

Title: Personalized Fatigue-Mitigation Lifestyle Coaching (PFMLC) to Improve Performance and Recovery among Emergency Medicine Residents on Night Shifts

I. Specific educational aims: The main objective of this pilot study is to examine whether a pre-shift personalized fatigue-mitigation lifestyle coaching (PFMLC) for Emergency Medicine (EM) residents on overnight shifts would minimize the effects of circadian rhythm disruptions on performance and recovery compared to those who receive one-time passive information on lifestyle practices. Showing evidence for learner centered PFMLC on EM residents on overnight shifts has the potential for critical change in graduate medical education (GME) in optimizing recovery and performance. If proven effective, the applications of PFMLC would extend far beyond GME training, with implications for all night-shift healthcare workers. This proposal directly addresses at least three priorities of the TMA: *Rigorous approaches to scholarship and innovation, Collaboration, Impact and Sustainability*. Furthermore, by studying the influence of one's sex, body-mass index (BMI), and caregiving responsibilities on fatigue mitigation, we hope to advance work on targeted personalized strategies on nutrition, sleep, stress, and cognitive enhancement impacting intersectional identities in GME. Future studies could incorporate precision medicine using personalized advice tailored to the individual's chronotype.

II. Project rationale: The 24/7 demand of EM requires residents, fellows, staff, and faculty to work variable clinical schedules, thereby frequently disrupting their sleep-wake cycles and circadian rhythms. This shiftwork schedule has varied costs and significance, including increased attributed [clinical errors](#) for night shifts, decreased [cognitive performance](#), increased [sleep disturbances](#), and significant [work-life disruptions](#). The adverse effects of shiftwork, and nightshifts, in particular, are well-positioned for interventions within lifestyle medicine. Nightshifts have been shown to [adversely affect](#) all aspects of well-being and have adverse individual and societal [economic impacts](#).

In a [survey](#) of residents, circadian disruptions were cited as the greatest obstacle to well-being. Longitudinal data from the Stanford WellMD faculty and resident Wellness Surveys consistently highlight [sleep-related impairment](#) as the top three major drivers for lower professional fulfillment and higher burnout levels. The few recommendations to address sleep-related impairment are not personalized, often contradict each other, and generally have little to no clinical evidence. Despite the significant cognitive and health effects of nightshifts, unlike aviation or transportation industries, little is taught about ways to effectively mitigate nightshifts' varied adverse effects in healthcare settings. Our team members have recently demonstrated that implementing [evidence-based nutrition and eating schedules on night shifts](#) improves alertness and decrease sleepiness among Stanford residents in different specialties. EM residents were not included in this study due to its unique scheduling. Furthermore, coaching programs at [Mayo Clinic](#) and [Stanford](#) have shown that one-on-one coaching of physicians leads to increased well-being and uptake and maintenance of healthy lifestyle behavior, including in sleep-related impairment. Our proposed study will address fatigue-mitigation and recovery using a 1-week pre-shift personalized fatigue-mitigation lifestyle coaching (PFMLC).

III. Approach: This is a prospective study investigating the role of PFMLC in minimizing the effects of circadian rhythm disruptions on EM residents on night shifts. At Stanford Emergency Medicine, 2nd, 3rd, and 4th-year EM residents have 6 consecutive overnight scheduled shifts. The Fitbit™ wearable device will track individual heart rate variability (HRV), sleep score, and readiness/recovery score at baseline and throughout the scheduled string of nightshifts.

In this parallel randomized intervention-control arm study, participants will be randomized into two groups in each week of nightshifts (i.e., residents on each string of nights will be assigned to one of the two arms, so they have similar working conditions). The intervention (active) arm includes PFMLC, and the control arm includes a passive information delivery via emailed handouts. The active PFMLC arm will utilize a certified health and well-being coach with expertise in mitigating circadian disruptions in aviation and healthcare workers. The PFMLC will

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occur in person, via phone, or Zoom™ 1-2 days before each participant's first night shift. Residents will schedule this session with an assigned coach. This coaching session will take approximately 30 minutes and will not cause any ACGME duty-hour issues. Residents will have the option to reach out to meet with the coach for a follow-up 30-minute session.

Both arms will provide residents with information on lifestyle strategies, including sleep, nutrition (including caffeine and alcohol use), and stress management. Biometric data will be collected using Fitbit™ and validated tools ([Stanford Sleepiness Scale](#) (30 seconds), Burns' [Anxiety and Depression Scale](#) (2 minutes), and NASA's [Psychomotor Vigilance Test](#) [PVT] (5 minutes) at the beginning, at intervals throughout the week, and until 24 hours after the last overnight shift. The [NIH PROMIS 4-item sleep-related impairment](#) (30 seconds) will be assessed before the coaching session and 24 hours after the last overnight shift. The validated survey tools will be collected via smart devices in Qualtrics or REDCap, and the PVT will be done via the iPhone/iPad app from NASA. We will collect data on sex, BMI, and caregiving responsibilities at baseline to examine their influence on the study outcomes.

IV. Timeline and plan for implementation:

Project Management Timeline		Pre- Grant Period (Aug-Sept 2022)	Pre- Grant Period (Sept-Oct 2022)	Fall (Oct 2022)	Winter - Spring (Nov 2022 - April 2023)	Spring (February - March 2023)	Spring (May 2023)	Summer (June 2023)	Post-Grant Period
Preparation	Curriculum Development	█							
	Completion of lifestyle-modification content.		█						
	Final adjustments to the design and curriculum content			█					
	Training of Coaches			█					
Implementation	IRB approval process	█	█	█					
	Intervention/Data Collection				█				
	Preliminary data analysis					█			
	Final analysis of the results						█		
Dissemination	Abstract submission using preliminary data: SIMEC, ACPH, ACGME, ACEP, SAEM, CORD					█			
	Share results with SIMEC, PWF						█		
	Manuscript/Conference Preparation							█	█

V. Anticipated work product: The anticipated work product includes a structured fatigue-mitigation strategy toolkit based on existing evidence on nutrition and sleep to enhance clinical and cognitive performance. This work is critical in EM, the specialty that suffers significantly from circadian-rhythm disruptions, leading to higher burnout and lower professional fulfillment levels. Because EM physicians are not unique to scheduled disruptions of their circadian rhythm, this study hopes to demonstrate effective practice recommendations for any career with similar circadian rhythm disruptions.

VI. Evaluation plan: Data will be analyzed with statistical assistance from the Dept of Emergency Medicine. We will compare subjective (self-reported data from validated survey measures) and objective (e.g., HRV, PVT) data between the two groups. We will also include a brief qualitative survey to understand how we can iterate and improve the study design as we expand to a longitudinal, multi-center study via the [Professional Well-Being Academic Consortium](#) (PWAC).

VII. Dissemination of results: The outcomes of this work will be presented at the TMA SIMEC locally and at WellIMD's Physician Wellness Forum. Broadly, work will be disseminated in academic assemblies aiming for the American Conference on Physician Health and the Annual Educational Conference of the Accreditation Council for Graduate Medical Education. Given the

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impact of this work, we aim to publish it in a peer-reviewed journal with the goal of JGME or Academic Medicine.