, the specimen information, such as the date and time of the specimen collection, as well as

the specimen type and the test required, was checked. It also included clinical history and the clinician's information, consisting of their designation, signature, and stamp.

Outcome measures

All the laboratory request forms were analysed for the presence or absence of the parameters (Table 1). Results obtained from the analysis were compared with the results of the previously conducted study in the same hospital.[4] The proportion of incompleteness in the two audits was compared to assess the significance of the improvement and used as an outcome measure of the targeted interventions.

Data analysis

Data was entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 27.0. For each selected parameter on the laboratory request form, the proportion of incomplete entries was calculated separately for 2019 and 2024. Comparisons of incompletion rates between the two audit periods were performed using a Chi-squared test, where a p-value of less than 0.05 was considered statistically significant. Parameters with statistically significant changes were identified as areas of improvement or concern in documentation practices over time.

Results

A total of 2,087 laboratory request forms were reviewed in the initial audit (2019), and 1,176 forms in the re-audit (2024) following the targeted interventions.

Overall, the completeness of laboratory request forms showed significant improvement in most parameters over the five-year interval, with statistically significant reductions in incompletion rates noted in key areas. However, certain fields showed persistent or worsening deficiencies, particularly related to specimen data.

Table 1. Comparison of incompletion rates in laboratory request forms between 2019 and 2025

Missing /Incomplete parameter	*Total request forms surveyed*		*p-value*
	2019 (n=2087)	*2025 (n=1176)*	
Patient's identification and demographic information			
Name	0 (0%)	0 (0%)	No changes
Age	37 (1.8%)	11 (0.94%)	0.043
Gender	380 (18.2%)	60 (5.1%)	<0.001
Bed Head Ticket /Clinic number	38 (1.8%)	02 (0.17%)	<0.001
Patient location	380 (18.2%)	84 (7.14%)	<0.001
Specimen Information			
Specimen collection date	1479 (70.9%)	170 (14.5%)	<0.001
Specimen collection time	2011 (96.4%)	1176 (100%)	<0.001
Specimen type	1150 (55.2%)	784 (66.7%)	<0.001
Test requested	12 (0.6%)	0 (0%)	<0.001
Clinical Information			
Short Clinical History	840 (40.2%)	299 (25.4%)	<0.001
Antibiotic given/to be given	1665 (79.7%)	No data available	-
Clinician Information			
Designation	1110 (53.2%)	485 (41.2%)	<0.001
Signature	131 (6.3%)	42 (3.6%)	<0.001
Stamp	No data available	1074 (91.3%)	-

Concerning patient identification data, documentation has improved across all parameters. The incompletion rate for patients' age has decreased significantly from 1.8% (37/2087) in 2019 to 0.9% (11/1176) in 2025 (p=0.043), while gender omissions dropped from 18.2% to 5.1% (p< 0.001). Bed Head Ticket (BHT) number incompletion also improved notably, from 1.8% to 0.17% (p< 0.001), reflecting enhanced adherence to proper patient identification practices.

In terms of specimen-related information, documentation of specimen collection date improved markedly, with incompletion rates falling from 70.9% (1479/2087) in 2019 to 14.5% (170/1176) in 2025 (p<0.001). However, specimen collection time showed a deterioration, with 96.4% incompletion in 2019 worsening to 100% in 2025 (p<0.001). Similarly, incompletion in recording specimen type increased significantly from 55.2% (1150/2087) to 66.7% (784/1176) (p< 0.001), indicating continued gaps in this critical area.

Regarding clinical information, there was a statistically significant improvement in the documentation of a short clinical history, with incompletion decreasing from 40.2% (840/2087) to 25.4% (299/1176) (p< 0.001). The field for test requested, which showed a 0.6% incompletion rate in 2019, was fully completed in all forms by 2025 (p < 0.001), indicating complete compliance.

For clinician-related details, the percentage of forms lacking clinician designation dropped from 53.2% (1110/2087) in 2019 to 41.2% (485/1176) in 2025 (p< 0.001). Incompletion in clinician signature also declined from 6.3% (131/2087) to 3.6% (42/1176) (p<0.001), suggesting improved accountability and documentation by the requesting personnel.

These findings highlight meaningful improvements in overall form completeness over time, particularly in patient and clinical information fields, while identifying ongoing deficiencies in specimen documentation that warrant targeted quality improvement efforts.

Discussion

The findings of the study demonstrate a significant overall improvement in the completeness of microbiology laboratory request forms from 2019 to 2024. This reflects enhanced compliance with patient identification protocols and improved clinician accountability. This trend also suggests the effectiveness of targeted interventions, which help to heighten awareness regarding accurate documentation practices among healthcare staff over time. However, critical gaps remain in the recording of specimen-related information, requiring continuous improvement efforts.

Significant decline in incompleteness related to patient identification data, patient location, clinician details, specimen type, and clinical diagnosis following educational interventions similar to our study was documented in a study done in a university teaching hospital in Nigeria, and was reported as an effective strategy.[8]

Another study conducted in a general hospital in Pakistan on histopathology request forms demonstrates the effectiveness of targeted interventions: presentation of audit findings, targeted communication with clinicians, development of a standard request form, and enabling easy accessibility to request forms with significant enhancement in documentation completion.[9]

Our study also highlights persistent and worsening gaps, notably in specimen collection times and specimen type, despite the interventions. These fields may be perceived as less relevant by the clinicians or may be missed due to time pressures and workflow inefficiencies. Similar lapses are also observed in an audit conducted in a haematology laboratory.[10]

Preanalytical quality improvement efforts are often low-cost, yet highly effective, particularly when focused on behavior change, training, and awareness. Demonstrating a reduction in incompleteness of laboratory request forms over time would not only validate the success of these interventions but also serve as a model for other institutions facing similar challenges. Conversely, identifying ongoing gaps in documentation would provide valuable insights to refocus quality improvement efforts, potentially justifying the implementation of more structured systems, such as mandatory electronic ordering or redesigned request forms.

Global shift towards digital health interventions such as Laboratory Information Management Systems (LIMS) and laboratory automation, Hospital Information Management Systems (HIMS) with Electronic Medical Records (EMR) has led to significant improvements in operational and workflow efficiency, minimizing documentation errors and improving patient care in healthcare settings.[11]

Improvements in form completeness may also be attributed to such transitions. The adoption of electronic laboratory request systems, which mandate the entry of key fields before submission, has been shown to significantly reduce documentation omissions and mitigate errors associated with paper-based methods.[12,13]

Conclusion and recommendations

This audit reflects significant progress in many areas of laboratory form documentation over the years, with targeted interventions based on clinician awareness and implementation of guidelines. However, it also underscores the need for continuous quality improvement through education-based interventions and audit-feedback loops. Future efforts should also focus on integrating more sustainable solutions, like digital solutions, to achieve accurate test requesting to enhance efficient laboratory workflow, along with continuous monitoring and feedback to ensure diagnostic accuracy and patient safety.

Authors' Contributions

Research concept and preparation of the first draft: DN

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Supervision of data collection: DN

Collection and verification of data: AF, RW, TG, TS

Writing of the manuscript: DN, GK

Final revision and editing: DN, TS, GK

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