ROOT CAUSE ANALYSIS: LABORATORY INVESTIGATION OF ABO INCOMPATIBLE TRANSFUSION

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INTRODUCTION

DAY 1

- Patient admitted to ED from nursing home with bradycardia and feeling generally unwell.
- FBC & UE samples taken at 00:10, received in lab at 00:27 Hb = 6.9g/dl
- G&S sample & crossmatch request for 1X RCC taken at 01:20 received in lab at 01:49
- Sample processed on IH1000 Result: A Rh D Positive ABS Negative.
- A Rh D Positive RCC unit selected and serological crossmatch preformed; Result: Crossmatch compatible.
- A Rh D Positive RCC transfusion commenced at 04:48.
- Second crossmatch request for 1X RCC received the following day, further A Rh D Positive RCC unit selected → 2nd RCC transfusion commenced at 17:50.
- Administration record showed no evidence of acute change in vital signs post transfusion of both units. No symptoms voiced by patient or documented in nursing notes.

Day 5

- Patient had GI Bleed, Haemoglobin Result: 7.8g/dl.
- New G&S sample & crossmatch request for 1X RCC received in lab.
- Sample processed on IH1000 Result: “ABO not interpretable RhD not interpretable ABS Negative”.
- Manual Review of result: Predominantly A RhD Positive with Mixed Field O RhD Negative (See Results)
- A Rh D Positive RCC unit had been allocated and serological crossmatch commenced →Result: Strong 3+ Positive → **Incompatible**

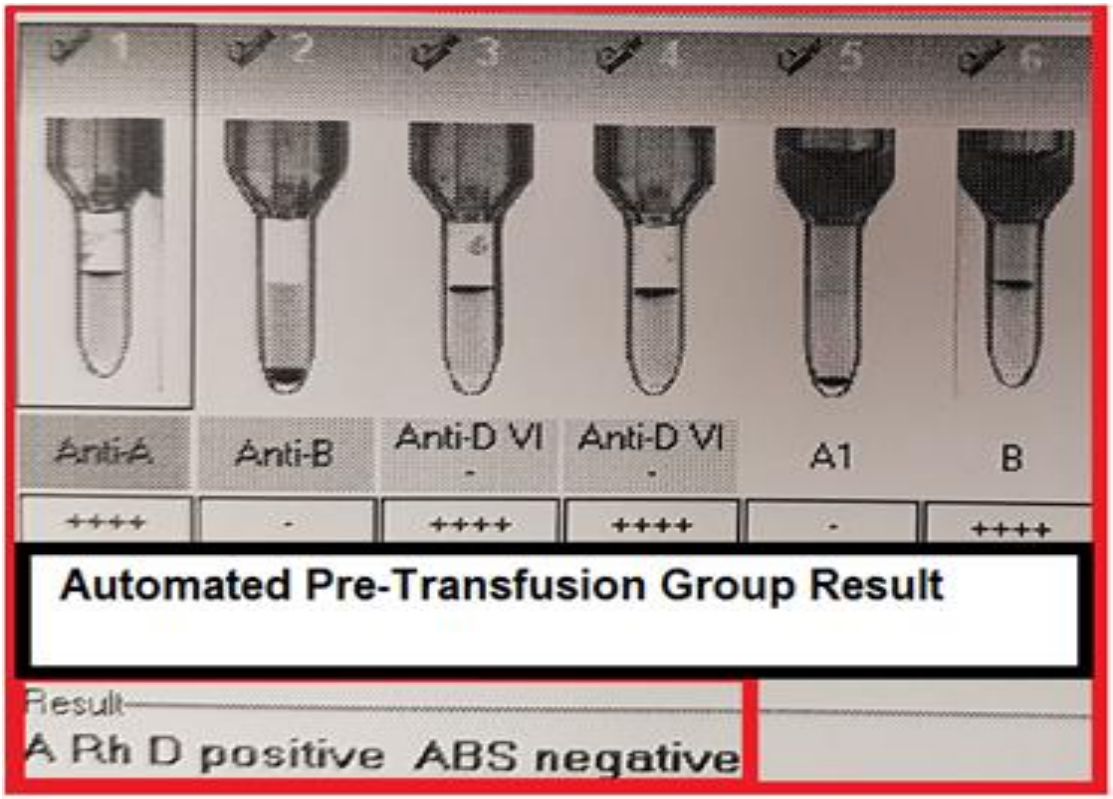
SEROLOGICAL INVESTIGATION

	Pre-Transfusion	Post Transfusion
Blood Group	A Rh D Positive	O RhD Negative with MF A Rh D Positive – Note reaction discrepancy with manual V automated technique
Antibody Screen	Negative	Negative
RCC group selected for X-Match	A Rh D Positive	A Rh D Positive (Based on historical group)
Serological X-Match Result	Negative	Positive
DAT	Negative	Positive
RCC group selected for X-Match post discrepant group result	N/A	O Rh D Negative

