Functional Specifications for Lab Medicine Specimen Transport and Protection System

Background:

Laboratory Medicine at the University of Washington processes several thousand clinical specimens each day. Nearly all of the specimens make their way into the UW system of laboratories via the *Specimen Procurement Services* (SPS) division, the "front-end" of lab medicine testing. Many of the specimens come from patients currently admitted to the UW and Harborview Medical Centers (HMC), where the two main specimen procurement facilities are located. Specimens collected from UWMC and HMC in-patient populations are transported to the respective SPS locations via pneumatic tube systems in each medical center. These specimens are not part of the tracking and transport system proposed in this document.

However, the UW Medical Labs also have a large number of clients (clinics, hospitals and other healthcare organizations) physically located at some distance from the SPS facilities, and there are also a number of in-patient specimens which are transported from one University medical center to another (called cross-hospital transfers). For external clients and cross-hospital transfers, SPS provides their own in-house specimen transportation services. The system consists of several couriers, vehicles and necessary equipment to assure correct environmental conditions for the specimens during transport. The couriers follow established routes to pickup and deliver patient specimens. Some of the routes are within the Seattle city limits; others go as far north as Bellingham and south to Olympia. A recently configured route crosses the mountains to provide laboratory services to several eastern Washington locations. See Figure 1 for clarification.

Problem:

The location (physical and logical progress) of some specimens is not available in the laboratory information system (LIS) until the specimens are actually received and processed by SPS team members. As a consequence: 1) Clients are not able to determine progress of their specimens in the sequence of transport, procurement processing and test completion; 2) Couriers following their usual client pickup sequence of visits do not know if there are any specimens waiting to be retrieved or if the client stop can be skipped because no specimens are available; 3) SPS and subsequent testing labs have no visibility for near term demand (the number of specimens couriers will be delivering to SPS on the in-process routes); and 4) There is no easy way to alert staff that critical/irreplaceable specimens are being transported, which will require special attention upon arrival.

Overall Objectives: Provide a secure and reliable transport system.

1. Create a UPS/FEDX-like tracking system for patient specimens and other materials as they are transported from client locations to labs and also intra-lab transfers. This would require attachment of transport barcode labels at the client location. The barcodes could be printed on special label printers at each client location, or they could be pre-printed, unique-to-client bar codes for each pickup location.
   After attachment of transport labels to the items to be transported, the system database should be updated to indicate that the specimen was available for pickup; the database is also updated by couriers when they pickup specimens and other items for secure transport; update of the

database also occurs when the courier delivers specimens and other secured materials to the appropriate destination (such as check-in to labs). If the number of delivered specimens is not equal to the number picked up, it should alert the courier and show him extra steps he needs to take to assure that the specimens do not remain in the delivery vehicle or transport carriers. These audit steps must be completed before he can sign-out of his shift.
The system should accumulate transactions in the database to support tracking the progress of the transported items (via query). There are several types of queries which will help alert processing facilities concerned about the type and amount of materials in-transit. Queries and reports would include: by destination and according to various tags which characterize specimens (e.g., special handling, irreplaceable, stat processing). All transactions and updates to the database should be time-stamped. Transactions should never be edited; the series of transactions provide a secure audit trail for materials transported.

2. Support two-way communications with couriers (i.e., via their PDA), so they can be dispatched to service emergent pickups (decision based upon based upon knowledge of courier location relative to pickup site). This might be as simple as entering dispatch requests into a database which would periodically transmit requests to the appropriate couriers.

3. Interface handheld PDAs to the tracking system. PDAs would have the ability to scan barcodes and generate a transaction which would update the tracking system database.

4. The PDAs need to also be used as a check list for the special steps that the courier needs to follow before he starts the shift and after he is done with his shift. These steps include inspection of the vehicle to avoid specimen misplacement inside the car, inspection of the portable storage, etc.

5. The PDAs should also display (static) client visit sequence sheets for the couriers (which locations to visit each day and the GPS routes to follow).

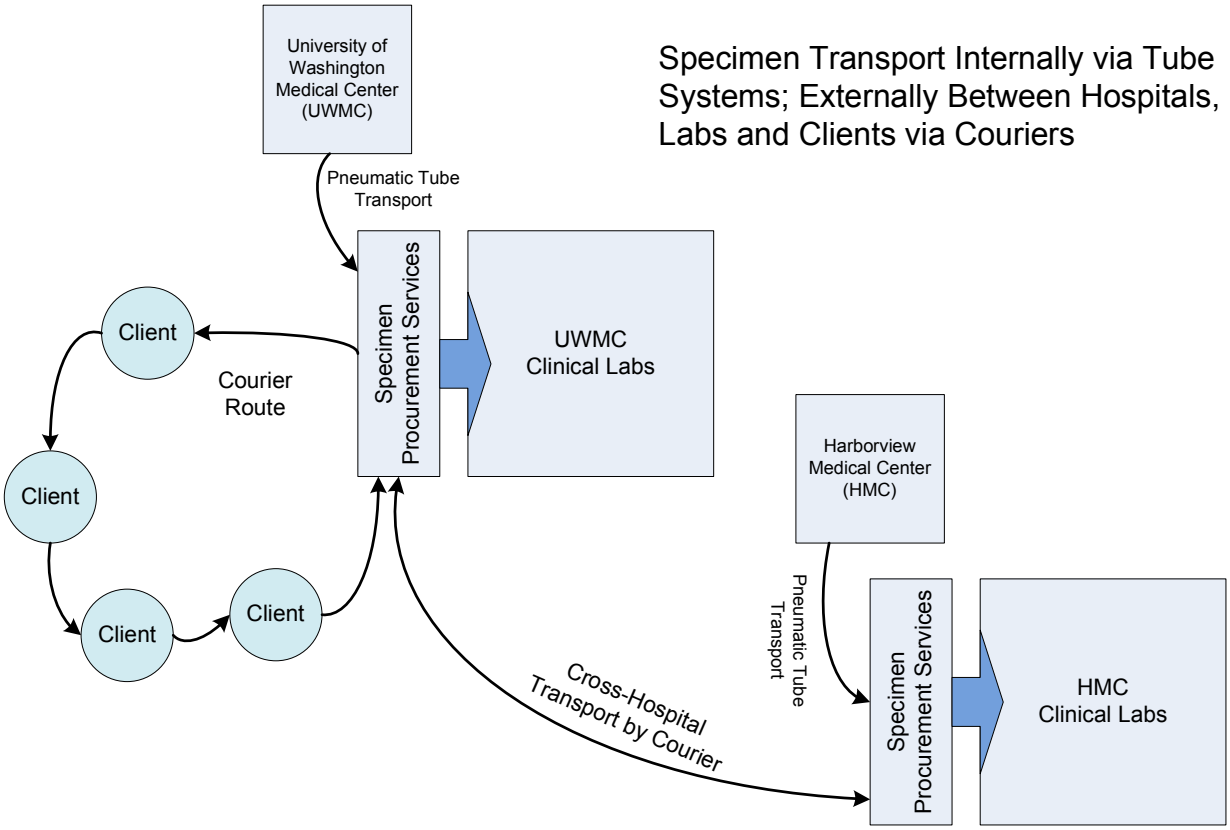

Figure 1. Simplified diagram illustrating specimen movement among labs, clients and within medical centers. Utilizes both couriers (vehicles and drivers) and pneumatic tubes (internal to medical center hospitals). This figure does not reflect movement of specimens among the clinical labs.