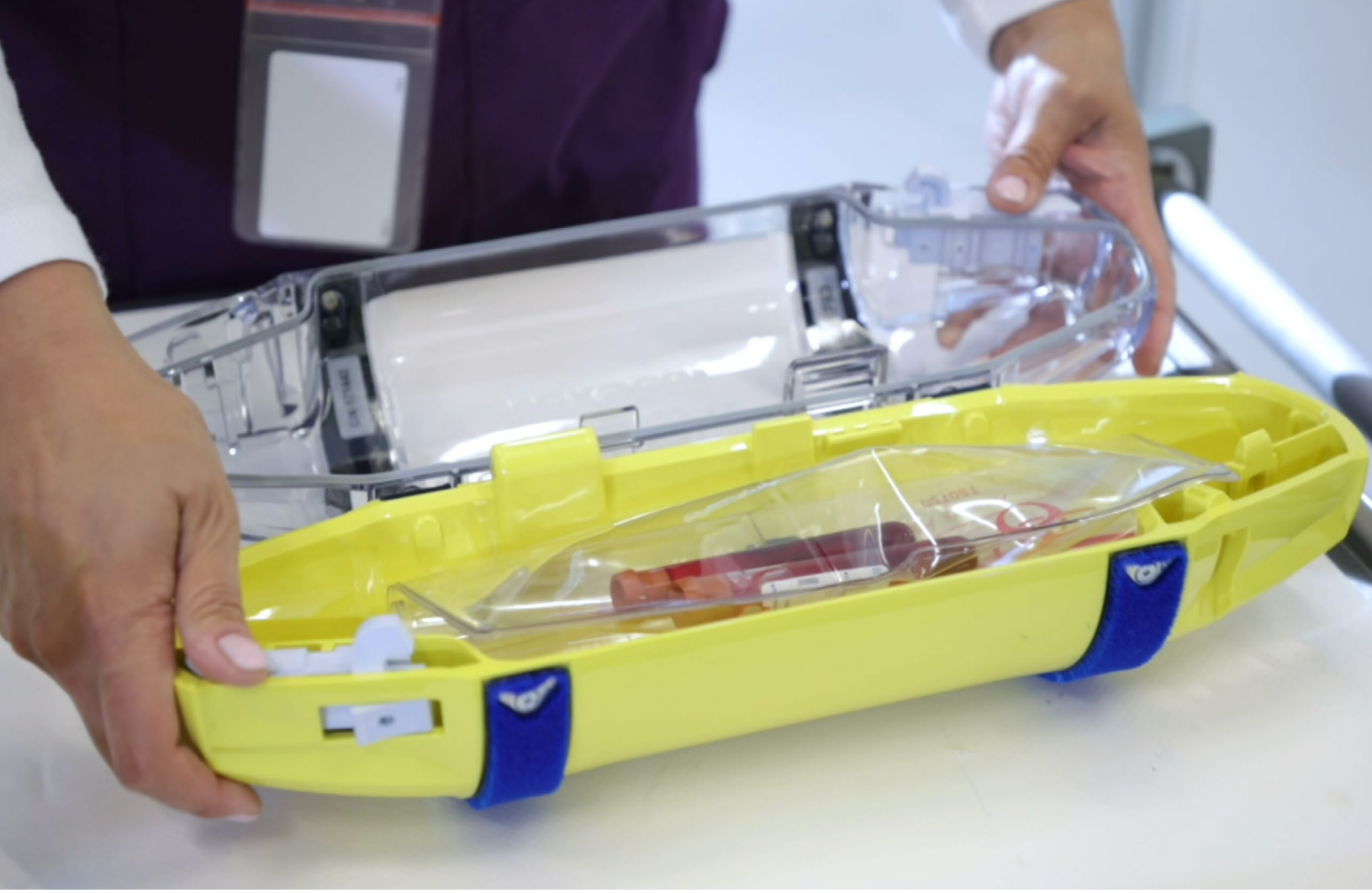

An Evaluation of the Use of TransLogic® 6-inch Pneumatic Tube Systems (PTS)

Evaluation of biochemical and hematological parameters in specimens; hematological parameters in blood products transported in PTS; transport and dispatch times; and susceptibility to breakage of specimen tubes transported in a PTS.

—Based on a study conducted at London Health Sciences Centre (London HSC), Victoria Campus by Sharon Delanghe RT, Ted Pompa RT BSc, and Glen Dietz ART

Introduction

Swisslog Healthcare's TransLogic pneumatic tube system (PTS) was installed in Phase 1 of the London Health Sciences Centre redevelopment. The PTS at this facility is a 6-inch PTS network consisting of 14 stations. The stations are situated to allow the transportation of materials between patient care areas and ancillary departments such as the laboratory.

Purpose

This study was undertaken to determine if it would be feasible to use the PTS to transport specimens to the laboratory and blood products to patient care areas such as surgery.

The study was divided into six parts to determine the following:

- Potential of biochemical changes in specimens transported using the TransLogic PTS.
- Potential of hematological changes in specimens transported using the system.
- Potential of hematological changes in blood products transported using the system.
- The effect on transportation times.
- Waiting time between carrier dispatches.