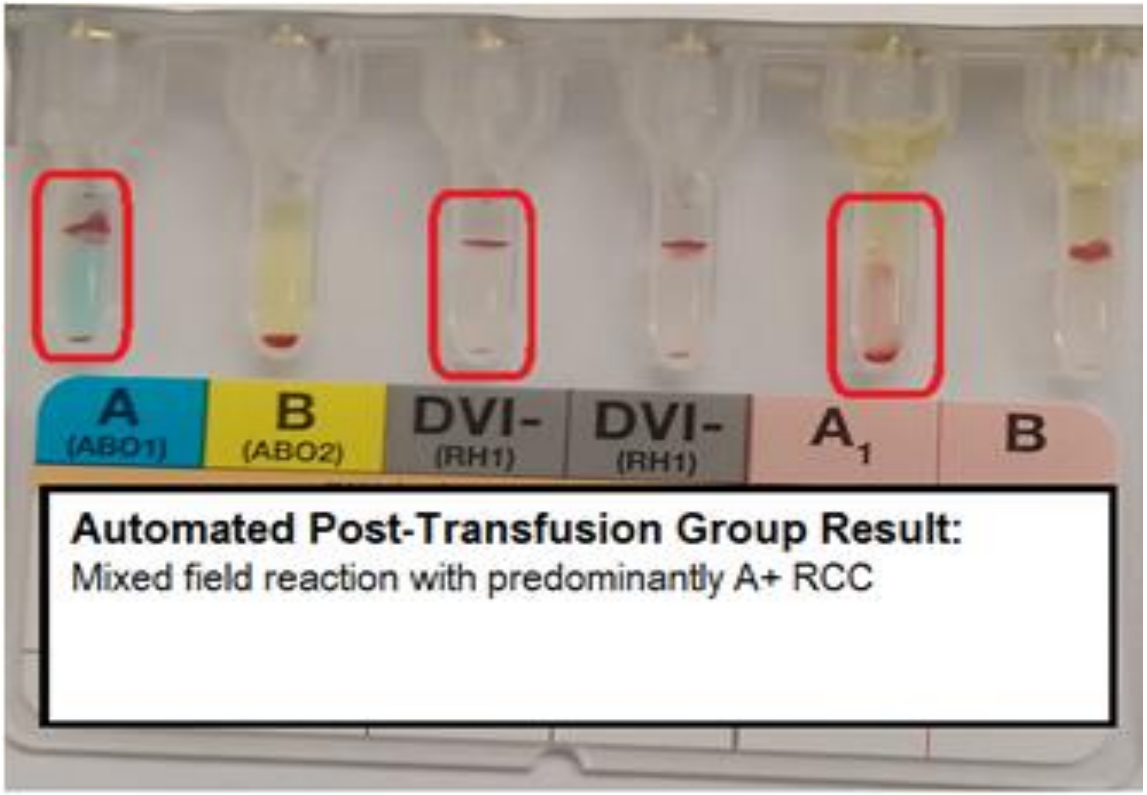
LABORATORY INVESTIGATION

Test	Result
Manual Tube Group	O Rh D Neg with microscopic dual population of A RhD Pos RCC
Manual Diaclon ABO/D + Reverse gel card pre warmed to 37ºC	O Rh D Neg with dual population of A RhD Pos RCC No Anti-A detected in reverse group
Antibody Investigation	Negative
DAT	DAT(IgG + C3D) Positive
Eluate (Referred to IBTS)	Confirmed presence of Anti-A bound to patient red cells

