

The Effectiveness of an Orientation Program in Reducing Errors in Histopathology Requisitions

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Abstract

Introduction: The majority of laboratory errors occur in the pre-analytical phase of the laboratory testing. A major contributor to this is the incomplete filling of the laboratory requisition form (LRF) especially in countries where it is filled manually. In histopathology, the lack of critical information may lead to inaccurate pathological diagnosis as well as delays in issuing the report. The purpose of this study was to determine if an orientation programme could minimise these errors.

Methods: This study analyzed each of the fields in the histopathology requisition forms (HRF) filled before and after an orientation program for intern doctors. The program focused on explaining why each of the fields should be filled. The prefixed fields were recorded on a Google Sheet. A score of 1 was given if the information was present or not applicable, and 0 was given if the question was left empty. The total count for each field was then obtained and used to calculate the percentage completion. Two-tailed t-tests for proportions were conducted to compare the percentage of completely filled responses before and after the orientation program, for each of the fields.

Results: Following the program, there was a significant improvement in the completion rates of twelve out of the twenty fields in the form.

Discussion: This study proved that implementation of an orientation programs is a valuable quality improvement initiative, which will undoubtedly contribute to the reduction of errors occurring due to incomplete filling of HRF especially in middle and low income countries without a digitized system.

Keywords: Pre analytical Errors, Histopathology, Incomplete Requisition forms, Orientation Program

Introduction

Clinical laboratories play a vital role in delivering effective patient care, with approximately 70% of all patient management decisions relying on the support of laboratory results (Plebani & Carraro, 1997). Most communication between the physicians and the laboratory occurs through a laboratory requisition form, an application that must be

filled out promptly and submitted when a specimen is handed in for testing. The laboratory testing process comprises three phases, i.e., pre-analytical, analytical, and post-analytical (Erasmus & Zemlin, 2009). Although it was initially believed that most errors occur in the analytical phase, research has suggested that this is not so and that most errors occur in the pre-analytical and post-analytical phases (Nutt, Zemlin & Erasmus, 2008; Bonini *et al.*, 2002; Lippi *et al.*, 2006; Jegede *et al.*, 2016). Of these, nearly 70% of the errors occurred in the pre-analytical phase (Plebani & Carraro, 1997; Bonini *et al.*, 2002; Lippi *et al.*, 2006). Therefore, to effectively reduce overall laboratory errors, it is crucial to

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put greater emphasis and scrutiny on minimizing errors in the pre-analytical phase (Jegade *et al.*, 2016).

Among the multiple sources of pre-analytical errors, a major contributor was the incomplete filling of the laboratory requisition form (Bonini *et al.*, 2002; Oyedeji, Ogbenna & Iwuala, 2015; Abbasi, Asghari & Niazkhani, 2023). In economically developed countries, laboratory quality management systems have been institutionalized, with functional and efficient screening systems to identify and reduce errors before they occur at any phase in the laboratory system (Jegade *et al.*, 2016). Additionally, requisition forms are digitized. However, in low- and middle income countries such as Sri Lanka, these requisition forms are filled manually, thus providing space for omission of the required details.

An incompletely filled requisition form could pose a danger to a patient's life as it contributes to delaying communication of health information (Bonini *et al.*, 2002). The lack of critical information in the requisition form may lead to inaccurate pathological diagnostic reports, as the pathologist could misinterpret the patient's condition (Plebani & Carraro, 1997). These flaws could be corrected if we understand the practical factors that cause them (Manoharan, Manoharan & Sharma, 2019), which was a contributing motivation for this study. Many studies worldwide have been conducted to analyze laboratory errors, especially in the pre-analytical phase (Manoharan, Manoharan & Sharma, 2019). However, most studies have only looked into other aspects of pre-analytical errors, and very little attention has been placed on analyzing the completeness of the requisition form (Abbasi, Asghari & Niazkhani, 2023). In studies examining the completeness of requisition forms, many have suggested an orientation program to train the medical staff (Abbasi, Asghari & Niazkhani, 2023; Oyedeji, Ogbenna & Iwuala, 2015; Jegede *et al.*, 2016; Tariq *et al.*, 2025; Kumarasinghe *et al.*, 2025), although the literature did not reveal details of implementation. In addition, little to no recent research has been conducted in Sri Lanka to investigate this aspect. Therefore, we aimed to

address the gap by analyzing the effectiveness of an orientation program in filling out laboratory requisition forms sent for the processing of histopathology samples. The main objective of this study was to determine the effect of an orientation program in filling out laboratory requisition forms by newly appointed intern doctors.

