

The Experience of Burnout among Primary Care Physicians

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1. INTRODUCTION

Examinations of the current state of the physician workforce, in the United States and globally, indicate a declining overall well-being among healthcare providers (Wallace, Lemaire, & Ghali, 2009), specifically, increasing burnout (Shanafelt et al., 2010; Shanafelt et al., 2009; Shanafelt et al., 2012; Shanafelt, Sloan, & Habermann, 2003), which is seen as a threat to achieving the triple aim (Berwick, Nolan, & Whittington, 2008). Consequences of this phenomenon include increasing rates of early retirements or exits from the professions (Williams et al., 2010), difficulties improving the patient experience (Linzer et al., 2005; Linzer et al., 2009a), and low levels of provider engagement with clinic-level and system-level initiatives (Scheurer, McKean, Miller, & Wetterneck, 2009). One aspect of physician well-being that has been examined in detail is burnout. Burnout appears epidemic for health care workers in general, and physicians specifically (Leiter, Frank, & Matheson, 2009; Maslach, 2003; Maslach, Schaufeli, & Leiter, 2001). Increasing job demands that result from increased change and innovation occurring within primary care practices are affecting physicians' relationship with their work, resulting in increasing levels of burnout (Maslach & Jackson, 1981; Maslach et al., 2001; Shanafelt et al., 2003). For physicians, burnout correlates with depression (Wrzosek, 2009), diminished engagement (Scheurer et al., 2009) and employee satisfaction (Scheurer et al., 2009), increases in rates of suicide (van der Heijden, Dillingh, Bakker, & Prins, 2008) and medical errors (Brazeau, Schroeder, Rovi, & Boyd, 2010; Shanafelt et al., 2010; West, Dyrbye, Sloan, & Shanafelt, 2009a;

Zantinge, Verhaak, de Bakker, van der Meer, & Bensing, 2009), reductions in patient satisfaction (Haas et al., 2000), high turnover (Pathman et al., 2002) and premature retirements (Pathman et al., 2002).

Burnout is defined as the state of emotional exhaustion, depersonalization or cynicism and reduced self-efficacy (Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach et al., 2001). Unlike other industries, where dissatisfied workers can often obtain relief by changing jobs, or employers; health care workplace conditions are often similar throughout the industry, and medical practices, in particular, are often hard to leave due to the costs and time associated with re-credentialing and re-licensure; the emotional and financial capital tied up in physician relationships with their patients; and the large investment of education and training physicians have made in preparation for their career choice. Prevalence of burnout among primary care professionals is estimated to range from 30% - 70% of all providers, indicating a significant issue in the work lives of physicians (Shanafelt et al., 2003).

1.1 Specific Aims

I was fortunate to observe a natural experiment that occurred in the primary care practice of a large Integrated Delivery System, and to have an opportunity to participate in that work, an evaluation of an organizational change, by collecting a variety of survey research data before, during and after the implementation of the organizational change. This experience afforded me the opportunity to address three important questions, which

arose from a review of the literature and from my experiences as a manager in health care insurance and in an integrated health care delivery system, regarding the experience of burnout among primary care physicians. First, can organizational interventions or changes reduce the experience of burnout for physicians? Second, are the determinants of burnout, indicated in other contexts, applicable to explain burnout among physicians? Lastly, what functional form do the components of burnout take over time? To answer these questions, this dissertation has three specific aims.

(1) Explore the relationship between an organizational change, Team Care, and Physician burnout, in a primary care clinic setting.

Interventions to reduce burnout have typically focused on individuals by deploying self-care or coping skills training although the theoretical literature suggests organizational interventions are essential (Maslach, 2003; Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001; Shanafelt, 2009). Initial emphasis of burnout research was primarily on the individual, rather than the individual as part of a work group; thus many of the early intervention strategies focused on stress reduction and personal improvement techniques. Recently, an improved understanding of burnout and its causes emerged, which emphasized the importance of organizational intervention strategies (Maslach et al., 2001). These findings suggest an increased power potential of combining individual and organizational practices for intervention (Awa, Plaumann, & Walter, 2010; Maslach & Leiter, 2008). For healthcare organizations this manifests as work process and/or practice model change. Such organizational interventions are novel treatments for burnout, although not widely studied empirically due to the challenge of

gaining access, acceptance, and funding for large-scale organizational process changes that target burnout reduction in the workplace. This study is a unique opportunity, in that the participating organization committed to and funded the intervention, and measures of burnout and the workplace were included as part of the evaluation framework, allowing for the assessment to include its impact on the experience of burnout.

(2) Test and extend an etiological model of burnout in a professional, clinic practice setting.

To date, most of the literature has focused on identifying burnout, cataloguing its causes and effects and creating a case for attending to its impact. Researchers are beginning to understand the antecedents of burnout, and to investigate the early warning signs of impending burnout. A causal model for burnout, the Areas of Worklife Scale (AWS) (Leiter & Maslach, 2004) has been developed and tested in an administrative employee setting which differs greatly from the context of professional clinical practice within a primary care clinic. Further, many reported estimates of burnout among physicians (Rafferty, Lemkau, Purdy, & Rudisill, 1986; Shanafelt, 2009; Shanafelt et al., 2010; Shanafelt et al., 2009; Shanafelt et al., 2003; West et al., 2009a) were conducted while in training programs, as residents and fellows; these lack measurement of burnout in more general practice settings, and among practicing physicians beyond graduate medical education. The setting and context of practice in primary care is substantively different from that encountered by physicians during training, including the practice environment, demands, availability of mentors and work processes. In order to determine

the applicability of this model in measuring burnout, its antecedents, and developing interventions, the model must be first tested in this setting.

(3) Measure and model the trajectory of burnout components among physicians

Much of the empirical study of burnout to date has been based on a fixed view of the phenomenon at a given point in time (Dunford, Shipp, Boss, Angermeier, & Boss, 2012). Much of the underlying theory of burnout suggests it is a dynamic phenomenon that evolves over time, diffuses through the three key dimensions and is a result of changes in the underlying work environment (Golembiewski, Munzenrider, & Stevenson, 1986; Maslach & Jackson, 1981). Several authors have questioned the value of fixed views of burnout and have called for more research regarding the changes in burnout over time (Lee & Ashforth, 1993, 1996). This study affords the opportunity to both examine the changes in burnout over time (across all three dimensions), but also the changes in the underlying antecedents of burnout, namely the Areas of Work life dimensions, as well. New empirical methods for evaluating changes over time, specifically modeling the trajectory of burnout and AWS dimensions will be employed (Bliese & Ployhart, 2002).

The literature is limited in terms of empirical exploration of these three issues, particularly among practicing physicians in community settings, versus the number of studies conducted in the academic or graduate medical education settings. As Aiken and colleagues (Aiken et al., 2011b) discuss, in health services research, the context is a dominant feature to consider in the applicability of findings, and researchers should not assume the transferability of findings across contexts, but should appreciate the

differences these settings may offer and their subsequent effects on the phenomenon which is observed. This dissertation attempts to contribute to the literature in the community practice setting, which represents the vast majority of primary care practices in the United States today. One important caveat is the study context, a single large integrated delivery system in the Upper Midwest United States, which has many unique aspects that are not generally found in all primary care settings, and may limit the generalizability to these findings.

