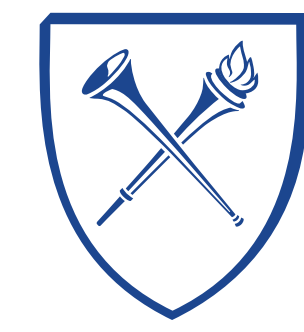


# Implementing an Automated Patient Worklist for Chimerism Testing

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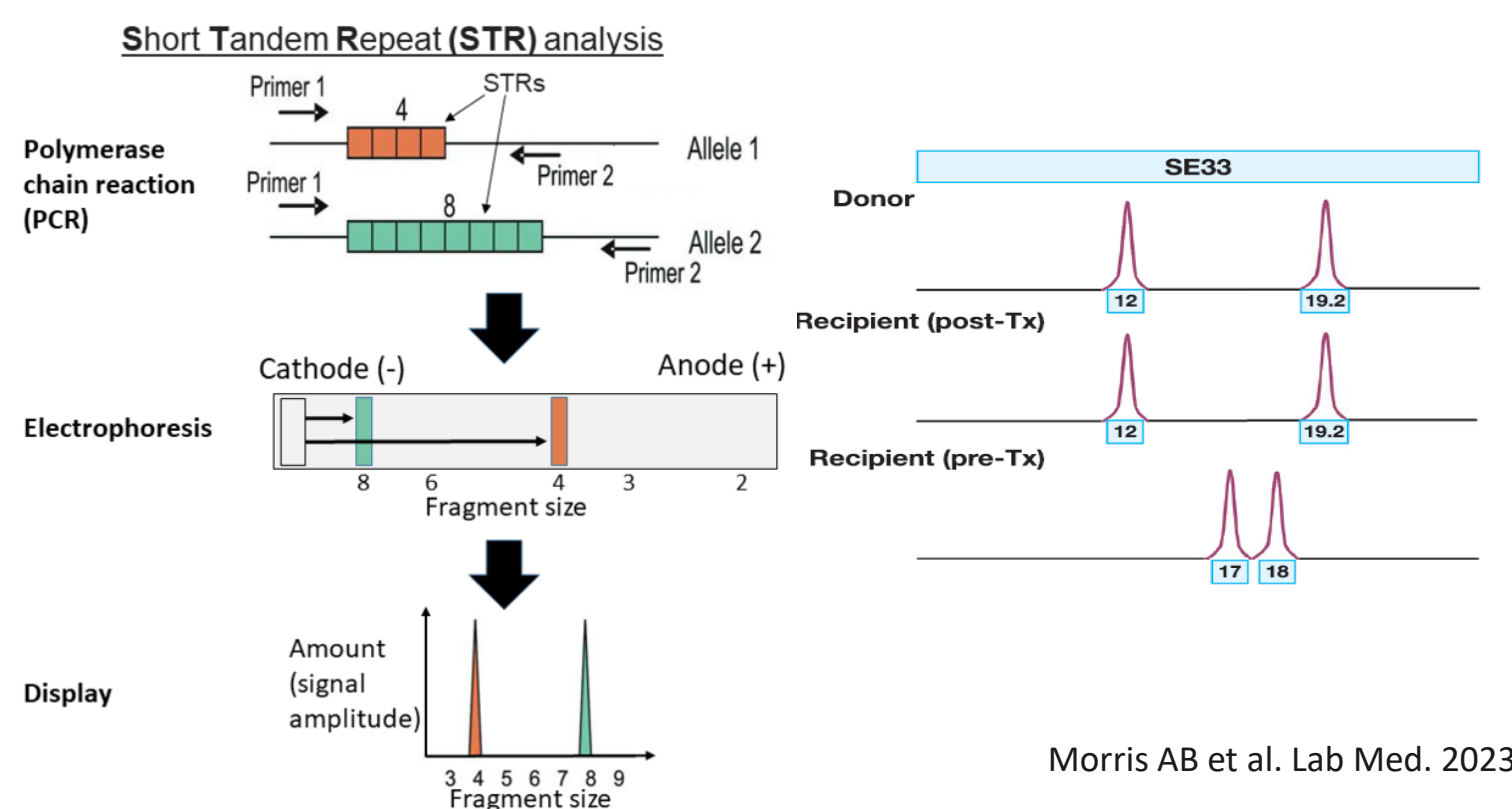


