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ON THE FRONTLINES OF COVID-19: A JD-R APPROACH TO BETTER UNDERSTAND
EMERGENCY MEDICINE CLINICIANS' PSYCHOLOGICAL WELL-BEING

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Industrial Organizational Psychology

by
Riley Lawrence McCallus Pegram
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ABSTRACT

Healthcare organizations have been heavily impacted by the COVID-19 pandemic, with emergency departments (EDs) facing especially large burdens. Increased patient volumes, fewer opportunities to disengage from work, and the persistence of the pandemic over many months continue to place demands on emergency medicine clinicians (EMC) and may elevate their levels of psychological stress. Psychological resilience and meaningful work experiences may protect EMC from these negative effects but may also be negatively impacted by high levels of ED crowding. Using the Job-Demands Resources model as a theoretical framework, this dissertation sought to explore how ED crowding (measured objectively and subjectively), psychological resilience, and meaningful work experiences function to impact EMCs' self-reported psychological distress. A mixed methods design was used to triangulate data from qualitative and quantitative results. Psychological resilience and meaningful work experiences were both negatively associated with psychological distress. Neither objective nor subjective ED crowding were not significantly associated with psychological distress. Psychological resilience and meaningful work experiences did not moderate the relationships between ED crowding and psychological distress.

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CHAPTER ONE

INTRODUCTION

The COVID-19 pandemic has changed the nature of work across a variety of industries, perhaps none more so than healthcare. Within weeks of the viral outbreak hospitals worldwide faced soaring patient volumes, resource and staff shortages, and increased work demands for clinicians. As the pandemic continues and these demands inflict increased strain on healthcare systems and employees, there is a growing need for occupational health research to examine how specific demands and resources interact to affect clinicians' psychological well-being. While previous literature offers various theoretical frameworks for assessing how psychological well-being affects employee health and performance, the job demands-resources (JD-R) model was chosen for the research presented here. This model provides an excellent framework for conceptualizing and measuring the relationships between job demands and resources, as well as the interactions between these workplace dimensions on outcomes such as engagement and burnout. A better understanding of how demands and resources affect clinicians' psychological health in the wake of COVID-19 will allow for healthcare organizations to support employees' well-being and better prepare for future pandemics.

Clinicians who experience elevated levels of psychological distress may be at a greater risk for burnout, a widespread concern that pre-dates the pandemic (Lim et al., 2020; Shanafelt et al., 2012; Rotenstein et al., 2018) but is certainly expected to be exacerbated by the present crisis (Amanullah & Ramesh Shankar, 2020). The pandemic has disrupted clinicians' work structures in a variety of ways, including rearranged clinical spaces and reorganized work teams (Miller et al., 2020). Emergency departments have been especially impacted by increased patient volumes and acuity, leading to overcrowding and resource shortages. These increased demands directly

affect emergency medicine clinicians (EMC) by exacerbating job demands and stressors. Certain resources such as psychological resilience and meaningful work experiences may buffer against these demands.

Clinicians who find meaning in their work demonstrate greater commitment, motivation and satisfaction and are at a lower risk for burnout (Khammissa et al., 2022). Elements of clinicians' jobs such as providing valuable and essential care to others, positive interactions with patients and colleagues, and gaining a sense of personal accomplishment can all promote greater feelings of meaningfulness at work. The COVID-19 pandemic has, in some instances, robbed EMC of opportunities to enjoy these experiences due to time and space constraints stemming from patient volumes, clinical challenges surrounding treatment options for the COVID-19 virus, and moral distress. It is important to explore the association between meaningful work experiences and psychological distress, as well as the effect that crowding may have on the ability for meaningful work experiences to buffer negative psychological impacts of crowding-related demands.

Psychological resilience, the ability to positively adapt and recover from adversity, is an important resource for workers in high-stress work environments. Resilience has been shown to protect against the negative effects of job demands and decrease the risk of burnout (García & Calvo, 2012; Taku, 2014). The high-stakes, fast-paced nature of emergency medicine departments, even prior to the COVID-19 pandemic, arguably demands strong levels of resilience from clinicians to ensure high levels of performance and positive clinical outcomes. EMC tend to report higher psychological resilience scores than many other specialties (Sánchez-Zaballos & Mosteiro-Díaz, 2020). Thus, it is possible that clinicians who choose to specialize in emergency medicine self-select for this environment because their resilience acts as a resource to

protect their psychological well-being even in the face of significant job demands and stressors. However, it is unclear whether the extreme demands brought on by the COVID-19 pandemic have impacted the association between psychological resilience, job demands, and mental health outcomes. Further research is needed to identify elements and risk factors of emergency medicine in the context of the COVID-19 pandemic that may lead to increased psychological distress and burnout (Lim et al., 2020), as well as resources which may serve to protect EMC against these risks (De Kock et al., 2021) --gaps to which the present research seeks to contribute.

Purpose of this Dissertation

This dissertation adds to the existing literature examining relationships between specific job demands and resources to assess how these elements function to predict psychological distress in EMC. I examined the relationships between ED crowding, psychological resilience, and meaningful work on psychological distress in EMC using data from an ongoing well-being assessment survey distributed to EMC at a large healthcare system in the southeastern United States. I used objective and subjective measures of emergency department (ED) crowding to examine whether ED crowding is associated with clinicians' psychological distress. In addition, I explored the effects of psychological resilience and meaningful work experiences on the relationship between ED crowding and psychological distress. I used a mixed methods approach in this dissertation, including quantitative and qualitative analyses to provide both measurement and context for the relationships between job demands, job resources and psychological distress among EMC.

Chapter 2 presents a brief overview of the JD-R model and background on previous occupational health literature related to healthcare workers, as well as an introduction to key

demands and resources relevant to this dissertation. Chapter 3 will provide a more in-depth discussion of relevant job demands and resources, as well as measurement discussions as they relate to the current research. Chapter 4 provides an overview of the mixed methods approach selected and applied here, including goals and rationale. Chapter 5 presents the hypotheses and research question posited based on an overview of previous literature presented in prior chapters. Chapter 6 outlines details of participants, measurements, and analytic procedures. Chapter 7 presents the quantitative and qualitative results from statistical procedures. Finally, Chapter 8 discusses the integration of results, implications of the findings, limitations and suggestions for future research, and conclusions.

CHAPTER TWO

THEORETICAL FRAMEWORK AND BACKGROUND

JD-R Model

The job demands-resources (JD-R) model is considered one of the foremost theoretical models for conceptualizing and studying job stress (Schaufeli & Taris, 2014). Introduced over two decades ago, the JD-R model posits that occupational risk factors related to job stress can be categorized as *job demands* and *job resources*, and that the function of these categories contribute to employee well-being, engagement, stress, and burnout (Bakker & Demerouti, 2007; Demerouti et al., 2001; Britt et al., 2021).

Job demands are elements of work that necessitate ongoing mental, physical and/or emotional labor. The severity and the duration of exposure to demands negatively affects mental well-being and poses a greater risk for employees to experience psychological distress. Emergency medicine job demands can stem from physical factors in the work environment (e.g., overcrowding, ergonomic barriers), psychological factors (e.g., anxiety, inability to detach from work outside of work), interpersonal factors (e.g., unpleasant patient interactions, lack of support from colleagues), or systems-level factors (e.g., lack of communication or support from leadership, organizational restrictions). Employees who are chronically exposed to such stressors often suffer negative consequences, resulting in a greater likelihood of burnout and negative health outcomes.

Job resources are elements of work that reduce demands, facilitate accomplishments at work, and buffer against work-related stressors. These aspects of the job can also be physical (e.g., space available for patients, opportunities to sit and/or eat on shift), psychological (e.g., resilience, feelings of accomplishment at work), interpersonal (e.g., assistance from colleagues,

appreciation from patients), or systems-related (e.g., clear and consistent communication, perceived organizational support). Resources also affect mental well-being, serving as protective factors against the negative effects of job demands and thus reducing the propensity for employees to experience burnout.

Importantly, the JD-R model offers the flexible approach that *any* demand or resource may impact employees' occupational health, rather than restricting categories to specific demands and resources (Bakker & Demerouti, 2007; Schaufeli & Taris, 2014). This model therefore lends more malleability towards conceptualizing occupational health than previous models, providing an excellent framework for studying a wide range of demands and resources in a variety of workplace settings. The JD-R model is thus a valuable theoretical framework for studying the multifaceted and rapid changes taking place in healthcare and how demands and resources associated with healthcare occupations impact clinicians' psychological well-being.

JD-R Model Applied to Burnout in Healthcare

Healthcare is a complex and dynamic industry featuring multi- and interdisciplinary multiteam systems. As globalization and technological advancements continue to connect healthcare organizations worldwide and treatment options are continuously advancing, medical care can be expected to continue its current trend of growth and expansion (Mittelman & Hanaway, 2012). The COVID-19 pandemic has escalated these and other changes, and it is imperative that researchers examine how these rapid shifts impact healthcare workers' occupational health and psychological well-being. As the goal of this dissertation is to examine how job demands and resources are related to psychological distress, the central focus of this study is on the health impairment process of the JD-R model (Bakker & Demerouti, 2007), which posits that job demands increase employees' stress, as evidenced by indicators such as

anxiety, emotional exhaustion, and burnout. Figure 1 depicts the health impairment process of the JD-R model in the context of pandemics. Furthermore, Figure 1 also reflects the JD-R model's assertion that job and personal resources can moderate the association between job demands and negative mental health outcomes.

Clinicians' psychological health is of particular interest in the context of this dissertation. Research interest in mental health among healthcare clinicians has increased worldwide over the past few decades (Shanafelt, 2021), as negative consequences of clinician burnout such as medical errors and high turnover rates have increased as well (Johnson et al., 2017). However, more research is needed to understand how specific job demands and resources affect clinicians' psychological health outcomes, as well as how these elements function to predict psychological distress (Britt et al., 2021). As clinicians are exposed to greater levels of job demands during the COVID-19 pandemic, a better understanding of the psychological consequences of such demands can inform stakeholders of the current state of clinicians' well-being, as well as potential interventions to preserve and promote clinicians' mental health.

Healthcare professionals often underreport feelings of psychological distress due to fears of stigma and a belief that symptoms of burnout are simply 'part of the job' (Backus et al., 2021). Clinicians who experience elevated levels of psychological distress may receive lower patient satisfaction ratings, lower levels of personal accomplishment (Dionisi et al., 2021), early retirements and resignations (de Wit et al., 2020) and—tragically—even increased clinician suicides (Patel et al., 2018). The COVID-19 pandemic has escalated these risks by putting individual clinicians and health systems at large under increased strain. Hospital and clinics worldwide face catastrophic staffing and financial challenges (Kaye et al., 2021), placing further stress on clinicians already putting their health and safety at risk treating infected patients (Ng et

al., 2020). Recent estimates show that while burnout rates are increasing across a variety of specialties, emergency medicine clinicians (EMC) are reporting the highest levels of burnout in the wake of the COVID-19 pandemic (Kane, 2022). It is therefore crucial to understand how specific job demands are impacting the psychological well-being of EMC, as well as which resources may protect against the negative consequences of these demands.

JD-R Model Applied to EMC Research During COVID-19

EMC have served on the medical frontlines of the pandemic throughout its two-year duration thus far including several surges in COVID-19 cases brought on by novel variants of the virus. In addition to stressors that have affected well-being and burnout among EMC prior to the pandemic such as long work hours and high stress work environments, EMC now also face record demands such as widespread staffing shortages, high risk of infection, and navigating new processes and protocols such as personal protective equipment (PPE) requirements and clinical treatment guidelines (Nguyen et al., 2021). EMC are also subject to personal and economic stressors outside of work including fear of posing risks to loved ones' health by working closely with infected patients, decreased household income due to widespread layoffs across many industries, and community concerns and conflicts surrounding social distancing and PPE mandates (Rodriguez et al., 2020). Given the evolving and complex nature of the pandemic and its effects on emergency medicine, additional research is needed to more clearly understand how certain job demands function to affect burnout in EMC.

Research exploring the burden of job demands among clinicians during COVID-19 have found that staffing shortages (Broetje et al., 2020), the physical burden of shift work (Havaei et al., 2021) and patient volumes (de Wit et al., 2020) contribute significantly to psychological distress and burnout. High volumes of patients challenge departmental throughput as inpatient

beds fill rapidly and prevent emergency patients from being admitted, thus resulting in widespread boarding in the ED. Crowded emergency departments are subsequently filled with patients not traditionally treated in the ED, cared for by clinicians who are not always trained or prepared to treat certain clinical conditions (i.e., ventilated patients) for sustained periods of time and leading to supply and medication shortages (Wanninayake et al., 2022). High patient to staff ratios and limited physical space hinders EMCs' abilities to provide optimal patient care, increasing emotional exhaustion and stress and decreasing levels of personal accomplishment (Buillon-Minois et al., 2021). Further research is needed to better understand how the demands of ED overcrowding affect the psychological well-being of EMC in the context of the health impairment process of the JD-R model.

In the context of the JD-R model, this dissertation also considers the impact that job and personal resources have on psychological distress and burnout, as well as how they interact with job demands to affect such outcomes. Certain coping mechanisms that EMC were able to formerly rely on prior to the pandemic such as social interactions with friends and family are now no longer consistent or available options, leading to increased feelings of isolation and higher levels of stress (Nguyen et al., 2021). These unfamiliar and unpredictable circumstances prevent many EMC from successfully experiencing psychological recovery from work, contributing to rising levels of burnout (Santarone et al., 2020). Stress levels on shift have also escalated due to widespread and critical staffing shortages among emergency medicine physicians (Sangal et al., 2021) and nurses (Apornak, 2021) stemming surging patient volumes. However, certain resources such as resilience (Maiorano et al., 2020) and meaningful work (Dinibutun, 2020) have been shown to buffer against the negative effects of job demands among EMC.

Psychological resilience is associated with lower levels of depersonalization and emotional exhaustion, and higher levels of personal accomplishment (Ferreira & Gomes, 2021), indicating its negative relationship to burnout in clinicians. Resilience has also been shown to buffer against the negative effects of secondary trauma in EMC associated with working in emergency medicine during the COVID-19 pandemic. However, clinicians' psychological resilience can be negatively impacted by social isolation due to quarantine and social distancing guidelines (Bahar et al., 2020) and drastic changes in work operations in response to COVID-19 challenges (Pappa et al., 2020). More research is therefore needed to understand the role of perceived psychological resilience as a resource for EMC to protect against psychological distress, as well as the potential for resilience to buffer against the negative impacts of demands such as overcrowding.

