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Improving Physician Electronic Health Record Usability and Perception Through Personalized Coaching

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Abstract. The relationship between poor EHR training and subsequent poor usability is increasingly being recognized. We utilized objective EHR audit log data to personalize EHR training with the goal of improving EHR usability and to identify changes in physician perceptions pre- and post-intervention. We found that time in the system and Pajama time decreased post-coaching intervention. Different physician perceptions were reported pre- and post-coaching. Overall, personalized EHR coaching improved the usability and perceptions of physicians.

Keywords. Electronic, Health, Records, Coaching, Personalized, Usability

1. Introduction

Electronic health record (EHR) usability challenges have accompanied the increased EHR use worldwide and can lead to physician dissatisfaction.(1, 2) Poor EHR usability contributes to physician burnout and fatigue, reduced physician satisfaction, and worsens the quality of care. (3-5) The relationship between poor EHR training and subsequent poor usability is increasingly being recognized.(6) Studies have shown EHR training has a significant impact on EHR use, efficiency, and satisfaction.(6, 7) Improving physicians' EHR skills with training may address EHR usability challenges, including physician workload, time spent on EHR tasks and pages, satisfaction, patient safety, and perceived quality of care.(6-9)

EHR training methods include classroom-based training, computer-based training, and a combination of classroom- and computer-based training.(10) Classroom-based training is currently the most utilized method; though it has been shown to be less effective than focused training methods.(11) Tailored coaching can help physicians identify and improve specific areas of inefficiencies in EHR use and improve user experience.(12) Use of objective measures like audit log data, which captures and timestamps user's activity in EHR, can help inform focused training sessions.(13, 14)

Our study utilized objective EHR audit log data to personalize EHR training with the goal of improving EHR usability and to identify changes in physician perceptions pre- and post-intervention.

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2. Methods

In this cross-sectional study, we recruited pediatric physicians from a major tertiary medical center in the Southeastern region of the US. The study coach was a pediatric physician who is a certified Epic® builder and holds extensive experience in EHR usability. Institutional review board approval was obtained prior to the beginning of the study. All coaching sessions were conducted virtually due to restrictions introduced by the COVID-19 pandemic. Each session was one hour in duration and physicians were compensated for their participation.

The personalization of the EHR coaching sessions was based on the analysis of the physician's EHR audit log. Before each session, the study coach (CS) thoroughly examined the EHR audit log for each physician and identified areas of improvement by comparing the physician's metrics to the departmental metrics. For example, if the physician was in the upper quartile of the department for time spent in the system, then the coach would identify 'time in the system' as an area to improve. Based on the EHR audit log analysis, the coach would personalize the session to provide specific solutions and tips to help improve the physician's use of the EHR. After the session, the coach would provide a written report to the physician summarizing the areas of improvement, proposed solutions, and additional resources that may be helpful to the physicians.

To characterize physician perceptions of the EHR and to monitor changes in perceptions pre- and post- intervention, we solicited perceptions at baseline and at exit of the study. Prior to the sessions, we asked all participating physicians to identify their top three favorable and frustrating features of the EHR. Then, post coaching sessions, we asked the same physicians to identify their top three favorable and frustrating features.

We obtained EHR audit log data for each physician to measure changes in EHR usability. We extracted Signal Data, an audit log report generated by the EHR vendor (i.e., Epic®). We collected EHR audit log data for the physicians one month prior and one month post the coaching intervention. Pre-intervention data was obtained for the month of October 2020 and post-intervention data was obtained in January 2021.

We collected three EHR audit log data for each physician: (1) total time spent in the system per day measured in minutes, (2) time spent in In-Basket measured in minutes, and (3) Pajama time during the one-month period before and after the intervention. Pajama time is defined as the average number of minutes spent in charting activities on weekdays outside working hours, defined between 7:00 AM and 5:30 PM, and any time on weekends and non-scheduled holidays.

Since the sample size of physicians was relatively small, we applied Wilcox Rank Test instead of paired T-test to compute the differences in EHR audit log data pre- and post-intervention. We conducted thematic analysis of the open text responses from physicians by grouping each response into two categories: 1) EHR features, 2) Rating. EHR features categorized the responses into commonly used usability concepts as outlined in the literature.(15) Rating categorized the responses into positive and negative perceptions towards the EHR.

3. Results

A total of 17 physicians received the coaching intervention. Of the 17 physicians, 9 (53%) were female, 6 (35%) were community physicians and 11 were practicing faculty,

9 (53%) were specialty pediatricians and 8 (47%) were primary care pediatricians, and 13 (77%) had five years of more of using Epic®.

The average (SD) time in the system decreased post-coaching intervention compared to pre-intervention (95.86 (47.83) vs. 103.27 (47.07), p-value= 0.47), Figure 1. Additionally, the average (SD) Pajama time decreased post-coaching intervention compared to pre-intervention (25.2 (20.21) vs. 21.42 (14.35), p-value= 0.30). Time spent in the In-Basket section of the EHR increased post-coaching intervention compared to pre-intervention (4.90 (3.24) vs. 4.35 (3.41), p-value= 0.723).

