INCREASING THE PERCENTAGE OF APPROPRIATE TESTS CONDUCTED IN THE SEROLOGY LABORATORY, HOSPITAL SULTANAH NUR ZAHIRAH

Azlina Yahya, Osama Abdul Nasir

Serology Laboratory
Hospital Sultanah Nur Zahirah, Kuala Terengganu

Corresponding Author: Azlina Yahya
✉ *azlina_yahya@moh.gov.my*

Abstract

Wastage due to unnecessary laboratory test requests is a major problem in government hospitals because they have cost implications. Although screening of infectious marker tests such as Human Immunodeficiency Virus (HIV), Hepatitis B surface Antigen (HBsAg), Hepatitis B antibody (AHBS) and Hepatitis C Virus (HCV)) before testing have been put in place, inappropriate tests were still being carried out in the Serology laboratory, which resulted in wasted human resources and reagents, increased workload and increased maintenance costs. Based on the verification studies using the Laboratory Information System (LIS), we observed only 70% of the tests followed the ordering guidelines or test specifications. Thus, we aim to increase the standard to more than 95% of the infectious marker test requests which were appropriate according to a few guidelines.

A cross-sectional study was conducted for all infectious marker tests received at Serology Laboratory from January 2015 to June 2016 to verify the problem. A workplace audit and questionnaire survey on the staff were carried out to gain more information. Low level of knowledge, unavailability of standardised guidelines for quick and easy reference, lack of staff and inefficient work processes were among the main contributing factors. Empowering new staff to screen specimens, developing simple and informative screening guidelines, providing adequate trays and refrigerators for screening purposes and strengthening and developing a more effective process of care were the strategies taken during this study.

The appropriate tests carried out from July to September 2015, October to December 2015, January to March 2016 and April to June 2016 were 99%, 98.80%, 99.50%, 98.90% respectively. During the same period, 711, 411, 710 and 768 tests were rejected. We monitored the performance and managed to achieve 100% appropriate testing for the period of July 2016 to June 2018 and an estimation of MYR 73,437.50 cost saving was achieved.

KEYWORDS: Appropriate test, infectious marker test, serology laboratory, quality study

Problem

In programmes such as Haemodialysis, Thalassemia, and Methadone rehabilitation, regular screening of infectious marker tests for (Human Immunodeficiency Virus (HIV), Hepatitis B surface Antigen (HBsAg), Hepatitis B antibody (AHBS), and Hepatitis C Virus (HCV) is important to ensure patients' safety. Besides, screening the antibody status of HBV in healthcare workers is also crucial to determine the immunisation requirement. The requisition of the above tests needs to comply with certain specification or guidelines, including those from the Ministry of Health (MOH) and state-level authority. Failure to meet the specifications or guidelines will result in inappropriate testing and wastage.

In order to ensure that clinicians' requests comply with the guidelines, screening of the requests before testing had been made compulsory in our laboratory since early 2014. However, verification study carried out in July to December 2014 showed that 30% of the requests did not comply with the specification and guidelines, particularly the request for the same test repetitively in a short period of time and failed to comply with the test algorithm.

The Serology Laboratory in the Pathology Department is one of the major laboratories in Hospital Sultanah Nur Zahirah that provides serological testing services to all health facilities in the seven districts of Terengganu. On average, our laboratory runs about 9,000 tests per month, of which 3,000 are infectious marker tests. There are eight medical laboratory technicians, three scientific officers and one medical officer (on a rotation basis) working in the Serology Laboratory. However, the screening process is performed only by the medical officer resulting in heavy workload, delays and ineffective screening process. Thus, this quality project aims to increase the percentage of appropriate infectious marker tests from 70% to more than 95% within six months.