The experience of meaningful work has also been identified as a resource to protect EMC against negative psychological outcomes. According to the Job-Person Fit Model, occupational stress occurs because of poor fit between an individual and their job (French & Kahn, 1962). Mismatch is theorized to increase susceptibility to burnout (Maslach & Goldberg, 1998) and can occur because of experiences such as work overload, insufficient internal or external rewards from work, and lack of connection to coworkers (Maslach & Leiter, 1997). Physicians who experience increased workloads and loss of autonomy, control, and support from colleagues are more likely to report lower experiences of meaningful work and higher rates of burnout (West et al., 2018). EMC who report lower levels of positive interactions with patients (Converso et al., 2015) are also more likely to report higher rates of burnout. In a clinical context, meaningful work experiences may therefore occur for EMC during clinician-patient interactions, a strong sense of personal accomplishment, and positive relationships with colleagues.

Finding meaning in one's work can serve as an internal reward from work through personal fulfillment and function as a resource to help buffer against negative effects of job demands. Dinibutun (2020) suggests that physicians who are actively involved in the fight against the COVID-19 virus, such as front-line clinicians, may experience a higher sense of meaning in their work and thus experience stronger levels of satisfaction, which may in turn decrease burnout levels. Burnout has high-stakes consequences for patients, clinicians, and healthcare organizations. It is therefore imperative to further investigate the relationship between meaningful work experiences and negative outcomes such as psychological distress. To better understand the impact that working in emergency medicine has on EMCs' psychological well-being, this dissertation investigates the relationships between EMCs' COVID-19 job demands and resources in the context of the COVID-19 pandemic using the JD-R model as a fundamental theoretical basis.

CHAPTER THREE

EMERGENCY MEDICINE JOB DEMANDS AND RESOURCES DURING COVID-19

Emergency Medicine Job Demands during COVID-19

Healthcare systems worldwide have struggled to cope with the many challenges inflicted by the COVID-19 pandemic. Emergency medicine departments have been particularly affected, experiencing resource scarcity, staffing shortages, lack of medications, and overwhelming patient volumes. High ED census numbers exacerbate shortages even further, as EDs have minimal opportunity to replenish supplies. Overcrowding in the ED also places increased psychological demand on EMC, increasing mental and physical exhaustion (Salvagioni et al., 2017). Recent research has pointed out the opportunity for healthcare research to capitalize on the COVID-19 crisis to reshape ED patient flow and incorporate clinician well-being indicators such as engagement in resource management (Dinh & Berendsen Russell, 2021). ED overcrowding is therefore of particular interest in the context of exploring job demands related to EMC psychological distress, as it impacts numerous elements of the ED work environment and poses large scale consequences to clinicians, teams, and systems at large.

Overcrowding. Healthcare facilities cannot operate optimally in overcrowded working conditions. Higher patient volumes lead to supply shortages, reduced physical space in the clinical environment to serve as treatment areas, increased workloads for staff, and longer wait times for patients. Organizations with emergency departments and trauma centers are especially vulnerable to challenges stemming from higher patient volumes, as they are required to remain open 24/7 to treat patients, and do not turn patients away (Davis et al., 2019). Patients seeking emergency medical care often present with severe symptoms or injuries that require immediate treatment and stabilization. However, EMCs' capacity to provide timely treatment is severely

hindered in overcrowded conditions (Weiss et al., 2004). Hoot and Aronsky (2008) emphasized the need for further research to better understand the complex nature of ED overcrowding, its antecedents, consequences, and possible solutions. Previous research can inform these efforts to evaluate the relationships between ED overcrowding as a job demand in relation to job resources and clinician outcomes.

Overcrowding has plagued emergency departments for decades (Hagland, 1991; Eisenberg, 2000; Forero et al., 2010). The American College of Emergency Physicians (2006) defines ED overcrowding as “the identified need for emergency services exceeds available resources for patient care in the emergency department, hospital, or both” (p. 585). In their 2008 systematic review of international ED crowding, Hoot and Aronsky identified three primary themes in causes of ED crowding: input factors, throughput factors, and output factors. Primary input factors include nonurgent patients (Afilalo et al., 2004; Grumbach et al., 1993; Howard et al., 2005), frequent-flyer patients (Anderson, 1995; Dent et al., 2003; Huang et al., 2003), and influenza season (Andersson & Karlberg, 2001; Glaser et al., 2002; Schull et al., 2004; Schull et al., 2005). Inadequate staffing is often cited primary cause of crowding related to throughput factors (Lambe et al., 2003; Schneider et al., 2003; Schull et al., 2003). Inpatient boarding (Andrulis et al., 1991; Fatovich et al., 2005; Pines et al., 2011; Schneider et al., 2003; Schull et al., 2003) and hospital bed shortages (Cooke et al., 2004; Forster et al., 2003; Hwang, 2006; Sun et al., 2006) are commonly cited output factors resulting from ED crowding.

In their 2008 systematic review, Hoot and Aronsky offered four primary categories of consequences associated with ED overcrowding: adverse outcomes, reduced quality, impaired access, and health system financial losses. A large proportion of literature focusing on ED overcrowding likewise focuses on patient and organizational outcomes, while very little research

has focused on clinician outcomes. Patient mortality (Miro et al., 1999; Richardson, 2006), transport (Neely et al., 1994; Schull et al., 2003) and treatment (Hwang et al., 2006; Liu et al., 2003; Schull et al., 2004) delays, patient elopement (Kyriacou et al., 1999; Polevoi et al., 2005), and financial losses (Bayley et al., 2005; Krochmal et al., 1994) are among the most studied adverse outcomes related to ED overcrowding. Only one study (Rondeau et al., 2005) examined outcomes related to clinicians' occupational health in relation to overcrowding, finding that emergency physicians' job satisfaction decreased as their perceived scarcity of resources increased. It is therefore important for more research to explore how ED overcrowding impacts EMCs' psychological well-being, and whether overcrowding is associated with indicators of psychological distress.

ED overcrowding affects patient outcomes (Grumbach, 1993) and satisfaction (Haines, 2006) as well as organizational functioning (Bayley, 2005). As the COVID-19 virus sporadically mutates and drives surges in infections, massive increases in ED patient volumes stretch clinicians' resources thin and may contribute to rising cases of EMC burnout. The need to examine the relationship between ED overcrowding and clinicians' psychological distress during COVID-19 is thus an important gap in the research. This dissertation aims to contribute to this body of literature by examining the effects of overcrowding on EMCs' psychological distress using both objective and subjective measures of ED overcrowding. This dissertation uses objective overcrowding scores developed by the National ED Overcrowding Study (NEDOCS; Weiss et al., 2004).

NEDOCS scores. Weiss and colleagues developed and presented their novel scoring system in 2004, upon discovering that no standardized scale or definition of ED overcrowding had been previously offered. Using site-sampling techniques at eight large academic health

centers with high patient volumes (i.e., over 40,000 adult patients per year in the ED), the researchers first collected site information from each facility including total yearly patients in the ED and the hospital and total beds in the ED and hospital. Investigators also inquired hospitals' procedures for managing overcrowding to compare national data collected from the Society for Academic Emergency Medicine website. Next, site investigators followed up with subsequent random sampling visits to collect objective data which represented a glimpse of the ED during the sampling window. Four subscales were developed to assess (1) the number of patients at various steps in ED management, (2) times needed for various steps in ED management (e.g., triage to bed placement, time spent waiting for test results), (3) staffing in the ED, and (4) diversion status (Weiss et al., 2004; p. 40). The researchers later determined that diversion status was difficult to determine between sites and was excluded from the full model.

Subjective data was also collected from charge nurses and attending physicians' judgments of the degree to which the ED was overcrowded to inform the outcome variable. The researchers offered that opinion questions would inform this variable, as no definitive quantitative measure of ED overcrowding existed prior to their study. Thus, their goal was to mathematically depict clinicians' sense of overcrowding. Using three questions posed to attending physicians and charge nurses on a six-point Likert-type scale inquiring about clinicians' opinions of crowding levels and whether they felt rushed, the responses were averaged to form a composite score. Nineteen predictor variables were selected based on previous literature and site coordinators at all eight locations, and a mixed-effects linear regression was used to assess model fit. A reduced model using five variables adequately predicted the full model fit (88%), and a nomogram was then developed to determine the NEDOCS score formula.

NEDOCS scores are calculated every fifteen minutes, with weights assigned to each of seven variables to create each incremental score: $85.8(C/A) + 600(F/B) + 13.4(D) + 0.93(E) + 5.64(G) - 20$, where C is the total number of patients in the ED, A is the total number of beds in the ED, F is the number of patients waiting for admission to the ED, B is the total number of beds in the hospital, D is the number of patients being treated with mechanical ventilators in the ED, E is the longest inpatient boarding time in hours, and G is the amount of hours the last patient admitted to the ED spent in the waiting room. NEDOCS scores are interpreted on a scale consisting of five levels: $<50.00 = Normal$; $50.00-100.00 = Busy$; $100.00-140.00 = Overcrowded$; $140.00-180.00 = Dangerous$; $>180 = Disaster$.

NEDOCS scores have shown considerable discriminatory power (Hoot et al., 2007), construct validity (Weiss et al., 2006) and are highly correlated to the number of patients that leave without being seen (Weiss et al., 2005). A comparative study of three ED crowding scoring systems, the NEDOCS score was found to be both reflective of ED crowding in real time, as well as predictive of imminent overcrowding (Ahalt et al., 2018). Hospital and ED administrators can use NEDOCS scores as an objective indicator of ED overcrowding to inform decisions and procedural tactics to respond effectively to overcrowded conditions (Dewi et al., 2021). Furthermore, the ease with which these scores can be accessed and stratified between different sites within an organization promotes their feasibility and utility to study ED overcrowding using objective measurement.

However, the NEDOCS scores have not proven reflective of EMCs' subjective ratings of overcrowding in all cases, notably in several studies conducted outside of the United States. An Australian study by Raj and colleagues (2006) found inconsistencies between senior staff members' subjective ratings of overcrowding and corresponding NEDOCS scores. Similarly,

researchers in Belgium found that simple occupancy rate scores performed as well or better than NEDOCS scores and better reflected the subjective ratings of overcrowding assessed by ED staff (Jobé et al., 2018). EMC did not report feeling at risk for ED overcrowding in a Colombian health center when NEDOCS scores indicated dangerously overcrowded conditions (Garcia-Romero et al., 2017). Research conducted at a health system in Texas found similar results, suggesting that NEDOCS scores may not be accurate in extremely high-volume ED conditions (Wang et al., 2014), which is important to consider for this dissertation in the context of the COVID-19 pandemic. NEDOCS scores are typically monitored by departmental and/or hospital leadership to assess crowding levels in the ED, estimate surge capacities, and track crowding trends over time. Further research is needed to understand the degree to which NEDOCS scores match the perceptions of crowding experienced by EMC working in the clinical environment.

Clinicians' perceptions of ED overcrowding are crucial to understanding how EMC "feel" the measurement of overcrowding as outlined by NEDOCS scores. Previous research suggests that it is beneficial to compare subjective and objective measurements of ED overcrowding to gain the best understanding of how EMC experience crowding in relation to objective measurements such as NEDOCS scores (Garcia-Romero, 2017; Raj et al., 2006). This dissertation incorporates subjective ratings and objective measurements of ED overcrowding to evaluate the association between job demands caused and exacerbated by overcrowding and EMCs' experiences of psychological distress.

Subjectively Assessed Crowding-Related Demands. Subjective experiences of ED overcrowding can help elucidate the psychological impacts that ED overcrowding has on EMC, and how it functions as a job demand to affect mental well-being. While it would be unreasonable to expect EMC to compute precise calculations of patient census numbers,

available beds in the ED or hospital, or number of patients on ventilators at a given time, certain outcomes stemming from ED overcrowding that directly impact EMC may serve as a subjective measurement of EMCs' perceptions of ED overcrowding. Research on previous pandemics (e.g., SARS, MERS, H1N1) suggest that overcrowding leads to a variety of constraints in the ED, including bed holds hindering patient admission and throughput (Ovens et al., 2003) and resource shortages (Rondeau et al., 2005). These findings from prior pandemics, along with consultations with emergency medicine subject matter experts informed the creation of subjective measurements in the present research to assess whether EMC identify and report experiencing crowding-related challenges.

In the present study, checklists were used to evaluate COVID-related job demands that the EMC reported experiencing over the prior month. Four items in the checklists referred to crowding-related job demands: (1) supply shortages, (2) medication shortages, (3) staffing shortages in the ED or Urgent Care (UC), and (4) difficulty admitting or transferring patients. Summative scores on these checklists were used to assess EMCs' total amount of COVID-related job demands during the prior month. This dissertation thus seeks to assess and compare objective measurements of ED overcrowding and subjective ratings of crowding-related demands as reported by EMC and evaluate the relationships between these constructs on psychological distress. In addition, this research seeks to explore how job and personal resources are associated with the relationship between ED overcrowding and psychological distress.

Job and Personal Resources for EMC During COVID-19

While job demands are largely unavoidable and can lead to negative occupational health outcomes, the JD-R model also incorporates resources into the model which can function to replenish psychological "losses" that may occur from extreme and/or chronic job stress. While

EMC may face extreme stress at work, especially during a global pandemic, certain personal resources and job elements may buffer against the negative consequences of demands such as crowding to preserve clinicians' mental well-being. This dissertation focuses on psychological resilience and meaningful work experiences as especially relevant resources in the context of EMC research.

Psychological resilience. Psychological resilience is a well-studied topic in psychological literature and related disciplines (Abiola & Udofia, 2011; Luthar et al., 2000; see Grossman, 2014 for a meta-analysis). Yet despite a plethora of research devoted to better understanding resilience, inconsistencies concerning the conceptualization, measurement, and definition of resilience warrant the need for additional research to better understand employee resilience through an industrial-organizational psychology lens (Britt et al., 2016). The ongoing pandemic highlights an especially important need for research to further examine resilience in healthcare employees to better understand a) how best to study resilience in healthcare employees and b) potential relationships between employee resilience with job and personal demands, resources, and outcomes such as psychological well-being. The present research seeks to contribute to this growing body of literature to offer insight into these research gaps as they apply to EMC.