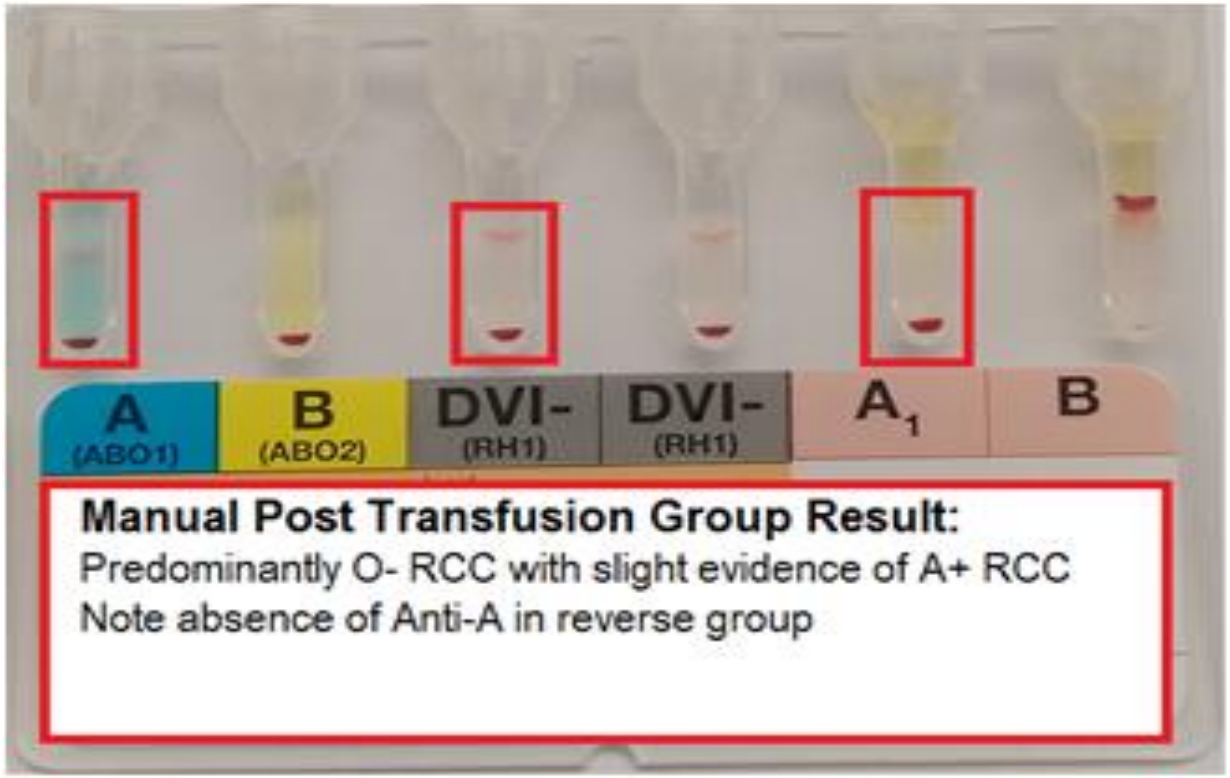
AUTOMATED PRE-TRANSFUSION RESULT



AUTOMATED POST-TRANSFUSION RESULT



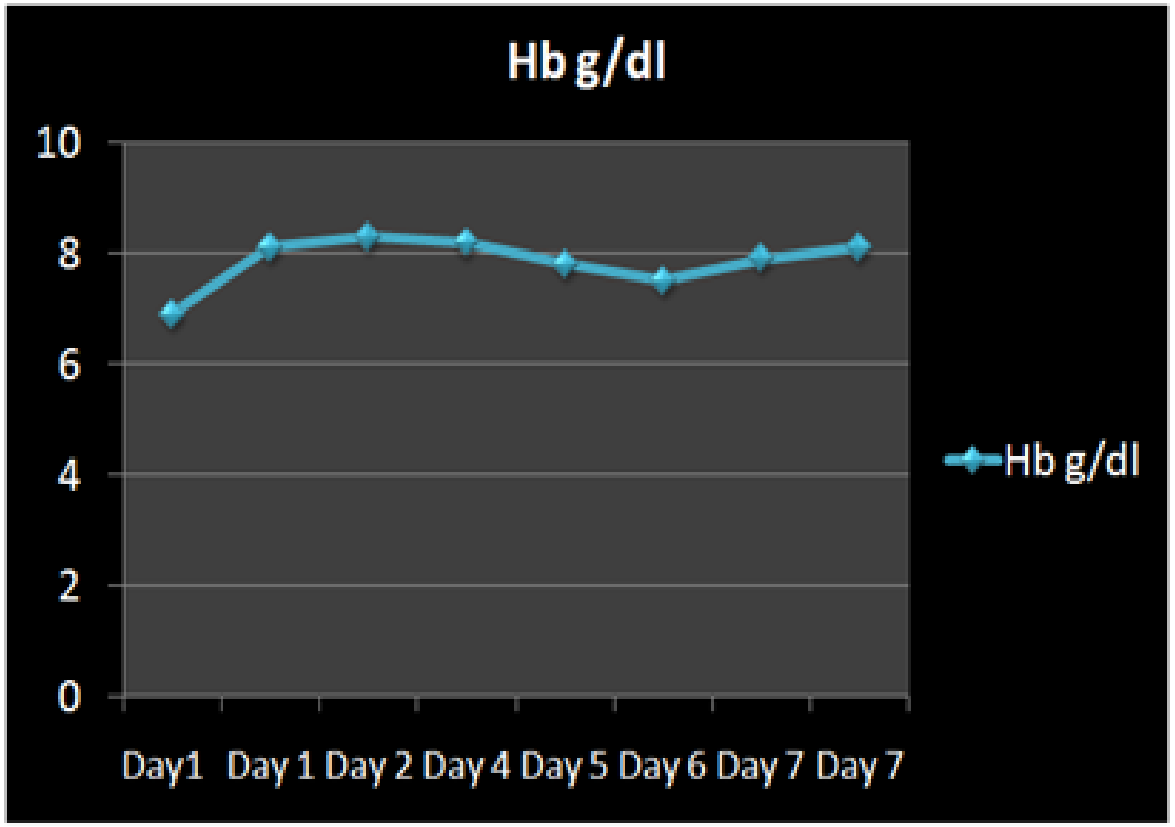
MANUAL POST-TRANSFUSION RESULT



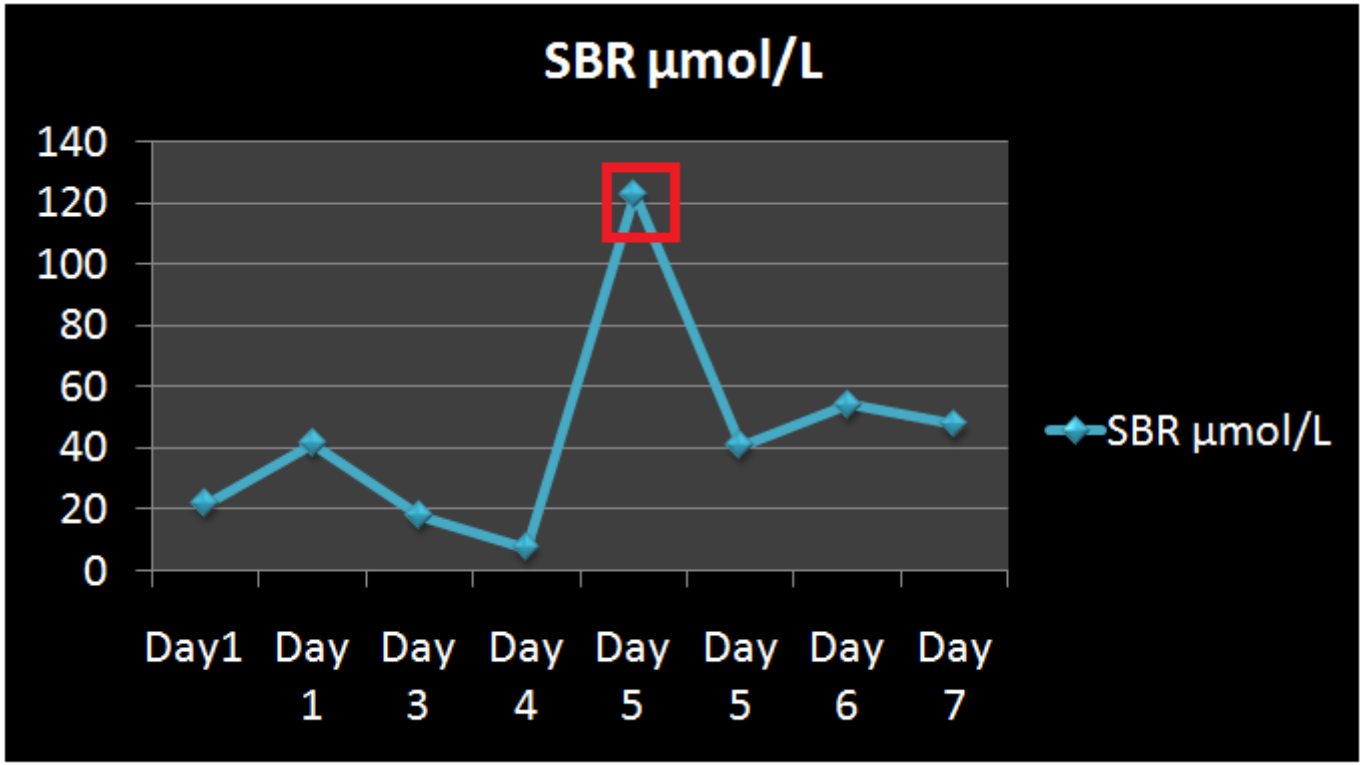
REASON FOR DIFFERENT GROUP RESULT WITH MANUAL V AUTOMATED METHOD

- Biorad technology samples red cells from bottom of centrifuged sample
- BCSH guidelines state that “Transfused cells are older and denser than patients own cells so may sit towards the bottom of centrifuged sample”
- Whereas manual sampling towards the top of the red cell button, where the population is mostly patient cells → ? Manual group more likely to be patient true group.
- No historical group on patient / No other samples retrievable to verify group / Post-Transfusion sample sent to IBTS for elution

HAEMOGLOBIN RESULTS

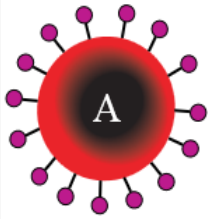
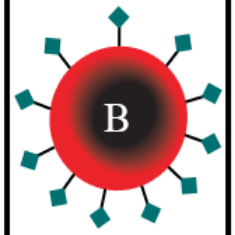
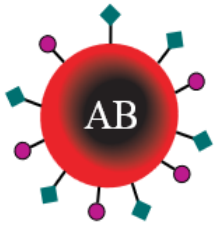
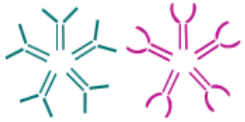


SBR RESULTS


SBR µmol/L
140
120
100
80
60
40
20
0
Day1
Day 1
Day 3
Day 4
Day 5
Day 5
Day 6
Day 7
SBR µmol/L

1 Initial incorrect Patient Blood Group

4 Patient's Actual Group

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red Blood Cell	 A antigen	 B antigen	 A and B antigens	None