1.2 Outline of the Dissertation

This dissertation was conducted using data collected to evaluate an organizational work process change for physicians within the primary care practice of a large Integrated Delivery System, and is advantaged by the commitment of the organization's leaders to the resources required to implement such a change, and their requirement to measure and evaluate the results. Further, they identified the need for a broader understanding of the etiology of burnout in order to combat it and its effects, as well as an interest in the underlying trajectory of burnout over time.

The balance of this dissertation is organized in the following manner. Chapter 2 contains a literature review from the organizational, health services research, specialty medicine, and applied psychology literatures regarding burnout, its etiology, prevalence among physicians, consequences, and results of interventions and organizational changes. Drawing from the literature, hypotheses, and conceptual models are offered and

explained in Chapter 3, followed by a detailed discussion of Study Methods in Chapter 4. Chapter 5 includes the results of the empirical tests of the Hypotheses, and Chapter 6 provides a discussion of the results and findings, and synthesizes the contributions from this study.

2. LITERATURE REVIEW

The literature review is organized to progress through the literature that best corresponds to each of the three specific aims, in sequence, as presented in Chapter 1. First, burnout is defined and the key theories of burnout are discussed. Burnout among physicians is then addressed, along with a discussion of the documented consequences for both physicians themselves, and for health care organizations, including patients. The measurement of burnout, and competing instruments is next presented. Determinants of burnout and an etiological model of burnout based on workplace factors is then reviewed, concluding with a discussion of an instrument designed as a model for burnout. This discussion provides the basis for testing a model for physician burnout indicated in specific aim #1. Interventions, both self-care and organizational, are discussed and findings reported to serve as comparisons for this study's evaluation, given in specific aim #2. And finally, the sparse literature regarding burnout trajectory, or change over time, is summarized, as a guide for the modeling of burnout trajectory in specific aim #3.

2.1 Burnout

Burnout is a specific stress reaction resulting from the relationship between an individual and their work, a response specific to one's relationship with their work, and is comprised of three components, Emotional Exhaustion, Depersonalization and Self-Efficacy. Emotional Exhaustion is described as the state of depletion resulting from the conduct of one's work. Depersonalization, often referred to as cynicism is the

withdrawal of oneself from personal interactions, or dehumanizing of those involved in one's work; especially concerning for health care professions at large and physicians specifically. Reduced Self-Efficacy assessments refer to feelings of minimal personal accomplishments or general feelings of futility with respect to one's work (Maslach, Jackson, & Leiter, 1996; Maslach & Leiter, 1997; Maslach et al., 2001) These dimensions occur in a temporal sequence and build in duration and severity (Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001), and can be explained using Conservation of Resources theory (COR) (Hobfoll, 1989; Hobfoll & Freedy, 1993). COR states that individuals seek to acquire and maintain resources, and stress occurs when those resources are threatened or depleted. COR theory predicts that stress occurs in three such situations, when resources are lost or depleted; when they are not sufficient to meet demands from the workplace; and when invested, they do not produce the intended result. Work both places demands on one's resources (e.g. energy) and provides resources (e.g. social support and accomplishments) to an individual to assist in completing the work. The nature of one's work, specifically its demands and impact on one's resources (e.g. energetic resources, self-efficacy and self-esteem etc.), produces the specific work related stress reaction known as burnout (Maslach & Leiter, 1997; Maslach et al., 2001). In order to understand the determinants of burnout, the nature of the workplace must be inspected to determine the aspects of work that deplete or threaten an individual's resource. The fundamental relationship between an individual and the workplace can be assessed in terms of degrees of "fit". This is a central point of theoretical integration. Fit, as in

person-environment or person-job fit (Saks & Ashforth, 1997), is the mechanism that underlies the demands and resources relationship between an individual and their work. In cases when fit is high, the demands of the workplace are balanced against the resources an individual brings to the workplace (e.g. energy and expectations) and the demands of the work (e.g. amount of workload required), and there is a positive COR outcome (e.g. resources are conserved). When fit is low, demands deplete resources, or resources from the work environment are insufficient to subsidize an individual's resources against the demands of the workplace. Demands have a more direct impact on the Emotional Exhaustion dimension, which further mediates their relationship with the Depersonalization and Self-Efficacy dimensions. Resources from the workplace, or lack thereof, impact the latter two dimensions of burnout, but show little effect on emotional exhaustion (Lee & Ashforth, 1996).

2.2 Burnout among physicians

Burnout is estimated to impact 30%-70% of all primary care providers, a significant issue in the work lives of these physicians (Shanafelt et al., 2003). The consequences of physician burnout are well documented, relatively easy to identify and can have profound impact on a number of areas, both personal and professional. Nevertheless, determining the appropriate actions for prevention, intervention and management of the consequences of burnout is significantly more difficult.

2.2.1 Personal/Career

Burnout is particularly bad for personal health and well-being. Evidence suggests that it can lead to poor employee physical health (Liljegren & Ekberg, 2009) and, for physicians specifically, to adverse outcomes such as increased anxiety, depression, suicide (Allo, 2009; Balch & Shanafelt, 2010; Center et al., 2003; Frank & Biola, 2000; Schernhammer, 2005) and substance abuse (Jenkins, 2009; Saadat, Lin, & Kain, 2010), resulting in an “impaired physician.” The medical profession has been active in creating personal interventions for the “impaired physician,” specifically those suffering from substance abuse and mental illnesses, (Ullwelling & Christensen, 2001) but has been far less involved in burnout intervention or prevention. Professionally, physicians fear license or privilege restrictions if they report a problem or ask for help; (Wallace et al., 2009) as a group, the culture of silence or issue avoidance is strong. The personal fear of asking for assistance or the collegial fear of confronting associates about distress is multiplied by the professional fear of potential license restrictions or limitations placed on the ability to practice medicine. Physician family life is also affected. The earliest descriptions of burnout identified the distancing of individuals from their families as an early and significant sign of burnout (Freudenberger, 1974). Recent work has confirmed that the long work hours, stressful case loads and complex emotional and intellectual problems compound family dysfunction and increase friction in marriage and family life (Doherty & Burge, 1989; Myers, 2001; Shanafelt et al., 2003). The skills necessary to

foster and nourish healthier relationships, family and professional, are not part of the medical education curriculum nor are they easily learned in a busy career (Myers, 2001).

2.3 Consequences for Health Care Organizations

Healthcare organizations experience profound consequences from workforce burnout. The most developed literature regarding the consequences of burnout for health care organizations is with respect to nurses, and the impacts on turnover and job satisfaction, as well as patient satisfaction, and of late, quality (Aiken et al., 2011a; Cimiotti, Aiken, Sloane, & Wu, 2012; Vahey, Aiken, Sloane, Clarke, & Vargas, 2004). These studies and others relate work place factors to the experience of burnout for nurses, and then ultimately to work place outcomes (e.g. turnover) and outcomes (e.g. patient satisfaction, and patient-specific clinical outcomes) (Aiken et al., 2011b). As traditionally employees of health care organizations, the link between nurse burnout and organizational outcomes has been easier to ascertain, albeit mostly in the inpatient setting.