While over 100 definitions of resilience have been put forth in previous literature (Meredith et al., 2011), the present study adopts the definition offered by Britt, Sinclair and McFadden in 2016: “the demonstration of positive adaptation in the face of significant adversity” (p.6) for two primary reasons:

First, Britt et al.'s (2016) distinction between the *capacity* for resilience and the *demonstration* of resilience directly applies to the goals of this research to better understand how

EMC cope with the demands associated with working in emergency medicine during COVID-19. Researchers examining the *capacity* for resilience often focus on personal, organizational, and community-related antecedents to study the *likelihood* that a person will positively adapt to their circumstances despite significant adversity (Britt et al., 2016). While the *capacity* for resilience is certainly an important construct to explore in the context of future research, especially research focused on resilience-promoting interventions, the present research is concerned with how EMC *demonstrate* resilience right now—amid an ongoing pandemic.

Second, the present research argues that Britt and colleagues' (2013) inclusion of *significant adversity* in their definition of resilience also suits the nature of EMCs' current work environments. Namely, this dissertation argues that EMCs' chronic exposure to challenges such as overcrowding, staffing shortages, and high-acuity patients over the past two years qualifies as *significant adversity* due to the intensity and duration of exposure to these and other stressors. In line with recommendations proposed by Britt et al. (2013), the present research seeks to document these environmental stressors through objective and subjective measures of ED overcrowding (Frese & Zapf, 1999).

Previous research has found perceived psychological resilience to be protective against negative psychological outcomes (Gao et al., 2017), burnout, and perceived workload (Watson et al., 2019) in healthcare clinicians. EMC tend to be particularly resilient in comparison to other specialties (Sánchez-Zaballos & Mosteiro-Díaz, 2020), a beneficial resource in the context of high-stakes, highly stressful work environments such as emergency rooms. Long work hours, variable shift schedules, and high acuity patients contribute to the numerous job demands placed on EMC, challenging their resilience (Philippon, 2019). Chronic exposure to these and other elevated job demands, as brought on by the pandemic, may affect clinicians' ability to

successfully rebound from increased levels of stress, spurring a call for efforts to support and promote EMCs' psychological resilience (Santarone et al., 2020).

While previous research has urged further examination of frontline healthcare employees' psychological resilience and well-being *after* disasters (Benedek et al., 2007), COVID-19 provides a unique opportunity to contribute to disaster research during an *ongoing* disaster. To better prepare for future pandemics, research must examine how chronic exposure (i.e., months, years) to significant adversity affects EMCs' psychological resilience and well-being. This study seeks to capitalize on the opportunity to examine resilience through the JD-R framework during the ongoing COVID-19 crisis, over a year after the initial acceleration phase and before the disease has been contained, thus preventing EMC from knowing when the crisis will "end."

One of the most common methods to assess psychological resilience in social science research is through self-report measures. Windle and colleagues reviewed nineteen resilience measures in their 2011 methodological review, all of which were self-report. The researchers found that the six-item Brief Resilience Scale (BRS) was among the top three scales evaluated, demonstrating sound construct validity and phrasing that directly focuses on rebounding from stress. The brevity of the BRS is also appealing for inclusion in surveys with other measures, such as the survey from which data was obtained for this dissertation. EMCs' self-reported psychological resilience scores were assessed using the BRS (see Appendix D).

It is important to understand how EMCs' psychological resilience interacts with job demands and resources to affect psychological well-being. The present study seeks to extend prior research to better understand how EMCs' psychological resilience is associated with psychological distress, as well as whether resilience may affect the relationship between ED overcrowding and psychological distress.

Meaningful Work Experiences. According to self-determination theory (SDT), people tend to have three fundamental psychological needs which promote motivation and growth: autonomy, competence, and relatedness (Ryan & Deci, 2000). In the context of occupational health, employees who report fulfillment of these needs achieve a higher sense of meaning from their job, promoting psychological well-being and work-related outcomes such as job satisfaction, work engagement, performance, and motivation (Autin et al., 2021; Rosso et al., 2010). Feelings of control and agency over one's work, personal achievement and forming connections to colleagues and consumers promote the frequency with which employees enjoy experiences of meaningfulness at work. Meaningful work experiences can thus be defined as subjective personal experiences created by evaluating the significance and emotional value an individual gains from one's work, as well as the degree to which one's work fulfills fundamental needs of autonomy, competence, and relatedness (Allan et al., 2016; Martela et al., 2021).

EMC play an especially important role in connecting community members with the healthcare system, as the ED often serves as a direct conduit between the public and their local healthcare systems. COVID-19 has further underlined this relationship, as community members flocked to emergency rooms after becoming infected with the virus. Overcrowding in emergency medicine settings stresses the resources (e.g., supplies, medication, beds, space) and exacerbates time constraints for EMC to treat as many patients as possible. Time and space constraints can compromise clinicians' abilities to deliver patient care safely and effectively. Poor patient outcomes lead to lower personal accomplishment in clinicians (Houkes et al., 2011), which may reduce feelings of competence and achievement. Likewise, morally distressing policies (e.g., visitor prohibition for dying patients, choosing which patients receive limited ventilators) may diminish clinicians' feelings of autonomy or control over workplace processes and contribute to

higher psychological distress (Corley, 2002). In addition, EMCs' compassion for patients and motivation towards work can be compromised if they are unable to detach from work outside of work which may be particularly difficult for EMC during the pandemic (Donahue et al., 2012).

In their 2019 review of meaningful work literature, Bailey and colleagues point out the broad range of theoretical bases and conceptualizations across a wide range of industries and workplace settings. One of the largest perspectives in the literature offers three central facets of meaningful work: subjective sense of positive meaning from work, meaningful work as a determinant of broader life meaning, and a drive to positively contribute to the greater good (p. 91). The authors also point out the opportunity for definitional creativity by merging broad theoretical foundations with data-driven evidence (p. 103). In addition, they highlight the need for more occupation-specific data within specific groups such as caring professions (p. 104) to better understand how meaningful work experiences impact employees in certain work environments.

Healthcare's unique connection to the human experience arguably positions it as the very epitome of a caring profession. Clinicians often decide to pursue careers in healthcare due to intrinsically motivating factors such as intellectual challenges, a desire to care for others in their moments of need, and a moral drive to significantly contribute to communities and society at large (Khammissa et al., 2022). Healthcare organizations who align their values and missions with those of their employees can support clinicians' psychological well-being by fostering and fulfilling feelings of autonomy, competence, and relatedness (Hartzband & Groopman, 2020). Clinicians are less likely to experience psychological distress and burnout if their psychological needs are fulfilled, promoting positive organizational outcomes such as patient safety and satisfaction.

This dissertation incorporated a novel meaningful work scale to assess EMCs' perceptions of meaningful work during the COVID-19 pandemic. Drawing on meaningful work measurements from previous literature, we sought to specify item phrasing in the context of healthcare. The Work and Meaning Inventory (WAMI; Steger et al., 2012) and the Comprehensive Meaningful Work Scale (MWS; Lips-Wiersma & Wright, 2012) are two of the most widely validated measures of meaningful work (Schnell & Hoffman, 2020). Both measures contain items which assess perceived meaning of one's work and/or career: "*We contribute to products and services that enhance human well-being and/or the environment*" (MWS); "*The work I do serves a greater purpose*" (WAMI). They also include an item assessing perceived personal contribution associated with one's work ("*I make a difference that matters to others*" (MWS); "*I know my work makes a positive difference in the world*" (WAMI). Items on both scales also assess personal benefit from work ("*I experience a sense of achievement*" (MWS); "*I view my work as contributing to my personal growth.*"). The MWS also contains an item assessing relatedness others ("*I have a sense of belonging*").

To promote content validity of the novel measurement scale used in the present research, we generated similar phrasing in our items to assess meaningful work in the context of clinical patient care. These items were structured to address similar facets as the MWS and the WAMI, including perceived meaning of one's work ("*I felt that my work was meaningful*"), perceived personal contribution associated with one's work ("*I positively impacted patients and their families*"), personal benefit from work ("*I had satisfying patient interactions*") and relatedness with others ("*I had positive interactions with my coworkers*"). During the first month of data collection, the measurement scale was dichotomously scored using a checklist format but was converted to a five-point Likert-type scale during subsequent waves of data collection (see

Appendix C for full measure). Data consolidation and reliability estimates are presented in chapter five.

There has been a recent call for increased research on meaningful work in the occupational health literature, which has heretofore received minimal attention (Bailey et al., 2019; p.93). To understand how meaningful work experiences impact EMCs' psychological well-being in the context of COVID-19 using a JD-R framework, it is important to understand the association between job demands and meaningful work. The present research explores the association between meaningful work and psychological distress, as well as how meaningful work functions as a resource to impact the relationship between ED overcrowding and psychological distress.

CHAPTER FOUR

MIXED METHODS APPROACH AND RATIONALE

Mixed methods research designs utilize quantitative and qualitative research designs for breadth and depth of research investigations (Schoonenboom & Johnson, 2017). Such methodologies are gaining increasing popularity in health research (O’Cathain et al., 2008; Tariq & Woodman, 2010) and can help counterbalance potential biases associated with relying on solely quantitatively or qualitatively driven healthcare research (Venkatesh et al., 2013). Occupational health psychology research can benefit from such designs as the subsequent results provide qualitative contextual “meat” to the quantitatively derived “bones” (Schoonenboom & Johnson, 2017). Researchers investigating occupational health constructs can benefit from mixed methods designs to achieve an in-depth exploration of psychological stressors, burnout, and relationships between demands and resources that function to impact these constructs (de Wit et al., 2010).

Previous research demonstrates the utility and applicability of mixed methods research in the context of healthcare and healthcare workers (see Tariq & Woodman (2010) for a methodological review). The complex and dynamic nature of healthcare-related topics sometimes requires both quantitative and qualitative assessments to understand a phenomenon more completely (Kaur, 2016). In addition to increasing credibility and validity of findings (Cohen et al., 2002), high-quality mixed methods research can expand and strengthen conclusions. This approach may also allow for more detailed interpretation of findings, promoting stronger and more suitable recommendations. In applied OHP research, this advantage is critical for designing effective interventions based on sound evidence.

Mixed methods research in senior medical staff provided important insight into specific job demands which contributed to burnout (Chambers et al., 2016), adding qualitative context to quantitative measurements of staff burnout. These findings allowed organizational leadership to address specific concerns among staff, informing targeted interventions. Mixed methods research at the beginning of the COVID-19 pandemic assessed burnout rates and factors contributing to distress in Canadian emergency physicians. Results showed that during the first 10 weeks of the COVID-19 pandemic, physicians' burnout levels were stable, and they reported greater distress stemming from economic uncertainty and the fear of the global impact of COVID-19 on the world at large, rather than clinical job demands (de Wit et al., 2020). Thus, mixed methods research can provide important context for healthcare-based occupational health research, allowing researchers to provide as much information as possible to organizational stakeholders.

A mixed method design was chosen for the present study which followed the Good Reporting of a Mixed Methods Study guidelines (O'Cathain et al., 2008). In addition to a small amount of previous research to the lack of research and understanding of EMCs' psychological well-being and experiences of burnout during the COVID-19 pandemic (Roslan et al., 2021), little research has examined these constructs through a mixed methods lens. This design is intended to provide comprehensive insight into relationships between EMCs' job demands and resources on their experiences of psychological distress. The mixed method design proposed here is a deductive-simultaneous quantitatively driven design.

Drawing on Greene et al.'s (1989) and Bryman's (2006) classifications of mixed methods research purposes, this research will use a deductive-simultaneous quantitatively driven design focused on *triangulation*, *complementarity*, and *illustration*. The primary goals of including both quantitative and qualitative analyses are to corroborate quantitative results with qualitative

comments with (*triangulation*), to gain elaboration of quantitative data through qualitative analyses (*complementarity*) and to “illustrate” quantitative findings, putting proverbial qualitative “meat” on quantitative “bones” (Schoonenboom & Johnson, 2017). In line with Fetters et al.’s (2013) integration method recommendations, the results will be integrated through a contiguous narrative approach. This design and these goals align with the research questions of the present research. See Figure 2 for a model of this design.

Specifically, this dissertation uses a deductive-simultaneous quantitatively driven design (QUANT + qual). In addition to quantitative analyses on the constructs of interest evaluated by survey measures, open-ended comments were also thematically analyzed to identify common themes and concepts related to respondents’ job demands and job and personal resources. Quantitative and qualitative analyses were conducted separately but during the same time frame, converged in a single report with separate sections for each type of data, then assessed for integration fit to determine whether the mixed method design was useful for providing meaningful context of the observed relationships assessed through quantitative analyses. See Figure 2 for a model of the mixed method design.

CHAPTER FIVE

HYPOTHESES AND RESEARCH QUESTION

Based on the JD-R model and prior research on the relationships between ED crowding, resilience, meaningful work and psychological well-being in EMC, the following hypotheses and one research question are offered here. See Figure 3 for a model of the proposed hypotheses.

- Hypothesis 1: Objective ED crowding (NEDOCS scores) will be positively related to psychological distress in EMC.
- Hypothesis 2: Subjective crowding-related demands will be positively related to psychological distress in EMC.
- Hypothesis 3: Psychological resilience will be negatively related to psychological distress in EMC.
- Hypothesis 4: Meaningful work will be negatively related to psychological distress in EMC.
- Hypothesis 5: Psychological resilience will buffer the relationship between objective ED crowding and EMCs' psychological distress.
- Hypothesis 6: Meaningful work will buffer the relationship between objective ED crowding and EMCs' psychological distress.
- Hypothesis 7: Psychological resilience will buffer the relationship between subjective crowding-related demands and EMCs' psychological distress.
- Hypothesis 8: Meaningful work will buffer the relationship between subjective crowding-related demands and EMCs' psychological distress.

Research Question: Does qualitative data provide insightful context to observed quantitative relationships between the constructs of ED crowding, psychological resilience, meaningful work, and psychological distress?

CHAPTER SIX

METHOD

Participants

This research stemmed from an ongoing quality improvement initiative at an academic health center in the southeastern United States. The sample included 183 emergency medicine attending physicians, advanced practice clinicians (APC), residents, and registered nurses (RN) working across seven ED and urgent care locations. Of this sample, 39.34% were attending physicians, 15.85% were APC, 6.6% were residents, and 38.25% were RN. Participants' responses included in this dissertation were gathered from the May 2021, June 2021, and July 2021 surveys to ensure that measures relevant to the research question and hypotheses (i.e., psychological resilience and meaningful work experiences) were included in these waves. As part of the larger quality improvement efforts, a monthly survey was distributed to EMC via personalized email links. Participants received a \$5 gift card as compensation for each survey completion. The primary goal of this survey was to provide department leadership with data and feedback about EMCs' psychological well-being and work experiences. Monthly results were analyzed and presented to department leaders within three to four days after the close of each survey.

