



Managing Immunohistochemistry Requests in a High Throughput Laboratory

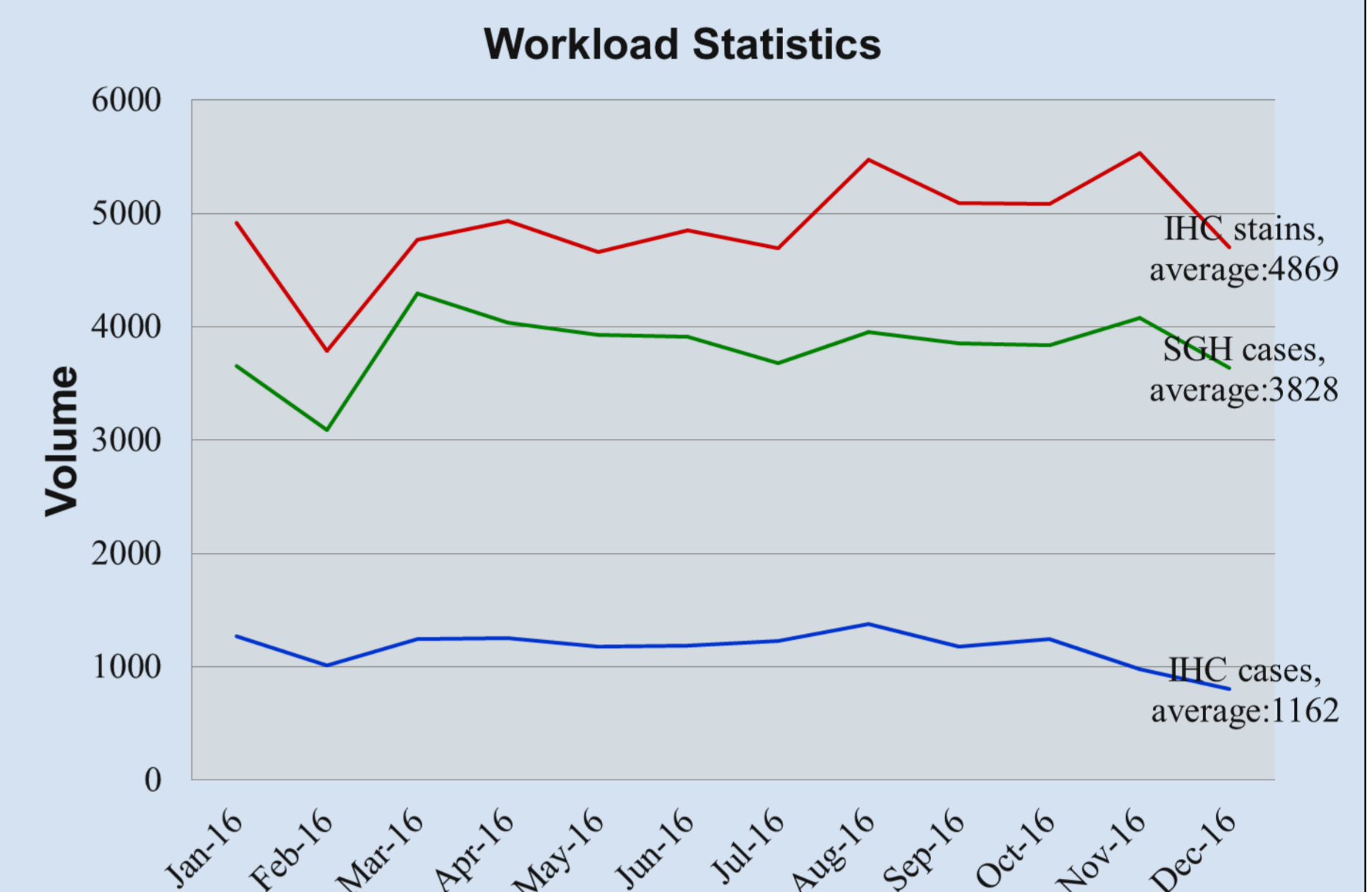