Specific to physicians, these impacts include decreased physician satisfaction, increased malpractice risk and increased turnover rates, essential issues for health care organizations, whether physicians are employed or have a traditional privileges-based relationship with the organization. In the employed-physician model, employers pay a large proportion of health care costs for most employees and one of the several main strategies for many employee health improvement initiatives includes reducing

workplace stress. Such employee health programs may have value in reducing burnout (Chapman, 2005; Linnan, 2010). Burnout places a heavy burden on healthcare systems as they attempt to maintain an adequate and healthy workforce to meet the increasingly complex demands of patient care.

2.3.1 Adding to the Primary Care Workforce Burden

Burnout and stress are often cited as primary reasons why physicians choose to exit the profession, change specialties or change careers, exacerbating an already acute issue of primary care physician shortages in the United States (Blanchard et al., 2010). A *Physicians Foundation* report from 2009 found that 49% of physicians are so dissatisfied that they are considering cutting back on their patient care responsibilities or in some cases retiring prematurely (Ulwelling & Christensen, 2001). The implication of this potential workforce reduction is not inconsequential. Even decreasing work hours puts an added burden on delivery systems, essentially equating to a further shortage of physicians. A recent report in the *Journal of the American Medical Association* suggests that decreasing physician hours worked per week by 4 hours is the equivalent of losing approximately 36,000 physicians over the course of a decade (Staiger, Auerbach, & Buerhaus, 2010). The full cost of recruiting, hiring and establishing a full practice for new physicians may exceed \$300,000 (Van, 2008; Wallace et al., 2009).

2.3.2 Quality and Patient Experience

A growing body of research has begun to associate physician stress and burnout with multiple adverse consequences for patients— including decreased access (as a

function of physician turnover, retirement and decreased hours worked), diminished patient experience, suboptimal outcomes and increased errors in care. The MEMO (Minimizing Error, Maximizing Outcomes) Study (Linzer et al., 2005) has offered conflicting evidence about the direct impact of burnout on care quality in primary care. Linzer and colleagues found an inconsistent association between care quality and physician burnout implying that physicians may act as a “buffer between adverse work conditions and patient care” (Linzer et al., 2009b).

In contrast, however, in the surgical specialty, both physicians and patients believe that burnout in physicians does contribute to increased errors (Blendon et al., 2002) and this association between surgeon burnout and major medical errors has been demonstrated (Shanafelt et al., 2010). In addition, several studies note a decrease in care quality and an increase in unethical actions by residents in training when the prevalence and severity of burnout increases (Blanchard et al., 2010). These data are confusing and more work needs to be done in this area to understand the clinical implications of provider burnout on patients. Studies from the surgical literature have demonstrated a connection between burnout/stress and surgical errors. Malpractice insurers have taken that even further and noted a direct correlation between surgeon stress and medical malpractice claims, adding business expenses for those organizations that self-insure against a major portion of malpractice litigation. Any strategy to reduce errors must focus on both error prevention and practitioner health (Campbell, 2010).

2.3.3 Productivity

Staiger, et al. in a 2010 study in JAMA reported that between 1998 and 2008, the average hours per week worked by a physician declined from 55 to 51 hours (Staiger et al., 2010). This represents an equivalent of losing 36,000 doctors over the course of a decade. At an average recruitment cost of \$300,000 or more per physician (Dunn, Arnetz, Christensen, & Homer, 2007; Jones, 2009; Van, 2008) any efforts to improve the wellness and work life, and therefore the retention of physicians, has the potential to reduce organizational expense. An additional, poorly quantifiable cost to those organizations is lost revenue from having insufficient physicians to meet the access demand of patients. A report from Europe estimated that in 2002, work-related stress disorders caused 20 billion Euros in organizational expenses (Awa et al., 2010). Addressing these stress disorders with workplace wellness programs has resulted in increased presenteeism, decreased absenteeism and improved job satisfaction (Linnan, 2010).

2.3.4 Contagion to Colleagues and Workgroup

Uncharacteristic behaviors that occur when workers struggle with burnout include short temper, snapping at co-workers and social withdrawal. These behaviors can become contagious within work groups, thereby contributing to even more burnout for self and partners (Maslach & Leiter, 1997; Maslach et al., 2001). As these behavior patterns become more widespread, physicians become more isolated from colleagues and more distanced from collegial support. In turn, an impaired or burned out physician is less

available to provide collegial support to others. Finally, in a vicious cycle, there is a relative workload increase for the remaining partners, contributing to increased stress on everyone (Freeborn, 1998).

2.4 Measurement of burnout

Following Maslach & Leiter's (Leiter et al., 2009; Leiter & Maslach, 2004; Maslach, 2003; Maslach & Jackson, 1981; Maslach & Leiter, 2008; Maslach et al., 2001) empirical work on burnout, the Maslach Burnout Inventory (MBI) (Maslach & Jackson, 1981) was developed to assess the prevalence and severity of burnout. Prevalence of burnout can be calculated using the West et al (2009) suggested method, which utilizes two questions from the MBI instrument (questions 8 and 10), and is expressed as a percentage of the sample. West and colleagues (2009) assessed the validity of a shorter instrument to conduct a simple, "rapid" diagnostic of burnout among physicians. The simplified approach asks two questions regarding the frequency of feelings of emotional exhaustion and callousness self-reported by physicians. The self-efficacy dimension is not included in the short assessment (West, Dyrbye, Sloan, & Shanafelt, 2009b). In factor analysis testing this simplified approach reported sufficient correlation and factor loadings as to suggest the use of the two questions as a proxy for overall burnout assessment. This measure is a composite of the two items that capture physician's reporting "Feeling of burnout" at least once a month or more frequently, indicating that they have "Become more callous towards people" at least once a month or more

frequently. These two questions have been shown to provide a valid screening tool to identify burnout (West et al., 2009a). The advantage to conceptualizing burnout as prevalence, dichotomizing into prevalence, is the ability to compare and contribute to the large body of work that exists on physician burnout, most importantly to demonstrate not just another replication of prevalence measurement, but the association of an organizational change in work processes, with a change in the experience of burnout, a key motivation for this study. Although dichotomizing is a data reduction method, that reduces the rich variation detectable in the full MBI components and their scores, demonstrating a change in prevalence associated with the organizational change in specific aim #1, offers a contribution to the physician burnout literature. The full measures of MBI, utilizing their continuous scores on all three components are used in detail for specific aims #2 and #3.

