

# Protocol for a Practical Turnaround Time Study Including STAT and Routine Tests Using the ARCHITECT® *ci8200*

Michael G. Rush<sup>1</sup>, Donna P. Reinbold<sup>1</sup>, Cecilia T. Cote<sup>1</sup>, Paul Smith<sup>2</sup>, Mindi Wiviott-Schumacher<sup>2</sup>, Tricia Ravalico<sup>2</sup>; <sup>1</sup>Chemistry Laboratory, Sacred Heart Medical Center, Spokane, Washington, U.S.A.; <sup>2</sup>Abbott Diagnostics Division, Dallas, Texas, Illinois, U.S.A. XIX International Congress of Clinical Chemistry, IFCC/AACC 2005 Annual Meeting, July 24 – 28, 2005 – Orlando, Florida

## Abstract

### Objective

To evaluate “real world” turnaround times for a test mix that reflects daily operations in an acute care hospital.

### Background

Turnaround time and test throughput are critical factors in choosing chemistry/immunochemistry analyzers. Our protocol was designed to put analyzers to a practical test that would be directly applicable to our operation.

### Method

A battery of 20 samples was based on the mix of STAT and routine test orders we usually receive in the laboratory. The testing protocol included the following guidelines:

- Record time each specimen is put on instrument
- Report BMP and other chemistry tests before Immunoassay samples
- Include hemolysis, icterus, and lipemic indices
- Program samples on analyzer manually

### Protocol Execution (per Abbott report)

The analyzer was presented with a loadlist for 20 samples (12 routine/8 STAT) with a mix of chemistry and immunoassay. The TAT was calculated using the time stamp of the completed results against the recorded time that each sample was placed on the analyzer.

Routine tests were introduced into the *ci8200* routine bays, and STAT samples were introduced into the *ci8200* priority bays. Time zero began at tray insertion.

All samples were analyzed for the indices, hemolysis, icterus and lipemia. Test types included various Chemistry Profiles, Lipid Panels, BNP's, Amylase, Lipase, TDMs, Cardiac Markers, Quantitative Beta-hCG, Prolactin, Alcohol, and Iron/TIBC.

### Results

TAT for entire loadlist	38 minutes and 14 seconds
TAT for all STATs	19 minutes
TAT for all chemistries	23 minutes
TAT for Basic Metabolic Panel	10 minutes
Maximum time to aspiration from sample loading for all STATs	1 minute 43 seconds
Earliest time assay results released (CO2)	1 minute 14 seconds
ISE results available after aspiration	3 minutes 40 seconds
Total tests processed	334 chemistry tests 22 immunoassay tests

- Measurement of Indices had minimal impact on throughput and no impact to loadlist TAT

### Conclusion

The TAT study provided valuable data to use in comparing vendors and was a key factor in our decision to choose the ARCHITECT *ci8200*. The results of the study showed that the ARCHITECT *ci8200* could meet the demands of our medical staff for rapid STAT testing and still efficiently process the routine testing of chemistry and immunochemistry analytes.

## Introduction

During the selection process of a new integrated chemistry/immunoassay analyzer, one of the main objectives for SHMC Chemistry Laboratory was assuring turnaround times were decreased or maintained, especially for the emergency department patients and for stats from the floor.

It was difficult to get substantial data on how well the instrument would handle a specific workload in the Chemistry Laboratory. Therefore, it was decided to put together a TAT study to be done in a “real-world” setting on each of the analyzers that were being considered. The TAT studies would provide scientific data to assess actual workflow time through the analyzers.

Discussion will be limited to the Abbott *ci8200* analyzer for purposes of this presentation.

## Results and Discussion

### Chart 1: Sample TAT for SHMC Patient Mix

The data shows the amount of time for each patient after loading the sample on the analyzer for Protocol I and II. As is noted, Patient Number 9 has a very long TAT due to a STAT Prolactin being included and two sample types (serum and CSF). For some of the data tables, sample #9 is deleted from the values due to practical reasons. Arrows mark the STAT tests.