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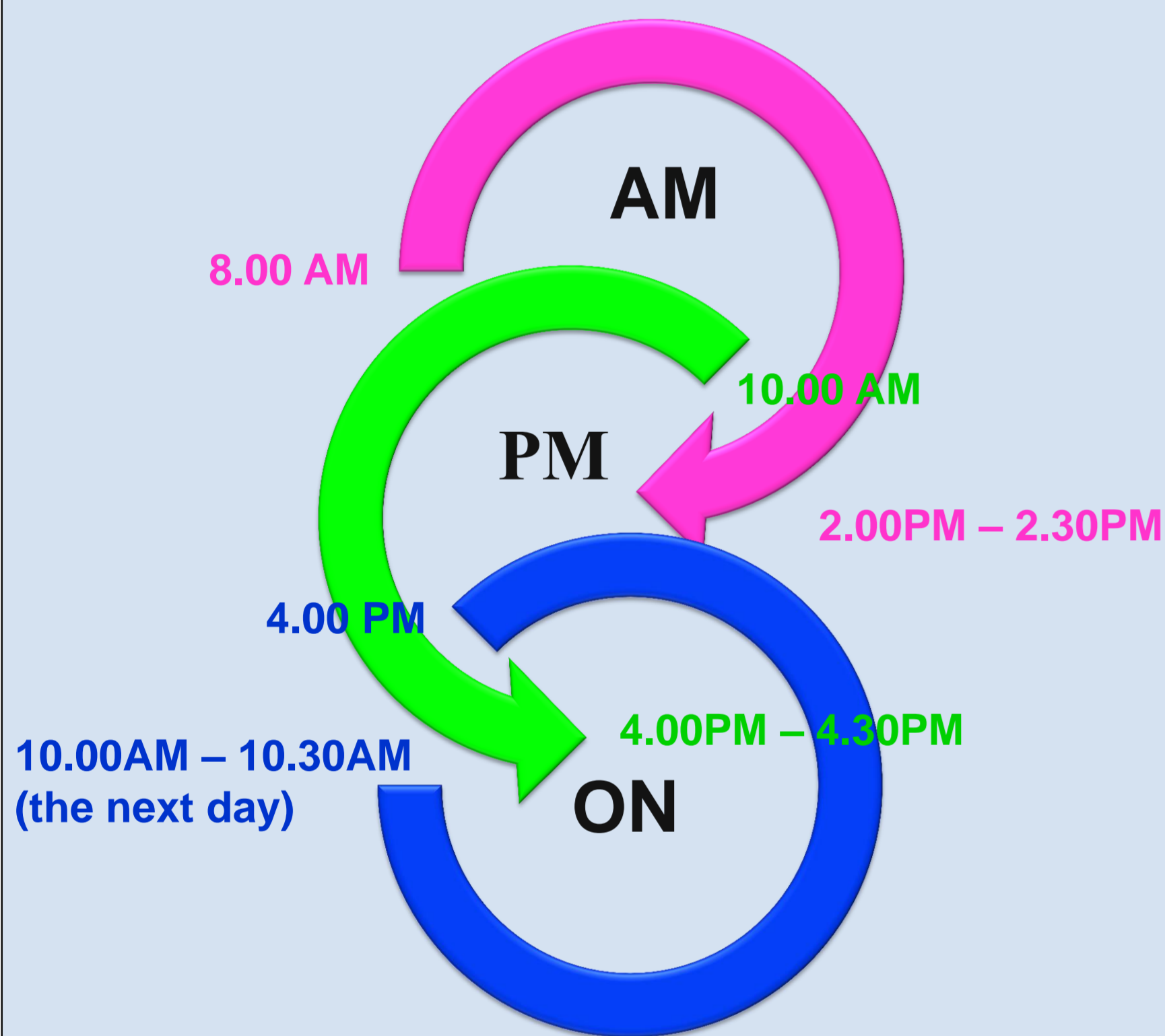
INTRODUCTION

