DCLP Group 1

Project Title: Work-Force Wellbeing and Technology

Project Sponsor: Jonathan Bae, MD

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Executive Summary

In the absence of well-being, providers experience burnout, a syndrome characterized by exhaustion, cynicism, and reduced effectiveness. Provider burnout, in turn, lowers patient satisfaction, leads to medical errors, and increases workforce turnover. Alarmingly, large numbers of healthcare professionals are experiencing burnout. The causes of burnout are multi-factorial and the interventions to address burnout must be multi-pronged to have a significant impact. After a thoughtful discovery process, our group combined electronic health record (EHR) usage data with results of the Duke Culture Pulse Survey to investigate the impact on provider burnout. Although there are no strong correlates of EHR usage with burnout metrics, we found that female providers are more likely than male providers to report burnout. This burnout may be correlated to time spent in the EHR, which is also higher in females compared to males. Our findings indicate factors outside of EHR usage data are likely responsible for work-life balance and burnout, as work-life balance was strongly correlated to burnout, even though EHR usage was not. Further investigation into institution and department specific factors is warranted.
**Background**

Fostering the well-being of our medical providers is essential not only to the providers themselves but to the entire health system. In the absence of well-being, providers experience burnout, a syndrome characterized by exhaustion, cynicism, and sense of limited personal accomplishment. Provider burnout, in turn, lowers patient satisfaction, leads to medical errors, and increases workforce turnover. Alarmingly, at least 50% of physicians report symptoms of burnout with the highest rates among those in primary care and emergency medicine (1). Surveys of Duke clinicians demonstrate a similarly high incidence of burnout symptoms. It is now imperative that effective interventions are derived and implemented.

The causes of burnout are multi-factorial, and the interventions to address burnout must be multi-pronged to have a significant impact. A review of the data on interventions to prevent and reduce physician burnout has shown that both individually-focused and organizational strategies can reduce symptoms (2). The impact of mindfulness, stress reduction, and small group discussion has been most studied, but no one strategy has been found to be most impactful. Therefore, a combination of approaches will likely be most effective. It is encouraging that many impactful interventions are relatively inexpensive, and relatively small interventions can have a significant impact (3).

Within Duke University Health System (DUHS), provider well-being is currently addressed in a variety of ways. A well-being virtual home highlights specific approaches to the issues, leader training information, resource links, and a library of educational and interventional tools. The Duke Center for Healthcare Safety and Quality offers resilience courses, tools, and other resources. There is emerging work involving the use of well-being measurement apps, a multifaceted peer support program, and other educational efforts, studies, and tools. There are also several provider wellness initiatives within various DUHS entities, departments, and service lines. However, to our knowledge, there has not yet been a robust and complete effort to consider the contribution of the electronic health record (EHR) to provider burnout within DUHS.

There is broad concern that the EHR is a significant factor in physician burnout (4). The EHR has become almost universal in the U.S. healthcare industry: in 2017, 96% of hospitals and 86% of community physicians were using an electronic record system (5). Despite many benefits of the EHR, such as improving communication, access to patient data, and safety, the EHR is also considered a time burden and potential dissatisfier. A 2018 poll of 521 primary care physicians found that 54% think the EHR reduces professional satisfaction, and 49% think it reduces their clinical effectiveness (6). A study of over 4000 physicians demonstrated that the use of health information technology is an independent predictor of burnout (7).

In order to effectively ascertain the contribution of EHR use to clinician burnout within DUHS, we must understand which providers have the highest rates of burnout and which characteristics of EHR usage are linked with these providers. One commonly used tool designed to measure burnout is the Maslach Burnout Inventory (MBI) (8). First described in 1981, it involves three subscales: emotional exhaustion, depersonalization, and personal accomplishment. Within each subscale, respondents select the frequency with which they experience certain described conditions. Each frequency choice is assigned a score from zero (never) to six (daily) with higher scores being associated with burnout. The 2019 DUHS Culture Pulse Survey measured burnout by the five items from the validated emotional exhaustion subset of the MBI.

Our group was charged with defining which areas of EHR usage should be targeted to reduce burnout among Duke providers based on data from the most recent Culture Pulse Survey and from Epic Provider Efficiency Profiles (PEPs), which provide clinician-level data such as workloads, time in certain activities, and use of various EHR tools designed for efficiency.

**Methods**

**Discovery process**

We conducted a series of in-person and remote meetings, dividing responsibilities to 1) Investigate the problem, 2) Meet with the project sponsor to understand needs, 3) Identify and speak with numerous stakeholders about the project, and 4) Consider possible solutions before deciding on our final proposal.
Investigating the Problem
We reviewed the literature and investigated strategies and data from other institutions considered to be leaders in workforce well-being and technology.