## Results and Discussion

### Chart 2: Sample TAT for Patient Mix of STAT Specimens

Stats were done well within 19 – 20 minutes as is shown by Chart 2 (excluding Patient Number 9). Overall, Protocol I results show a quicker TAT.

### Chart 3: Time to Result from Sampling: c8000 Panel: BMP

Results for BMP with indices are shown with the longest test being Glucose at 9 minutes and 55 seconds. Note that ISEs are resulted at 3 minutes and 40 seconds and CO2 is done at 1 minute and 13 seconds, a very fast TAT. These results were from Protocol I.

### Chart 4: Number of Tests Per Minute

Chart 4 shows how many tests were done every five minutes, on the c8000 and the i2000 side. Both modules were involved, c8000 and i2000. Note from these results that with Protocol I, the greater number of tests were reported at 11 – 15 minutes and in Protocol II, at 21 – 25 minutes.

### Other Observations

- Direct IA and CC tests are sent to the appropriate and available modules.
- Prioritized STAT sampling offers immediate system response.
- The analyzer can immediately release results upon completion.
- Indices (HIL) are offered in 9 minutes and 55 seconds on saline and AST.
- On-line operators manual is handy.
- On-board maintenance log – can include operator ID and is printable.

## Method/Procedure for Study

The team leaders put together a protocol reflective of tests and volumes performed in the laboratory at Sacred Heart Medical Center (Figure 1). Due to the high number of stats expected on this analyzer, 35% of the specimens were included as priority samples. Guidelines for the experiment were included along with a list of the Panel Definitions (Figure 2). Vendors received this study electronically with the following parameters:

- run on analyzer in a lab or in a technical area of a vendor facility
- if the analyzer was not set up to run a certain test, either notate it as such or run a test that had a similar TAT in its place
- computer simulations were acceptable as additional data but not as the primary data
- interfaces were not allowed

## Method/Procedure for Study

Once vendors scheduled the study, one of the team members traveled to the site to oversee and observe the experiment. A spreadsheet was created to enter the data when it was received. Data was reviewed in various ways to assess how the instrument would work in the Chemistry laboratory at SHMC. Along with the TAT data, equipment features, ease of use, software advantages were summarized by the team member who was the observer.

## Method Sheets/Data

### Order List for Study – Figure 1

#### Patient Test Mix:

- Pt. 1 – CMPAC, Lipid Panel, Iron, HIL
- Pt. 2 – BMPAC, CK, CKMB, Troponin I, BNP, HIL
- Pt. 3 – **STAT**- BMPAC, Amylase, Lipase, Hepatic Panel, HIL
- Pt. 4 – **STAT**- CMPAC, Ethanol, Acetaminophen, Salicylate, CK, CKMB, Myoglobin, Troponin I, HIL
- Pt. 5 – **STAT**- CMPAC, Dbili, Phosphorus, Amylase, Lipase, Digoxin, HIL
- Pt. 6 – **STAT**- NICTPN, Theophylline, HIL
- Pt. 7 – **ER STAT** -CK, CKMB, Myoglobin, Troponin I, BNP, BMPAC, HIL
- Pt. 8 – CMPAC, Vancomycin, Gentamicin, HIL
- Pt. 9 – **STAT** Prolactin, Dilantin (Phenytoin), Phenobarbital, BMPAC, CSF Protein/Glucose
- Pt. 10 – AST, Creatinine, Lipid Profile, HIL
- Pt. 11 – STAT- BHCG
- Pt. 12 – NICTPN, Vancomycin, HIL
- Pt. 13 – 24 hour Urine for Uric Acid, Urea, Creatinine, Total Protein, Calcium
- Pt. 14 – CK, CKMB, Myoglobin, Troponin I, Renal Function Panel, Lipid Profile, Uric Acid, HIL
- Pt. 15 – CMPAC, Phosphorus, Magnesium, CK, CKMB, Myoglobin, Troponin I, Digoxin, HIL
- Pt. 16 – BMPAC, HepaticPanel, Amylase, Lipase, Theophylline, HIL
- Pt. 17 – Phenytoin, Phenobarbital, CMPAC, Phosphorus, Magnesium, Uric Acid, HIL
- Pt. 18 – STAT - BMPAC, Ethanol, HIL
- Pt. 19 – BMPAC, AlbuminP, AST, ALkP, Magnesium, Phosphorus, T.Bil, Valproic Acid, Digoxin, CK, CKMB, Myoglobin, Troponin I, BNP, HIL
- Pt. 20 – Valproic Acid, Lactic Acid, NICPTN, HIL

