Chronic Exhaustion and Physician Empathy

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1 Project Overview

Provider empathy is a cornerstone of high-quality medical care: it can theoretically improve both patient welfare (by increasing satisfaction and trust, improving clinical outcomes, etc) and provider welfare (by reducing rates of litigation, increasing reimbursement levels by increasing patient experience scores, etc) (James, 2023; Kelm et al., 2014). However, there is evidence that physician fatigue is negatively associated with clinical behaviors that require empathy (such as prescribing pain medication to patients etc (Choshen-Hillel et al., 2022; Licciardone et al., 2024)). Given that physicians frequently work under conditions of extreme exhaustion (Kuehn, 2023), the associated deterioration of empathy and its effects on patient outcomes is a serious concern.

This project has two parts: (i) a field experiment in which we will test two interventions to preserve physician empathy under conditions of chronic sleep exhaustion, and (ii) an observational data analysis of electronic health records to establish the causal effect of physician empathy on patient outcomes. Specifically:

I. Field experiment:

- We propose a 1×3 design to evaluate two interventions aimed at preserving or enhancing physician empathy under exhaustion: (i) a note-taking AI assistant tool and (ii) a humanizing intervention. These interventions draw on prior research and address two different pathways – cognitive depletion vs. behavioral dysregulation – for why empathy is said to be compromised under exhaustion.
- Given budget constraints, we do not manipulate exhaustion in this experiment. Instead, we measure physician exhaustion over three months by monitoring sleep patterns using wearable devices. We will use this measured data on chronic exhaustion to understand how measured exhaustion may moderate the effects of our 2 interventions on empathy. This (non-causal) moderation analysis will inform the design of our future research projects on this topic.
- We will examine the role of patient age as a potential moderator, as older patients with complex conditions may both benefit more from these interventions, and be harmed more from lowered empathy.

II. Observational data analysis:

- Analyze unstructured text data in a large electronic health record database, using econometric techniques to explore how variation in provider empathy causally affects key patient outcomes (using a "judge" design) (Chyn, Frandsen, & Leslie, 2024).

This project will make several novel contributions to the literature on physician empathy. First, while most studies focus on short-term fatigue (e.g., after a long shift), our setting examines chronic exhaustion – as measured by prolonged sleep deprivation—a less studied yet more relevant indicator of physician exhaustion. Second, our project seeks to shift the research focus from a passive perspective ("what is happening?") to an active perspective ("what can be done about it?"). In their recent review of the physician decision-making literature, Currie, MacLeod, and Musen (2024) accurately highlighted that although there is abundant research exploring the many factors that affect physician decision-making, there is virtually no research on how to leverage this understanding to enhance those decisions and improve patient care. This project is specifically designed to fill that gap by focusing on empathy. Third and finally, by using a complementary mixed-methods approach, we can connect the experimental insights from the field experiment to broader clinical data, thus capturing the full chain of events from physician fatigue to patient well-being via empathy.

2 Field Experiment

We will recruit 400 resident physicians from teaching hospitals and academic medical centers, distributing study announcements through program coordinators and residency directors. Additionally, we will use targeted email outreach and departmental presentations to engage residents interested in empirical research on physician well-being and patient care.

There are few studies that quantify the effects of any intervention on empathy in the medical setting. However, based on our power calculations, detecting a small-to-moderate effect size (around r = 0.20) would require approximately 400 resident physicians for adequate statistical power. Although prior estimates suggested needing up to 650–1300 physicians for extremely small effects (r $\sim$ 0.10–0.14), this more modest target balances feasibility with maintaining sufficient power for our primary analyses.

2.1 Chronic Exhaustion Measurement

We will track chronic sleep exhaustion over three months. Each participating resident physician will be provided with a Fitbit or similar wearable device to monitor sleep patterns, heart rate variability, and other indicators of fatigue over a period of three months. By the end of this period, we will have accumulated objective, longitudinal data on participating residents that reflect their sleep habits, supplemented with questionnaires that inform us about how typical these habits are for them and more subjective indicators of well-being, exhaustion, and burnout.