2.5 Interventions to combat burnout

Interventions to reduce burnout have typically focused on individuals by deploying self-care or coping skills training although the literature suggests organizational interventions are essential (Maslach, 2003; Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001; Shanafelt, 2009). The initial emphasis of burnout attenuation research was primarily on the individual, and thus many of the early intervention strategies focused on stress reduction and personal improvement techniques. More recently studies contain an improved understanding of burnout and its causes,

which emphasize the importance of institutional intervention strategies (Maslach et al., 2001). These findings suggest the potential for increased power and effectiveness by combining individual and organizational interventions (Awa et al., 2010; Maslach & Leiter, 2008).

For healthcare organizations these interventions manifest as work process and/or practice model changes. Such organizational interventions are novel treatments for burnout, although not widely studied empirically due to the challenge of gaining access, acceptance, and funding for large-scale organizational process changes targeting burnout reduction in the workplace.

2.5.1 Self-care Interventions

In the literature are qualitative studies that describe efforts employed by individual physicians to address burnout. These studies have ranged from personal testimonials to peer reviewed journal articles. All recount similar themes: attention to work/life balance and self-care behaviors. Meldrum reviewed (Meldrum, 2010) “AMA Exemplary physicians” who presumably had “figured out” the burnout dilemma and identified the five tactics they employed as: (a) establish personal work limits, (b) protect family time, (c) exercise, (d) practice relaxation, and (e) engage in humor (Meldrum, 2010) In a larger study, Weiner queried over 300 primary care physicians on personal wellness practices and came to similar conclusions. He found the following major themes lead to increased personal happiness and psychosocial wellbeing: (a) work/life balance, (b) religion/spirituality, (c) self-care, and (d) relationships (Weiner, Swain,

Wolf, & Gottlieb, 2001). Allo advocates attending to the “Terrible Too’s:” “too much stress, too much work, too much paperwork, too little sleep and too little remuneration” (Allo, 2009). Other self-care regimes include exhortations to avoid cynicism, read more, attend conferences or join support groups (Zeckhausen, 2002). All recognize the need for physicians to be mindful about their own health, both physical and mental. Recent efforts have begun to focus on more structured self-care programs such as resiliency training, (Adams, Camarillo, Lewis, & McNish, 2010), mindfulness and narrative practices (Arnetz, 2005; Krasner et al., 2009; Remen, 2001), approaches to enhance meaning in work (Krasner et al., 2009; Remen, 2001; Shanafelt, 2009), and intentional efforts to introduce concepts of personal well-being into the medical education curriculum at both the medical school and residency levels (Dobkin & Hutchinson, 2010; Dyrbye et al., 2010; Saadat et al., 2010)

2.5.2 Organizational Interventions

Evidence supporting organizational interventions is relatively scarce in the literature compared with the abundance of reports on self-care interventions (Maslach, Leiter, & Jackson, 2011). As noted earlier, organizational interventions to combat burnout require large scale organizational changes to the work environment and or work processes. For this reason, organizations are likely to be reluctant to invest in such changes without strong evidence of their effectiveness in reducing burnout, especially without attending to key outcomes for the organization such as productivity, clinical quality and patient experience. Along with the evolution of healthcare business models,

an emphasis on care system redesign that focuses on efforts to decrease the cost and improve the outcomes of care has become widespread in the United States and other countries. A consequential side effect of redesign may be decreased physician burnout. Efforts to correlate system redesign and financial performance with effects on burnout are sparse in the literature, but they are present and they are significant. One such organizational intervention was reported by Legacy Health System in Portland, Oregon (Dunn et al., 2007). This intervention addressed clinician burnout by raising the importance of physician well-being to an equal footing with financial and quality performance measures. Senior leadership within the clinic drove the initiative by monitoring the outcomes regularly alongside the usual practice scoreboard parameters, such as quality, utilization and patient experience. Over the course of five years, a series of site specific improvement plans (mostly work process changes), resulted in measurable decreases in MBI scores, specifically scores for the emotional exhaustion dimension of burnout, which decreased by circa 30%, and staff turnover as reduced by circa 50% (Dunn et al., 2007).

Reid, et al. of Group Health of Puget Sound reported the effects of a major delivery model change in its implementation of a Medical Home prototype in one of its clinics. This prototype contained a substantial change in the organization of work in the primary care setting, including changes to roles, accountabilities and patient panels. Along with significant improvements in patient experience and cost of care delivery, they found a measurable decrease in clinician burnout scores as compared to control groups

reflecting an improvement in both emotional exhaustion and depersonalization (Reid et al., 2010). Reid and colleagues (2010) reported a \$10.30 per member per month savings (approaching a 1.5:1 ratio of savings to investment) with a major redesign of a single clinic using a medical home model. At the same time, there was a measureable decrease in physician burnout noted and a measureable and sustained improvement in patient experience (Reid et al., 2010). Although sparse in the literature, evidence exists that organizational changes to the nature of the workplace can impact the experience of burnout for physicians and staff, specifically in the practice and delivery of primary care. This directly motivates specific aim one of this dissertation, the evaluation of an organizational change's impact on burnout for primary care physicians; therefore I offer hypothesis one:

H1: An organizational change is associated with reduced experience of burnout for primary care physicians, participating in the change

2.6 Determinants of burnout

To date, most of the literature has focused on identifying burnout, cataloguing its causes and effects and creating a case for why the medical establishment should attend to its impact. Researchers have only just begun to address efforts to understand the antecedents of burnout, intervene in its expression and investigate the early warning signs of impending burnout. In the 2005 MEMO Study, work culture and work conditions were the greatest contributors to physician disaffection and burnout (Linzer et al., 2009b). Prior to the advent of large medical systems, care was delivered primarily as a contract or

relationship between the patient and the physician in a single office setting, allowing a high level of practitioner control over the environment. Newer delivery models place a heavy emphasis on strategic planning, financial imperatives and professional management, resulting in greatly reduced control by physicians. This lack of control (autonomy) is a prime contributor to disengaged, dissatisfied physicians (Cole & Carlin, 2009; Cossman & Street, 2009a). The ensuing burnout not only has an impact on physician satisfaction, but it also may lead to diminished patient satisfaction, increased medical errors, and an increased prevalence of personal and organizational malpractice litigation (Balch & Shanafelt, 2010; Jones et al., 1988). When physicians perceive a disconnect between organizational values, work conditions and underlying fundamentals of patient care, the result is dissatisfaction and an increased propensity to leave the organization or profession altogether (Blanchard et al., 2010).

2.6.1 Workplace Factors

Returning to the theory explaining burnout, Coordination of Resources (COR) (Halbesleben, 2006; Hobfoll, 1989; Hobfoll & Freedy, 1993), and the fundamental definition of burnout, a stress reaction to one's work, and specific to one's work (Maslach & Jackson, 1981; Maslach & Leiter, 1997), it is reasonable to conclude that determinants of burnout should arise from the nature or characteristics of the workplace. In the case of physicians, such workplace factors have been assessed in conjunction with the measurement of burnout and related constructs (job satisfaction, stress etc.) (Linzer et al., 2005; Linzer et al., 2002; Linzer et al., 2000; Linzer et al., 2009a; Williams et al., 2002;

Williams et al., 2010; Williams, Manwell, Konrad, & Linzer, 2007). One limitation of these approaches is that they employ unique measures for both burnout and the workplace. An opportunity exists to utilize generally validated measures for both burnout and the workplace, which have been demonstrated to have causal relationships, to provide insight into the workplace determinants of burnout.