Meeting with the Project Sponsor
We met with our Project Sponsor, Dr. Jonathan Bae, to understand his primary hypothesis that the EHR, Maestro (Epic Health Research Network, Verona, WI) may be contributing to burnout, as reported in the University-wide Culture Pulse Survey. Dr. Bae was interested in strategies to understand what aspects of the EHR may be contributing to provider burnout.

Discussion with Stakeholders
We met and collaborated with additional stakeholders within DUHS including David Staples, Director, DUHS Analytics; Dr. Mina Boazak, Clinical Associate in the Department of Psychiatry and Behavioral Sciences, and Dr. Eugenia McPeek Hinz, Duke Health Associate Chief Medical Information Officer. We also collaborated with external entities, including Matthew Betts and Scott Mondore, PhD, from SMD, the third party vendor linking Culture Pulse data to the EHR metrics.

Possible Solutions Evaluated
Based on our review and discussions, we considered and evaluated multiple solutions, including:
1. Selecting specific EHR metrics for evaluation versus analyzing all data and correcting for multiple hypotheses
2. Considering the null hypothesis, namely that EHR usage is not linked to burnout
3. Assessing the impact of specific strategies, including use of support staff (scribes, APPs) to expedite provider time or familiarizing providers with technological shortcuts (e.g. smart phrases)
4. Determining if age of providers impacts utilization of technologic tools for patient care
5. Investigating differences between specialties regarding utilization of technologic tools for patient care or implementation of anti-burnout strategies

Final Agreed Upon Solution
After considering the above possibilities, we ultimately opted to analyze all data, as well as to strongly consider the null hypothesis.

Data Source
In collaboration with SMD, Dr. Mina Boazak, and Dr. Eugenia McPeek Hinz, we combined EHR usage data with results of the Duke Culture Pulse Survey.

Duke Culture Pulse Survey
The Culture Pulse Survey is an employee engagement and culture of safety survey which was administered to all DUHS providers in May 2019. The number responding was 19,396, representing a 72.3% response rate. Survey questions were set to a 5-point Likert scale to measure safety climate, teamwork climate, work-life balance, and emotional exhaustion or “burnout.” Burnout was transformed to a 100-point scale for ease of interpretation, ranging from 0 to 100, with higher scores representing more burnout.

Duke Electronic Health Record Usage Data
EHR data was obtained from audit log data from the Epic Signal report, derived from processing primary user action logs (UALs). The UAL calculates active time in an EHR activity according to time, keyboard clicks, and mouse strokes. Audit logs also classify time outside of scheduled hours as after-hours time on days with outpatient appointments, as well as time on nonscheduled days. To synchronize data with the Culture Pulse Survey results administered in May 2019, we utilized the audit log from April 2019.
We evaluated 16 audit log metrics for this study. Metrics, divided by category, included: provider EHR usage (time-in-system, days-in-system versus days with scheduled appointments, time completing in-basket messages), provider work volume (total number of in-basket messages and documentation length.) Time in the system included total time on scheduled days, after-hours time on scheduled days, and time on nonscheduled days. Appendix A includes all selected audit log metrics along with their definition and the Signal report source metric name. To explore the volume of time spent during scheduled hours versus nonscheduled hours, we calculated a ratio of (“After-hours on scheduled days” plus “Time on nonscheduled days”) divided by “Total time spent in the EHR.” Statistical analysis was conducted using R (R Foundation for Statistical Computing, Vienna, Austria). Summary statistical analysis by provider type and gender was performed. Various statistical tests were utilized, including a Kruskal-Wallis test to analyze variance of differences across provider types and a Mann-Whitney U test to compare metrics that were found to significantly differ. Finally, using Spearman’s Rank Rho coefficient testing, an analysis was conducted on correlates of burnout scores from the employee engagement and well-being survey to response domains and EHR audit log data.

Results

Regarding Culture Pulse Data, respondent self-identified sense of commitment (R=0.57, p<0.001) and work life balance (R=0.50, p<0.001) were the most strongly inversely correlated with burnout (Fig. 1). Despite the apparent burnout relationship with notions of work life balance, however, ultimately there were no strong correlations found between EHR usage and burnout, as the strongest Rho value was 0.16 (Fig. 1). Statistically significant relationships between burnout and some “work life balance”-reflective EHR usage metrics did exist, including total time in system, days with appointments, and various calculations of unscheduled time, but these relationships again were only weakly correlative despite the statistical significance (Fig. 1). Through the Kruskal Wallis analyses of different provider groups, it was revealed that statistically significant differences in burnout did indeed exist across different specialties, gender, and provider type, but not across race (Fig. 2). Regarding specialty, for instance, highest median burnout scores were found within neurology and OBGYN, while the lowest median scores were found within gastroenterology and general surgery (Appendix B). The most significant differences in burnout data, however, were found among males and females (p=1.04E-05, Fig. 2). As seen in Fig. 3, females exhibited higher burnout scores across all provider types while also spending more time in the EHR.