## Aim Statement

**HLA will reduce the time required to generate the patient worklist by 40% by implementing automated patient worklist to test chimerism by March, 2024.**

## Background

Chimerism testing is performed for a variety of clinical applications, most notably to monitor engraftment and relapse after stem cell transplantation. While several methods exist for chimerism testing, the HLA laboratory employs Short Tandem Repeat (STR) analysis, which is the most common method. Pre-transplant recipient and donor samples are used to determine reference STR alleles needed to evaluate the post-transplant sample.



After DNA amplification, the STR amplicons are assessed by capillary electrophoresis on the ABI 3500XL Genetic Analyzer (Thermo Fisher Scientific). In order to run the samples on the ABI 3500XL, the HLA laboratory technologist must manually generate and enter a patient worklist for each batch.

## Baseline Conditions

After amplification of the specimen DNA, a patient batch worklist is generated by HistoTrac. The patient information on the list has to be transferred to both a plate editor worksheet and then into the ABI 3500XL Data Collection Software. Currently this is done by manual entry (i.e., hand typed). The Plate editor identifies each sample location on the 96 well plate and keeps track of which wells have been used, as each plate may be used multiple times. The ABI 3500XL software, known as the Data Collection Software, is used to perform the testing. The plate is set up so that a patient sample is assigned to a specific well location on the 96 well plate.

## Actions/Tests of Change

We implemented an automated patient worklist for chimerism testing to streamline the process of entering patient information including patient name, sample type, and sample date. This automated method represents a custom report build by HistoTrac IT, which queries the database for the required patient information. The generated report is a text file that is copied and pasted into a Microsoft Excel document. The resulting spreadsheet matches the format of the Plate Editor worksheet, obviating the need to manually enter data into the Plate Editor (i.e., the spreadsheet replaces the Plate Editor). The information in the Excel spreadsheet is then imported into the ABI 3500XL Data Collection Software.

## Measures

The measure for this project is the amount of technologists' time saved by implementation of an automated patient worklist that can be directly imported to the plate editor and into the Data Collection Software, instead of manual data entry. To assess this, time studies were conducted to compare the manual entry process with the automated process. Six of the test batches contained 24 patient samples, and one batch contained 19 samples.