In an attempt to identify the drivers of burnout, areas of work life were proposed to examine the dimensions of an individual's work (Leiter & Maslach, 2004; Maslach & Leiter, 2008). Six key dimensions were recognized that represent the "demands and resource predictors" indicated by Lee & Ashforth (1996; pp.123) of the workplace; they are depicted below in Figure 1. The six aspects of the work life, Control, Workload, Rewards, Values, Community and Fairness, and their contributions to the three dimensions of burnout are as follows, Workload: when job demands exceed the workers capacity and there is insufficient time or resources to recover. Control: the active participation in workplace decisions. Community: the overall quality of social interaction at work, including conflict resolution, mutual support, closeness and the capacity to work as a team. Fairness: the extent to which decisions are perceived as being fair and equitable; the outcome is less important than the equity. Reward: financial, institutional or social rewards place greater value on work. Values: a conflict between the personal values that bring physicians to their work and the expression of organizational values (Maslach & Leiter, 2008).

Insert Figure 1: AWS – MBI Causal Model (Maslach & Leiter, 2004)

Fit of an individual across each of the six domains has its own theoretical explanations (Leiter, Gascón, & Martínez-Jarreta, 2010). Three separate stress theories describe the effect of these dimensions on burnout, specifically the element of emotional exhaustion. First, job demands/resources theory (Bakker & Demerouti, 2007) describes the impact of workload (demands) on an individual's level of emotional exhaustion. Workload demands that are in excess of the resources (time, energy, etc.) that an individual has results in depleted resources, thus causing stress and specifically burnout. The rewards dimension reflects the resources, in terms of monetary, social well-being and self-esteem, provided by, or lacking, as a result of the effort one puts forward in the conduct of their work (Leiter et al., 2010). The workplace offers many opportunities for relationships and social support which are key resources that can be either supported by or threatened by the workplace, thus contributing to overall levels of burnout (Leiter et al., 2010). The demands/control theory (Karasek & Theorell, 1992) of stress describes the role of control and autonomy over one's work in relationship to stress. The dimensions of control represent this most broadly. In addition, the fairness present in one's work place and the resulting justice affords one a sense of control over the environment (Leiter et al., 2010). Lastly, person-environment fit theory (Saks & Ashforth, 1997) is helpful to describe the degree of value congruence between an individual and the organization or

workplace. A situation in which there is a mismatch among values is likely to produce significant stress reactions and thus impact burnout.

Examining the Areas of Worklife dimensions against those employed by several noted authors in the physician work life studies area, notably Linzer and Williams (Linzer et al., 2005; Linzer et al., 2002; Linzer et al., 2000; Linzer et al., 2009b; Williams et al., 2002; Williams et al., 2010; Williams et al., 2007), reveals concordance, although these authors did not propose or test the casual relationships among workplace factors and burnout components, as the focus of these studies were on important outcomes or consequences of burnout, such as medical errors, exit from the profession, and patient quality outcomes. This presents an opportunity to develop and test this theory for burnout in the primary care setting, which motivated specific aim two, determining the applicability of the Areas of Worklife model in measuring burnout for primary care physicians. To specific aim two, I offer and test the following hypothesis:

H2: The hypothesized model of AWS → MBI in Figure 1 fits data for physicians in the clinical practice setting.

2.7 Burnout Trajectory over time

In studies of burnout reported in the literature there is an interesting gap, the relatively small number of studies that examine change in burnout measures within an individual over time (Dunford et al., 2012; Houkes, Winants, Twellaar, & Petra, 2011; Leiter et al., 2012; Schaufeli, Maassen, Bakker, & Sixma, 2011). While most studies report single time period measures of burnout and then focus on the consequences or

effects of burnout, several authors note the relative importance of understanding changes in burnout over time in order to gain insights into potential interventions or solutions to improve the experience of burnout for individuals (Ashforth & Lee, 1997; Dunford et al., 2012; Lee & Ashforth, 1993, 1996). In what little exists in the literature regarding longitudinal studies of burnout (Dunford et al., 2012; Houkes et al., 2011; Leiter et al., 2012; Schaufeli et al., 2011), most examine burnout over a relatively long time period, two, five, ten and twelve years respectively, and identify the changes in burnout components, primarily based on the predictions offered by previous measures of the components. For shorter time periods, over the course of one year, correlations among longitudinal measures of burnout components range from 0.50-0.60 (Schaufeli et al., 2011), and increase to 0.60-0.70 at two years (Houkes et al., 2011). Examining even shorter timeframes, Golembiewski and colleagues (1989) estimated that 48% of individuals remained at constant burnout levels over seven-weeks, further adding to the stability argument (Golembiewski, Deckard, & Rountree, 1989).

From a theoretical perspective, relative stability in burnout over time is supported by the notion that the burnout is a resultant stress reaction that individuals have with respect to their work. The chronic imbalance between resources and demands, suggested by Coordination of Resources (COR) theory is thought to be the culprit (Halbesleben, 2006; Hobfoll, 1989; Hobfoll & Freedy, 1993; Leiter et al., 2009; Leiter et al., 2010; Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008). Relative stability in workplace factors over time, result in the stability of this imbalance, and thus the

resultant stability in burnout over time. Leiter et al. (2012) note that the problem of stability is severe, in that individuals in flux, i.e., improving or declining burnout experience, are not easily detected against the larger appearance of stability among the masses. With a conclusion of stability in burnout for a large group, individuals suffering or thriving are grouped together as stable, when in fact their trajectories are quite different from each other. For this reason, more focus on the analysis of burnout over time has been identified as important by many authors (Leiter et al., 2010; Leiter & Maslach, 2004; Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008; Maslach et al., 2011). This motivates specific aim three, to model the trajectory of burnout components over time. Hypothesis three is offered as:

H3: The trajectory of each burnout dimension (Emotional Exhaustion, Depersonalization and Self-efficacy) takes curvilinear form (increasing or decreasing at variable rates) for individuals over time

2.8 Summary

A review of the literature for burnout generally, and burnout among physicians specifically, identifies three important opportunities for contribution; these directly motivated the specific aims of this dissertation study. First, there is a direct call for more emphasis on organizational factors relating to burnout, and the implementation and testing of organizational interventions and changes designed to combat burnout, or to understand the relationships between such changes or targeted interventions on the experience of burnout (Maslach et al., 2011). Second, little evidence exists for a causal model for burnout as expressed by the Areas of Worklife model (Leiter & Maslach, 2004;

Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008). As previously mentioned, the physician burnout literature has estimated the prevalence of burnout exhaustively, and then focused primarily on the consequences of burnout, or other related constructs such as job satisfaction (Linzer et al., 2005; Linzer et al., 2002; Linzer et al., 2000; Linzer et al., 2009b; Linzer et al., 2009a; Williams et al., 2002; Williams et al., 2010; Williams et al., 2007). Testing of the Areas of Worklife model in the primary care setting among physicians is an important contribution to our understanding of the influence of work place factors on burnout. Lastly, understanding the changes in burnout for individuals over time can help further develop knowledge addressing the controversy of measured stability, against theoretical arguments that burnout is a dynamic and evolving condition for individuals, even over relatively short time periods.