To qualify for inclusion, the participants must have completed both the psychological resilience and meaningful work scales, as both constructs are key components of the theoretical basis for this dissertation. In addition, participants' personalized schedule for the month prior to survey completion was required in order to calculate a personalized NEDOCS score. The data set for this research included 138 responses from May 2021, 27 responses from June 2021, and 18 responses from July 2021 for a total of 183 participants.

Measures

Quantitative and qualitative items were included throughout the survey and periodically modified to address specific questions or needs as requested by department leadership, as well as to gather more information on certain trends that emerged in the data. The data used in this dissertation includes survey questions which were consistent from May through July 2021. The survey was designed to be easily completed on a computer, laptop, tablet, or phone. Therefore, brevity was emphasized across measures to encourage higher response rates. See Appendices for full measures.

Quantitative Measures

Psychological distress. This dissertation sought to examine how specific job demands and resources function to predict psychological distress. The 7-item Well-Being Index (WBI) developed by the Mayo Clinic was chosen as the primary outcome variable to measure psychological distress, which prior research has evaluated and established as reliable and valid (Dyrbye et al., 2013). Originally developed for use in physician populations, the WBI has since been validated and used for measuring psychological distress in residents (Dyrbye et al., 2014) and nurses (Dyrbye et al., 2018) as well. All measurement items assess the propensity for feelings of psychological distress (e.g., anxiety, depression), therefore this dissertation uses the term *psychological distress* in reference to scores on this measure.

The survey used in this dissertation included an adapted version of the WBI. The original scale includes seven dichotomous items assessing symptoms of psychological distress including depression, emotional detachment, and anxiety. Each ‘yes’ response contributes one point to the respondent’s overall psychological distress score. We substituted the first dichotomous question, “*Have you felt burned out from your work?*” and instead included the single item burnout

measure from the Mini Z burnout scale (Dolan et al., 2015). The single item burnout measure is scored from one (“*I enjoy my work. I have no symptoms of burnout.*”) to five (“*I feel completely burned out. I am at the point where I may need to seek help.*”), with scores of three, four, and five indicating that the respondent is experiencing moderate to severe feelings of burnout. Respondents who selected three, four, or five on the single burnout measure received an additional point towards their overall psychological distress score. Thus, the psychological distress scores in the present research range from zero to seven, with higher scores indicating greater potential for psychological distress.

In addition, we modified the original phrasing for item 5 (“*During the past month, have you been bothered by emotional problems (such as feeling anxious, depressed, or irritable)?*”) to exclude the word ‘*depressed*’ in the example feelings, as item 2 (“*During the past month have you often been bothered by feeling down, depressed, or hopeless?*”) also included the word ‘*depressed*’ along with associated synonyms. To avoid confounding risks between the two items, item 5 was rephrased (“*During the past month, have you been bothered by emotional problems (such as feeling anxious or irritable)?*”) so that only item 2 referred to feelings of depression, while item 2 referred more distinctly to feelings of anxiety.

Demands

Crowding. ED crowding was assessed objectively and subjectively for the purposes of this study. Objective crowding was measured using NEDOCS scores (Weiss et al., 2004). Importantly, personalized NEDOCS scores were calculated that best reflected individuals’ experiences with ED crowding during the month prior to their survey response, as survey measures were phrased as such to respondents (see Appendices for measures). To compute individualized NEDOCS scores, clinicians’ shift schedules were obtained from department

managers to match their specific working hours over the month prior to their survey submission date to the corresponding NEDOC scores generated the ED(s) in which they were working during those shifts. For example, if a clinician submitted their survey on May 9, specific shift hours for that clinician from April 10-May 9 were collected from full schedule data. Next, all 15-minute increment NEDOC scores corresponding to the relevant location and hours for all shifts within this timeframe were averaged, resulting in a unique NEDOC score for each clinician that reflects crowding levels during the specific timeframes and hospital location(s) in which that clinician worked.

Crowding was also evaluated subjectively using checklist items. Checklists were included in the survey to evaluate COVID-related job demands that the EMC reported experiencing over the prior month. Four items in the checklists were selected by subject matter experts as reflective of crowding-related job demands (see Appendix B). Summative scores were used to assess EMCs' subjective experience of crowding-related demands, offering a comparative evaluation alongside the objective NEDOC scores for each clinician.

Resources

Psychological resilience. Psychological resilience was measured using the Brief Resilience Scale (BRS; Smith et al., 2008), which consists of six items, three positively worded (e.g., *"I tend to bounce back quickly after hard times"*) and three negatively worded (e.g., *"I have a hard time making it through stressful events"*). The BRS is scored on a 5-point Likert scale ranging from one (*strongly disagree*) to five (*strongly agree*). The three negatively worded items are reverse-coded and summed with the positive items, then an average is taken of all six items for a total score of one to five. In their 2011 methodological review of resilience scales, Windle and colleagues concluded that the BRS is among the three most valid resilience

measurement scales. It is also by far the shortest of the three most valid scales, which suited the brevity goal of the survey used in this research without compromising validity. Rodriguez-Rey et al. (2016) also promoted the BRS as the best measure of resilience, highlighting the scale's ability to evaluate resources that promote resilience, which may provide important insight for the proposed research.

Meaningful work experiences. Meaningful work was assessed using a 5-item scale designed for this survey to measure EMCs' perceptions of meaningful work that reflect constructs found in existing validated measures of meaningful work (Lips-Wiersma & Wright, 2012; Steger et al., 2012) such as perceived meaning in one's work ("*I felt my work was meaningful.*"), personal achievement ("*I positively impacted patients and their families.*"), and relatedness to their colleagues ("*I had positive interactions with coworkers.*"). See Appendix C for full measures.

This item was scored dichotomously using a checklist format during May 2021, then converted to a five-point Likert-type scale during subsequent months (see Appendix C). To consolidate data for this measure and assess reliability, May scores were analyzed separately from non-May scores before standardizing and consolidating. Parallel analyses for both sets of meaningful work scores suggested one principal component, and first eigenvalues for both sets were large (3.543 for May and 3.712 for non-May), suggesting one overarching construct. Standardized alpha estimated strong reliability for both the May scores ($\alpha = 0.90$) and the non-May scores ($\alpha = 0.91$). Scale scores from May and non-May data were then combined to produce scale scores for all 183 participants. Standardized alpha of the overall measure also estimated strong reliability (Cronbach's $\alpha = 0.90$).

Procedure

This dissertation sought to better understand the relationships between job demands (crowding) and resources (resilience, meaningful work) as they function to predict EMCs' psychological distress. Survey design and constraints informed the analytic procedure. Respondents varied with each iteration of the survey. That is, the same set of employees did not respond to the monthly survey from one month to another. In addition, as demands, policies, and resources changed over the course of the pandemic, some items included in the survey varied as well. Particularly important for the proposed research, psychological resilience and meaningful work experienced were assessed beginning in May 2021.

To keep the survey as brief as possible while maximizing response rates, the survey included the resilience assessment until August 2021, long enough to gather a resilience score for as many EMCs as possible. After an EMC filled out the resilience assessment, the question did not appear in that EMC's subsequent monthly surveys. For example, Dr. A completed the May survey and filled out the resilience measure in May, and therefore did *not* see or have the option to fill out the measure in the June or July surveys. Dr. B who *did not* complete the May survey (and therefore did not complete the resilience measure in May) but *did* complete the June survey filled out the resilience assessment in June. Each clinician's resilience score was collected at the same time point as all other scores associated with that individual. Thus, while the data presented here was collected across three waves of the survey, each EMC is only included in the data set once (e.g., all data from "Dr. A" comes from the May survey; all data from "Dr. B" comes from the June survey).

Analytic Approach

Quantitative procedure. Quantitative data was analyzed using R (R Core Team, 2022). After cleaning the data to remove participants who did not have a psychological resilience score

and/or a NEDOCS score, the final sample size consisted of 184 EMC. Descriptive statistics and Pearson's product moment correlations were computed. Multiple linear regressions were performed to test for main effects of NEDOCS scores, crowding-related job demands, psychological resilience, and meaningful work experiences on psychological distress. Mediated regressions were performed to test for moderating effects of psychological resilience and meaningful work experiences on the relationships between NEDOCS scores and crowding-related job demands on psychological distress.

Qualitative procedure. Three open-ended qualitative questions were selected based on their inclusion and consistency throughout May, June, and July 2021, as well as phrasing which inquired about work- and non-work-related stressors and resources (see Appendix E). These questions were chosen to provide contextual qualitative data to the central theoretical bases in this dissertation investigating how job demands interact with job and personal resources to impact psychological distress. Therefore, questions regarding both work and non-work elements were included to provide a holistic picture of respondents' job demands and psychological state as clearly as possible from the qualitative data.

Qualitative responses were thematically coded using three independent coders. To account for threats to internal validity, method triangulation and interrater agreement informed thematic codes and coding procedures for each response to all qualitative measures. Noble and Heale (2019) note that triangulation enriches research by exploring and offering explanations for multiple aspects of a phenomenon. Coders independently coded all items separately, then met to discuss disagreements in codes and reach consensus for each response. Responses were then considered by question type as well as by month to contribute the most meaningful qualitative context for the integration of data in this dissertation.

CHAPTER SEVEN

RESULTS

Quantitative Results

After cleaning the data and reading the file into *R* Studio, Pearson's product moment correlations were calculated for the five variables. Perceived psychological distress and perceived psychological resilience were statistically significantly correlated, $r(181) = -0.373, p < 0.001$.

Multiple linear regressions were performed to test for main effects of NEDOCS scores, crowding-related job demands, psychological resilience, and meaningful work experiences predicting psychological distress (i.e., hypotheses 1-4). Psychological resilience and meaningful work experiences were both significantly negatively associated with psychological distress, $F(6,176) = 6.622, p < .001$. For each 1-unit increase in psychological resilience, psychological distress decreases by 2.070 units, $t(176) = -5.663, p < 0.001$. These results support hypothesis 3. For each 1-unit increase in meaningful work experiences, psychological distress decreases by 0.385 units, $t(176) = -2.436, p < 0.05$. These results support hypothesis 4. Hypotheses 1 and 2 were not supported. This model explained 18.42% of the variance in psychological distress (see Table 2). Normality of residuals and homoscedasticity were graphically checked to confirm the assumptions of linear regression, and data was verified to be normally distributed and the homoscedasticity assumption was satisfied (Rosopa et al., 2013).

Moderated regressions were performed to test interaction effects of each resource (i.e., psychological resilience and meaningful work experiences) on the relationship between each job demand (NEDOCS scores and crowding-related job demands) and psychological distress. There was no significant interaction effect of psychological resilience on the association between

NEDOCS scores and psychological distress $F(5, 177) = 6.943, p < 0.001$. This suggests that higher or lower levels of psychological resilience does not moderate the relationship between NEDOCS scores and psychological distress scores. There was a significant main effect of psychological resilience on psychological distress, $t(177) = -2.821, p < 0.001$ (see Table 3). Thus, hypothesis 5 was not supported.

The interaction effect of meaningful work experiences on the association between NEDOCS scores and psychological distress approached significance but was not statistically significant $F(5, 177) = 1.617, p > 0.05$ ($p = 0.158$). This suggests that higher or lower levels of meaningful work experiences does not significantly moderate the relationship between NEDOCS scores and psychological distress scores (see Table 4). Thus, hypothesis 6 was not supported.

There was no significant interaction effect of psychological resilience on the association between crowding-related job demands and psychological distress, $F(5, 177) = 5.992, p < 0.001$. This suggests that higher or lower levels of psychological resilience does not moderate the relationship between crowding-related job demands and psychological distress scores. There was a significant main effect of psychological resilience psychological distress, $t(177) = -3.423, p < 0.001$ (see Table 5). Thus, hypothesis 7 was not supported.

Last, there was no significant interaction effect of meaningful work experiences on the association between crowding-related job demands and psychological distress $F(5, 177) = 1.259, p > 0.05$ ($p = 0.284$). This suggests that higher or lower levels of meaningful work experiences does not moderate the relationship between crowding-related job demands and psychological distress scores (see Table 6). Thus, hypothesis 8 was not supported. Normality of residuals and homoscedasticity were graphically checked to confirm the assumptions of moderated regression,

and data was verified to be normally distributed and the homoscedasticity assumption was satisfied.

Qualitative Results

Responses to the three open-ended questions chosen for inclusion in this dissertation (see Appendix E) were extracted from the larger data set for analyses. A total of 524 comments were included: 192 from the first question, 181 from the second question, and 151 from the third question. Responses came primarily from the May survey ($N = 327$), followed by July ($N=108$) and June ($N = 89$). Thematic analyses were applied to the qualitative data to determine how variables were coded during that month.

To provide the most useful incorporation of data, both question type and month of submission were considered when evaluating. Question 1 asked, *“What is one thing at work or at home right now that is going really well or feels supportive?”* Approximately 51% of respondents cited members of their family in response to this question, with the many comments featuring phrases relating to “family,” “kids/children,” and “spouse/husband/wife.” A smaller subset (approximately 20%) related to coworkers and/or leaders, with many comments including phrases such as “staff are supportive,” “great teamwork,” “good colleagues.” Several responses in the May and June surveys also mentioned enjoying time outdoors and spending time in nature. The remaining responses focused on miscellaneous topics (e.g., exercise, hobbies). These dominant categories suggest that respondents are citing relationship factors both outside of work and at work as highly important to their psychological well-being. Social connections with family members and co-workers may serve as personal resources to help preserve EMCs’ psychological well-being and replenish potential resource losses that may stem from stressful work experiences.

Question 2 asked, “*What, if anything, are you finding especially difficult right now at work?*” Approximately 49% of the responses in this category related to ED overcrowding. Responses included phrases such as “too few staff to keep up with patient volumes,” “constantly short on supplies to treat patients,” and overwhelming number of bed holds.” Some EMC report feelings of increased stress and anxiety associated with these challenges, especially when the overcrowding and crowding-related stressors are described as chronic. This qualitative information suggests that EMC identified several areas in which overcrowding affected their job-related well-being. Other themes in responses to this question included frustration with leadership regarding communication and transparency, desires for increased pay, and interpersonal conflicts with other staff members.

Question 3 asked, “*What, if anything, are you finding especially difficult right now outside of work?*” Interestingly, the response theme cited most in this category was “N/A or nothing,” indicating that respondents reported no or minimal challenges related to their lives outside of work. Approximately 25% of respondents cited family, personal, or health concerns such as “family issues,” “father is in hospice care,” and “challenges at home with children.” Similarly, about 25% of respondents cited challenges relating to work-life balance such as “keeping up with responsibilities at home” and “finding motivation to do anything outside of work.” Approximately 10% of respondents reported sleep challenges. These responses indicate that EMC may be experiencing spillover stress from work stemming from increased stress at work.