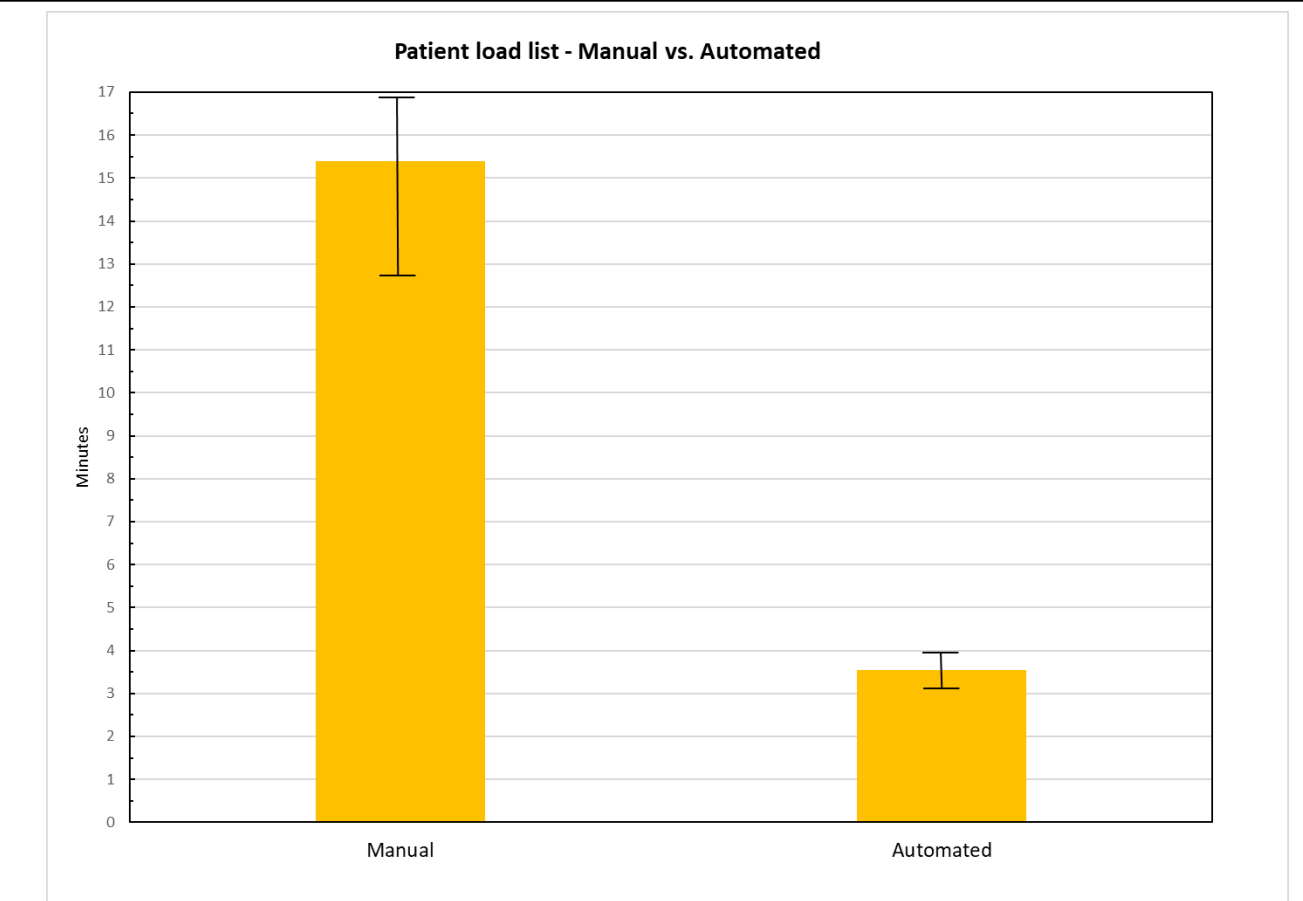
The time taken for each task (manual vs. automated) was recorded and compared to determine the time saved via an automated patient worklist. This calculation was based on the average difference in time between the two methods across all samples by the 7 technologists.

Calculation:  

$$\left[ \frac{(\text{Time (in min) to analyze manually} - \text{Time (in min) to analyze automated})}{\text{Time (in min) to analyze manually}} \right] \times 100$$

The time differences between manual and automated entries were compared by paired T-test. Statistical significance was set at  $p < 0.05$ .