Background

Carrying out tests following inappropriate requests resulted in wastage of multiple resources, including funds, laboratory reagents and human resources because of the heavy workload for unnecessary tests. These circumstances might have resulted from the ineffectiveness of the specimen screening system in Serology Laboratory, heavy workload and lack of personnel. A Study conducted in Turkey reported that 12.9% test requests were not suitable for Anti-HBs test (1). Findings from another study in a tertiary hospital showed that 11% of tests were repeated, over-utilised, simply avoidable and could be excluded, while 10% of ordering physicians were responsible for the problems (2). In addition, a study carried out in Sarkaya University revealed that high test repetition rate of 87.7% resulted in a waste of USD 6,489 for a period of five years while the estimated cost of wasted tests for unnecessary testing of antiretroviral, anti-HCV and HBsAg tests across Turkey was USD 1,042,215 (3). Evidence showed that single and combined interventions, such as educational initiative and guideline dissemination were effective in improving test utilisation and physician orders (4). Moreover, another study suggested that a computerised ordering system, complete with algorithms, clinical pathway analysis, and cost information could help in examining and restricting the order of test (5).

Measurement

Initial data were gathered using the Laboratory Information System (LIS), monthly rejection statistics, questionnaires and workplace audit. Data from LIS were used to calculate the number of requests that were appropriate for testing and the number of cases rejected in both pre and post-remedial phase. Cases for inappropriate infectious marker test requests that should not have been tested, but still had been carried out were also calculated. This study used the percentages of appropriate tests request against the total tests run as the indicator to evaluate the achievement, with a standard of more than 95%, based on our group consensus. Our baseline findings showed that only 70% of infectious marker test requests were appropriate, while 30% of the specimens should have been rejected

earlier. We collected data using LIS for a period of six months.

Initial Assessment of the Problem

According to the problem analysis, a few factors contributing to the problem in hand including a low level of knowledge on the screening process, too many specimens received daily, lack of staff to perform the screening, inefficient work process, and inadequate specimen isolation system.

We begin the study by assessing the knowledge of Serology Laboratory staff using a set of questionnaires comprising 10 questions. The questionnaires focused on whether they had performed screening of specimens or not and their knowledge about specific guidelines for infectious marker testing. The questionnaires were distributed before and after interventions to evaluate the successfulness of the educational initiative strategies.

Results showed that only 10% of the staff knew about the guideline and had performed screenings, 20% had knowledge but did not perform screenings, while 70% were not aware of the screening processes, which concluded the staff's poor level of knowledge of the screening process.

In order to understand more about the screening process, we reviewed the work process of care, the key person responsible for screening and the standard operation procedure (SOP). Photos were taken and the flow of the screening process was observed to gain more information about the existing problem. Audits finding showed that there was only one medical officer assigned for the screening process. As a state hospital that received 3,000 specimens every month, screening handled by one staff was definitely inadequate. We also found that screening was not efficient as the rejection comments, which were supposed to be clear so as to educate the requestors on the correct guidelines, were not standardised.

In the process of care (POC) evaluation, we found that the current POC used in screening the specimens was inadequate to guide the screener, thus, resulting in the inefficient screening process. There was no guideline for reference at the receiving area. The flow of specimens and forms to be used in the stages of receiving, accepting and rejecting was unclear in the existing POC. The available refrigerator was inadequate to store all of the specimens received, efficiently. The forms and specimens between the screened and unscreened were not properly sorted and labelled. These data supported all the potential factors contributing to the problem during the problem analysis phase.

Strategy

Based on the identified contributing factors, we discussed and set up four improvement strategies to be implemented. A QA team consisting of scientific officers and laboratory technologists was established at Serology Laboratory under the supervision of a Clinical Microbiologist. The implementation team met every four weeks during the cycles to monitor the implementation of the new POC.

Staff management was the first strategy implemented to enhance the screening process. Four scientific officers were assigned as screeners in addition to the existing medical officer. They were responsible for screening all specimens received twice a day; in the morning and afternoon. This new arrangement had sped up the screening process and reduced delay in testing the samples.