CHAPTER EIGHT

DISCUSSION

The results of this dissertation offer insights into the associations between ED overcrowding, psychological resilience, meaningful work experiences, and psychological distress. Quantitative results will be discussed first, followed by qualitative results. Limitations of each procedure will be identified, as well as suggestions for future research. Integration and holistic discussion will then be offered followed by conclusions.

Quantitative Discussion

While not all hypotheses were supported, psychological resilience and meaningful work experiences were both significantly negatively associated with psychological distress, supporting hypotheses 3 and 4. While both constructs are heavily discussed in the literature, the significant relationships between these constructs and EMCs' scores on the WBI measure provide additional support for the importance of considering job and personal resources as key influences on occupational health outcomes in EMC.

Psychological resilience interventions are highly sought after by healthcare organizations, leaders, and stakeholders to try to counteract the negative psychological burdens that are sometimes associated with working in healthcare. Unfortunately, a high percentage of these strategies and interventions place the onus of responsibility on individuals themselves—effectively advising distressed individuals to independently reduce their *own* stress through practices such as mindfulness training, self-compassion, and exercise (Albott et al., 2020). This recommendation may inadvertently place *additional* stress on an individual who is already struggling to cope with the psychological distress they may be experiencing in relation to their job. Rather, healthcare systems should design and implement systems-based interventions and

apply them to achieve healthy workplaces. In their systematic review and meta-analysis of resilience interventions for physicians, Angelopoulou and Panagopoulou (2022) found that systems-level interventions that featured investment and support from organizational leadership showed significant improvement in physicians' resilience. Future research is needed to understand how healthcare leaders and stakeholders can work with clinicians by involving them in the design process to best structure and implement such interventions to achieve meaningful improvement in individual resilience.

Meaningful work experiences can help promote psychological well-being and reduce the risk of burnout in healthcare clinicians (Shanafelt et al., 2012; Tak et al., 2017). Personal achievement, positive interactions with others at work, and experiencing a sense of fulfillment and accomplishment through work provide intrinsic motivation for EMC to engage in their jobs. Callahan and colleagues (2018) suggest that clinicians who develop a personal philosophy based on their self-identified intrinsic motivators report greater feelings of control over their work and higher levels of meaning in life overall. With so much control removed from certain aspects of EMCs' work due to the uncertainty and instability of the COVID-19 pandemic, it is arguably more important for clinicians to identify and engage in this philosophical development to buffer against negative work experiences.

One of the most successful interventions for promoting meaningful work is through interprofessional storytelling and protected conversations around difficult and sensitive topics related to healthcare work, such as Schwartz Rounds (Heath et al., 2020). These and similarly designed interventions are evidence-based forums for healthcare staff to discuss emotional experiences related to work, providing an opportunity for staff to share, discuss, and provide

support to one another. Group-based storytelling has been shown to increase connectedness at work (Callahan et al., 2018), which may promote relatedness among EMC.

NEDOCS scores and subjective crowding-related demands were not significantly related to psychological distress. While these results did not support hypotheses 1 and 2, additional research is needed to better understand the relationships and measurement strategies that best capture these relationships. One limitation that may have contributed to these findings is the process by which ED overcrowding was subjectively calculated. The checklist items selected for inclusion in this dissertation were chosen to best reflect overcrowding-related measures. However, these items may not adequately capture the subjective ratings that EMC create during times of overcrowding. Further research is needed to better understand how subjective ratings of ED overcrowding may be captured using alternate and/or additional items such as feeling rushed or concerned about patient safety as a result of overcrowding. Additional research may inform future measures of ED overcrowding based on subjective data to best capture these metrics in the future. Thus, the quantitative results of this dissertation offer positive insights into the associations between job resources and psychological outcomes, but perhaps less insight into how ED overcrowding affects such outcomes. Limitations and suggestions are discussed.

Limitations. This dissertation utilized a cross-sectional design, with all variables within-persons collected simultaneously, therefore removing the researchers' ability to identify or predict causal relationships between the variables. Future research should incorporate longitudinal designs to assess whether ED overcrowding, meaningful work experiences, and psychological resilience can predict *subsequent* scores of psychological distress in EMC.

Psychological resilience, meaningful work experiences, crowding-related job demands, and psychological distress were all measured using self-report items. While self-report measures

are useful for understanding EMCs' perceptions of job demands and resources, it is important for researchers to explore objective measures for occupational constructs as well. This dissertation included the NEDOCS score as an objective measure of ED overcrowding but found no significant relationships between the NEDOCS scores and EMCs' psychological distress. However, methodological limitations may have influenced these findings.

First, the NEDOCS scores were calculated for all emergency departments every fifteen minutes. For larger emergency departments with multiple wings or 'pods,' this overall score may not fully reflect the degree to which a certain segment of the ED is overcrowded. In the sample used for this dissertation, 62.50% of the respondents worked in an ED that featured this format. Certain pods are reserved for patients with severe clinical presentations (e.g., trauma, stroke, heart attack), while others are reserved for populations such as behavioral health patients or pediatric patients. The NEDOCS score for each pod likely varies over time in comparison to other pods, and thus EMCs' experiences of overcrowding would also likely vary at these locations. Future research should assess whether pod-specific scores may be specified within the NEDOCS scoring reports.

The NEDOCS scores are also a potential limitation for the present research. The novel approach used here to "personalize" scores may not optimally capture the true degree of overcrowding experienced by EMC. Barriers to schedule interpretations and extreme variations in schedule formats hindered score calculations for some EMC, potentially failing to capture the full extent of overcrowding for everyone. For example, notations of "on call" were not able to be verified and were recommended by subject matter experts to be left out of score calculations. Certain schedule notations were uninterpretable by nurse leaders and were therefore also recommended for removal. Inconsistent schedule formats should be further analyzed and ideally

matched across locations to alleviate some of the challenges in calculating personalized NEDOCS scores.

Previous research has suggested that additional research is needed to determine the optimal time between intervals for measuring ED overcrowding using NEDOCS scores, with some research suggesting that larger time frames of one to four hours is preferable to fifteen-minute increments (Wang et al., 2017). Furthermore, alternative overcrowding tools have been offered as alternatives to NEDOCS such as the Severely overcrowded-Overcrowded-Not overcrowded Estimation Tool (SONET) and have found to more closely correlate with clinicians' subjective ratings of ED overcrowding (Wang et al., 2015). Additional research is needed to better understand the degree to which the NEDOCS scores reflect clinicians' subjective experiences of ED overcrowding.

Subjective measures of ED overcrowding were assessed using checklist items, and sums were totaled to produce personalized subjective scores of 0 to 4. Subjective measures which evaluate the degree to which EMC report crowding-related job demands, such as Likert-type measures, may provide more context and provide additional insight into how overcrowding affects certain job demands, and therefore the extent to which clinicians "feel" the effects of ED overcrowding in comparison to objective measurement scales' scoring of overcrowding, such as the NEDOCS.

Qualitative Discussion

The qualitative results of this study provided interesting insight into how EMC elaborated on their quantitative scores through their open-ended responses. EMC showed great appreciation for sources of social support in their lives, which mainly included family and coworkers. This finding suggests that social support both at work and outside of work is important for EMC to

replenish psychological resource losses, which they may suffer from highly stressful work experiences and environments.

They also identified several job demand challenges directly associated with ED overcrowding during the COVID-19 pandemic, including staffing and supply shortages, high patient volumes and overflow, and exhaustion associated with trying to maintain job performance in the context of these demands. ED overcrowding thus seems to affect EMC through hindering patient throughput and diminishing vital resources, which may in turn reduce psychological capital and increase the risk of psychological distress. Chronic exposure to crowding-related demands increases EMCs' risk of burnout, which in turn increases their risk for absenteeism, turnover, and transitioning out of healthcare entirely. Organizational strategies to anticipate ED overcrowding challenges and response planning should identify ways in which department and organizational leaders can respond to such demands.

EMC did not reported challenges related to balancing work with non-work life tasks and duties, as well as personal challenges associated with family, health, and finances. While the COVID-19 pandemic has undoubtedly affected EMCs' work lives to affect their psychological well-being, it has also affected life outside of work. This multifaceted impact may not only prevent EMC from effectively replenishing psychological resources outside of work that they may lose during work, but they may experience even *more* stress resulting from challenges at home in addition to those at work. Furthermore, the spillover stress of job demands may reduce EMCs' ability to psychologically detach from work outside of work and influence their overall psychological distress (Kilroy et al., 2020). While organizations likely cannot meaningfully alleviate many EMCs' personal challenges, providing resources at work (e.g., increased pay,

flexible scheduling) where possibly may reduce overall psychological distress and decrease the likelihood of burnout.

Integration of Quantitative and Qualitative Data

Taken together, these results can provide important insight for factors influencing EMCs' psychological distress during the COVID-19 pandemic, as well as how quantitative and qualitative data can provide a more holistic picture of how elements of EMCs' jobs such as demands and job and personal resources affect mental well-being. While the quantitative results did not yield significant relationships between ED overcrowding and psychological distress, the qualitative results indicated that EMC overtly reported experiences stress related to ED overcrowding. The novel introduction here of "personalized" NEDOCS scores calculated based on average departmental scores may not reflect EMCs' subjective experience of overcrowding in the clinical environment. While subjective ratings were also included, the dichotomous nature of that measurement along with the limited choice count may have also failed to capture the extent to which EMC experienced stress related to ED overcrowding.

Future research should also explore other elements of the job that may be affected by overcrowding, such personal accomplishment. EMC are accustomed to stabilizing high acuity patients and admitting them to the hospital for inpatient care. ED overcrowding and bed holds have disrupted patient flow, causing high acuity patients to become backed up in the ED (i.e., "bed holds" or "boarding") and placing responsibility for their care on EMC instead of inpatient clinicians. Certain elements of intensive care patients' medical needs are not part of EMCs' standard operating procedures and may therefore be more difficult for ED staff to manage in addition to the emergency medicine patients they are also treating. Future research should further

explore certain facets of crowding-related demands that may not have been captured with current measurements.

The qualitative data demonstrate the importance of relationships outside of work for EMCs' psychological well-being. While the meaningful work scale assessed interactions with coworkers (see Appendix C, question 5), no quantitative measurements specifically assessed the degree to which personal resources outside of work may influence psychological distress. Although these factors may be outside the scope of applied organizational research, it may be prudent for future research to explore how resources and demands outside of work influence EMCs' self-reported psychological distressed as it is measured in the context of work. A better understanding how demands and resources at work *and* outside of work may provide additional details or insight into EMCs' experiences of stress during the COVID-19 pandemic and contribute to the broader occupational health research.

Conclusions

The JD-R model provided an excellent framework to examine how job demands and job and personal resources interact to influence EMCs' psychological well-being. The mixed methods approach used in this dissertation allowed for context to be applied to certain findings, and also raised important follow-up questions that future research should explore to gain a better understanding of the constructs. Resources such as psychological resilience and meaningful work experiences are important areas for applied research to apply carefully designed and implemented interventions to promote EMCs' psychological well-being. Evidence-based practices can inform these strategies to provide meaningful insight for organizational leadership and stakeholders to support EMC.

REFERENCES

- Abiola, T., & Udofia, O. (2011). Psychometric assessment of the Wagnild and Young's resilience scale in Kano, Nigeria. *BMC Research Notes*, 4(1), 1-5.
- Afilalo, J., Marinovich, A., Afilalo, M., Colacone, A., Leger, R., Unger, B., & Giguere, C. (2004). Nonurgent emergency department patient characteristics and barriers to primary care. *Academic emergency medicine*, 11(12), 1302-1310.
- Ahalt, V., Argon, N. T., Ziya, S., Strickler, J., & Mehrotra, A. (2018). Comparison of emergency department crowding scores: a discrete-event simulation approach. *Health care management science*, 21(1), 144-155.
- Albott, C. S., Wozniak, J. R., McGlinch, B. P., Wall, M. H., Gold, B. S., & Vinogradov, S. (2020). Battle buddies: Rapid deployment of a psychological resilience intervention for health care workers during the coronavirus disease 2019 pandemic. *Anesthesia and analgesia*.
- Allan, B. A., Autin, K. L., & Duffy, R. D. (2016). Self-determination and meaningful work: Exploring socioeconomic constraints. *Frontiers in Psychology*, 7, 71.
- Amanullah, S., & Ramesh Shankar, R. (2020, December). The impact of COVID-19 on physician burnout globally: a review. In *Healthcare* (Vol. 8, No. 4, p. 421). Multidisciplinary Digital Publishing Institute.
- American College of Emergency Physicians. (2006). Crowding. *Annals of Emergency Medicine*, 47, 585.
- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter?. *Journal of health and social behavior*, 1-10.
- Andersson, G., & Karlberg, I. (2001). Lack of integration, and seasonal variations in demand explained performance problems and waiting times for patients at emergency

- departments: a 3 years evaluation of the shift of responsibility between primary and secondary care by closure of two acute hospitals. *Health Policy*, 55(3), 187-207.
- Andrulis, D. P., Kellermann, A., Hintz, E. A., Hackman, B. B., & Weslowski, V. B. (1991). Emergency departments and crowding in United States teaching hospitals. *Annals of emergency medicine*, 20(9), 980-986.
- Angelopoulou, P., & Panagopoulou, E. (2022). Resilience interventions in physicians: a systematic review and meta-analysis. *Applied Psychology: Health and Well-Being*, 14(1), 3-25.
- Apornak, A. (2021). Human resources allocation in the hospital emergency department during COVID-19 pandemic. *International Journal of Healthcare Management*, 14(1), 264-270.
- Autin, K. L., Herdt, M. E., Garcia, R. G., & Ezema, G. N. (2021). Basic psychological need satisfaction, autonomous motivation, and meaningful work: a self-determination theory perspective. *Journal of Career Assessment*, 10690727211018647.
- Bahar, A., Koçak, H. S., Bağlama, S. S., & Çuhadar, D. (2020). Can psychological resilience protect the mental health of healthcare professionals during the COVID-19 pandemic period?. *Dubai Medical Journal*, 3(44), 133-139.
- Bakker, A. B., & Demerouti, E. (2007). The job demands–resources model: State of the art. *Journal of Managerial Psychology*, 22, 309-328.
- Bayley, M. D., Schwartz, J. S., Shofer, F. S., Weiner, M., Sites, F. D., Traber, K. B., & Hollander, J. E. (2005). The financial burden of emergency department congestion and hospital crowding for chest pain patients awaiting admission. *Annals of emergency medicine*, 45(2), 110-117.