3. RESEARCH METHODS

This study observed a natural experiment that occurred in an employed primary care practice at a large, urban, Integrated Healthcare Delivery System in the Upper Midwest of the United States. As described in the previous section, an organizational change, Team Care, was implemented within the practice, as a significant work process/model change. In addition, the implementation and evaluation team collected additional data concerning workplace factors and the experience of burnout among primary care physicians.

3.1 Study Design and Setting

The foundation for the research design is an observation of a natural experiment in which eight clinics were selected to participate, four clinics receiving the intervention and four serving as matched control clinics. All physicians and staff within the four selected treatment clinics received the organizational process change, Team Care. Clinics were selected by the ambulatory care management team, which attempted to select implementation and comparison clinics that were similar in terms of size, age, organic or acquisition, socio-demographics and urbanization of the clinic and is an effort to represent the full spectrum of clinics represented in the ambulatory care division of the large integrated delivery system located in the Upper Midwest. This represents the common method employed by the health system in similar measurement and evaluation activities. In order to ensure fidelity of the intervention and its implementation, the

project implementation was centrally managed and deployed at the division level using a standard implementation plan and resources; an extensive training program for physicians and staff was conducted prior to implementation by the implementation team. This study was conducted in the ambulatory care division of a large Integrated Delivery System (IDS) in the Upper Midwest United States, during the Spring, Summer and Fall Of 2011. The physicians studied, were all employed primary care physicians, practicing within wholly-owned clinics of the IDS.

3.1.1 The Team Care Organizational Change

Team Care, the study intervention, is a work process and organization change implemented with the clinical teams within primary care clinics. From the preliminary assessment of burnout and its antecedents, two primary dimensions of work were suggested to be significant drivers of clinician burnout, workload and control. This motivated the evaluation of the Team Care intervention to reduce burnout by improving that workload and control dimensions of work for clinicians. Among the clinical personnel in the primary care clinics, the current work and processes are organized around a dyad of providers (physicians, advanced practices nurses, or mental health providers) and certified medical assistants (CMAs). These dyads are responsible for delivering the office visit, including rooming the patient, obtaining vital signs, documenting the presenting complaints, ordering and performing diagnostic tests, conducting the examination, managing medications and finally, documenting the patient visit within the electronic medical record to meet the standards of Acceptable Use. In

addition, this dyad must follow-up with patients after visits and field and triage inbound calls during the day.

The Team Care intervention model changes the dyad to a work team consisting of two providers and three CMAs, who jointly manage the panel of patients, including all appointments, coordinating other clinical activities such as triage, pharmaceutical refill requests, and other care coordination activities. This additional CMA resource is, in its simplest form, a 50% increase in resources; more expansively, however, it introduces a team to take responsibility for the diagnosis, treatment, and care of a designated group of patients. This intervention is designed to first, reduce the workload demands on each member of the team as a result of adding resources, and second, to increase control of providers by pairing them with three assigned CMAs.

3.2 Data

The measurement strategy for this project consisted of a three wave data collection effort that surveyed physicians to assess their level of perceived burnout and its reported antecedents. Baseline measures were assessed two weeks prior to the initiation of the intervention. Physicians and staff in both treatment and control clinics were invited, via email, to complete an electronically-delivered online survey containing the full MBI and AWS battery, and important covariates. The survey was repeated twice more, the second one twelve weeks after implementation, and final one at six months following completion of the intervention. Figure 2 below describes the design.

Insert Figure 2: Overall Research Design

3.2.1 Considerations on unit of analysis and level for measurement

The unit of analysis for this study is the individual physician, over time, nested within a clinic in which he or she practices. Given the individual unit of analysis, a choice is required in terms of the level at which measures of the workplace, AWS, are determined. This choice of level is actually a distinction between interpreting AWS as the subjective experience of an individual regarding his or her perception of their workplace, or alternatively, specifying the AWS dimensions as actual properties of the workplace. Considering burnout, as described by Maslach (1981) and the widely accepted conceptualization, as a specific, personal and intimate stress reaction of an individual resulting from their perceptions of their workplace (Maslach, 2003; Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001), I have chosen to remain consistent and consider AWS as the same individual's perception of their workplace. The primary value of this approach is the consistency with the conceptualization of the dependent variable, burnout. Following COR theory, individuals make specific calculations regarding their resources and demand in the workplace (Halbesleben, 2006; Hobfoll, 1989; Hobfoll & Freedy, 1993). This calculation is highly individualized and subjective. Further, Leiter & Maslach (2004) discuss AWS as an individual's perception of the workplace; use in this study is intended to be consistent

with previous literature (Leiter & Maslach, 2004; Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008).

Considering AWS as a property of the work setting reduces the individual-level variation in these measures and is inconsistent with COR, from the perspective of the individual's internal calculation. This calculation is highly subjective, so an assessment of the workplace, including resources, demands and outcomes, that is highly subjective is consistent and is a logical choice for this application. AWS as a property of the workplace is a reasonable choice, and is often used to assess the climate of a workplace, essentially the mean value of all group members perceptions, and is suggested by several organizational research methodologists (Klein, Conn, Smith, & Sorra, 2001; Van Mierlo, Vermunt, & Rutte, 2009). In cases where the specification of theory indicates a role of overall climate or properties of the work setting, this approach is superior to the subjective assessment by each individual, and often more realistic. Based on the currently accepted conceptualization of burnout, and consideration of the COR theoretical framework, it is my conclusion that both AWS and MBI be considered an individual's subjective assessment, rather than properties of the workplace.

3.2.2 Key Study Variables

Following Maslach & Leiter's (Leiter et al., 2009; Leiter & Maslach, 2004; Maslach, 2003; Maslach & Jackson, 1981; Maslach & Leiter, 2008; Maslach et al., 2001) empirical work on burnout, the Maslach burnout Inventory (MBI-GS) (Maslach & Jackson, 1981) was used to assess the prevalence and severity of burnout. Burnout is

comprised of three components, Emotional Exhaustion, Depersonalization and Self-Efficacy. These dimensions occur in a temporal sequence and build in duration and severity. In an effort to better understand the dimensions of an individual's work, and thus to determine the presence of mismatches, and ultimately the degree of burnout, the Areas of Worklife Scale (AWS) (Leiter & Maslach, 2004) measure has been developed. The AWS assesses six aspects of worklife (Control, Workload, Rewards, Values, Community and Fairness) and their individual contributions to burnout and the Areas of Worklife Scale (AWS) (Leiter et al., 2009; Leiter & Maslach, 2004; Maslach & Leiter, 2008). By measuring these six dimensions of work (AWS) along with assessing an individual's burnout (MBI), we can begin to understand the determinants of burnout. The advantage of using the full MBI versus a simple screen is the ability to assess both the acuity of burnout and identify the specific dimensions associated with it. A summary of constructs and Key Study Variables is given in Table 1, below.

