EPH192

Enhancing Transfusion Medicine Efficiency via NAT Screening System Technology Innovation

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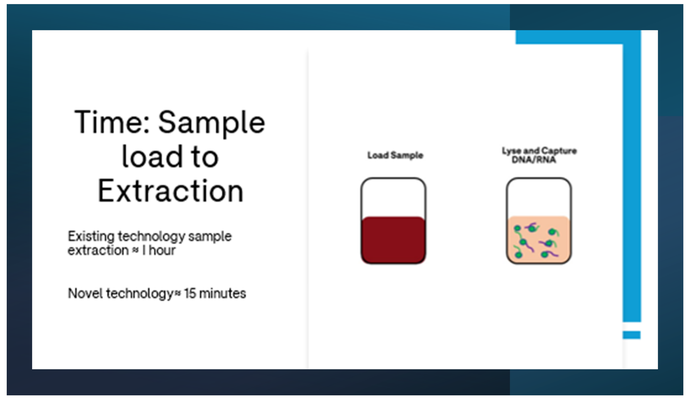
OBJECTIVES:

Historically, clinical laboratories have leveraged consolidation and/or centralization to maximize efficiencies of scale. Blood and plasma screening laboratories may have reached an efficiency ceiling due to stagnant investment in molecular (NAT) screening technology innovation, limiting high-throughput lab optimization and restricting accessibility to decentralized NAT screening. We aim to demonstrate NAT system innovation impact on laboratory utilization improvement and accessibility expansion.

METHODS:

A cohort simulation model was developed to evaluate a novel NAT screening system against existing technology, ensuring performance yields results that, like existing systems, are actionable within a screening algorithm. Statistical analysis of the observed model and benchmark theoretical improvement to the existing available throughput per hour and 24-hour throughput per square meter (m2) was performed.



RESULTS:

Donor samples were tested sequentially (three consecutive 8-hour periods). The model system (footprint 1.9m2) achieved test completion time of 35 minutes, throughput of 3600 samples/24 hours (150 samples/hour), and 1877 samples throughput/24hours/m2. In contrast, the available system footprint was 3.8m2 (2x space) with test completion time of 210 minutes (500% longer), corresponding throughput of 2040 samples/24 hours (85 samples/hour), and 382 samples throughput/24hours/m2. Against 20% improvement to currently available performance (102 samples per hour, 459 samples throughput/24hours/m2) in an independent sample population (n=1000), the increased throughput/hour and throughput/24hours/m2 achieved by the NAT model was significant ($p<0.01$).

CONCLUSIONS:

The observed NAT system innovations deliver potentially transformative screening efficiencies beyond boundaries imposed by existing technology. The significantly higher throughput (76%/hour) in less space reduces capital footprint, regardless of laboratory size. These improvements may also allow lower-throughput laboratories to reconsider expanding accessibility via decentralization. Opportunity exists to examine outcome improvements not considered above (workflow optimization, faster product availability, improved transfusion-adjacent outcomes, and access to state-of-the-art technology in markets previously without).