- Benedek, D. M., Fullerton, C., & Ursano, R. J. (2007). First responders: mental health consequences of natural and human-made disasters for public health and public safety workers. *Annu. Rev. Public Health, 28*, 55-68.
- Britt, T. W., Shuffler, M. L., Pegram, R. L., Xoxakos, P., Rosopa, P. J., Hirsh, E., & Jackson, W. (2021). Job demands and resources among healthcare professionals during virus pandemics: A review and examination of fluctuations in mental health strain during COVID-19. *Applied Psychology, 70*(1), 120-149.
- Britt, T. W., Shen, W., Sinclair, R. R., Grossman, M. R., & Klieger, D. M. (2016). How much do we really know about employee resilience?. *Industrial and Organizational Psychology, 9*(2), 378-404.
- Britt, T. W., Sinclair, R. R., & McFadden, A. C. (2013). Introduction: The meaning and importance of military resilience. In R. R. Sinclair & T. W. Britt (Eds.), *Building psychological resilience in military personnel: Theory and practice* (pp. 3–17). Washington, DC: American Psychological Association.
- Boyle, A., Abel, G., Raut, P., Austin, R., Dhakshinamoorthy, V., Ayyamuthu, R., ... & Burton, J. (2016). Comparison of the International Crowding Measure in Emergency Departments (ICMED) and the National Emergency Department Overcrowding Score (NEDOCS) to measure emergency department crowding: pilot study. *Emergency Medicine Journal, 33*(5), 307-312.
- Broetje, S., Jenny, G. J., & Bauer, G. F. (2020). The key job demands and resources of nursing staff: An integrative review of reviews. *Frontiers in Psychology, 11*, 84.
- Bryman, Alan. 2006. Integrating quantitative and qualitative research: How is it done? *Qualitative Research 6*:97–113.

- Bouillon-Minois, J. B., Raconnat, J., Clinchamps, M., Schmidt, J., & Dutheil, F. (2021). Emergency Department and Overcrowding During COVID-19 Outbreak; a Letter to Editor. *Archives of Academic Emergency Medicine*, 9(1).
- Callahan, K., Christman, G., & Maltby, L. (2018). Battling burnout: strategies for promoting physician wellness. *Advances in pediatrics*, 65(1), 1-17.
- Castner, J., Norful, A. A., Cato, K., & Chang, B. P. (2020). 297 Emergency Nursing Workforce, Burnout, and Work Environments in the United States: A National Sample Survey Analysis. *Annals of Emergency Medicine*, 76(4), S114-S115.
- Chambers, C. N., Frampton, C. M., Barclay, M., & McKee, M. (2016). Burnout prevalence in New Zealand's public hospital senior medical workforce: a cross-sectional mixed methods study. *BMJ open*, 6(11), e013947.
- Cohen, L., Manion, L., & Morrison, K. (2002). *Research methods in education*. Routledge.
- Converso, D., Loera, B., Viotti, S., & Martini, M. (2015). Do positive relations with patients play a protective role for healthcare employees? Effects of patients' gratitude and support on nurses' burnout. *Frontiers in Psychology*, 6, 470.
- Cooke, M. W., Wilson, S., Halsall, J., & Roalfe, A. (2004). Total time in English accident and emergency departments is related to bed occupancy. *Emergency Medicine Journal*, 21(5), 575-576.
- Corley, M. C. (2002). Nurse moral distress: a proposed theory and research agenda. *Nursing ethics*, 9(6), 636-650.
- Davis, Z., Zobel, C. W., Khansa, L., & Glick, R. E. (2020). Emergency department resilience to disaster-level overcrowding: a component resilience framework for analysis and predictive modeling. *Journal of Operations Management*, 66(1-2), 54-66.

- De Kock, J. H., Latham, H. A., Leslie, S. J., Grindle, M., Munoz, S. A., Ellis, L., ... & O'Malley, C. M. (2021). A rapid review of the impact of COVID-19 on the mental health of healthcare workers: implications for supporting psychological well-being. *BMC public health, 21*(1), 1-18.
- de Wit, K., Mercuri, M., Wallner, C., Clayton, N., Archambault, P., Ritchie, K., ... & Network of Canadian Emergency Researchers. (2020). Canadian emergency physician psychological distress and burnout during the first 10 weeks of COVID-19: A mixed-methods study. *Journal of the American College of Emergency Physicians Open, 1*(5), 1030-1038.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*(3), 499-512.
- Dent, A. W., Phillips, G. A., Chenhall, A. J., & McGregor, L. R. (2003). The heaviest repeat users of an inner city emergency department are not general practice patients. *Emergency Medicine, 15*(4), 322-329.
- Dewi, S. C., Muafi, N., Endarwati, T., Maryana, M., & Sutejo, S. (2021). Relationship of the Emergency Department Density Level with Nursing Work Stress. *Open Access Macedonian Journal of Medical Sciences, 9*(T4), 279-283.
- Dinh, M. M., & Berendsen Russell, S. (2021). Overcrowding kills: How COVID-19 could reshape emergency department patient flow in the new normal. *Emergency Medicine Australasia, 33*(1), 175-177.
- Dinibutun, S. R. (2020). Factors associated with burnout among physicians: an evaluation during a period of COVID-19 pandemic. *Journal of healthcare leadership, 12*, 85.

- Dyrbye, L. N., Johnson, P. O., Johnson, L. M., Satele, D. V., & Shanafelt, T. D. (2018). Efficacy of the Well-Being Index to identify distress and well-being in US nurses. *Nursing research, 67*(6), 447-455.
- Dyrbye, L. N., Satele, D., Sloan, J., & Shanafelt, T. D. (2013). Utility of a brief screening tool to identify physicians in distress. *Journal of General Internal Medicine, 28*(3), 421-427.
- Dyrbye, L. N., Satele, D., Sloan, J., & Shanafelt, T. D. (2014). Ability of the physician well-being index to identify residents in distress. *Journal of graduate medical education, 6*(1), 78-84.
- Eisenberg, D. (2000, January). Critical condition. *Time, 52*-54.
- Fatovich, D. M., Nagree, Y., & Sprivulis, P. (2005). Access block causes emergency department overcrowding and ambulance diversion in Perth, Western Australia. *Emergency medicine journal, 22*(5), 351-354.
- Ferreira, P., & Gomes, S. (2021). The role of resilience in reducing burnout: A study with healthcare workers during the COVID-19 pandemic. *Social Sciences, 10*(9), 317.
- Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health services research, 48*(6pt2), 2134-2156.
- Forero, R., Hillman, K. M., McCarthy, S., Fatovich, D. M., Joseph, A. P., & Richardson, D. B. (2010). Access block and ED overcrowding. *Emergency Medicine Australasia, 22*(2), 119-135.
- Forster, A. J., Stiell, I., Wells, G., Lee, A. J., & Van Walraven, C. (2003). The effect of hospital occupancy on emergency department length of stay and patient disposition. *Academic Emergency Medicine, 10*(2), 127-133.

- French, J. R. P., Jr., & Kahn, R. L. (1962). A programmatic approach to studying the industrial environment and mental health. *Journal of Social Issues*, 18 (3), 1–47.
- Gao, T., Ding, X., Chai, J., Zhang, Z., Zhang, H., Kong, Y., & Mei, S. (2017). The influence of resilience on mental health: The role of general well-being. *International Journal of Nursing Practice*, 23(3), e12535.
- Hangland, M. M. (1991). ED overcrowding spurs interest in quality and credentialing issues. *Hospitals*, 65, 33-36.
- Hartzband, P., & Groopman, J. (2020). Physician burnout, interrupted. *New England Journal of Medicine*, 382(26), 2485-2487.
- Havaei, F., Ma, A., Staempfli, S., & MacPhee, M. (2021, January). Nurses' workplace conditions impacting their mental health during COVID-19: A cross-sectional survey study. In *Healthcare* (Vol. 9, No. 1, p. 84). Multidisciplinary Digital Publishing Institute.
- Heath, C., Sommerfield, A., & von Ungern-Sternberg, B. S. (2020). Resilience strategies to manage psychological distress among healthcare workers during the COVID-19 pandemic: a narrative review. *Anaesthesia*, 75(10), 1364-1371.
- Hoot, N. R., Zhou, C., Jones, I., & Aronsky, D. (2007). Measuring and forecasting emergency department crowding in real time. *Annals of emergency medicine*, 49(6), 747-755.
- Garcia-Romero, M., Rita-Gáfaró, C. G., Quintero-Manzano, J., & Angarita, A. B. (2017). NEDOCS vs subjective evaluation, ¿Is the health personnel of the emergency department aware of its overcrowding?. *Colombia Médica*, 48(2), 53-57.
- Glaser, C. A., Gilliam, S., Thompson, W. W., Dassey, D. E., Waterman, S. H., Saruwatari, M., ... & Fukuda, K. (2002). Medical care capacity for influenza outbreaks, Los Angeles. *Emerging infectious diseases*, 8(6), 569.

- Greene, Jennifer C., Valerie J. Caracelli, and Wendy F. Graham. 1989. Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis* 11:255–274.
- Grossman, M. R. (2014). *Clarifying the nature of resilience: A meta-analytic approach*. (Unpublished Dissertation). University of South Florida.
- Grumbach, K., Keane, D., & Bindman, A. (1993). Primary care and public emergency department overcrowding. *American journal of public health*, 83(3), 372-378.
- Houkes, I.; Winants, Y.; Twellaar, M.; Verdonk, P. Development of burnout over time and the causal order of the three dimensions of burnout among male and female GPs. A three-wave panel study. *BMC Public Health* 2011, 11, 240.
- Howard, M. S., Davis, B. A., Anderson, C., Cherry, D., Koller, P., & Shelton, D. (2005). Patients' perspective on choosing the emergency department for nonurgent medical care: a qualitative study exploring one reason for overcrowding. *Journal of Emergency Nursing*, 31(5), 429-435.
- Huang, J. A., Tsai, W. C., Chen, Y. C., Hu, W. H., & Yang, D. Y. (2003). Factors associated with frequent use of emergency services in a medical center. *Journal-Formosan Medical Association*, 102(4), 222-228.
- Hwang, J. I. (2006). The relationship between hospital capacity characteristics and emergency department volumes in Korea. *Health Policy*, 79(2-3), 274-283.
- Jobé, J., Donneau, A. F., Scholtes, B., & Ghuyssen, A. (2018). Quantifying emergency department crowding: comparison between two scores. *Acta Clinica Belgica*, 73(3), 207-212.

- Johnson, J., Hall, L. H., Berzins, K., Baker, J., Melling, K., & Thompson, C. (2018). Mental healthcare staff well-being and burnout: A narrative review of trends, causes, implications, and recommendations for future interventions. *International journal of mental health nursing, 27*(1), 20-32.
- Kaur, M. (2016). Application of mixed method approach in public health research. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine, 41*(2), 93.
- Kaye, A. D., Okeagu, C. N., Pham, A. D., Silva, R. A., Hurley, J. J., Arron, B. L., ... & Cornett, E. M. (2021). Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives. *Best Practice & Research Clinical Anaesthesiology, 35*(3), 293-306.
- Kelker, H., Yoder, K., Musey, P., Harris, M., Johnson, O., Sarmiento, E., ... & Welch, J. L. (2020). Longitudinal prospective study of emergency medicine provider wellness across ten academic and community hospitals during the initial surge of the COVID-19 pandemic. *Research Square*.
- Khammissa, R. A., Nemitandani, S., Shangase, S. L., Feller, G., Lemmer, J., & Feller, L. (2022). The burnout construct with reference to healthcare providers: A narrative review. *SAGE Open Medicine, 10*, 20503121221083080.
- Kilroy, S., Bosak, J., Flood, P. C., & Peccei, R. (2020). Time to recover: The moderating role of psychological detachment in the link between perceptions of high-involvement work practices and burnout. *Journal of Business Research, 108*, 52-61.
- Krochmal, P., & Riley, T. A. (1994). Increased health care costs associated with ED overcrowding. *The American journal of emergency medicine, 12*(3), 265-266.

- Kyriacou, D. N., Ricketts, V., Dyne, P. L., McCollough, M. D., & Talan, D. A. (1999). A 5-year time study analysis of emergency department patient care efficiency. *Annals of emergency medicine*, 34(3), 326-335.
- Lambe, S., Washington, D. L., Fink, A., Laouri, M., Liu, H., Fosse, J. S., ... & Asch, S. M. (2003). Waiting times in California's emergency departments. *Annals of emergency medicine*, 41(1), 35-44.
- Lim, R., Van Aarsen, K., Gray, S., Rang, L., Fitzpatrick, J., & Fischer, L. (2020). Emergency medicine physician burnout and wellness in Canada before COVID19: a national survey. *Canadian Journal of Emergency Medicine*, 22(5), 603-607.
- Lips-Wiersma, M., and Wright, S. (2012). Measuring the meaning of meaningful work: development and validation of the Comprehensive Meaningful Work Scale (CMWS). *Group Organization Management*, 37, 655–685.
- Liu, S., Hobgood, C., & Brice, J. H. (2003). Impact of critical bed status on emergency department patient flow and overcrowding. *Academic Emergency Medicine*, 10(4), 382-385.
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child development*, 71(3), 543-562.
- Maiorano, T., Vagni, M., Giostra, V., & Pajardi, D. (2020). COVID-19: Risk factors and protective role of resilience and coping strategies for emergency stress and secondary trauma in medical staff and emergency workers—An online-based inquiry. *Sustainability*, 12(21), 9004.