Methodology and Results

Analysis of Certain Biochemical and Hematological Parameters in Specimens. (See Table 1)

Blood samples were obtained by venipuncture from patients and normal healthy volunteers. Each set consisted of Vacutainer tubes drawn at one time into two red tops, two purple tops or two blue tops. One sample was hand-carried to the laboratory, and the other was transported via the tube system. The samples were packaged in appropriate foam liners within the carriers before being transported.

The duplicate specimens were then tested in parallel. Eight red-top Vacutainer sets were tested to determine serum lactate dehydrogenase (LDH) and serum potassium levels. Ten purple-top Vacutainer sets were tested to determine red blood cell count and platelet count. Six blue-top Vacutainer sets were tested to determine partial thromboplastin time (PTT) and prothrombin time (PT).

Table 1
Results of Biochemical and Hematological Tests Performed on Specimens Transported Using the Swisslog Healthcare TransLogic 6-inch Pneumatic Tube System

Specimen	Hand Carried		Transported by PTS	
	RBC Count X 10^{12}/L	Platelet Count X 10^{9}/L	RBC Count X 10^{12}/L	Platelet Count X 10^{9}/L
1	3.06	194	3.00	187
2	3.58	284	3.52	276
3	4.75	242	4.68	229
4	4.10	339	4.05	338
5	4.34	232	4.37	241
6	4.53	284	4.52	275
7	3.56	372	3.59	390
8	3.89	190	3.85	196
9	3.72	328	3.64	328
10	4.42	264	4.35	265
	LDH i	Potassium mmol/L	LDH i	Potassium mmol/L
1	286	4.4	263	4.2
2	233	3.8	255	3.7
3	212	4.0	194	4.1
4	177	4.0	206	4.0
5	158	3.7	154	3.7
6	185	4.0	192	3.9
7	135	3.8	165	3.8
8	208	3.9	232	4.0
	PT Seconds	PTT Seconds	PT Seconds	PTT Seconds
1	11.2	39	11.6	39
2	9.9	25	9.9	25
3	10.2	30	10.2	29
4	11.1	29	10.8	28
5	10.7	30	11.0	29
6	11.1	29	11.3	29

Analysis of Certain Hematological Parameters in Blood Products Transported Using the Pneumatic Tube System (See Table 2)

One unit of whole blood and one unit of packed red blood cells were obtained from the Canadian Red Cross Blood Transfusion Service. An aliquot of the unit was retained in the laboratory for comparison. The remainder of the blood pack was then carried to the ward location and transferred to the laboratory in the 6-inch PTS with suitable padding. Both samples were tested in parallel to determine the red cell count.

Table 2

Results of Hematological Tests Performed on Blood Products Transported via the PTS

Specimen	Hand Carried	Transported by PTS
	RBC Count X 10^{12}/L	RBC Count X
Whole Blood	3.80	3.81
Packed Cells	6.46	6.46

Evaluation of Transport and Dispatch Times (See Table 3)

Six tubes were transported between a ward location (level 7) and the laboratory through the tube system.

Telephone contact was made between the sending and receiving locations before the transfer was made. The elapsed time was measured and recorded. (See Table 4)

Table 3

Time Required to Transport Specimens Using the PTS

Tube Number	Time Carrier was in the PTS (seconds)
1	22
2	25
3	25
4	26
5	28
6	25
Average	25

Table 4

Waiting Time Between Carrier Dispatches

Tube Number	Time Between Carrier Dispatches (seconds)
1	24
2	42
3	36
4	52
5	39
6	41
Average	39
Standard Deviation	8.3

To insure proper delivery of all carriers, the PTS computer is designed to track each carrier from its point of origin to its destination. Because of this necessary feature, a dispatching delay can occur at peak traffic times in the network. The computer will queue up the next carrier and automatically dispatch when the line is cleared of other transactions. To test the length of the dispatch delay, a series of ten carriers was sent to the laboratory station from a ward location. The waiting time between dispatches was recorded.

Susceptibility of Specimen Tubes Transported in PTS to Breakage

Proper padding and packaging of specimen tubes typically insures their integrity in the PTS. Unfortunately, it is not always possible to monitor and enforce the packing of the laboratory samples in the carriers. To determine the effect of improper packaging, ten Vacutainers filled with water were sent through the tube system in a carrier without the foam insert. An 11th tube was sent through the PTS a total of ten times.

In both trials, the Vacutainer tubes arrived intact.

Conclusion

The changes in biochemical and hematological test parameters for blood specimens or for units of whole blood or packed cells were inside the range of reproducibility for the instruments and the methods being used for the assays. The slight differences in the test results do not seem to be related to the method used to transport the specimen to the laboratory.

The time it takes to transfer a sample to the laboratory should not be a concern if the PTS is used for this purpose, or if blood products are sent to patient ward locations, or the surgical site. The amount of time to hand-carry the specimens far outweighs the time requirements for transportation through the system.

Breakage of specimen containers is not a concern. It would be desirable to determine if there are biochemical or hematological changes in blood specimens which are sent through the tube system without proper padding since specimens may be received in tubes without the appropriate inserts. If this were done, the technologist would know if the specimen should be rejected, or if they could be used safely for specific test procedures. It would be much more preferable to insure usage of the padded liners.

In summary, use of the PTS provides safe, inexpensive, and reliable means of transporting blood specimens and blood products if the hospital should choose to utilize the system for this purpose.

Information provided by the London HSC, Victoria Campus study, conducted by Sharon Delanghe RT, Ted Pompa RT BSc, and Glen Dietz ART

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