



# Improving Specimen Flow and Turn Around Times at Vancouver General Hospital (VGH)

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## REVISED ABSTRACT

**Background:** As the major reference centre and hub of the Vancouver Coastal Health (VCH) Regional Laboratory system, workload at the VGH laboratory is particularly heavy in the pre-analytic phase, including phlebotomy and specimen login procedures. Workflow bottlenecks cause turnaround time (TAT) delays. A process improvement project using lean methodology was undertaken to identify and address the systemic factors that lead to inefficient workflow and delayed TAT.

**Methods:** Project was deployed through these steps: (1) team was selected and trained, (2) team then chose a small study case to examine process, (3) objectives were developed based on study case findings, (4) process was re-designed using lean methodology principles, (5) new process was implemented and evaluated, first for the study case ward, then rolled out to other wards within VGH. The medical unit was the selected study case. Times to perform the pre-lean process steps were measured over a 2-week period. Wait times and non-value added activities were identified.

**Results:** The pneumatic tube transport was determined to contribute to workflow congestion during peak hours from 0600-1100 hours. As both STAT and routine bloodwork were transported via the pneumatic tube, both categories of samples were delayed due to the large volume handled.

Based on study case findings, a new process was designed to transport routine bloodwork during peak hours to improve workflow. This parallel process diverted routine bloodwork away from the pneumatic tube, which became less congested and remained crucial for transport of STAT samples. First phase of the new process was implemented to include 5 floors of nursing wards. Pre-analytic TAT for routine samples, from collect to receipt at 90<sup>th</sup> percentile, reduced from 2.2 hours to 1.3 hours. The re-designed process was then implemented to VGH wards. Overall TAT for inpatients has improved 22% (collect to receipt) and 26% (collect to result). Concurrent TAT improvement for STAT samples from Emergency Department (ED) was also accomplished.

**Conclusions:** Lean process methodology uncovered a surprising cause to workflow problems. By addressing the systemic cause of congestion, workflow improved for all samples. Other benefits include standardized phlebotomy carts, standardized work procedures, and staff who are motivated by the results.

## INTRODUCTION

The VGH laboratory provides routine and reference clinical diagnostic services in Chemistry, Hematology, Transfusion Medicine, Microbiology, Anatomic Pathology, Cytogenetics, and Transplant Immunology. The Specimen Collection and Processing area performs pre-analytic functions including phlebotomy and accessioning procedures:

- 230,000 venipunctures performed by laboratory staff each year, with approximately 800 per each weekday, and 500 per each weekend day
- 50% of all blood collections are performed during 0600-1100hrs
- 40% of samples are requested and processed as STAT

Lean methodology is a business approach that is based on the fundamental goal of eliminating waste and maximizing flow. Process improvement is achieved through reduction of non-value added steps. We used lean methodology to address TAT delays and increasing workload issues in our Specimen Collection and Processing area.

## METHODS

**Core team:**

- 2 medical laboratory assistants, 2 medical laboratory technologists and 2 operations directors formed the core team. An external consultant was retained. Core team worked on project from October 2007 to March 2008

**Lean tools applied:**

- Define Value and Value Stream Mapping (VSM)
- Pull production
- Reduce waste through 5S (Sort, Store, Shine, Standardize, Sustain)

**Communication:**

- Regular meetings to provide updates and share data with pre-analytic area staff. Feedback and suggestions were actively requested and incorporated
- Regular meetings were also held with analytic areas and laboratory stakeholders
- Core team members communicated with ward staff personally before changes were implemented

## RESULTS

### Results 1: Streamlined Process

#### Pre LEAN VSM

Q = Wait time

#### New VSM for Routine Samples

- Many non-value added activities
- Lots of Queue times. Pneumatic tube system = "Clogged freeway during rush hour!"
- 80% Routine samples diverted from pneumatic system by PULLING from wards
- Reduced non-value added activities
- Reduced handoffs

### Results 3: Standardized Equipments & Improved Workflow

#### 5S & Standardized Carts

**BEFORE** **AFTER**

- Phlebotomy carts reduced from 21 to 14
- Phlebotomy baskets reduced from 19 to 4

#### 5S & Standardized Work Stations

**BEFORE** **AFTER**

- Standardized and organized work environment

#### Pre-LEAN Study Case Findings

- STAT and routine bloodwork were all transported using pneumatic tube system to lab
- Bottleneck results in congestion and delays
- Chaotic work environment, exasperated staff

Collect to Receipt (Analyzer):  
 Range: 40-115 min  
 Ave: 76 min, 90<sup>th</sup> %: 103 min

#### Results of the 1<sup>st</sup> Circle

**First phase:**

- Collect to Receipt TAT at 90<sup>th</sup> percentile reduced from 2.2 to 1.3 hours.

#### Receiving Bench Aligned with Workflow

**BEFORE:** cluttered receiving bench  
**AFTER:** consistent workstation

- Re-aligned workflow reduced traffic through lab

#### Results 4: Further Efficiency Gains

- With improved collection times, working with Chemistry to eliminate:
- 250 grey top tubes per day = 100,000 tubes / year

### Results 2: Improved TAT

#### Ongoing TAT Data from In-Patients

All VGH inpatients, All Priorities at 90<sup>th</sup> percentile:

- Collect to Receipt: 80 min (22% improvement)
- Collect to Result: 110 min (26% improvement)

*Results are reported 30-60 minutes earlier*

#### Ongoing TAT Data from ED (All ED samples are STAT)

ED All STAT at 90<sup>th</sup> percentile:

- Collect to Receipt: 32 min (26% improvement)
- Collect to Result: 52 min (21% improvement)

*Concurrent ED volume increase from 3000 (Nov 07) to 3500 (Mar 08) per period*

## CONCLUSIONS

Using lean methodology, we identified the pneumatic tube as a contributing factor to our workflow problems during peak hours. We examined and re-designed our process, and:

- Improved specimen flow by reducing bottlenecks, reducing non-value added activities, and aligning benches with workflow
- Achieved TAT improvements of 21% to 26%
- Standardized phlebotomy carts, workstations, and training
- Reduced unnecessary supplies and waste
- Achieved a less cluttered, and more organized workplace
- Achieved team work and collaboration amongst phlebotomists, lab reception staff, and analytic area staff

## REFERENCE

1. BMG, 2002. *Lean for Transactional Business Processes*. Breakthrough Management Group Inc.

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