We developed a simple and informative screening guideline to assist the screeners. Continuous training sessions for all staff was conducted as the second strategy. This guideline covered the category of request, appropriate detention for a repeat test, an appropriate time interval for each test, and a test algorithm based on the MOH Malaysia guideline. Training was conducted for all serology staff based on the new guideline to increase their knowledge and facilitate the screeners in assessing the appropriateness of the requests and confidently reject specimens, which did not meet the specification or did not follow the guidelines. Softcopy of the guideline was made available in each computer at Serology Laboratory for ease of access. Orientation sessions were conducted for new staff by senior staff to disseminate knowledge on the screening

process and they were supervised during the screening activities. New junior doctors were also exposed to the guidelines for appropriate test request during the orientation programme. Using standardised reasons for rejection resulted in better understanding and acceptability by the requesting clinicians.

We reviewed the current process of care and found that it was inadequate to guide the staff for effective screening. Therefore, the process of care (Figure 1) was streamlined in more detail, which involved the work processes and surrounding structures according to our Model of Good Care (MOGC). We added a few steps in the process of care that are critical to making the screening process more effective. The new POC ensures only specimens that passed the screening process were tested.

Screenings were carried out based on the new guidelines developed in which the standardised rejection criteria comments as outlined in the guideline were used to reject inappropriate specimens. This is important in order to educate the requestor on the criteria for an appropriate test request.

Systematic isolation of specimens and forms had been implemented whereby specimens and forms were separated into two different trays, which were labelled as screened and unscreened, to ensure the screening process efficiency and facilitate staff. Additional double door refrigerator had been placed in Serology Laboratory to accommodate all specimens received. Accepted and rejected specimens were segregated and properly labelled between those screened and unscreened, and stored appropriately in the refrigerator.

Results

The post-remedial evaluation was conducted to assess the effectiveness of the measures that had been implemented. In July to September 2015, 99.2% of the tests conducted were appropriate with 711 specimens rejected, while in October to December 2015, 98.7% of tests conducted were appropriate with the rejection of 411 tests. The outcomes suggested that the measures taken were effective in overcoming the stated problems, and tests that do not meet the guidelines were rejected. In January to March 2016, 99.5% of the tests were screened and appropriately tested with a rejection of 710 tests, while in April to June 2016, the appropriate test was 98.8% with a rejection of 768 tests. QA Standard of more than 95% was successfully achieved until June 2016, indicating that all measures taken were effective.

The monitoring continued until June 2018 to assess the sustainability of the applied measures. All specimens received were efficiently screened and appropriately tested, which in turn, achieved the QA standard of 100% (Figure 2).

After the interventions, 60% of staff knew and screened, 20% had knowledge but did not perform screening, while 20% still had low awareness of the screening processes (Figure 3).