Kruskal Wallis (Multiple Hypothesis Testing)

<table>
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<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Race</td>
<td>0.52699975</td>
</tr>
<tr>
<td>Provider Type</td>
<td>0.000959788</td>
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</table>

Fig. 1. Culture Pulse and EHR Correlates to Burnout

Fig. 2. Results of Kruskal Wallis Analysis of Differences in Burnout Across Specialty, Gender, Race, and Provider Type.
Study Conclusions

Although provider scores for work life balance on the Culture Pulse Survey were strongly and inversely correlated with burnout scores, EHR usage metrics were only weakly correlative. This suggests that perceptions of work life balance involve factors that may include, but also seemingly extend beyond, EHR usage. Interestingly, burnout varies significantly by provider type, specialty, and gender. Female providers are more likely than male providers to report burnout, regardless of provider type. Higher burnout in females may or may not be related to their time spent in the EHR, which is also higher. Our findings suggest that EHR usage may be a component of burnout, but that there are seemingly factors beyond EHR usage metrics that contribute one’s sense of work life balance and/or burnout. As there are significant differences between specialties with regard to burnout, specialties at either extreme may represent an opportunity to perform a deeper dive and identify some of these additional contributing factors.

![Fig. 3. Gender Differences in Burnout Score and Time Spent in EHR. LEFT. When compared to their males, female providers had higher burnout scores. RIGHT. Female providers were also the most likely to spend time in the EHR.](image)

Deliverables: Recommendations, Timelines, and Implications

**Suggested Outcomes of Proposal**

- Further investigation of gender or sex-based differences in burnout is needed. Interestingly, women spend more time in the EHR, but also use more smart tools. We recommend examining work-based and home-based domains, as well as focus groups and qualitative interviews.
- Further investigation of provider type (physician, resident, APP) differences in burnout is needed. Investigation should include differences in support mechanisms available to each.
- A survey into perceived components of work life balance should be considered. Analysis of the impact of COVID-19 should be included.
- Specialties at either extreme of the burnout scale represent an opportunity to perform a deeper dive and identify department-specific best practices and opportunities for improvement.
- Consultant services to aid with the above should be considered.

**Implementation and Proposed Timeline for Next Steps**

- Provider focus groups and qualitative interviews (6 months)
- Use the results of the focus groups and interviews for survey development (10 months)
- Focused Surveys Administration (12 months)
- Data analysis (15 months)
- Evaluation of recommendations based on findings (17 months)
- Discussion of key findings with key Duke Health leaders (18 months)
- System-wide implementation (30 months)
- Implementation analysis (36 months)

**Downstream effects including financial Impacts, positive and negative**

- Positive financial impacts include less physician / APP turnover, fewer sick days, higher productivity, fewer medical errors.
- Negative financial impacts include costs of the survey and study analysis, as well as any consultants.

**Risks and Alternatives**

- The risks of ignoring this problem include the following: worsening physician / APP burnout, increased clinician turnover, increased utilization of sick days, overall job dissatisfaction, and negative impact of DUHS reputation. Provider burnout also lowers patient satisfaction, leads to medical errors, and increases workforce turnover.
- The risks of addressing this problem are financial cost of addressing the problem, implications for highlighting/exposing gender and provider differences within DUHS.
- Alternatives include pausing for further information gathering and analysis. They also include less focused intervention aimed at reducing burnout across all clinicians, regardless of differences.

**Likelihood of Adoption**

- Anticipated adoption of strategies to reduce burnout is high, especially in the COVID-19 era.
- As far as adopting processes, while survey fatigue may be real, clinicians might well be interested in targeted interventions and participating in focus groups to improve burnout rates.

**Novelty of Proposed Approach**

- A targeted approach to investigating and reducing burnout alone has never been employed at Duke.
- Successful targeted solutions for groups at risk would be novel and publishable and would promote Duke’s reputation as a thought leader and innovator in recognizing and addressing provider satisfaction.

**Relevance to the Institution’s Overall Mission**

- The Duke Health Mission and Vision are to advance health together by delivering tomorrow's health care today, accelerating discovery and its translation, creating education that is transforming, building healthy communities, and connecting with the world to improve health globally.
- This project is relevant to the Duke Health mission and vision as tomorrow’s health care assuredly involves strategies to improve patient satisfaction and reduce medical errors by newly focusing on a key contributor: provider burnout. Likewise, building healthy communities should include DUHS and its providers as a community whose health is essential to ensure.