[Note: Ideally, we would *manipulate* exhaustion in addition to measuring it. We would like a within-participant design where, at the three-month mark, half of the residents would receive push notifications and monetary incentives to increase their sleep. We would then follow them for another 3 months. However, this approach exceeds our current budget. Thus, we have two options: (i) We manipulate exhaustion in future studies and grants; and/or (ii) We are also simultaneously applying for the USC Roybal Center Grant; if additional funds become available through collaboration, we will incorporate this feature into our experiment.]

2.2 Pop-Up Online Clinic

After the three-month period, we will establish a pop-up online clinic, which the recruited resident physicians will be required to attend. During this clinic, each resident will interact one-by-one with 4-6 patients recruited from reputable medical advice forums like r/AskDocs. These patients will be carefully prescreened to ensure they present genuine medical concerns, verified through their inquiry history on these forums. Physician-patient dyads will interact on screen in real time in recorded sessions.

This approach has several key advantages. First, recruiting patients who are volunteers with authentic health concerns helps capture genuine clinical interactions without the confounding effects of established patient-physician relationships or patient histories. Second, resident physicians, who often contend with considerable physical and cognitive fatigue, provide an ideal sample for studying how chronic exhaustion influences empathic care. Their busy schedules expose them to the types of exhaustion likely to affect both decision-making and patient interactions. Third, attempting to manipulate or measure exhaustion directly in a "real" clinical setting poses logistical and ethical challenges, and may not provide the best setting for our research question. Our carefully structured pop-up clinic thus achieves a high degree of ecological validity—mirroring real-world clinical encounters—while preserving the rigor needed to explore how empathy can be sustained under exhaustion.

2.3 Intervention Design (1 x 3)

The goal of the field experiment is not to isolate behavioral mechanisms driving empathy loss under exhaustion, but rather to rely on previously established theory to design a policy-oriented experiment that allows us to test different interventions that can preserve empathy in real-world settings. Thus, we will use a single-factor, three-level design to test how effective two different interventions are to preserve or boost empathy under exhaustion. One key advantage of our design is that each intervention targets a different reason why empathy is believed to decline under exhaustion: (i) *cognitive depletion*: exhaustion reduces the cognitive resources required for empathy (e.g., physicians understand the need to show empathy but are reallocating their limited cognitive resources to other more highly prioritized tasks) (Gamble, Henry, & Vanman, 2023; Goodhew & Edwards, 2022); vs (ii) *behavioral dysregulation*: even when they have the cognitive capacity to do so, empathy is crowded out by other emotional states due to exhaustion (e.g., stress, emotional detachment, negative affect etc) (Park et al., 2015).

Control condition: This will include standard 10-min consultations between doctor and patient (5 patients per physician, seen one-by-one) where the physicians take notes and provide health guidance.

Intervention 1: (AI Assistant intervention) In addition to the control setting, physicians will use a simple AI note-taking tool that records the encounter and summarizes it in real time (the tool will be pre-validated to ensure that it does in fact reduce physician documentation load). If the cognitive depletion pathway plays a role, then this note-taking AI tool may be more likely to maintain or increase empathy under exhaustion because the tool frees up cognitive resources.

Intervention 2: (Humanizing intervention) In addition to the control setting, the physician has access to some personal information provided by the patient prior to the encounter (e.g., the patient's response to "What do you wish your physician knew about you that would not otherwise be known?"). If the behavioral dysregulation plays a role, this humanizing intervention may be more likely to increase empathy under exhaustion by making the centrality of empathy to the doctor-patient encounter more salient to the physician.

The online environment of our study allows us to deliver the interventions with high fidelity. If cognitive depletion plays a greater role in empathy loss under exhaustion, then the difference in outcomes (our measures of empathy) between Intervention 1 and the Control condition will be larger than the difference between Intervention 2 and the Control condition. If behavioral dysregulation plays a greater role in empathy loss under exhaustion, then the difference in outcomes between Intervention 2 and the Control condition will be larger than the difference between Intervention 1 and the Control condition.