Methods

This cross-sectional descriptive study was conducted at the Histopathology Laboratory of the University Hospital of the Kotelawala Defence University (UHKDU), Sri Lanka. All histopathology requisition forms filed and kept in the histopathology laboratory during the stipulated period between 1 January 2021 and 31 December 2022 (before the orientation program), and between 31 August 2024 and 31 December 2024 (after the orientation program), were considered in the study.

The prefixed fields from the requisition form, shown in Table 1, were obtained from the requisition form and recorded on a Google Sheet. A score of 1 was given if the information was present or not applicable to that specific case, and 0 was given if the question was left empty. The total count for each field was then obtained and used to calculate the percentage completion. Two-tailed t-tests for proportions were conducted to compare the percentage of completely filled responses before and after the orientation program, for each of the fields on the requisition form. To provide a comprehensive assessment of changes across all questions, a chi-square test of homogeneity was also done. All statistical analyses were conducted at a 95% confidence level. The results from both stages were then compared to assess the impact of the intervention.

The orientation program was introduced during the month of August 2024. This intervention targeted newly appointed intern doctors who had recently graduated from medical school as they are mainly responsible for filling out requisition forms on behalf of consultants. At UHKDU, approximately 30 interning doctors join each hiring cycle. These doctors were

from universities all across Sri Lanka and therefore from different medical training backgrounds. To accommodate all of them, the orientation program was conducted 5–6 times within the course of two weeks. Each intern was expected to participate in one session. Around five doctors participated in each session, and these sessions were conducted at the laboratory premises during the lunch break. During the session, the pathologist went through the requisition form with the interns and discussed how each field on the requisition form contributes to arriving at the diagnosis and formulating the final pathology report, thereby emphasizing the necessity of providing complete and accurate information. The intern doctors were encouraged to ask questions, and any challenges they faced when completing the forms were noted and solutions recommended.

This study received ethical approval from the Ethics Review Committee of the Faculty of Medicine of the KDU (RP/2025/09) on 02. 24. 2025. This is an IRB-approved study, all

patient information was de-identified and patient consent was not required. Patient data will not be shared with third parties.

Results

A total of 6869 forms and 1527 forms were used for the pre-orientation and the post-orientation analysis, respectively (Table 1). The results revealed that 12/20 questions had statistically significant improvements in their response rates following the orientation program. From these improvements, the most significant improvements were seen in the fields for specimen orientation (+43.16 percentage points [pp]), Status of neoadjuvant therapy (NAT) (+34.6 pp), and contact number (+31.44 pp). Conversely, a few fields showed declines in response rate. These were for relevant radiological findings (-29.09 pp), the consultant's seal (-14.15 pp), and the ward (-3.53 pp). Furthermore, a chi-square test of homogeneity ($p < 0.05$) suggested statistically significant differences between the proportions before and after intervention.

Table 1: Response rates for different fields in the requisition form before and after the orientation program

Data Group	Question	Before (count)	Before (%)	After (count)	After (%)	Statistically significant (95% Confidence level)
Patient Information	Patient Name	6869	100.00	1527	100.00	No
	Age	6861	99.88	1527	100.00	No
	Ward	6778	98.68	1453	95.15	Yes
	Contact Number	4646	67.64	1513	99.08	Yes
	Gender	6537	95.17	1519	99.48	Yes
	Bed Head Ticket (BHT) Number	6841	99.59	1525	99.87	No
Clinical Information	Specimen Type & Size	6861	99.88	1527	100.00	No
	Relevant Clinical History (Duration and Findings)	6663	97.00	1478	96.79	No
	Probable/ Differential diagnosis	4689	68.26	1351	88.47	Yes
	Relevant Radiological Findings	5750	83.71	834	54.62	Yes
	Details of a previous biopsy were done	5047	73.48	1481	96.99	Yes
	Neoadjuvant Therapy Given/Not given	4326	62.98	1490	97.58	Yes
	Relevant Operative findings/Endoscopic findings	4796	69.82	1486	97.31	Yes
Administrative Information	Specimen Orientation	3770	54.88	1497	98.04	Yes
	Date	6672	97.13	1507	98.69	Yes
	Name	5013	72.98	1319	86.38	Yes
	Designation	4651	67.71	1152	75.44	Yes
	Consultant's Seal	2650	38.58	373	24.43	Yes
	Signature	6052	88.11	1511	98.95	Yes
	Name of the Consultant	6693	97.44	1517	99.35	Yes

