Mohs Turnaround Time Tracking

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Adeline Drier, Kevin Tan, Madison Bugel, Thomas Turinske, Christopher Pudzisz

Client: Mr. Ryan Dauman | Advisor: Dr. Melissa Kinney

UW BME Design

Abstract

Mohs surgery is a dermographic procedure that involves removing and analyzing cancerous skin lesions. The time to return a tissue sample for analysis, turnaround time (TAT), is a direct measure of efficiency and accuracy within a point-of-care lab. At the UW-Hospital, the Mohs Laboratory team was looking to improve their TAT system, which used physical time cards to track important steps of site preparation. This system had several issues that made it infeasible to measure TAT accurately and reliably. For these reasons, the TAT tracking system utilizes two multi-purpose scanners to integrate the barcodes associated with each site and take reliable time stamps. The time stamps are read into EPIC, where they are manual de-identified, uploaded to a Google Spreadsheet, and analyzed through custom Python code. This system provides a more efficient and accurate way of tracking TAT in order to define time standards for site preparation, increase lab efficiency, and decrease wait times for patients and physicians. After being implemented in the Mohs lab, these goals have been met along with the design criteria.

Problem Statement

- Modify and update the existing TAT system used in the Mohs surgery lab
- Current physical time cards are inefficient and unreliable [3]:
  - Misplaced cards and incomplete data
  - Lacking space for multiple timestamps
  - Mixing up cards between sites

Motivation

- Create a system that effectively:
  - Replaces the old, manually written timecards
  - Tracks time spent on a specimen
  - Bring attention to errors or outliers
  - Helps technicians with their workflow

Background & Impact

- Mohs surgery involves the removal of tissue specimens and subsequent laboratory work [1]
- Mohs surgery is a single visit outpatient procedure
  - It includes procedure, analysis, and results
- TAT systems are used to:
  - Measure lab performance
  - Find weaknesses with the current processing of specimen
  - Provide expectations
  - Make sure every patient does not have to wait long [2]
- Four checkpoints are used to track activity going on in lab:
  1. Physician inks/ delivers specimen to technicians
  2. Lab technician pick up, inspect, and cure specimen
  3. After cutting specimen, it is transferred to a smaller slide
  4. Slide is delivered to a physician to conclude the results
- Utilizing the existing barcodes associated with the specimen
- Has potential to impact to other labs with a flexible TAT system that can be easily implemented with a patient barcode system
  - Create establish standards and time requirements for similar laboratory procedures

Image 4,5: Competing Time Card design. The physical card, left, and stamping machine, right.

Design Criteria

- Can be used in the Mohs lab Monday through Friday
- Cost less than $200 and have compatibility with existing equipment
- Maintain HIPAA compliance
- Antimicrobial and have the ability to be sterilized
- Cause minimal disruption to the workplace (no significant increase to processing time for sample α = .05)
- Can be used to analyze:
  - lab's average time per specimen
  - lab turnaround times
  - technician averages
  - errors in scanning

Final Prototype

Data Collection

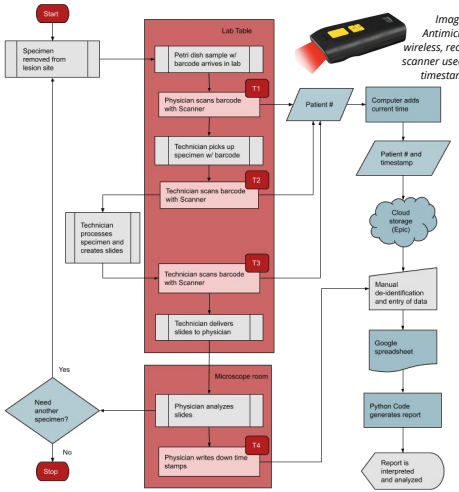

Image 3: Antimicrobial, wireless, rechargeable scanner used to collect timestamps [4]

Figure 1: Mohs Lab flow chart with the time stamps labeled accordingly (T1-T4). This chart depicts each step in the analysis of a specimen and the respective barcode that is scanned. The scanner automatically sends the patient # along with a timestamp into EPIC to maintain HIPAA compliance. Manual de-identification before uploading to Google Sheets for analysis is required to maintain compliance.

Data Analysis

- Outputs in the Data Report include:
  - All-time interval and TAT averages
  - Box plot of interval time distribution
  - Daily interval and TAT averages w/ 7 day graph
  - Outliers for specific intervals
  - Incomplete time stamps for specific sites

Testing Results

- Time Card (TC) vs. Scanner (S) Data Observations:
  - Missed stamps: 7 (TC) vs. 0 (S)
  - Time Stamps per Site: 3 (TC) vs. 4 (S)
- TC system required manual entry of every time stamp
- 2 Sample t-test for differences in mean processing times failed to show statistical difference between systems (p=0.584 , n=99)
  - No evidence that scanner system increases TAT at α = .05

Every relevant lab staff member took the survey

Survey Responses (n= 3)	Time Card	Scanner
Integration into Workflow	2.33	3.67
Ease of Use	1.67	3.67
System Efficiency	3.33	4.33
Lack of Technical Difficulties	2.33	3.33
Overall Favorability (0= TC, 5= S)	Scanner (4.33)	

Table 1: Survey responses from Mohs Lab Technicians using the Scanner and Time Card Systems. They evaluated each criteria on a scale of 1 (worst) to 5 (best). The scanner system outperformed in all categories. [3]

Conclusion & Future Work

- The testing results and technician survey conclude that the scanner system improves upon the previous TC system

Future work includes:

- Implement the system fully into EPIC
- Obtain one scanner for each lab technician and physician (6)
- Streamline de-identification process (automatic)
- Utilize a QR code printer to attach codes to slides.

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References

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[3] Moh's TAT Team, "Moh's Time Tracking Satisfaction Survey," *Google Forms*, 22-Nov-2020. [Online]. Available: https://docs.google.com/forms/d/1fQCByZ8MknwE33AXbsSyfYJHH81tHzRLwAnZId8NF5Y/edit?usp=forms_home&ths=true. [Accessed: 03-Dec-2020].

[4] Bluetooth Mobile Waterproof Antimicrobial 2D Barcode Scanner (image) https://www.officedepot.com/a/products/8035844/Adesso-NuScan-3500TB-Bluetooth-Mobile-Waterproof/