3 Patients Plasma contains Anti-A.
A Antigen + Anti-A react: Can lead to Acute Intravascular Haemolysis

2 •Patient received Group A red cells
•Contain A Antigen

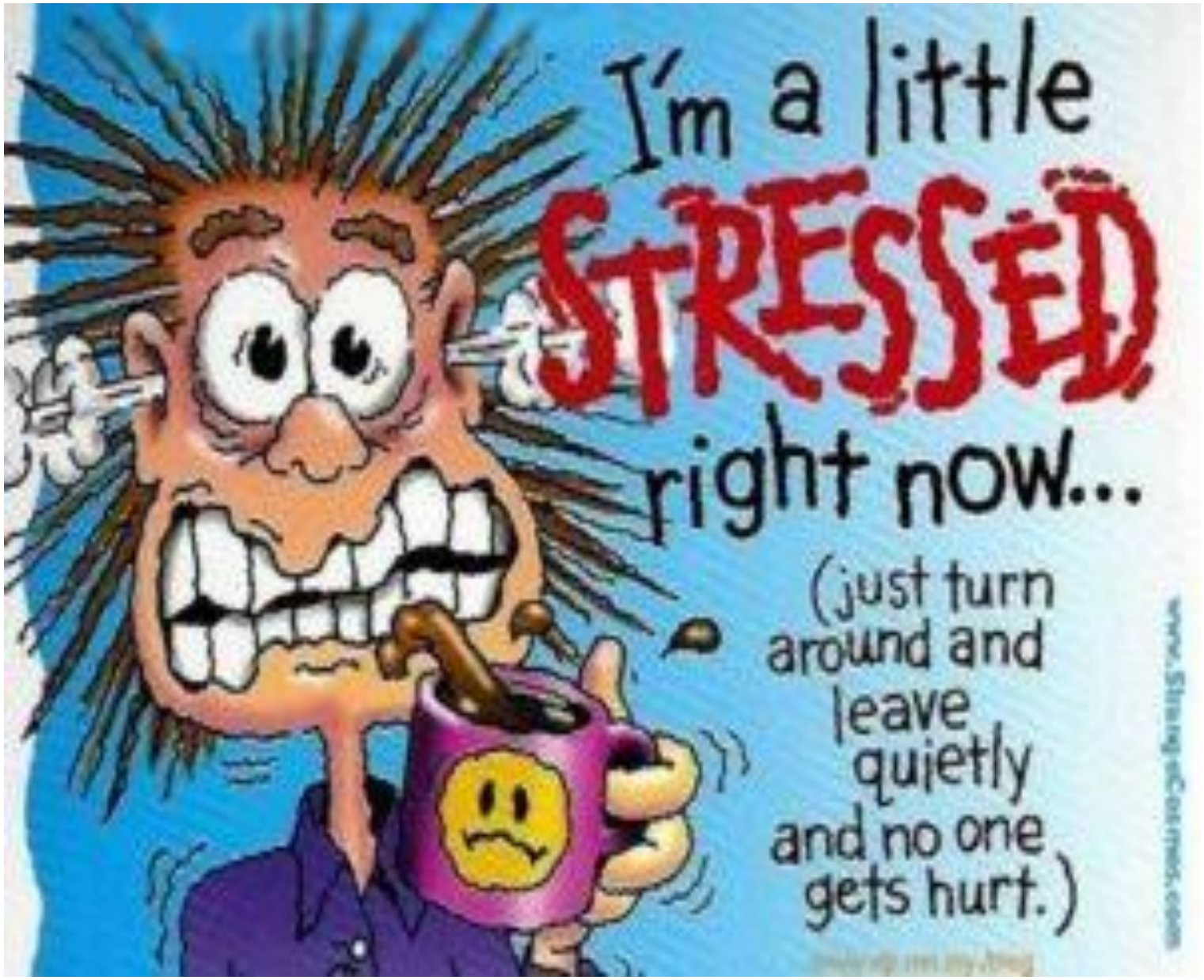
LABORATORY CONCLUSION

- No other G&S samples received from ED during the night shift of day 1
- No other samples for “Patient X” received with the G&S sample received at 01:20.