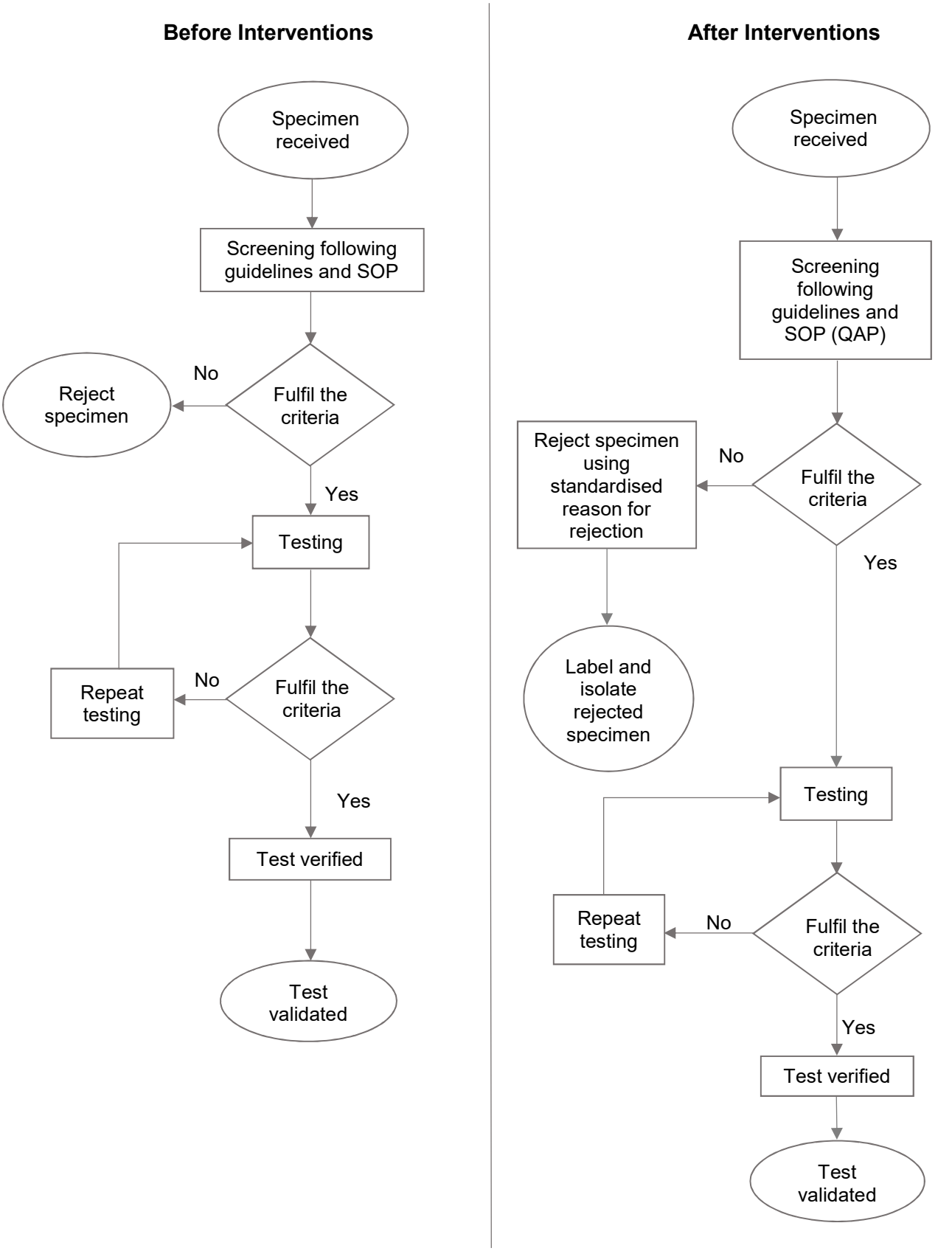

Figure 1: Improved SOP/ POC to enhance test screening in the serology laboratory.