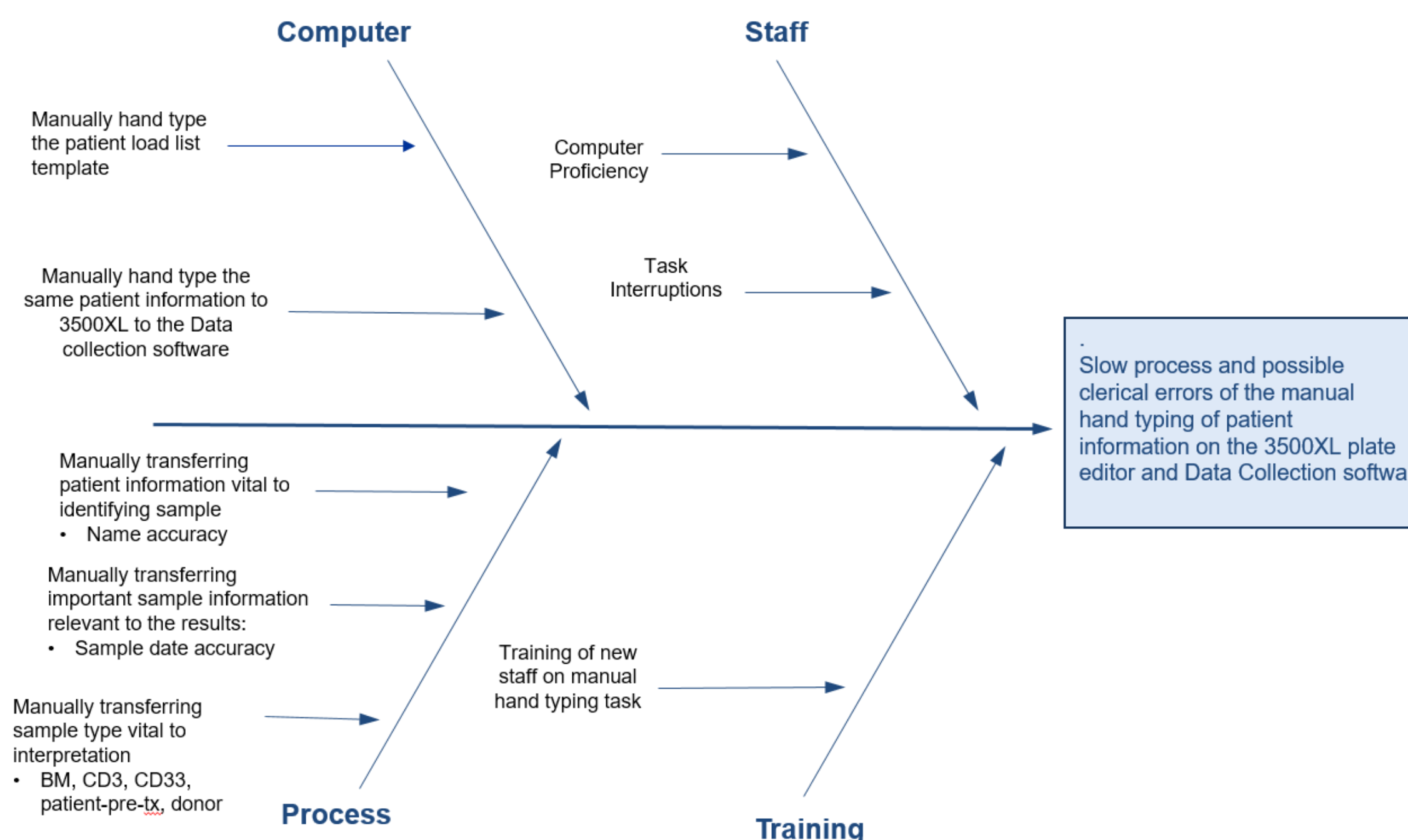
## Results



\* $\left[ \frac{(\text{Time to hand type the patient load list} - \text{Time automated load list to import to the Data Collection software})}{\text{Time hand type the patient load list}} \right] \times 100$

Calculation:  $\left[ \frac{(15.39 - 3.55)}{15.39} \right] \times 100 = 76.9\%$  time savings. The difference in time between the manual and automated methods was statistically significant, with a p-value of  $< 0.001$

## Analysis



## Reflection/Follow-up

In conclusion, our aim to reduce the time required for generating patient batch worklists by 40% via automated batch creation, has been significantly surpassed. The results of our study demonstrate a remarkable average time savings of 11.84 minutes per batch, representing a 76.9% decrease in the time needed to generate batch worklists. This method not only fulfilled our original objective but also underscores the efficiency and effectiveness of an automated method.

Importantly, although not directly assessed in this study, the automated method likely reduces the opportunity for transcriptional errors thereby providing an additional benefit. Such errors, if present, could potentially lead to errors in estimating engraftment and untoward clinical consequences. Therefore, the adoption of the automated method not only enhances work flow efficiency but also contributes to the overall quality and safety of the testing process. The automated method will likely improve technologist satisfaction as well.

In summary, our findings highlight the substantial time-saving and potential error-reducing benefits associated with an automated computer utility for chimerism testing. Such a tool will be invaluable for improving laboratory workflow and ensuring accurate and timely resulting of critical patient information.