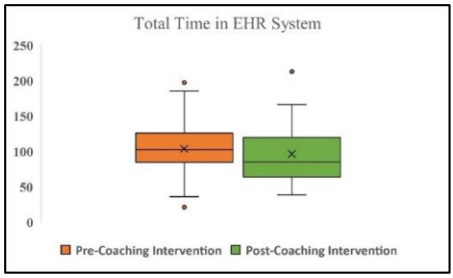

Figure 1. EHR time spent in EHR system among physicians (n=17) pre- and post- coaching intervention.

Pre-coaching intervention, physicians reported the features they liked and disliked about the EHR. Among the top complaints among physicians were documentation burden, difficulty reviewing lab results, and the click-heavy nature of the interface. Particularly, some physicians reported that to attain effective EHR usability, additional EHR training is needed to complement the current EHR training that relies on classroom-based training.

Other EHR challenges included finding patient information, and too many clicks to complete a task, and the interface design not being user-friendly. Physicians commended the ability to assess data from across the health system and between different health care systems, Table 1.

Table 1. EHR perceptions Pre-Coaching Interventions

EHR Features	Quote	Rating
Adequate Training	"Difficult to navigate if you are not fully trained"	Negative
Accessibility	"I can access all records across the health system"	Positive
Interoperability	"Connects with other health systems, available on my phone"	Positive
Interface Design	"Too many toolbars in the sides of the screen, seems updates do not have "real" users in mind"	Negative
Interface Design	"Multiple clicks to access some items (sexual history, flowsheets, etc)"	Negative
Information Retrieval	"Some things in Social History are hard to get to (too many clicks)"	Negative
Time Burden	"time consuming, frequent updates disrupt usability"	Negative

Post-coaching, physicians reported satisfaction with EHR features while also voicing some concerns. Physicians found merit in the coaching session with regards to finding and reviewing patient information, the use of built-in tools for documentation such as autocomplete and customized templates for orders, which saved physicians time

in using the system. Additionally, physicians voiced satisfaction using search functions and filters to locate information in the EHR.

Negative feedback remained about too much customization of the interface, which was found to be confusing for physicians. Similarly, the click-heavy nature of the interface remained to be problematic even post-coaching.

Table 2. EHR perceptions Post-Coaching Interventions

EHR Features	Quote	Rating
Accessibility	"As an EMR - all of the patient information is in one place"	Positive
Accessibility	"Allows relatively easy access of information, ability to review data and enter orders."	Positive
Customization	"Organization and searchability of information"	Positive
Customization	"Too many ways to do the same task"	Negative
Interface Design	"There is still a lot of manual data entry, lots of clicking from screen to screen"	Negative
Information Retrieval	"Finding past information about patients; care everywhere"	Positive
Information Retrieval	"search function, filters"	Positive
Usability	"Intuitive, saves time once smartphrases built, provides a way to have consistency across providers and improve quality"	Positive

4. Discussion

To our knowledge, this is the first study to investigate the use of personalized EHR training on physicians on EHR usability. We report that personalized coaching led to improvements in pediatric physicians' use and impressions of the EHR. We found that physicians spent less time in the EHR system after coaching compared to before coaching. We report that total time in the system and Pajama time reduced post-intervention, while time in In-Basket increased post intervention. Although we do not have an explanation for the increased time spent in In-Basket, it is plausible that there were higher volumes of messages generated in the month post-intervention, which we could not account for. . Other studies focusing on personalized coaching via a 3-day intense EHR education (8) or online needs assessment (12) have shown improvement in similar parameters.

We found that physicians were mainly concerned about the EHR interface design and particularly the required effort to find information coupled with the click heavy interface. Prior studies done with emergency department and intensive care physicians have reported similar concerns. (1,15) Post-coaching intervention, physicians complimented the ability to find information in the EHR along with its overall usability. One explanation for this change in perception is that the coach assisted the physicians to customize their interface, which could help them find information easier as well as facilitate access to search functions that streamlined information retrieval. This correlates with previous studies, which suggest ongoing education to help physicians personalize retrieval and their interface leads to improved physician satisfaction (6).

One limitation of this study was that we could not account for the severity of the patients seen by the physicians pre- and post-intervention to eliminate any confounding bias that may impact EHR audit log metrics. This was a single-site, single-EHR system study, which may affect the generalizability of the finding, despite Epic® being the largest and most prominent EHR system in the US. Future work will include testing the effectiveness of personalized coaching across multiple sites and various EHR systems.

In summary, physicians found merit in personalized EHR coaching to improve their time in the EHR and to improve their competency skills regarding existing EHR functionality.

References

[1] Khairat S, Burke G, Archambault H, Schwartz T, Larson J, Ratwani RM. Perceived Burden of EHRs on Physicians at Different Stages of Their Career. Appl Clin Inform. 2018;9(2):336-47. Epub 2018/05/17. doi: 10.1055/s-0038-1648222. PubMed PMID: 29768634.