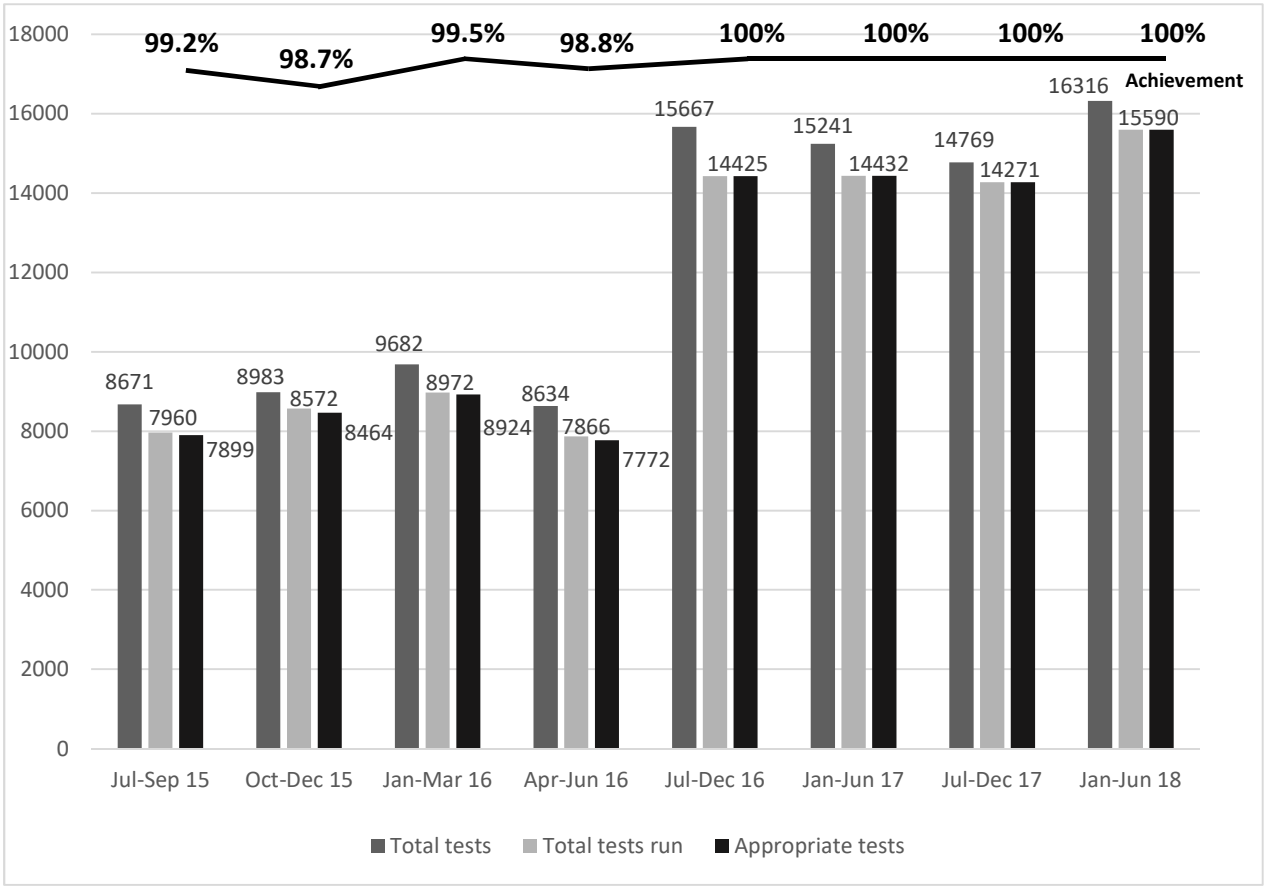

Figure 2: Total number of tests received, tests run and appropriate tests.

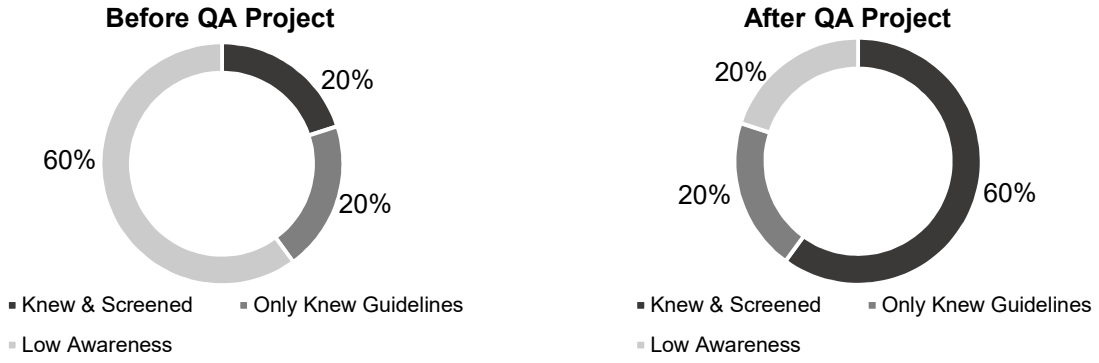

Figure 3: Staff knowledge on screening guidelines and process before and after the intervention.

