

1 Gap Analysis - Pneumatic Tube Data

We were able to acquire some but not all data needed for our gap analysis, as the dataset we were provided contained timestamps for when orders were placed and administered, but there was not much information on the steps in between. In fact, after interviewing Tom Kaszmetskie, a senior business intelligence developer for JHHS Quality and Clinical Analytics, we learned that the pharmacy does not have a standardized workflow for how to report rejected or cancelled orders, so none of the available datasets are organized clearly enough to derive a linear timeline for each order. Moreover, he showed us that in the thirteen months of data available to him of all PICU antibiotics orders, a timestamp for when an order was received was only recorded for 221 orders, as opposed to the 6472 timestamps available for when an order was sent. Essentially, once an order is marked as sent, regardless of whether it is sent via the tube system or brought by a runner, we only know when the medication was received 3% of the time.

To address the lack of quantitative data, we conducted our gap analysis using a combination of the available timestamps and our interviews from shadowing Dr. Fackler in the PICU. We suspected that the biggest unknown in the delivery process was the transition from the pharmacy to the PICU through the pneumatic tube, as there is no alert system for when the antibiotics have arrived at the tube stations in the PICU, and that is also where the dataset is largely lacking. Although shipments from the pharmacy to the PICU only take around 2.4 minutes on average, there are about 140 cases per month where it takes longer than 3 minutes, with the longest delivery taking more than 23 minutes. This information can be found in Figure 1.

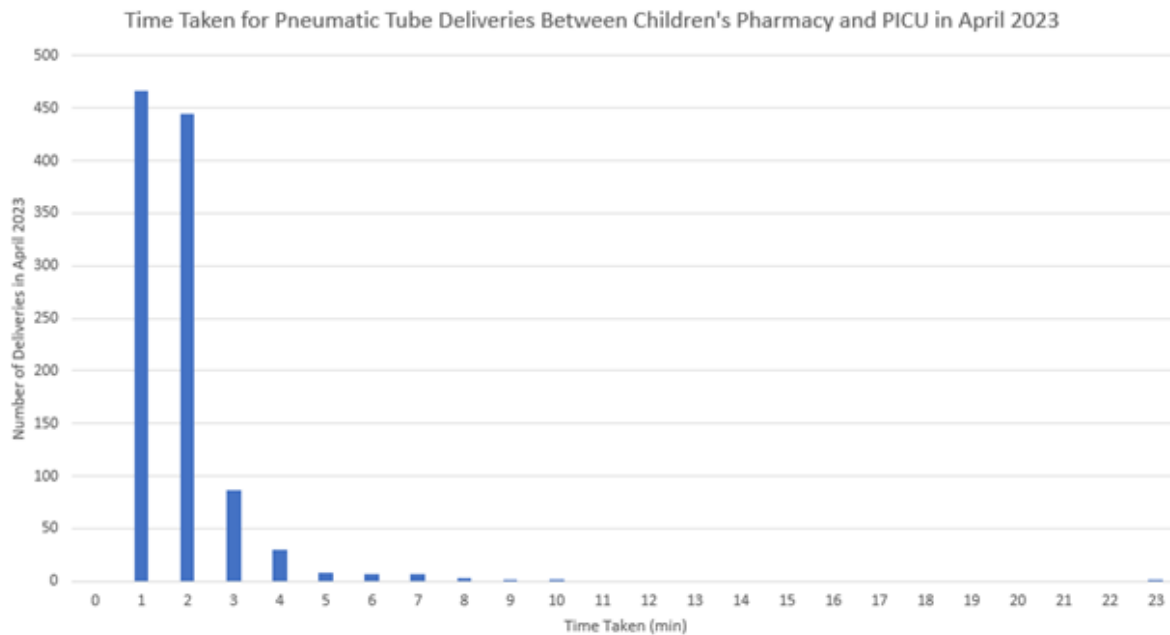


Figure 1: Time Taken for Pneumatic Tube Deliveries between the Children's Pharmacy and PICU in April 2023

According to Mr. Gimburg, the pneumatic tube system that Hopkins uses is very old and can run into issues with ghost carriers, where a capsule may get stuck, but the system won't recognize that and will send another capsule, causing the desired delivery locations to all be offset by one. Problems like these require a complete shutdown of the system and manual delivery during that time. Even when shipments do arrive within a couple minutes, the lack of an alert system leads to infrequent checking of the tube station, and we observed that nurses took up to 10 minutes to pick up a capsule from the PICU tube station once it had arrived.