Utilization of an Artificial Intelligence-Based Documentation System Improves Provider Efficiency in Outpatient Orthopaedic Clinics: Reducing the Afterhours Burden of the Electronic Health Record

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INTRODUCTION:

Despite recent technological advancements including smart-text phrases, note templating, and “speech recognition systems”, documentation within the electronic health record (EHR) remains an arduous, monotonous task within orthopaedic surgery and may contribute to provider inefficiency, prolonged work hours, and increased burnout. The purpose of this pilot study was to determine whether the utilization of an artificial intelligence (AI)-based, ambient documentation system could improve provider efficiency in the EHR during outpatient encounters.

METHODS:

A retrospective, quality improvement study was conducted. EHR metrics from providers within the Department of Orthopaedics at an urban, academic medical center and satellite facilities were collected. The EHR Epic Signal database, which provides detailed provider-level information was queried for metrics pertaining to the documentation process including the average number of appointments per day, progress note length, time in notes per day, pajama time, time on unscheduled days, time outside 7am – 7pm, time outside scheduled hours, and percent of appointments closed same day. Pajama time is defined as the average number of minutes a provider spends on charting activities on weekdays outside the hours of 7am – 5:30pm or outside scheduled hours on weekends or non-scheduled holidays. Post-utilization months (4-month interval December 2023 to March 2024) were compared to the same 4-month interval from the previous calendar year (pre-utilization) as a control to calculate the difference and percent change for each metric (Table 1). Data were subclassified based on provider utilization thresholds (Figure 1). Additionally, the highest utilization provider’s metrics were analyzed over time (Figure 2).

RESULTS:

19 providers including attending physicians (n=11), advanced practice providers (n=5), and podiatrists (n=3) were included. There was no statistically significant difference in the average number of appointments per day in the pre and post-utilization periods. The average AI-tool utilization rates ranged from 24.0% to 31.4% of encounters per month in the post-utilization period. Compared to the pre-utilization period, provider use of the AI-tool improved provider efficiency across nearly all metrics analyzed (Table 1). In particular, the afterhours burden parameters all had a marked reduction. The pajama time, time on unscheduled days, time outside 7am – 7pm, and time outside scheduled hours decreased 15.9 (41%), 22.3 (31%), 23.6 (61%), and 9.0 minutes (24%) respectively. The average progress note length decreased 590.5 characters (15%) and the average time in notes per day decreased 16.9 minutes (31%). However, there was no improvement seen in the percent of appointments closed same day (Table 1). Interestingly, primary outcome metrics (time in notes per day, pajama time, time outside 7am – 7pm) had pronounced efficiency improvements at higher utilization thresholds (Figure 1). Similarly, using the highest utilization provider as an example, primary outcome metrics continued to improve over time suggesting that increased efficiency savings can be achieved with extended use (Figure 2).

DISCUSSION AND CONCLUSION: Use of an ambient, AI-based documentation system markedly improved orthopaedic provider efficiency as measured by Epic Signal data metrics in this pilot, quality improvement study. Increased utilization rates and extended use over time allowed for maximum improvements in provider efficiency. The reduction in afterhours time and effort was striking and has the potential to have a significant positive influence on provider wellbeing. More widespread adoption of similar AI-based documentation tools may allow for reduced daily work hours, reduced provider burnout, increased efficiency and thus revenue, and overall improved satisfaction rates. This technology deserves increased attention and warrants further study.

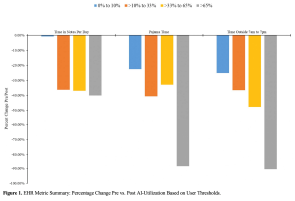

Figure 1. EHR Metric Summary: Percentage Change Pre vs. Post AI-Utilization Based on User Thresholds.

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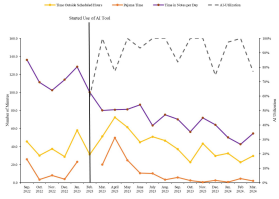

Figure 2. EHR Metric Summary Over Time for Highest Utilization Provider.

Signal Data Variable	Pre-AI Utilization Dec. 2022 - March 2023 [A]	Post-AI Utilization Dec. 2023 - March 2024 [B]	Difference [C] = [B] - [A]	Percent Change
Number of Providers [1]	19	19		
Appointments per Day	22.7	21.9	-0.8	-3%
Progress Note Length	4,064.4	3,473.9	-590.5	-15%
Time in Notes Per Appointment	7.5	4.4	-3.1	-41%
Time in Notes Per Day	39.5	17.3	-16.9	-31%
Pajama Time [2]	38.7	22.8	-15.9	-41%
Time on Unscheduled Days [3]	71.6	49.3	-22.3	-31%
Time Outside 7am to 7pm [4]	38.7	15.1	-23.6	-61%
Time Outside Scheduled Hours [5]	36.7	27.7	-9.0	-24%
Percent of Appointments Closed Same Day	76.2%	76.0%	-0.2%	-0%

[1] To be included in the analysis, an individual must meet the threshold in a given month. For example, if Provider A only met the threshold in February 2024, they were included in the pre and post period for February only. If provider B met the threshold in December 2023 and January 2024, they were then only included in December 2023 and January 2023. The counts provided are the unique number of providers included. As such, while a count may say 19, the provider may have been in the analysis for all months, or only a subset.
[2] Pajama time is defined as the average number of minutes a provider spends on charting activities outside the hours of 7am – 5:30pm or outside scheduled hours on weekends or non-scheduled holidays. Pre-utilization dates exclude February 2023 and February 2024.
[3] * Indicates data is available for combined individual or sub-cohorts of providers

Table 1. EHR Metric Summary: Pre vs. Post AI-Utilization.