Discussion

Laboratory diagnosis is a vital step in the hospital procedure. It is estimated that as many as 98,000 people die per year due to medical errors made in hospitals (Institute of Medicine, 2000). Therefore, it is essential that all diagnostic forms are filled out completely and correctly by doctors. Many errors are known to occur in the pre-analytical phase of which the incomplete filling of requisition forms plays a major part. Our study demonstrated that the orientation program had a dramatic improvement in the completion of these requisition forms overall.

The improvement was most pronounced in the specimen orientation field. Accurately indicating the specimen orientation is crucial to identifying surgical margins. This is especially important when handling malignancies (Patel and Jenkins, 2016). In surgical pathology, 27-38% of the mistakes occur due to incorrect specimen identification (Nakhleh and Zarbo, 1996). If the specimen orientation is not indicated, histopathologists cannot differentiate the surgical margins. This can cause false-positive or false-negative reporting of margin status. A false negative margin causes local recurrence (Persing *et al.*, 2011; Burstein *et al.*, 2019). If the surgical margin is inadequate (adequacy varies from lesion to lesion), the surgeon may have to excise more tissue from that particular margin. Therefore, it is essential that the medical officer in the theatre at the time of the surgery indicates the specimen orientation on the request form. If the orientation is not given, the surgeon will have to be contacted for this information. The lack of orientation is usually noted only when the specimen is taken for grossing, which is about 24 hours after the surgery, as it is standard procedure to keep specimens in the fixative for this period before grossing to ensure good tissue fixation. As such, there are increased chances of error in the surgeon's recall. Our study indicates that an orientation program could combat this problem by educating doctors regarding this aspect, as post-orientation results indicate that 98% of the forms had the specimen orientation filled, a

43.1% increase from 54.9% before the orientation program was conducted.

In addition, there was also a notable improvement in informing the status of neoadjuvant therapy (NAT) i.e., whether NAT has been given or not given. This information is critical when handling specimens with malignancies that have undergone NAT before surgery. For example, if a tumour responds well to NAT, there may not be macroscopic evidence of the tumour in the surgical specimen (Marchiò *et al.*, 2015). This will be a conundrum for the pathologist who has not been informed that the patient has undergone neoadjuvant therapy. In addition, the tumour response and nodal response to NAT must be stated in the report of these patients. Tumour staging should also indicate that the patient has undergone NAT. None of this will be possible if the pathologist is unaware of the NAT status of the patient. As such, the report will be incomplete and lack information critical for patient management (Sahoo *et al.*, 2022). In our study, the filling of this field significantly improved 34.6% from 63% before the intervention to 97.6% after the intervention.

We also found that filling of the relevant operative/procedural findings increased from 69.8% to 97.3%, filling of information regarding previous biopsies of the lesion also improved from 73.2% to 94.3%, and the probable/differential diagnosis was given in 88.3% of the request forms compared to the 68.0% seen prior to the orientation program. The relevant clinical details and a differential diagnosis are required for accurate interpretation of histopathology slides, as these data help the histopathologist to narrow down from a range of possible suspect diagnoses (Nakhleh and Zarbo, 1996). In the study conducted by Nakhle *et al.*, it was found that out of the 77% rate of error due to discrepancy or lack of sufficient information, 40% occurred due to no clinical history or diagnosis being available in the requisition form. This reinstates the need to have the relevant clinical details, including operative findings, details of previous biopsies done of the lesion, and differential diagnosis in the requisition form. Additionally, some studies

reported clinical history missing in 50% and 85% of the forms, while other studies reported much lower rates of missing clinical information (Abbasi, Asghari and Niazkhani, 2023; Oyedeki, Ogbenna and Iwuala, 2015). A study conducted in South Africa found the clinical diagnosis to be lacking in 19.1% of the cases (Nutt, Zemlin and Erasmus, 2008). In contrast, in our study, the differential diagnosis was indicated a 68.0% of the forms before the orientation. However, even after the intervention, the filling rate only reached 88.3%, which signals that further investigation has to be conducted to find any other reasons for the problem.