## Method Sheets/Data

### SHMC Panel Definition – Figure 2

BMPAC

NA, K, CL, CO2, CREAT, CALC, GLUC, BUN

CMPAC

NA, K, CL, CO2, CREAT, CALC, GLUC, BUN, AST, ALB, ALKP, TP, ALT, TBIL

HEPATIC PANEL

AST, ALB, ALKP, TP, ALT, TBIL, DBIL

LIPID PANEL

HDL, CHOL, Trig

NICTPN

NA, K, CL, CREAT, CALC, GLUC, BUN, PHOS, ALB, ALKP, ALT, DBIL, NBIL, MG, Trig

RENAL FUNCTION PANEL

NA, K, CL, CO2, CREAT, CALC, GLUC, BUN, PHOS, ALB

### Abbott Execution of Protocol – Figure 3

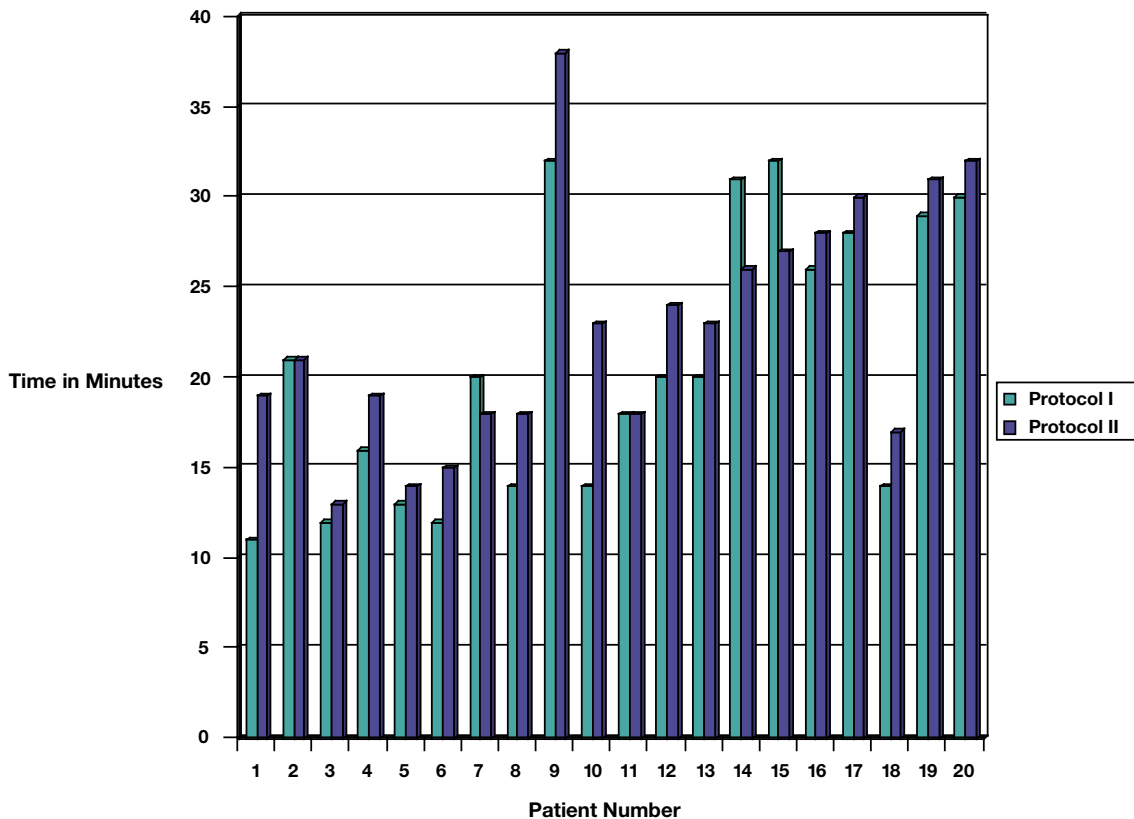
#### Protocol I

In an effort to simulate anticipated daily laboratory workflow, routine samples were loaded on the analyzer first with STAT specimens introduced at consistent 2-minute intervals. The final STAT sample was loaded 16 minutes after protocol initiation.