“Wrong Blood in Tube” taken in ED on Day 1 at 01:20

IMPACT TO PATIENT……

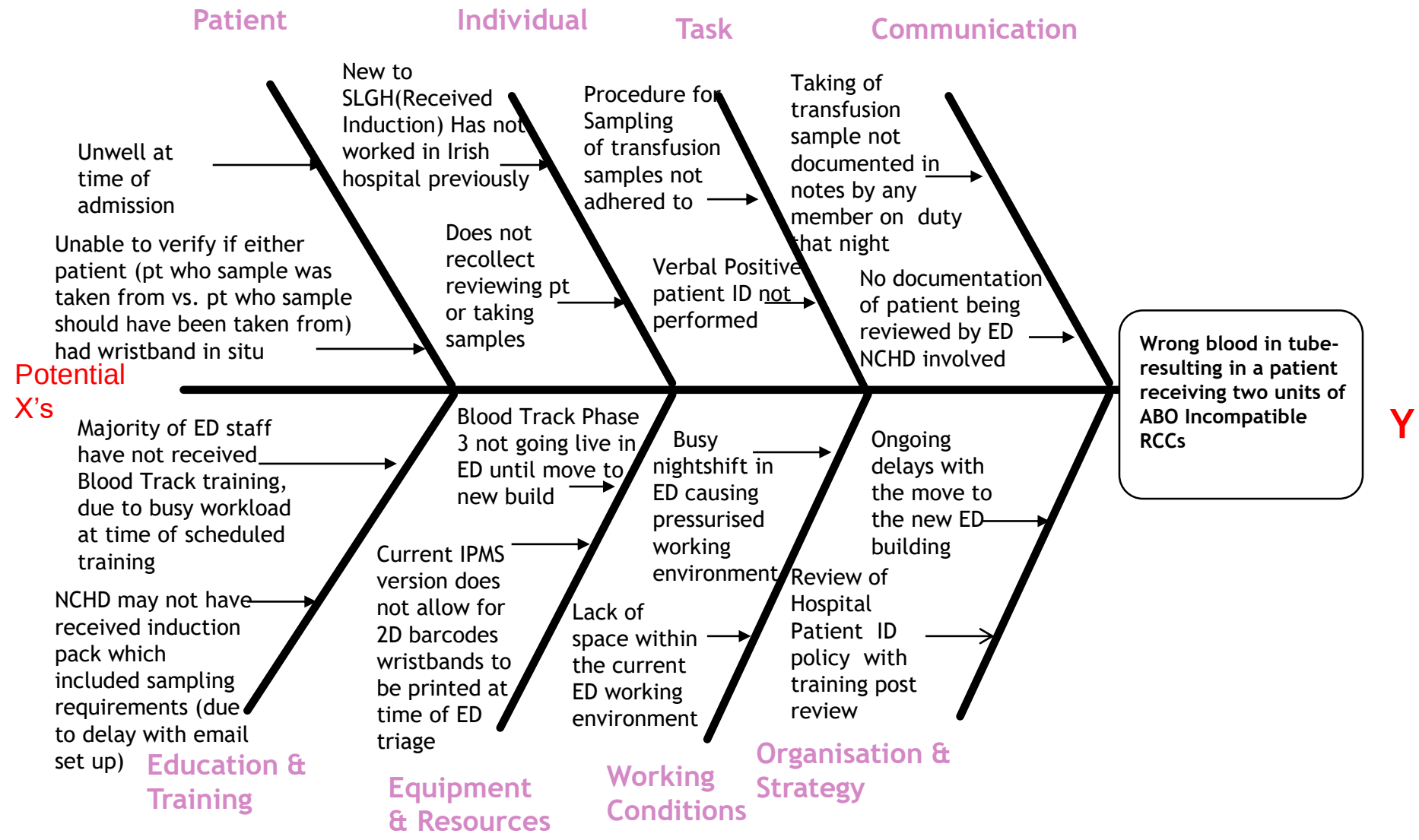
IMPACT TO LABORATORY QUALITY TEAM……


I'm a little
STRESSED
right now...
(just turn around and leave quietly and no one gets hurt.)