- Manzano García, G., & Ayala Calvo, J. C. (2012). Emotional exhaustion of nursing staff: influence of emotional annoyance and resilience. *International Nursing Review*, 59(1), 101-107.
- Martela, F., Gómez, M., Unanue, W., Araya, S., Bravo, D., & Espejo, A. (2021). What makes work meaningful? Longitudinal evidence for the importance of autonomy and beneficence for meaningful work. *Journal of Vocational Behavior*, 131, 103631.
- Maslach, C., & Goldberg, J. (1998). Prevention of burnout: New perspectives. *Applied and Preventive Psychology*, 7, 63–74.
- Maslach, C., & Leiter, M. P. (1997). *The truth about burnout: How organizations cause personal stress and what to do about it*. San Francisco, CA: Jossey-Bass.
- Melnikow, J., Padovani, A., & Miller, M. (2021). Frontline Physician Burnout During the COVID-19 Pandemic: National Survey Findings.
- Meredith, L. S., Sherbourne, C. D., Gaillot, S. J., Hansell, L., Ritschard, H. V., Parker, A. M., & Wrenn, G. (2011). Promoting psychological resilience in the US military. *Rand health quarterly*, 1(2).
- Miller, I. F., Becker, A. D., Grenfell, B. T., & Metcalf, C. J. E. (2020). Disease and healthcare burden of COVID-19 in the United States. *Nature Medicine*, 26(8), 1212-1217.
- Miro, O., Antonio, M. T., Jimenez, S., De Dios, A., Sánchez, M., Borrás, A., & Millá, J. (1999). Decreased health care quality associated with emergency department overcrowding. *European journal of emergency medicine: official journal of the European Society for Emergency Medicine*, 6(2), 105-107.
- Mittelman, M., & Hanaway, P. (2012). Globalization of healthcare. *Global advances in health and medicine*, 1(2), 5-7.

- Neely, K. W., Norton, R. L., & Young, G. P. (1994). The effect of hospital resource unavailability and ambulance diversions on the EMS system. *Prehospital and disaster medicine, 9*(3), 172-176.
- Ng, K., Poon, B. H., Kiat Puar, T. H., Shan Quah, J. L., Loh, W. J., Wong, Y. J., ... & Raghuram, J. (2020). COVID-19 and the risk to health care workers: a case report. *Annals of internal medicine, 172*(11), 766-767.
- Nguyen, J., Liu, A., McKenney, M., Liu, H., Ang, D., & Elkbuli, A. (2021). Impacts and challenges of the COVID-19 pandemic on emergency medicine physicians in the United States. *The American journal of emergency medicine, 48*, 38-47.
- Noble, H., & Heale, R. (2019). Triangulation in research, with examples. *Evidence-Based Nursing, 22*(3), 67-68.
- O'cathain, A., Murphy, E., & Nicholl, J. (2008). The quality of mixed methods studies in health services research. *Journal of health services research & policy, 13*(2), 92-98.
- Ovens, H., Thompson, J., Lyver, M., Murray, M. J., & Innes, G. (2003). Implications of the SARS outbreak for Canadian emergency departments. *Canadian Journal of Emergency Medicine, 5*(5), 343-347.
- Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V. G., Papoutsis, E., & Katsaounou, P. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain, behavior, and immunity, 88*, 901-907.
- Philippon, A. L. (2019). Work shift duration for emergency physicians—the shorter, the better: the French experience. *European Journal of Emergency Medicine, 26*(6), 396-397.

- Polevoi, S. K., Quinn, J. V., & Kramer, N. R. (2005). Factors associated with patients who leave without being seen. *Academic Emergency Medicine*, *12*(3), 232-236.
- Pines, J. M., Hilton, J. A., Weber, E. J., Alkemade, A. J., Al Shabanah, H., Anderson, P. D., ... & Schull, M. J. (2011). International perspectives on emergency department crowding. *Academic Emergency Medicine*, *18*(12), 1358-1370.
- R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- Raj, K., Baker, K., Brierley, S., & Murray, D. (2006). National emergency department overcrowding study tool is not useful in an Australian emergency department. *Emergency Medicine Australasia*, *18*(3), 282-288.
- Richardson, D. B. (2006). Increase in patient mortality at 10 days associated with emergency department overcrowding. *Medical journal of Australia*, *184*(5), 213-216.
- Rodríguez-Rey, R., Alonso-Tapia, J., & Hernansaiz-Garrido, H. (2016). Reliability and validity of the brief resilience scale (BRS) spanish version. *Psychological assessment*, *28*(5), e101.
- Rodriguez, R. M., Medak, A. J., Baumann, B. M., Lim, S., Chinnock, B., Frazier, R., & Cooper, R. J. (2020). Academic emergency medicine physicians' anxiety levels, stressors, and potential stress mitigation measures during the acceleration phase of the COVID-19 pandemic. *Academic Emergency Medicine*, *27*(8), 700-707.
- Rondeau, K. V., Francescutti, L. H., & Zanardelli, J. J. (2005). Emergency department overcrowding: the impact of resource scarcity on physician job satisfaction/practitioner application. *Journal of Healthcare Management*, *50*(5), 327.

- Roslan, N. S., Yusoff, M. S. B., Asrenee, A. R., & Morgan, K. (2021, January). Burnout prevalence and its associated factors among Malaysian healthcare workers during COVID-19 pandemic: an embedded mixed-method study. In *Healthcare* (Vol. 9, No. 1, p. 90). Multidisciplinary Digital Publishing Institute.
- Rosso, B. D., Dekas, K. H., & Wrzesniewski, A. (2010). On the meaning of work: A theoretical integration and review. *Research in organizational behavior*, 30, 91-127.
- Rosopa, P. J., Schaffer, M., & Schroeder, A. N. (2013). Managing heteroscedasticity in general linear models. *Psychological Methods*, 18(3), 335-351.
- Rotenstein, L. S., Torre, M., Ramos, M. A., Rosales, R. C., Guille, C., Sen, S., & Mata, D. A. (2018). Prevalence of burnout among physicians: a systematic review. *Jama*, 320(11), 1131-1150.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68.
- Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L., & Andrade, S. M. D. (2017). Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PloS one*, 12(10), e0185781.
- Sánchez-Zaballos, M., & Mosteiro-Díaz, M. P. (2021). Resilience among professional health workers in emergency services. *Journal of Emergency Nursing*, 47(6), 925-932.
- Sangal, R. B., Venkatesh, A. K., Kinsman, J., Dashevsky, M., Scofi, J. E., & Ulrich, A. (2021). Simulating approaches to emergency department pandemic physician staffing during COVID-19. *American journal of disaster medicine*, 16(2), 85-93.

- Santarone, K., McKenney, M., & Elkbuli, A. (2020). Preserving mental health and resilience in frontline healthcare workers during COVID-19. *The American journal of emergency medicine*, *38*(7), 1530-1531.
- Schaufeli, W. B., & Taris, T. W. (2014). A critical review of the job demands-resources model: Implications for improving work and health. *Bridging occupational, organizational and public health*, 43-68.
- Schneider, S. M., Gallery, M. E., Schafermeyer, R., & Zwemer, F. L. (2003). Emergency department crowding: a point in time. *Annals of emergency medicine*, *42*(2), 167-172.
- Schnell, T., & Hoffmann, C. (2020). ME-Work: Development and validation of a modular meaning in work inventory. *Frontiers in psychology*, 3405.
- Schull, M. J., Lazier, K., Vermeulen, M., Mawhinney, S., & Morrison, L. J. (2003). Emergency department contributors to ambulance diversion: a quantitative analysis. *Annals of emergency medicine*, *41*(4), 467-476.
- Schull, M. J., Mamdani, M. M., & Fang, J. (2004). Community influenza outbreaks and emergency department ambulance diversion. *Annals of emergency medicine*, *44*(1), 61-67.
- Schull, M. J., Mamdani, M. M., & Fang, J. (2005). Influenza and emergency department utilization by elders. *Academic emergency medicine*, *12*(4), 338-344.
- Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *69*(2), 107-131.
- Shanafelt, T. D. (2021, October). Physician well-being 2.0: where are we and where are we going?. In *Mayo Clinic Proceedings* (Vol. 96, No. 10, pp. 2682-2693). Elsevier.

- Shanafelt, T. D., Boone, S., Tan, L., Dyrbye, L. N., Sotile, W., Satele, D., ... & Oreskovich, M. R. (2012). Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Archives of internal medicine*, *172*(18), 1377-1385.
- Sprivulis, P., Grainger, S., & Nagree, Y. (2005). Ambulance diversion is not associated with low acuity patients attending Perth metropolitan emergency departments. *Emergency Medicine Australasia*, *17*(1), 11-15.
- Steger, M. F., Dik, B. J., and Duffy, R. D. (2012). Measuring meaningful work: the work and meaning inventory (WAMI). *Journal of Career Assessment*, *20*, 322–337
- Sun, B. C., Mohanty, S. A., Weiss, R., Tadeo, R., Hasbrouck, M., Koenig, W., ... & Asch, S. (2006). Effects of hospital closures and hospital characteristics on emergency department ambulance diversion, Los Angeles County, 1998 to 2004. *Annals of emergency medicine*, *47*(4), 309-316.
- Taku, K. (2014). Relationships among perceived psychological growth, resilience and burnout in physicians. *Personality and individual differences*, *59*, 120-123.
- Tak, H. J., Curlin, F. A., & Yoon, J. D. (2017). Association of intrinsic motivating factors and markers of physician well-being: a national physician survey. *Journal of general internal medicine*, *32*(7), 739-746.
- Tariq, S., & Woodman, J. (2013). Using mixed methods in health research. *JRSM short reports*, *4*(6), 2042533313479197.
- Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS quarterly*, 21-54.

- Wang, H., Ojha, R. P., Robinson, R. D., Jackson, B. E., Shaikh, S. A., Cowden, C. D., ... & Zenarosa, N. R. (2017). Optimal measurement interval for emergency department crowding estimation tools. *Annals of emergency medicine, 70*(5), 632-639.
- Wang, H., Robinson, R. D., Bunch, K., Huggins, C. A., Watson, K., Jayswal, R. D., ... & Zenarosa, N. R. (2014). The inaccuracy of determining overcrowding status by using the national ED overcrowding study tool. *The American journal of emergency medicine, 32*(10), 1230-1236.
- Wang, H., Robinson, R. D., Garrett, J. S., Bunch, K., Huggins, C. A., Watson, K., ... & Zenarosa, N. R. (2015). Use of the SONET score to evaluate high volume emergency department overcrowding: a prospective derivation and validation study. *Emergency medicine international, 2015*.
- Watson, A. G., Saggar, V., MacDowell, C., & McCoy, J. V. (2019). Self-reported modifying effects of resilience factors on perceptions of workload, patient outcomes, and burnout in physician-attendees of an international emergency medicine conference. *Psychology, Health & Medicine, 24*(10), 1220-1234.
- Weiss, S. J., Derlet, R., Arndahl, J., Ernst, A. A., Richards, J., Fernández-Frankelton, M., ... & Nick, T. G. (2004). Estimating the degree of emergency department overcrowding in academic medical centers: results of the National ED Overcrowding Study (NEDOCS). *Academic emergency medicine, 11*(1), 38-50.
- Weiss, S. J., Ernst, A. A., Derlet, R., King, R., Bair, A., & Nick, T. G. (2005). Relationship between the National ED Overcrowding Scale and the number of patients who leave without being seen in an academic ED. *The American journal of emergency medicine, 23*(3), 288-294.

- Weiss, S. J., Ernst, A. A., & Nick, T. G. (2006). Comparison of the national emergency department overcrowding scale and the emergency department work index for quantifying emergency department crowding. *Academic Emergency Medicine, 13*(5), 513-518.
- West, C. P., Dyrbye, L. N., & Shanafelt, T. D. (2018). Physician burnout: contributors, consequences and solutions. *Journal of internal medicine, 283*(6), 516-529.
- Windle, G., Bennett, K. M., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and quality of life outcomes, 9*(1), 1-18.

APPENDICES

Appendix A

Modified Well-Being Index

Adapted from Dyrbye et al., 2013

During the past month:

	Yes	No
Have you worried that your work is hardening you emotionally?	<input type="radio"/>	<input type="radio"/>
Have you often been bothered by feeling down, depressed, or hopeless?	<input type="radio"/>	<input type="radio"/>
Have you fallen asleep while stopped in traffic or driving?	<input type="radio"/>	<input type="radio"/>
Have you felt that all things you had to do were piling up so high that you could not overcome them?	<input type="radio"/>	<input type="radio"/>
Have you been bothered by emotional problems (such as feeling anxious or irritable)?	<input type="radio"/>	<input type="radio"/>
Has your physical health interfered with your ability to do your daily work at home and/or away from home?	<input type="radio"/>	<input type="radio"/>

Using your own definition of "burnout," please select one of the answers below:

- I enjoy my work. I have no symptoms of burnout.
- I am under stress, and don't always have as much energy as I did, but I don't feel burned out.
- I am definitely burning out and have one or more symptoms of burnout (e.g., emotional exhaustion).
- The symptoms of burnout that I am experiencing won't go away. I think about work frustrations a lot.
- I feel completely burned out. I am at the point where I may need to seek help.

Note. Total scores were calculated by summing each 'yes' response to the first set of dichotomous items, then adding a point if respondents selected item 3, 4, or 5 on the second question. Scores range from 0-7, with higher scores indicating greater potential for psychological distress.

Appendix B

Subjective Crowding-Related Demands

Which of the following are you currently experiencing or concerned about? **Check all that apply:**

- Staffing concerns in the ED/Urgent Care (e.g., too few doctors, too few nurses, too few staff)
- Difficulty admitting or transferring patients
- Shortage of supplies needed to treat patients
- Shortage of medications needed to treat patients

Appendix C

Meaningful Work Scale

May 2021 Survey:

Have any of the following been true for you in the past month? **Check all that apply.**

- I felt that my work was meaningful.
- I positively impacted patients and their families.
- I had satisfying patient interactions.
- I left work in a positive mood.
- I had several positive interactions with coworkers.

June-August 2021 Surveys:

How often have the following been true for you in the past month?

	Never/Hardly ever	Seldom	Sometimes	Often	Always
I felt my work was meaningful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I positively impacted patients and their families.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had satisfying patient interactions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I left work in a positive mood.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had positive interactions with coworkers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix D

Brief Resilience Scale

Smith et al., 2008

Please indicate the extent to which you agree with each of the following statements by using the scale indicated below:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I tend to bounce back quickly after hard times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time making it through stressful events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It does not take me long to recover from a stressful event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is hard for me to snap back when something bad happens	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually come through difficult times with little trouble	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to take a long time to get over setbacks in my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note. Scores are computed by reverse-coding items 2, 4, and 6 and finding the mean of the six items. Scores range from 1-6.

Appendix E

Qualitative Open-Ended Questions

1. What is one thing at work or at home right now that is going really well or feels supportive?
2. What, if anything, are you finding especially difficult right now **at work**?
3. What, if anything, are you finding especially difficult right now **outside of work**?