Table 1: Constructs and Key Study Variables

3.3 Empirical Models

Data collected for this study contain several properties that require special attention in analysis and testing of the empirical models, namely because of both the hierarchical and longitudinal nature of the data. The unit of analysis is the physician practicing in a clinic that was selected as either a Team Care clinic, receiving the organizational change, or a control clinic. The physician is then nested within two hierarchies, the clinic and the treatment or control group. Additionally the data were collected over three measurement waves with approximately ninety days between first and last dates of survey completion. Such repeated measures of an individual over time are not independent and identically distributed (i.i.d) due to the correlation of errors within an individual over time, and thus violate a critical assumption of General Linear Modeling (Greene, 2007). Both of these data nuances, hierarchical or nested units, and repeated measures require specific analytical treatment, specifically, random effects for physicians nested in clinics over time.

3.3.1 Hypothesis #1

Team Care is associated with a reduction in the experience of burnout for primary care physicians

The dependent variable, prevalence of burnout, is a dichotomous variable indicating whether the individual, at time t, is an incident case of burnout following the West et al (2009) method for determining prevalence from the MBI. This analysis was

conducted using Stata 12 implementing panel-data logistic regression with three estimation options, random-effects, fixed effects and population averaged. Prior to performing the analysis, I tested for fixed or random effects for the individual respondent by using the Hausman test (Greene, 2007), which tests whether or not the errors, u_{it} , are correlated with the regressors. The test null hypothesis is that these errors are not correlated. If the resulting probability of $\chi^2 < 0.05$, then fixed effects are required, otherwise a random effect for the individual is present. Assuming a random effect for repeated measures of an individual over time is determined, the empirical model used to test this hypothesis will be as follows:

$$\Pr(Y=1|X_{it}) = TC_{it} + \text{Time} + TC_{it} * \text{Time} + v_i + \epsilon_{it} > 0$$

ϵ_{it} is i.i.d. logistic distributed with mean zero and variance $\sigma^2_{\epsilon} = \pi^2/3$, independent of v_i

Where:

Y_{it} = Prevalence of an individual (i) at time (t)

X_{it} = The matrix of explanatory variables

TC_{it} = Dummy coded variable indicating assignment to eam Care or Comparison for individual (i) at time (t),

Time = Dummy Coded variable indicating Time (t) where t = (0,1,2) for Baseline, 12 week and 6 months respectively

v_i = random, individual specific effect and accounts for the repeated measures of an individual over time

ϵ_{it} = individual (i) error term at each time (t)

3.3.2 Hypothesis #2

The hypothesized model of AWS \rightarrow MBI, fits data in the professional clinical practice setting and thus is a valid model for burnout in this context.

The Maslach and Leiter (2004) model was developed with a sample of administrative employees, and thus must be tested in order to determine the

generalizability and applicability to the professional primary care practice context. The model depicted in Figure 1, was tested using Structural Equation Modeling (SEM) following the procedures employed by Maslach & Leiter (2004), using Stata 12. While there are several estimation methods available to test this model, I chose SEM in order to compare model fit statistics in the literature with those obtained in this study (e.g. Maslach & Leiter, 2004), and to evaluate the fit of the model vis a vis the primary care practice context, thus considering the applicability of AWS for use as a casual discussion in this setting.

The hypothesized model, adapted from Maslach & Leiter (2004) is depicted in Figure 1, and will be used to test Hypothesis 1. SEM provides several estimation methods. Based on previous literature (e.g. Maslach & Letier (2004)), I used the standard Maximum Likelihood method. In this method, SEM requires a normality assumption, a considerable limitation that is noted by several authors (Edwards & Lambert, 2007; Preacher, Rucker, & Hayes, 2007). To correct for this limitation, I bootstrapped the standard errors following the Preacher et al (2007) procedure using the Stata 12 SEM Module.

The empirical model to test this hypothesis is as follows:

X_1 = Control , and is Exogenous to the system
 X_2 = Workload , X_3 = Rewards , X_4 = Community , X_5 = Fairness , X_6 = Values , X_7 = Emotional Exhaustion , X_8 = Cynicism , X_9 = Self-Efficacy
 $(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, \varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4, \varepsilon_5, \varepsilon_6, \varepsilon_7, \varepsilon_8, \varepsilon_9) \sim$ i.i.d with mean μ and variance Σ

The equations used to fit the model are as follows:

$$X_2 = \alpha_1 + X_1\beta_1 + \varepsilon_1$$

$$\begin{aligned}
X_3 &= \alpha_2 + X_1\beta_2 + \varepsilon_2 \\
X_4 &= \alpha_3 + X_1\beta_3 + \varepsilon_3 \\
X_5 &= \alpha_4 + X_1\beta_4 + \varepsilon_4 \\
X_6 &= \alpha_5 + X_1\beta_5 + X_3\beta_6 + X_4\beta_7 + X_5\beta_8 + \varepsilon_5 \\
X_7 &= \alpha_6 + X_2\beta_9 + X_6\beta_{10} + \varepsilon_6 \\
X_8 &= \alpha_7 + X_7\beta_{11} + X_6\beta_{12} + \varepsilon_7 \\
X_9 &= \alpha_8 + X_8\beta_{13} + X_6\beta_{14} + \varepsilon_8
\end{aligned}$$

Model fit was determined by inspecting a variety of fit measures recommended in the literature, borrowing heavily from the recommendations of McDonald & Ho (Kline, 1998; McDonald & Ho, 2002). These fit statistics are depicted in Table 2 below. In addition to fit measures, SEM allows the estimating of three effects, direct effects of an independent variable on a dependent variable, indirect effects and total effects (Kline, 1998; McDonald & Ho, 2002). Tables for these three effect components will be reported as results for specific aim 1b, allowing the assessment of the effect size for each AWS dimension on each of the burnout dimensions.

Table 2: SEM Fit Statistics

3.3.3 Hypothesis #3

The trajectory of each burnout dimension (Emotional Exhaustion, Depersonalization and Self-efficacy) takes curvilinear form (increasing or decreasing at variable rates) for individuals over time.

To assess the trajectory of each burnout dimension for each individual, I used the method detailed by Bliese and Polyhart (2002). This method has been used recently to

assess trajectories for employees at a large hospital system (Dunford et al., 2012), which was the first such assessment of trajectories with greater than two data points. This study will allow me to add to this literature by extending the examination of trajectories to (1) the primary care setting, and (2) the impact of individual (level-2) changes in burnout antecedents, namely AWS measures.