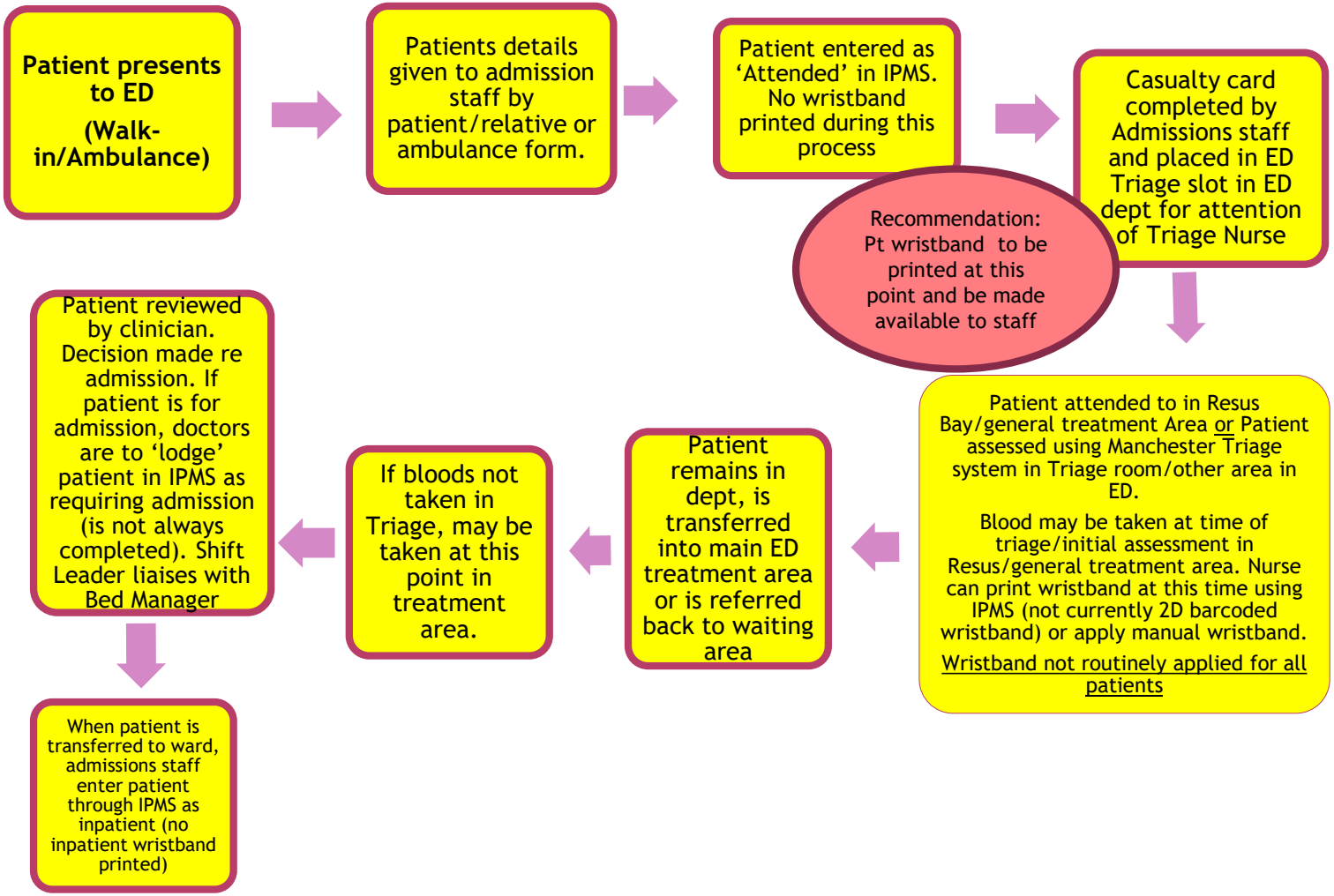
HAEMOVIGILANCE INVESTIGATION

- Discussions held with ED Nursing staff, NCHD (ED Registrar), ED Consultant, Consultant Haematologist, Clinical Risk Manager, Medical Scientists & Hospital General Manager.
- Following these discussions, it was identified that there were gaps in positive patient identification procedures.
- Process flow of ED completed, in relation to patient ID wristbands/ venepuncture
- Fishbone completed to identify potential root causes of sampling error

FISHBONE DIAGRAM OF ROOT CAUSES



ED PROCESS FLOW



CORRECTIVE ACTIONS

2ND PRE-TRANSFUSION SAMPLE FOR ABO CONFIRMATION

- All handwritten samples received in BT from patients with no historical blood group will be "stamped" using the "First Sample" label- **IMPLEMENTED**
- Samples taken using Blood Track PDA do not require a second sample.
- If RCC transfusion required second sample must be requested to confirm blood group **IMPLEMENTED**
- Until 2nd sample available group "O" red cells issued **IMPLEMENTED**

CHANGE IN PATIENT ID PROCEDURE IN EMERGENCY DEPARTMENT

- All patients to have ID wristbands applied at the time of triage in ED/ AMAU **IMPLEMENTED**
- These wristbands to contain a 2D barcode which is required for the Blood Track PDA **IMPLEMENTED**

LABEL ALL SAMPLES USING BLOOD TRACK

- Inpatient Management System (IPiMS) update to be implemented to allow ED/AMAU to print 'inpatient' wristbands with correct 2D barcode which are suitable for Blood Track **IMPLEMENTED**
- Continue implementation of Phase 3 on a phased basis in SLGH (had commenced prior to WBIT).
- Blood Track Phase 3 to be implemented in ED and used to label all pre-transfusion samples **IMPLEMENTED**

HAEMOVIGILANCE TRAINING

- All ED staff, both nursing and NCHDs to be retrained in safe transfusion practices, including Blood Track Phase 3 training **IMPLEMENTED**