**Next Steps and Key Elements for Success**

- Next steps include discussion of these findings with leadership, assessment of result validity, and review of likely strategies and timelines.
- Key elements for success include leadership buy-in, designing appropriate tools for assessing gender and provider differences in burnout, as well as tools for assessing the true contributors to work-life balance, inclusive of but extending beyond the EHR. Consultant services may be considered.
- Lead metrics include number of focus groups conducted, number of interviews conducted, actionable items delivered from groups/interviews, timelines met, survey administration, and improvement in burnout metrics. Provider turnover, patient and provider satisfaction, and medical errors can all be considered lag metrics for assessment.
- If our proposed strategies are adopted and timelines correct, next year’s DCLP group could be involved in interpretation of results obtained from focus groups and other interviews, as well as design/selection of surveys and additional strategies to follow these results.
Acknowledgements

Mina Boazak, MD, MMCi, Clinical Associate in the Department of Psychiatry and Behavioral Sciences
Eugenia McPeek Hinz, MD, MS, Associate Chief Medical Information Officer, Duke Health
David Staples, Director, DUHS Analytics
Matt Betts, PhD, Strategic Management Decisions (SMD)
Scott Mondore, Ph.D., VP, Workforce Engagement. Strategic Management Decisions (SMD)
Jennifer Swanson MD, Associate Chief Medical Officer of Operations

References

### APPENDIX A: Selected Access Log Metrics, Definitions, and Signal Source Data

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<tr>
<th>Selected Metric</th>
<th>Definition</th>
<th>Signal Source of Data</th>
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<tbody>
<tr>
<td>Days with appointments</td>
<td>Days with appointments during the reporting period.</td>
<td>Days with Appointments Numerator</td>
</tr>
<tr>
<td>Days in the system</td>
<td>Days provider is in system during the reporting period.</td>
<td>Time in System Per Day Denominator</td>
</tr>
<tr>
<td>Total Completed IM Messages (per month)</td>
<td>Number of completed messages in reporting period.</td>
<td>Seconds per Completed Message Denominator</td>
</tr>
<tr>
<td>Seconds/Message</td>
<td>Seconds per completed message.</td>
<td>Seconds per Completed Message Value</td>
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<tr>
<td>Average Progress Note Length (number of characters)</td>
<td>Average progress note length.</td>
<td>Progress Note Length Value</td>
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<td>Total new visits</td>
<td>Total new visits in the reporting period.</td>
<td>Sum of new patient level of service numerators for 99201-99205</td>
</tr>
<tr>
<td>Total consults</td>
<td>Total consults in the reporting period.</td>
<td>Sum of consult patient level of service numerators for 99241-99245</td>
</tr>
<tr>
<td>Calculated Total Patient Visits</td>
<td>Total patient visits (new, return, and consults) in the reporting period</td>
<td>Difference between scheduled days in system and total days spent in system.</td>
</tr>
<tr>
<td>Unscheduled days</td>
<td>Unscheduled days in system.</td>
<td>Time outside of scheduled hours numerator + Time on unscheduled days numerator/time in system per day denominator</td>
</tr>
<tr>
<td>Calculated Unscheduled Time (minutes/day)</td>
<td>Total time in system during unscheduled hours averaged over the number of scheduled day.</td>
<td>Ratio of unscheduled time in system to scheduled time in system</td>
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<tr>
<td>Calculated Unscheduled Time/Total Time</td>
<td>Ratio of unscheduled time in system to total time in system.</td>
<td>&quot;unscheduled time&quot; metric / &quot;time in system&quot; metric</td>
</tr>
<tr>
<td>Total Time in System (minutes/day)</td>
<td>Total time in system per day.</td>
<td>Time in system per day value</td>
</tr>
<tr>
<td>Calculated Time in IM (minutes/day)</td>
<td>Calculated time providers spends in in basket on messages per day.</td>
<td>Seconds per completed message value/80*&quot;time in system per day denominator.</td>
</tr>
<tr>
<td>Voice recognition use for notes.</td>
<td>Percentage of note content composed via voice recognition in the reporting period.</td>
<td>Note Composition Method by Author Voice Recognition Value</td>
</tr>
<tr>
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<td>Note Composition Method by Author Manual Value</td>
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<td>Note Composition Method by Author Copy/Paste Value</td>
</tr>
<tr>
<td>Smart Tool</td>
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</tr>
<tr>
<td>Other Author</td>
<td>Percentage of note content completed by alternate author.</td>
<td>Note Contribution Source Test Written By Other</td>
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### APPENDIX B: Median Burnout Scores by Specialty (Medians Decrease from Left to Right)

![Median Burnout Scores by Specialty](image-url)