We learned that after the interventions, more specimens that did not follow the guidelines were able to be identified efficiently and rejected. The rejected specimens as shown in Figure 4 reflect the efficiency of the new POC whereby all inappropriate tests were successfully screened and rejected with standardised rejection comments. We also found that rejected specimens tripled from before QA (Oct – Dec 2014), which was around 246 specimens and after the QA strategies were implemented, the rejection was as high as 1,242 specimens in July to December 2016 (Figure 4). The rejection rate from October to December 2015

decreased and more appropriate specimens were received. These findings were derived from the standardised rejection comment that has been implemented, which taught the requestors of the correct guidelines and guided them in sending appropriate specimens.

However, the rejection rate increased from January to Jun 2016, which could be due to the high turnover rate of housemen that might have contributed to the unnecessary specimen sent to Serology laboratory. This is despite the training given during the orientation programme for house officers that was held at the Pathology Department from time to time. The number of rejected specimens fluctuated from July to September 2015 and from January to June 2018 and we stipulated that this has resulted from an upturn in regulatory compliance (Figure 4).

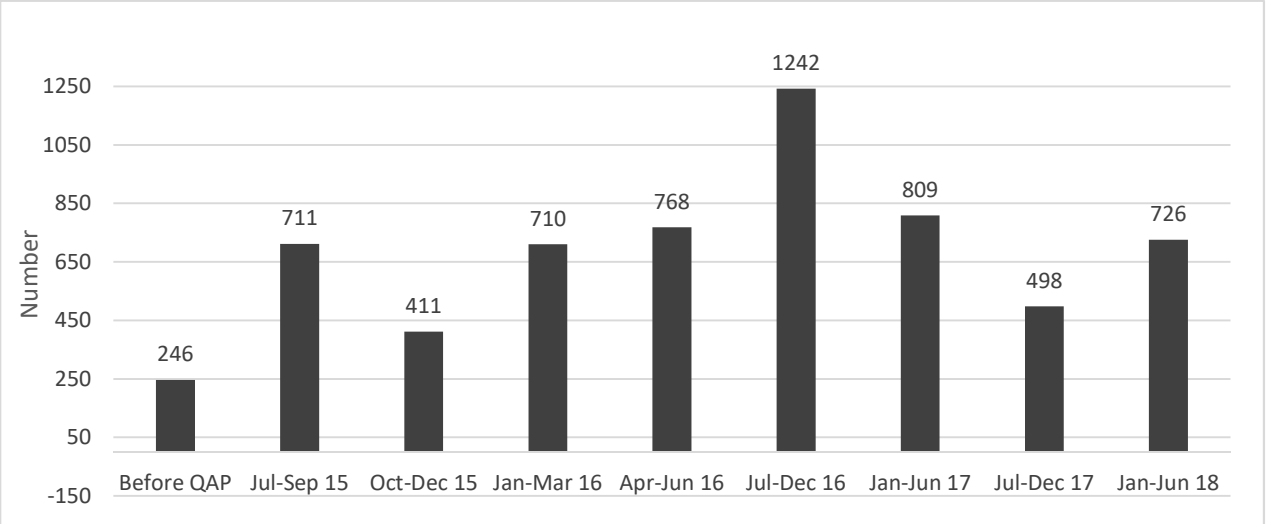

Figure 4: Number of tests rejected in post remedial phase in serology laboratory.

Through this study, we rejected 5,875 tests from July 2016 to June 2018, which did not meet the guidelines or specifications and we estimated that MYR 73,437.50 of reagent cost could be saved. This savings can be channeled to more needed tests in the routine microbiology test, such as blood culture and sensitivity test, CSF analysis, and others.

Lessons and Limitations

The QA study had opened our eyes to the causes that contributed to the problem and the implemented strategies had successfully improved the specimens' routine screening process and reduced inappropriate testing. Appropriate testing of infectious diseases' tests has increased from 70% to more than 95% in six months.