- Mandatory Haemovigilance training (incorporating Blood Track) to continue hospital-wide **ONGOING**

REVIEW OF CORRECTIVE ACTIONS

- Open Disclosure performed- patient informed of error by Primary Consultant.
- Discussed at specially-convened Hospital Transfusion Committee meeting
- Reported to the NHO as Serious Adverse Event- re-catergorised as Serious Adverse Reaction due to rise in serum bilirubin. Accepted as 'Immunological Haemolysis due to ABO Incompatibility'
- Reported as Serious Reportable Event to the National Incident Learning Management Team/ Clinical Indemnity Scheme by Clinical Risk Manager
- Patient Identification Wristband Audit performed to establish level of compliance with presence and quality of patient ID wristbands within the hospital
- Blood Track Phase 3 Implementation Audit completed for sample labelling & Administration
- Audit of 2nd Sample compliance in BT completed

CLOSE OUT

- Patient ID Wristband Audit: 72% of patients audited had legible IPiMS-printed wristbands, remaining pts had addressograph labels over IPiMS wristbands (15%), illegible wristbands (3%), ED not inpatient wristbands(7.5%) or no wristband (3%)
- Audit of Blood Track Phase 3 Implementation for Sample labelling: 33% of pre transfusion samples labelled via Blood Track Feb 2017 compared to 5.3% in Sept 2016.
- Audit of Blood Track Phase 3 Implementation for Administration: 93% of RCC transfusions commenced through the Blood Track system during December 2016.
- Audit of 2nd sample in BT: All crossmatches had either a previous group on file OR requested a 2nd sample prior to issuing group specific blood.
- Phlebotomy department went live with Phase 3 during December 2016 and implementation near completion hospital-wide.

REFERENCES

- BCSH Guidelines: Pre Transfusion Compatibility Procedures in Blood Transfusion Laboratories December 2012
- American Association of Blood Banks Technical Manual 13th Edition