On the other hand, the least omitted fields before the orientation program were patient name (0%), patient age (0%), and specimen type & site (0.12%). These results were similar to two studies conducted in the UK and Turkey, where patient name and specimen type were filled in more than 90% of the requisition forms sampled (Burton and Stephenson, 2001; Abbasi, Asghari and Niazkhani, 2023). The patient's age and gender sometimes help histopathologists to arrive at a differential diagnosis (Nakhleh and Zarbo, 1996). In the study conducted in Turkey, age was found to be filled in about 82% of the forms, which slightly contrasts with our results, where this field was filled in about 99.9% of the forms even prior to the orientation program.

In our study, only 67.7% of the pre-orientation requisition forms had the contact number of the patient. This is a direct contrast to the study conducted in Turkey, which showed a more than 90% filling rate (Abbasi, Asghari and Niazkhani, 2023). A contact number is especially needed when the pathologist needs additional clinical information or details regarding investigations in order to arrive at a diagnosis, or to finalize the histopathology report. It is also needed by the lab to inform patients regarding urgent reports that should be shown to the clinician immediately. The orientation program improved the filling of this field by 31.5%, from 67.6% to 99.1%.

While the completion rates of most fields increased significantly after the intervention, we also spotted declines in the completion rates in some of the fields. The inclusion of the consultant's seal decreased by 14.2%, from 38.6% before the intervention to 24.4% after the intervention. The consultant's seal is put on requisition forms as a means of confirming the identity of the clinician responsible for the patient and, hence, sending the specimen. We postulate that this decline might be due to the increments seen in filling the name (13.4%), signature (10.84%), and the designation (7.73%) of the doctor filling the requisition form. This decline may suggest that the doctors believe filling out their name, signature, and designation could compensate for the missing consultant's seal, as the seal conveys similar identifying information used to authorize the tests. A seal reinforces institutional policy and could prompt clinicians to think twice about test necessity (Eaton *et al.*, 2018). Hence, it is required to be put on histopathology requisition forms.

A notable decline in completion rates was also observed in the inclusion of relevant radiological findings, with rates decreasing from 83.71% before the intervention to 54.62% following it. However, in many of the post orientation forms collected, a copy of the original radiological reports was seen to be attached, which is clinically diligent. We postulate that, as copies of the radiological reports are attached, the interns might have thought it was redundant to write it again in the requisition form. However, from an administrative perspective, it is necessary to have all sections filled as it is more reliable in the event the attached copies get misplaced. Therefore, future training should stress the administrative necessity of completing all relevant fields even when reports are attached. A key limitation of this study is the single-center design. However, the interns working in this centre had done their undergraduate studies in other universities across the country. Therefore, though this study was done at a single centre, the requisition forms used, were filled by interns that have passed out from many different universities and hence a broad sample of training backgrounds is included in

the study. This in turn strengthens the generalizability of the training intervention itself.

The use of a laboratory information management system with electronic requests containing mandatory fields and automated error checks would drastically reduce requisition errors. Therefore, implementation of such a system should be a priority in any hospital including hospital in low resource settings.

Another strategy is for medical schools to have greater emphasis on pre-internship training of requisition form filling. This can be done during the clinical appointments where it is made mandatory for the students to fill requisition forms under the guidance of senior doctors.

Other possible methods that can be used to reduce requisition errors include standardizing the design, auditing high-error departments as well as maintaining feedback loops.

Conclusion

The orientation program focused on explaining and helping intern doctors understand why it is important to fill each of the fields in the histopathology requisition form. Following this, we saw a significant improvement in the completion rates of most of the fields in the requisition form. Our data reinforces that such orientation programs are a valuable quality improvement initiative, particularly in a high-stakes environment like a tertiary care histopathology laboratory. Therefore, regular implementation of such orientation programs will undoubtedly contribute to the reduction of pre-analytical errors such as incomplete filling of HRF especially in resource-limited settings or those without a fully digitized system.

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