Singapore General Hospital (SGH) is one of the biggest hospitals in Singapore, receiving a high volume of cases every day with various and wide range of specimens, and different degree of complexity. Serving at least 50 histopathologists, immunohistochemistry (IHC) laboratory in SGH receives an average of 55 cases per day and ranges from 150 to 320 microscopic slides to stain every single day. With the limitation of space, labour, costing factors and lengthy staining duration and overall procedures, IHC lab had to find a way to maximise resources within the given working hours. It has to also find a lean solution to establish a workflow that would help reduce time wastage and eliminate unnecessary steps and procedures.

IHC laboratory in SGH holds 4 Roche Ventana Ultra machines, 2 Leica Bond III machines and 1 Leica Bondmax machine. We have narrowed down into 3 steps in managing immunohistochemistry requests in a high throughput laboratory.



STEP 1: Batch staining



Morning (AM) Run
Cut-off time: 9.00am
Start run: 10.00am
Submission of slides: 2.00 – 2.30pm (single IHC stains)
4.00 – 4.30pm (double stains and ISH stains)

Afternoon (PM) Run
Cut-off time: 12.00pm
Start run: 1.00pm
Submission of slides: 4.00 – 4.30pm (single PM IHC stains and AM double stains/ISH stains)

*Double and ISH stains are not run in PM batch.

Overnight (ON) Run
Cut-off time: 4.00pm
Start run: 5.00pm
Submission of slides: 10.00am – 10.30am (submission of all stains is on the following day)

Entire cycle starts from collecting requests to submitting of slides. Each run overlaps each other. Hence, timing is crucial. The advantage of batch staining method as compared to stain as per demand is that time and resources are well managed. Successfully achieving a lean workflow in IHC lab would also mean decreasing turnaround time so that pathologists are able to diagnose faster. A major disadvantage of this method is that one run affects the other subsequent runs. Any delay in a cycle (due to high volume workload or incompetent histotechnologist) will significantly affect other runs. In addition to that, any staining or machine error would more likely to affect the whole batch and troubleshooting can only be done once the batch staining is done.

STEP 2: Breaking up each cycle into bite-size tasks

Having smaller tasks allows multiple jobs to be done simultaneously. This will reduce time wastage tremendously. However, team synergy is very critical for this method to be carried out. Inefficiency and human errors will cause unnecessary hiccups and more time spent on troubleshooting. Assigning these small tasks to different allocated manpower is the key. Instead of one person do-it-all system.

Accessioning requests and collecting paraffin blocks	<ul style="list-style-type: none"> External requests from private clinics or lab Add on request from SGH campus Retrieve archived paraffin blocks
Transferring requests to paraffin blocks	<ul style="list-style-type: none"> Tedious task of recording each stain manually. First level of human error <ul style="list-style-type: none"> Written wrong stain Missed out stains
Taking control slides for each stain	<ul style="list-style-type: none"> Another tedious and time-consuming task Choosing appropriate positive control Pre-cut controls for each stain Basic knowledge of stains is useful
Microtomy	<ul style="list-style-type: none"> Competent in microtomy Produce good quality sections in shortest time Fish sections nicely on coated slides 20 mins of heating on the hotplate after cutting
Generating Ventana and Bond labels	<ul style="list-style-type: none"> Choosing appropriate autostainer Generating labels for new and add-on cases Labels for single and double stains Create a stains-vs-machines plan based on labels printed
Matching and pasting labels to slides	<ul style="list-style-type: none"> Pasting of labels onto slides Detecting and rectifying errors <ul style="list-style-type: none"> Missed out stain – send block back for cutting Wrong control – send block back for cutting Wrong block – retrieve correct block Printing error – reprint label
Preparing staining machines and reagents	<ul style="list-style-type: none"> Prepare antibodies for autostainers Use correct dilution ratio Top up bulk reagent buffers Ensure waste is below max level
Loading slides and starting machines	<ul style="list-style-type: none"> Correct position of slides in autostainer Ensure machine/run starts Take note of error message and follow corrective measures
Charging cases	<ul style="list-style-type: none"> Charge each case in the system Charge appropriately for add-on stains
Counterstain, dehydrate and mount stained slides	<ul style="list-style-type: none"> Remove slides from autostainer Separate stains which need to counterstain and/or dehydrate only. Clean autostainer and any accessories after run
QC stained slides	<ul style="list-style-type: none"> Identifying weak stains Grade the stains
Submissions of slides to pathologists	<ul style="list-style-type: none"> Arrange slides according to cases Submit to pathologists Dispatch external cases to requesting institutions

STEP 3: Manpower & Training

Another contributing factor in achieving a streamline process is actually dependent heavily on the efficiency and competence of histotechnologists. As the process of slides and machines preparation is very manual and tedious, it provides room for human errors.