#### Protocol II

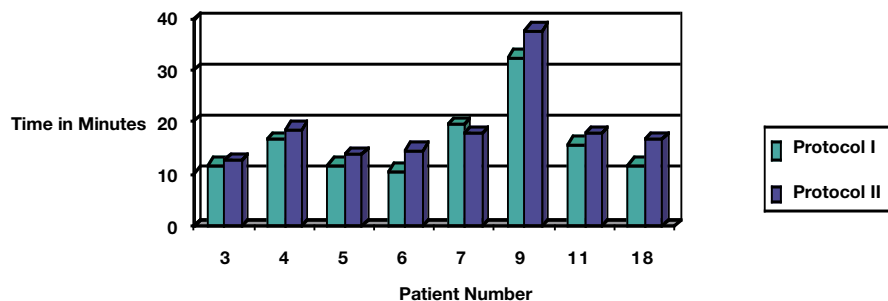
Routine and STAT samples were placed on the analyzer at the same time, thus allowing timing consistency between Abbott and other diagnostic competitors. STAT samples were programmed in the STAT bays on the analyzer.

### Sample TAT for SHMC Patient Mix – Chart 1



## Method Sheets/Data

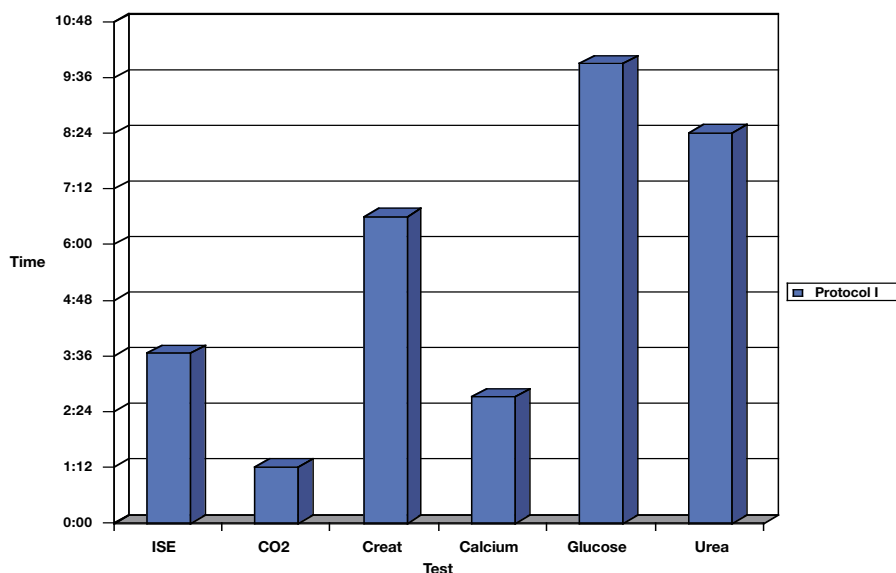
### Sample TAT for Patient Mix of STAT Specimens – Chart 2



## Conclusions

A sample TAT study is an excellent way to determine how an analyzer will handle workload in a laboratory. The Abbott ARCHITECT *ci8200* proved to be a good fit for SHMC Chemistry Laboratory. The TAT study showed that the analyzer could handle the workload within a specified timeframe. Chemistry and immunoassay testing was reported in a timeframe that would suit the physicians in the hospital. This was one factor in the decision to implement the *ci8200* in the laboratory. When choosing an analyzer, consider a TAT study comparable to the testing of the patient population in the laboratory.

### Time to Result from Sampling: c8000 Panel: BMP – Chart 3



### Number of Tests Per Minute – Chart 4