[2] Howe JL, Adams KT, Hettinger AZ, Ratwani RM. Electronic Health Record Usability Issues and Potential Contribution to Patient Harm. Jama. 2018;319(12):1276-8. doi: 10.1001/jama.2018.1171.

[3] Melnick ER, Dyrbye LN, Sinsky CA, Trockel M, West CP, Nedelec L, et al. The Association Between Perceived Electronic Health Record Usability and Professional Burnout Among US Physicians. Mayo Clin Proc. 2020;95(3):476-87. Epub 2019/11/19. doi: 10.1016/j.mayocp.2019.09.024. PubMed PMID: 31735343.

[4] Khairat S, Coleman C, Ottmar P, Jayachander DI, Bice T, Carson SS. Association of Electronic Health Record Use With Physician Fatigue and Efficiency. JAMA Netw Open. 2020;3(6):e207385. Epub 2020/06/10. doi: 10.1001/jamanetworkopen.2020.7385. PubMed PMID: 32515799; PubMed Central PMCID: PMC7284310 Pharmaceuticals outside the submitted work. No other disclosures were reported.

[5] Tajirian T, Stergiopoulos V, Strudwick G, Sequeira L, Sanches M, Kemp J, et al. The Influence of Electronic Health Record Use on Physician Burnout: Cross-Sectional Survey. Journal of medical Internet research. 2020;22(7):e19274-e. doi: 10.2196/19274. PubMed PMID: 32673234.

[6] Longhurst CA, Davis T, Maneker A, Eschenroeder HC, Jr., Dunscombe R, Reynolds G, et al. Local Investment in Training Drives Electronic Health Record User Satisfaction. Appl Clin Inform. 2019;10(2):331-5. Epub 20190515. doi: 10.1055/s-0039-1688753. PubMed PMID: 31091545; PubMed Central PMCID: PMC6520075.

[7] Stevens LA, DiAngi YT, Schremp JD, Martorana MJ, Miller RE, Lee TC, et al. Designing An Individualized EHR Learning Plan For Providers. Appl Clin Inform. 2017;8(3):924-35. Epub 20171220. doi: 10.4338/aci-2017-04-0054. PubMed PMID: 30027541; PubMed Central PMCID: PMC6220690.

[8] Robinson KE, Kersey JA. Novel electronic health record (EHR) education intervention in large healthcare organization improves quality, efficiency, time, and impact on burnout. Medicine (Baltimore). 2018;97(38):e12319. Epub 2018/09/22. doi: 10.1097/md.0000000000012319. PubMed PMID: 30235684; PubMed Central PMCID: PMC6160120.

[9] Alami J, Hammonds C, Hensien E, Khraibani J, Borowitz S, Hellems M, et al. Usability challenges with electronic health records (EHRs) during prerounding on pediatric inpatients. JAMIA Open. 2022;5(1):ooac018. Epub 20220308. doi: 10.1093/jamiaopen/ooac018. PubMed PMID: 35571358; PubMed Central PMCID: PMC9097610.

[10] Samadbeik M, Fatehi F, Braunstein M, Barry B, Saremian M, Kalhor F, et al. Education and Training on Electronic Medical Records (EMRs) for health care professionals and students: A Scoping Review. Int J Med Inform. 2020;142:104238. Epub 20200814. doi: 10.1016/j.ijmedinf.2020.104238. PubMed PMID: 32828034.

[11] Kirshner M, Salomon H, Chin H. An evaluation of one-on-one advanced proficiency training in clinicians' use of computer information systems. International journal of medical informatics. 2004;73(4):341-8. doi: https://doi.org/10.1016/j.ijmedinf.2003.11.001.

[12] Lopez CA, Omizo RK, Whealin JM. Impact of a tailored training on advanced electronic medical records use for providers in a Veterans Health Administration Medical System. JAMIA Open. 2018;1(2):142-6. doi: 10.1093/jamiaopen/ooy031.

[13] Adler-Milstein J, Adelman JS, Tai-Seale M, Patel VL, Dymek C. EHR audit logs: A new goldmine for health services research? Journal of Biomedical Informatics. 2020;101:103343. doi: https://doi.org/10.1016/j.jbi.2019.103343.

[14] Rule A, Chiang MF, Hribar MR. Using electronic health record audit logs to study clinical activity: a systematic review of aims, measures, and methods. J Am Med Inform Assoc. 2020;27(3):480-90. Epub 2019/11/22. doi: 10.1093/jamia/ocz196. PubMed PMID: 31750912; PubMed Central PMCID: PMC7025338.

[15] Khairat S, Coleman C, Teal R, Rezk S, Rand V, Bice T, et al. Physician experiences of screen-level features in a prominent electronic health record: Design recommendations from a qualitative study. Health Informatics J. 2021;27(1):1460458221997914. Epub 2021/03/12. doi: 10.1177/1460458221997914. PubMed PMID: 33691524.