Amending errors would cause unnecessary repeated steps and time wastage. Any delay in one of the processes of the workflow would result in delayed slides submission, increasing turn around time and at the same time affecting and delaying subsequent runs as well.

Hence, sufficient training of at least 3 months is essential to prepare an immunohistochemistry tech. An assessment will be conducted at end of 3rd month to grade the technician. Training will be extended if necessary.

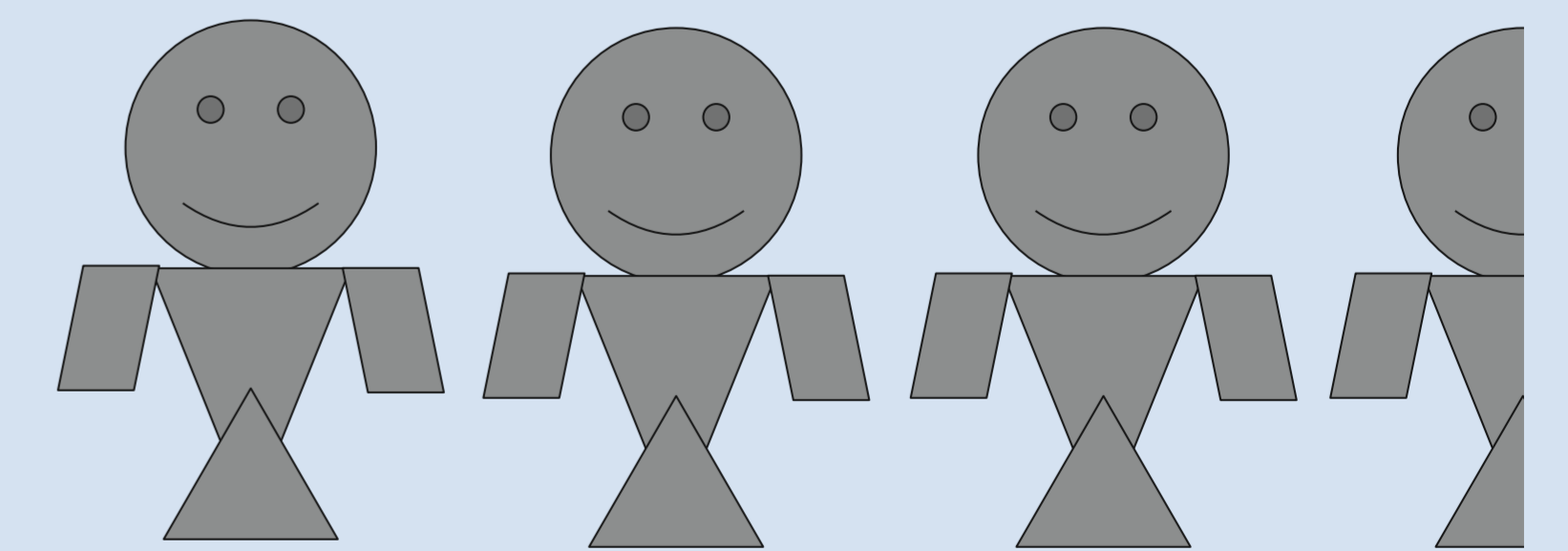
Training covers all technical aspects of pre-run, preparation of machines, antibodies and maintenance of machines. As well as inventory, statistics, basic QC of stained slides and troubleshooting skills.

The objective is to produce a competent and independent immunohistotechnologist who is able to perform duties with minimal supervision and errors.

In terms of manpower, the ideal number to run SGH immuno lab is 3 and half person (excluding immuno I/C). Each person is responsible of each run and the half person helps in wherever needed. AM, PM and ON person manages their cycle, making sure all requests are submitted, target time are met and stains are working well. Also, it is important to help in other runs and other miscellaneous duties.

Even with a competent tech, any lesser than 3 man will disrupt overall workflow.

Hence, besides having a batch-staining system, a clear job scope, great team work and communication, appropriate number of manpower is also needed to maintain the whole system, managing immunohistochemistry requests in a high throughput laboratory.



ACKNOWLEDGEMENT

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