2.4 Data Collection and Measurement

All clinic sessions will be video and audio recorded for comprehensive analysis of physician-patient interactions. Our primary outcome measure is empathy; thus, objective and subjective markers of empathy will be captured via:

- Behavioral observations from recorded sessions (coded by research assistants and language models).
- Patient and physician assessments of perceived empathy and satisfaction.
- NLP-based analyses of dialogue to detect empathic language.
- Computer vision analyses of video recordings to detect nonverbal cues (e.g., facial expressions, posture)

We will integrate these measures with longitudinal Fitbit data to assess the relationship between physicians' chronic exhaustion levels and their empathy during the pop-up clinic sessions. Physician residents who experience greater sleep deficits relative to their average (both in the fitbit data and as reported in questionnaires) may exhibit lower empathic responses and may benefit more from empathy-preserving interventions.

Importantly, we will test whether patient age acts as a moderator. This will help us determine whether our empathy-preserving interventions works differently for older adults, who often have more complex healthcare needs (e..g, dementia, multi-comorbidities etc) and could benefit disproportionately from high-empathy clinical encounters. We will also examine the role of physician gender as a moderator.

3 Observational Analysis (EHR Data)

For the second part of our project, we will analyze data from a large electronic health record database. We will deploy natural language processing techniques on provider notes to assess the causal impact of being assigned to a high versus low empathic provider (as measured by note-taking behavior) on long-term patient outcomes using a quasi-random-assignment mechanism (such as a "judge" design (Chyn, Frandsen, & Leslie, 2024) in emergency department triage, inpatient settings, or as walk-ins to a primary clinic).

Outcomes will include: (i) Chronic disease management (e.g., HbA1c levels for diabetes, blood pressure readings for hypertension, and other relevant lab results over time); (ii) use of preventive services (e.g., vaccinations, mammograms, colonoscopy etc); (iii) medication adherence (e.g., prescription refill rates, and notes indicating discussions about medication importance); and (iv) engagement with care (e.g., no-show rates, appointment cancellation rates, and follow-up visit compliance). As with the field experiment, detecting a small-to-moderate effect size (around r = 0.20) would require 400 physicians in the dataset for adequate statistical power.

4 Future Steps

This project is part of a larger research agenda on how physician exhaustion (and burnout more broadly) affects empathy in the doctor-patient encounter, and its effects on patient outcomes. This agenda has the potential to add to a research area – physician empathy – that is severely lacking in causal evidence, yet has been recognized over and over to be a critical part of patient care (Chen, 2008; Friedman, 2007).

There are many extensions to this particular project. As we have already mentioned, we would like to manipulate exhaustion directly, instead of only measuring it. We would also like to expand our independent variable beyond just exhaustion to encompass burnout as well (which measures exhaustion, detachment, and reduced personal efficacy). We would like to have a larger sample with more precise interventions that allow us to test behavioral theories driving empathy, while following residents longitudinally over their training to both observe the evolution of the exhaustion-empathy relationship and whether our interventions have effects on it over longer time horizons.

Ultimately, as the model progresses into Stage II and beyond, we will gain a better understanding of how best to ensure high-quality empathic care that improves patient outcomes even in the high-exhaustion setting of healthcare. The goal is not to assume physicians are inherently better at one particular aspect of care but rather to discover exactly which functions are most impaired by burnout, and then fine-tune interventions to support to preserve or strengthen those functions. For instance, we still do not know what is the most critical point in the patient care cascade to provide empathic care, nor whether empathic care *has* to be provided by physicians. As the healthcare industry moves towards integrating machines and artificial intelligence into patient care – and thus a reallocation of decision rights and care responsibilities – these questions about who should provide empathic care, when, and how, are worth considering carefully.

5 Budget

1 summer month each for the co-PIs + 1 program coordinator 0.5 FTE + fringe = $82,496
Payment to residents: $100 per hr x 400 residents = $40,000
Payments to patient volunteers: $10 for 10 min per volunteer x 5 volunteers per resident x 400 residents = $20,000
Fitbits: $100 x 400 residents = $40,000
Fitabase to follow residents fitbits over time: $10 per resident x 400 residents x 3 months = $12,000
Total budget = **$194,496** in direct costs.

6 Timeline

Month 1 - Month 6: IRB process; patient and physician recruitment; mailing fitbits; design virtual clinic; analyze secondary data
Month 6 - Month 9: Follow physicians for 3 months, culminating in the 1-hr long virtual clinic
Month 9 - Month 12: Analyze data and finalize a working draft of paper

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