Laboratory Automation in the Blood Bank

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Why Fully Automation in Blood Bank ?

- To achieve "safe & timely blood transfusion"

- Faster TAT in T&S tests => faster blood transfusion

- Reduce labour intensive manual test procedure

- Test results directly upload to LIS (Reduce transcription error)

   Thus, better quality of blood transfusion

LIS = Lab Information System

The Fully Automated Analyzer

Laboratory Features of the Automated Blood Group Analyzer

Fully automated walk-away instrument

TAT of ABO/Rh(D) blood group = 9 minutes

TAT of T&S* = 24 minutes

Throughput = 28 samples / hour

Test Types: 1) ABO/Rh(D) blood group;
2) Antibody Screen;
3) Type & Screen (**Main tests**);
4) Crossmatch ;
5) Antibody Identification;
 6) RhK phenotyping.

Test Types 1-5 – Lab accreditated tests; test no. 6 –seeking lab accreditation
* Type & Screen test

Design of Blood Bank Automation

- The analyzer system produces <u>precise & accurate</u> test results.

- Fully automated analyzer with <u>knowledge & intelligence</u>

- Capable to <u>communicate with other products</u> (e.g. HA Blood Bank LIS; middleware/data manager) to avoid transfusion result transcription error(s).

- Capable to <u>communicate with laboratory staff.</u> Thus, the **usability** and **interface design** of the analyzer system – utmost importance.

Construction of the Lab Automated Analyzer System

Analyzer 1 ←→ Middleware → HA-BBLIS → HA-CMS
←   ←
(Blood Bank)   (Ward)

Analyzer 2
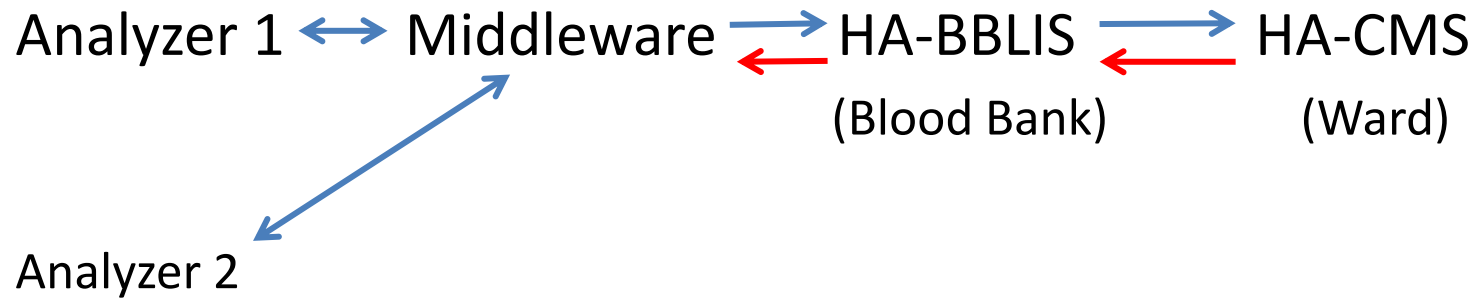
← indicates future blood transfusion data transfer.

Use of Computer Middleware

- Hardware / software that enables communication and management of data/information in different equipment & IT systems (e.g. HA-BBLIS).

- Can be described as "software glue" – **connect the analyzer to the HA –BBLIS**. Blood bank test results transfer to HA-CMS thro HA-BBLIS.

Need Other Computer Associated Technology

-   Use of Barcode technology

-   1 D or 2D barcode

Reduce typing error

Faster & accurate lab data input

-   Also use in Identification in specimen taking & blood adminstration

FMEA = **Failure Mode and Effect Analysis**
失效模式和效果分析

一种用来确定潜在失效模式及其原因的分析方法。
Why FMEA in Blood bank Laboratory Automation？

Benefits – Reduce errors & risk in blood bank testing

Aim – to avoid adverse event in blood bank testings (i.e. Type & Screen and Crossmatch) leading to harming of patient(s).

Definition – to identify & prevent transfusion process errors before they occur.
One of the various tools used in Lean Six Sigma Methodology.

A systematic way to examine for possible error(s) in the Blood Bank testing thus re-design the process to avoid failure.

Types of FMEAs - Process FMEA & Design FMEA

Process FMEA – Assumes the T&S test works perfectly and assess potential process failures and their effects.

Design FMEA - Assumes the T&S process works perfectly and assess the T&S results and its potential failures and their effects.

Method of FMEA:
1) Construct process maps of manual & automated FMEA
2) Process map – process steps; process inputs; type of inputs; process outputs & defect opportunities.
3) Develop FMEA for each method; calculate the RPN
4) **RPN** = Risk priority number
   RPN = Rankings of Severity X Probability X Detection of failures

Result of FEMA Study for T&S Test

Method	Manual	Automated
Process step	37	6
RPN	7633	129

The risk of automated method is much lower than manual method.

Other FEMA Study:

Method	Manual Tube	Manual Gel	Automated Gel
Process step	30	9	3
RPN	8962	4070	136

South et al Transfusion 2002 , 42(Suppl): 116S

Other **Lean Six Sigma Methodology** used

- Aim at optimize the benefit of using automated blood group analyzer system

- Process flow analysis

- Process waste management

After Laboratory Automation in the Blood Bank

1) Faster TAT in T&S

Year	TAT of T&S /minutes	Method
2011	97	Manual
2012	69	Automated
2013	62	Automated

2) Safer fully automated method used

Thus, safe & timely transfusion can be achieved.

Looking at the Blood Transfusion Workflow

- Patient & specimen identification in blood taking (UPI)
- Fully automation in Blood Bank Testing
- Patient & blood unit identification in blood administration (UPI)
- Computer-generated action alert/prompting in CMS /LIS
- Interfacing blood vending machine (blood storage refrigerator) with LIS
- Computer tracking of blood units

UPI = Unique Patient Identification

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Thank you for your attention