Rejected requests were accompanied by uniform comments of the guideline and this has indirectly fostered positive values among clinicians to order the right test. Rejected specimens were still high compared to our department target rate of rejections, which should be less than 1.5%. Continuous training session for new staff must be maintained especially for House Officers. Besides that, this project provided the opportunity of collaborative work to improve the patients' outcome with limited resources and also enhanced the spirit of teamwork between clinicians and laboratory staff.

One of the limitations of this study was that our Hospital Information System (HIS) could not be fully utilised and synchronised with the Laboratory Information System (LIS) to assist clinicians to make decisions in ordering tests for patients. This was a challenge for both parties to maintain good practices to optimise laboratory testing requirement.

Conclusions and Next Steps

This study suggests that the improvement in the screening process of infectious diseases had led to the appropriateness of testing in Serology Laboratory. However, there are rooms for

continuous improvement to ensure that the testing process is carried out in accordance with the appropriate clinical justification, such as involving medical laboratory technologist as a screener and expanding the screening process to other tests in Serology Laboratory. This will minimise wastage in healthcare which is in line with the government's aspiration to optimise the budget allocation for the Ministry of Health.

The guideline produced based on this QA project has been circulated to all hospitals and health clinics in the state of Terengganu. This QA project was in line with the recommendation by the Honorable Prime Minister of Malaysia and the Ministry of Health Malaysia for the budget-saving measure. In April 2016, a circular from Pathology Service MOH related to screening and conducting 'clinically indicated' test was issued which is in line with our guideline.

In addition, we also plan to expand the screening process to all tests in Serology Laboratory such as Leptospirosis test, Dengue test, tests from TORCHES panel (Toxoplasma, Rubella, Cytomegalovirus, Syphilis and Herpes Simplex 1/2) and Autoimmune tests, such as the Anti-Nuclear Antibody test to ensure that all tests carried out in the laboratory are appropriate. We also need to reduce the high rejection rate to the standard of our departments, besides being able to screen the clinicians' requests successfully.

Acknowledgement

The authors would like to thank the Director General of Health Malaysia for his approval to publish this work. The authors are grateful to Dr. Nor Azimi binti Yunus, the Director of Hospital Sultanah Nur Zahirah, Dr. Alawiyah binti Awang Abd Rahman, the Head of Pathology Department and Dr. Fatimah Haslina binti Abdullah, the Head of Microbiology Unit. The authors would also like to extend the appreciation to the Serology Laboratory Members; Rosmawati binti Ab Rahman, Mazirah binti Mazlan, Mohd Fuaad bin Hasan and Amira Nabila binti Mohamad.

Conflict of Interest

None

Funding

None

References

1. Ağca H. Inappropriate requests of viral hepatitis serologic tests. J Clin Exp Investig. 2012;3(2):181-184. doi:10.5799/ahinjs.01.2012.02.0140.

2. Khalifa M, Khalid P. Reducing unnecessary laboratory testing using health informatics applications: A case study on a tertiary care Hospital. Procedia Comput Sci. 2014;37:253-260. doi:10.1016/j.procs.2014.08.038.

3. Demiray T, Koroğlu M, Karakeçe E, Özbek A, Altindiş M. Cost of unnecessary repeat requesting of tests for hbsag, anti-hcv and anti-hiv screening in a university hospital. Viral hepatit derg. 2015;21(3):76–9.

4. Vegting IL, Van Beneden M, Kramer MHH, Thijs A, Kostense PJ, Nanayakkara PWB. How to save costs by reducing unnecessary testing: Lean thinking in clinical practice. Eur J Intern Med. 2012 Jan;23(1):70–5.

5. Freedman DB. Towards Better Test Utilization - Strategies to Improve Physician Ordering and Their Impact on Patient Outcomes. Ejifcc. 2015;26(1):15-30. http://www.ncbi.nlm.nih.gov/pubmed/27683478%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4975220.