FIGURES

Figure 1

JD-R Model Applied to EMC During Pandemics

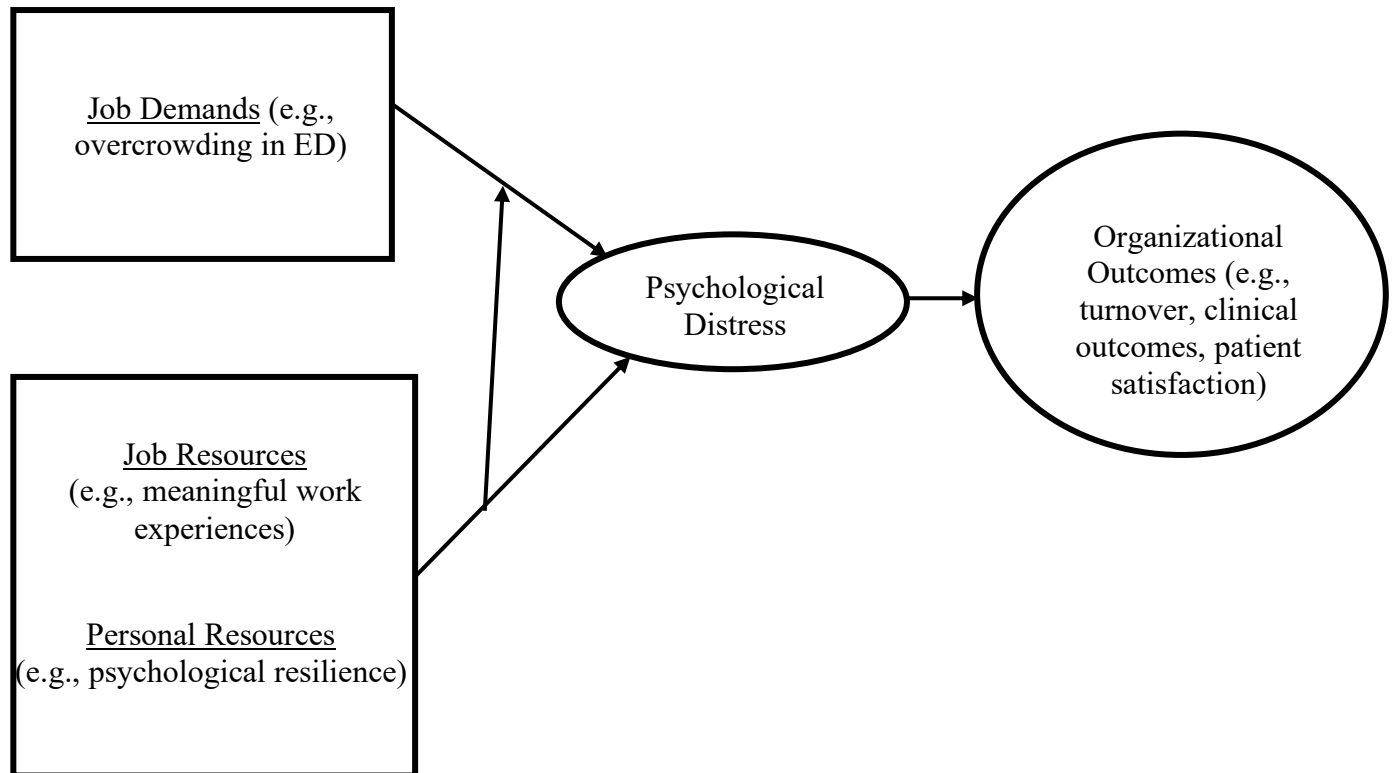


Figure 2

Mixed-Methods Research Design

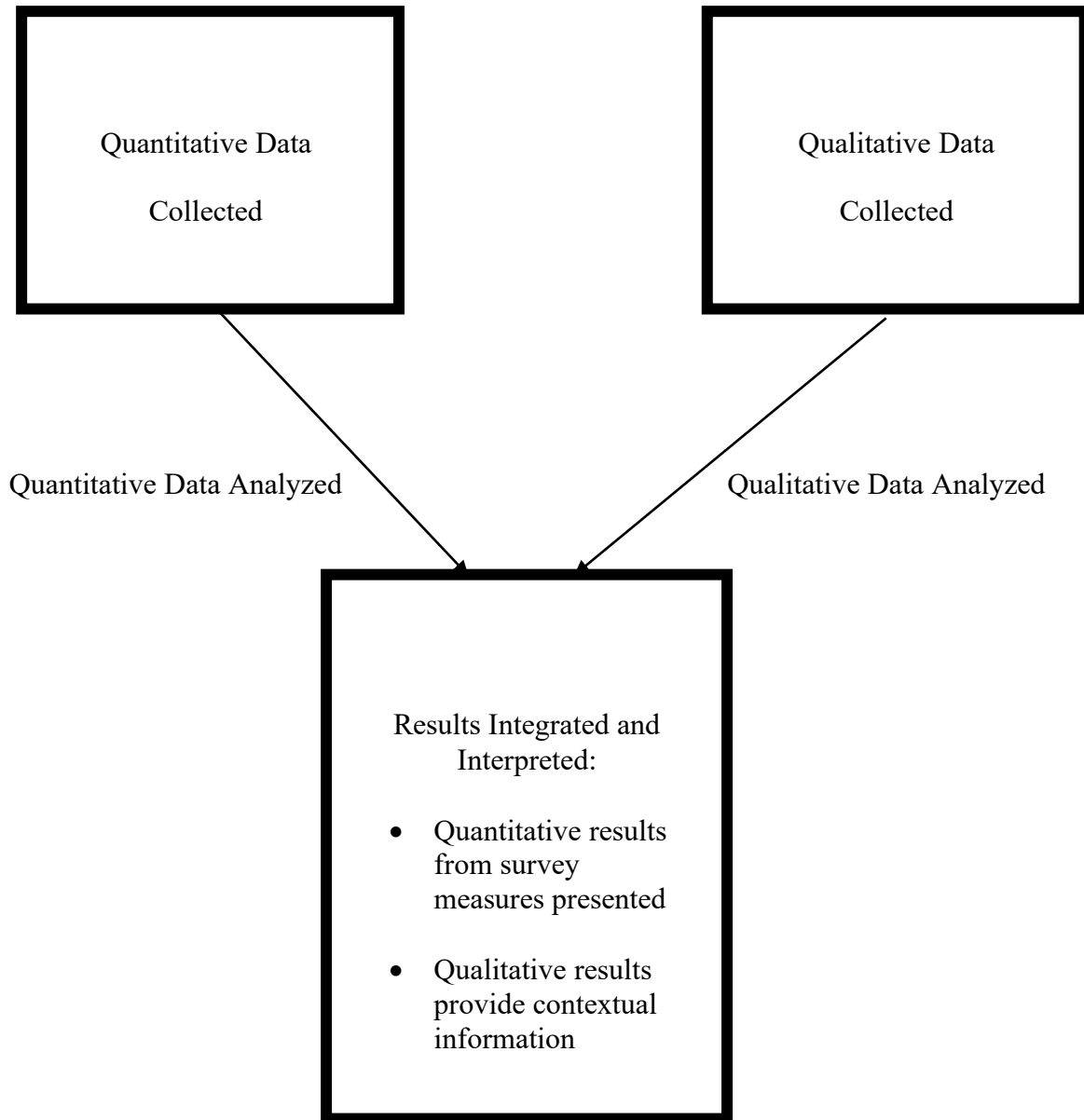


Figure 3

Model of Hypotheses

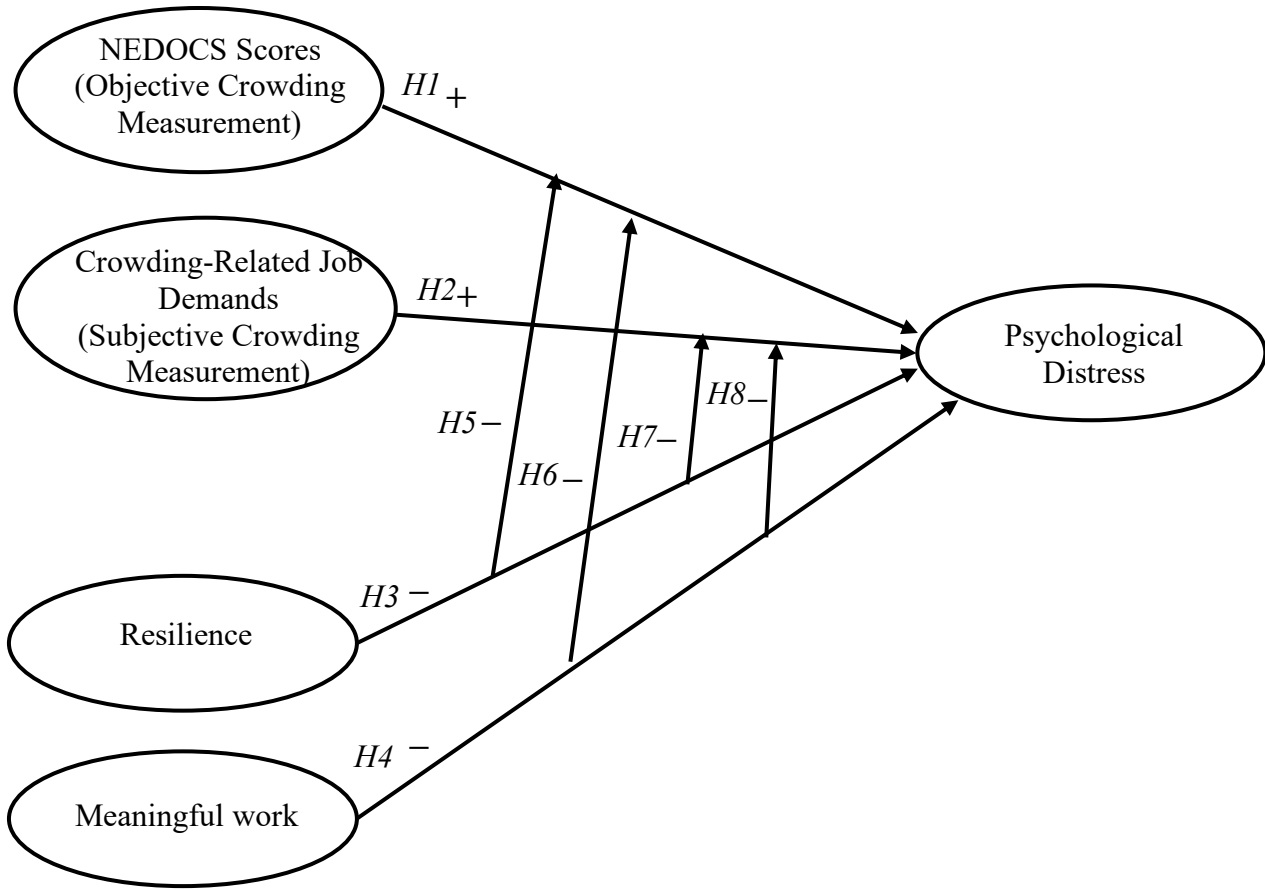


Table 1*Means, standard deviations, and correlations*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
1. Psychological Resilience	3.528	0.362	0.82			
2. Psychological distress	2.246	1.899	-0.373*** [-0.491, -0.241]	0.74		
3. Meaningful work experience	0.000	0.843	-0.065 [-0.208, 0.081]	-0.134 [-0.274, 0.011]	0.90	
4. Crowding-related job demands	1.262	1.009	0.076 [-0.069, 0.219]	-0.045 [-0.189, 0.100]	-0.106 [-0.248, 0.039]	
5. NEDOCS scores	89.11	28.807	-0.007 [-0.152, 0.138]	-0.075 [-0.218, 0.071]	-0.183 [-0.319, 0.039]	0.089 [-0.057, 0.231]

Note: *M* and *SD* are used to represent mean and standard deviation, respectively. Cronbach alpha reliability scores are presented on the diagonal. Values in square brackets indicate the 95% confidence interval for each correlation. * indicates $p < 0.05$ ** indicates $p < 0.01$ *** indicates $p < 0.001$

Table 2*Multiple Linear Regressions Table*

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	12.168	2.358	5.159
Psychological resilience	-2.070	0.365	-5.663***
Meaningful work experiences	-0.385	0.158	-2.436*
NEDOCS	-0.011	0.005	-1.932
Crowding-related job demands	-0.074	0.134	-0.551

Multiple R-squared: 0.1842

$F(6, 176) = 6.622^{***}$

Note. *b* represents to the unstandardized beta scores, *SE* represents the standard error, *t* represents the *t* statistic. ** indicates $p < 0.01$ *** indicate $p < 0.001$

Table 3*Moderated Regression Table for Hypothesis 5*

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	18.221	5.194	3.508***
Psychological resilience	-3.674	1.302	-2.821**
NEDOCS	-0.007	0.005	-1.568
Psychological resilience X NEDOCS	0.018	0.013	1.309

Multiple R-squared: 0.164

 $F(5, 177) = 6.943***$

Note. *b* represents to the unstandardized beta scores, *SE* represents the standard error, *t* represents the *t* statistic. ** indicates $p < 0.01$ *** indicate $p < 0.001$

Table 4*Moderated Regression Table for Hypothesis 6*

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	2.915	1.789	1.630
Meaningful work experiences	-0.043	0.279	-0.154
NEDOCS	-0.006	0.006	-0.971
Meaningful work experiences X NEDOCS	-0.005	0.004	0.172

Multiple R-squared: 0.044

 $F(5, 177) = 1.617, p > 0.05 (p = 0.158)$

Note. *b* represents to the unstandardized beta scores, *SE* represents the standard error, *t* represents the *t* statistic. ** indicates $p < 0.01$ *** indicate $p < 0.001$

Table 5*Moderated Regression Table for Hypothesis 7*

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	11.250	2.810	4.004***
Psychological resilience	-2.358	0.689	-3.423***
Crowding-related job demands	-1.070	1.517	-0.705
Psychological resilience X Crowding-related job demands	0.295	0.432	0.682

Multiple R-squared: 0.145

 $F(5, 177) = 5.992^{***}$

Note. *b* represents to the unstandardized beta scores, *SE* represents the standard error, *t* represents the *t* statistic. ** indicates $p < 0.01$ *** indicate $p < 0.001$

Table 6*Moderated Regression Table for Hypothesis 8*

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	1.605	1.320	1.215
Meaningful work experiences	-0.081	0.292	-0.279
Crowding-related job demands	-0.092	0.146	-0.632
Meaningful work experiences X Crowding-related job demands	-0.205	0.190	-1.078

Multiple R-squared: 1.259

 $F(5, 177) = 1.259, p > 0.05 (p = 0.284)$

Note. *b* represents to the unstandardized beta scores, *SE* represents the standard error, *t* represents the *t* statistic. ** indicates $p < 0.01$ *** indicate $p < 0.001$