Following Bliese and Polyhart (2002), the method used to estimate trajectories includes estimating models for two levels, level -1 which estimates the overall or grand mean model, and level -2 which incorporates covariates for each individual to predict an individual's slope and intercept variability. The steps are as follows, as taken from Bliese and Polyhart (2002) Table 8, pp. 380.

Level -1 Model

1. Estimate the Interclass Correlation Coefficient, which partitions the total variance into the portion resulting from between-individual differences.
2. Model "fixed functions" for time, testing the significance of parameters in a linear and curvilinear specification of the model.
3. Determine the variation in the parameters using the likelihood ratios for each of the two model specifications.
4. Select the best fitting error structure for the model selected in step 3 based on the best fitting likelihood ratio for the model with four different error specifications.

Level-2 Model

1. Add the individual-level covariate, (Team Care) and evaluate the effects based on significance tests for each covariate.

Equations for estimation are as follows, and represent the linear specification of the trajectory model, assuming that the data from the study is arranged in long format, where each row of data represents an individual's values at a specific point in time:

$$Y_{ij} = \pi_{0j} + \pi_{1j}(Time_{ij}) + r_{ij}$$

$$\pi_{0j} = \beta_{00} + \mu_{0j}$$

$$\pi_{1j} = \beta_{10} + \mu_{1j}$$

Where

I = time (1,2,3)

j = individual respondent (1,2..j)

Y_{ij} = Emotional Exhaustion, Depersonalization, or Self-efficacy

This model allows for the estimation of the level-1 model for the trajectory of each of the three burnout dimensions. Once the level-1 model is specified, level-2 individual covariates can be added to complete the trajectory model. Considering the model for Emotional Exhaustion, the following equation represents the model to be estimated.

$$Y_{ij} = \pi_{0ij} + \pi_{1ij}(Time_{ij}) + r_{ij}$$

$$\pi_{0j} = \beta_{00} + \beta_{01}(X_{ij}) + \mu_{0j}$$

$$\pi_{1ij} = \beta_{10} + \beta_{11}(X_{ij}) + \mu_{1j}$$

Where

I = time (1,2,3)

j = individual respondent (1,2..j)

Y_{ij} = Emotional Exhaustion

X_{ij} = vector of individual covariate (Team Care)

The final model incorporating level-2 covariates will be evaluated by inspecting the significance level of the parameters included in the model(s). Results will be presented for each of the three burnout dimensions, and the resulting model specification (functional form) will be compared to forms found in the literature (Dunford et al., 2012).

3.4 Limitations of Method & Threats

This research design is not without its limitations. A Randomized Controlled Trial (RCT) would be the optimal research design, but, randomizing physician participants across clinics was not feasible, given the desire of the sponsoring organization to have standardized care delivery processes within each clinic. This lack of randomization is problematic as it provides the potential for selection bias to interfere and thereby impact the results, specifically in the causal determination in specific aim #1, the effect of Team Care on the experience of burnout. Fundamentally this selection bias is likely to be a

result of the lack of randomization in terms of the clinics in which physicians choose to practice and/or be employed. The Team Care protocol selected four clinics to receive the organizational change, and therefore all physicians practicing in the clinic received the organizational change. The unit of analysis is the primary care physicians, but clinics were selected and all physicians within the selected clinics were then assigned to either the implementation or control protocol.

Several potential solutions exist to adjust results and/or limit the bias resulting from a lack of randomization in natural experiments such as the one occurring in this study. Beyond the employment of a RCT, there are several approaches that could be applied to observational or surveillance designs to allow for a casual conclusion, especially for specific aim #1. The first is the use of the instrumental variables approach in which the treatment variable, in this case the indicator of whether a physician received the Team Care organization change or not, is updated in order to adjust for potential selection bias resulting from the lack of randomization. This requires a new variable, termed “Z,” that is uncorrelated with the outcome, burnout, and is deemed to be reasonable to predict the assignment of the physician to either Team Care or Control. In effect, this would operate as a selection model for the physician’s choice of where to practice and be employed. Potential “Z’s” are plentiful, and include such variables as distance from the clinic to the physician’s home, or location of medical school and training, and have been used in other studies (Wholey & Lawton, 1991), but unavailable for use in this study, based on the data set prepared by the sponsoring organization.

Propensity score methods (Greene, 2007) also offer an approach for adjusting models for potential selection bias, by calculating the probability that a physician receives the organizational change, Team Care. This approach requires the same variable, “Z,” as in the instrumental variables approach, and thus is unavailable for use in this study. The question that remains is whether any selection issues influenced the process of Team Care. Therefore the inclusion of a dummy variable for clinic in the empirical models, in place of treatment (Team Care), and inspection for significance were conducted. Clinic analysis showed no significance for anything other than Team Care clinics (collinear with Team Care treatment variable), thus bias may be less problematic than expected.

The lack of randomization is most problematic to specific aim #1, the assessment of Team Care’s impact on the Experience of burnout. The potential selection bias resulting from a lack of randomization, and the inability to adjust or correct for this potential bias, jeopardizes causal conclusions for specific aim #1. As a result, I shifted from a causal view of specific aim to an associative one. To do this, I report the associations of Team Care with reductions in the experience of burnout, compared with physicians in control clinics. While this approach is less desirable than a causal analysis and conclusion, it is most appropriate given legitimate concerns regarding the lack of randomization and potential selection bias in causal results. The second limitation to this research design includes the potential for clinic-level confounding. There is potential for collinearity between the clinic and the treatment, because Team Care was deployed at the

clinic-level to all physicians practicing in these four clinics. In order to ameliorate this potential confounding, tests for clinic-level effects are included in the analysis plan, by including the clinic indicator in empirical models and analyses.

Due to the length of the instruments measuring key study constructs, twenty-two questions and twenty-nine questions respectively, the resulting data set contains a reduced set of covariates than would be ideal. Physician response rates to surveys has been shown to be lower than other occupational classes, and the length of survey instrument shows considerable impact on response and completion/abandonment rates (Asch, Jedrziwski, & Christakis, 1997). The survey instrument was able to capture several important covariates including age, gender, years in practice and full time equivalent, all indicated in previous studies to be important covariates (Linzer et al., 2005; Linzer et al., 2002; Linzer et al., 2000; Linzer et al., 2009b; Linzer et al., 2009a; McMurray et al., 1997; Mechaber, Levine, Manwell, Mundt, & Linzer, 2008; Williams et al., 2002; Williams et al., 2010; Williams et al., 2007). In addition to a limited set of variables, there is potential for omitted variable (OV) bias, wherein potential independent, unobserved confounders, causally related to both treatment and outcome, or correlated multiple omitted variables which in turn influence both treatment and outcome variables. Potential OV's would be causally related, with both the treatment (Team Care) and the workplace variables and related to the outcome, burnout. Such variables could be clinic characteristics that influence the physician selection of clinic in which to work, which then influences assignment to Team Care or Comparison, through study clinic

designation by management. To account for this possibility, each Team Care clinic was “matched” to a Comparison clinic with similar characteristics. By analyzing the pairs as contrasts, the possibility of bias was determined. If the association declines or ameliorates when the analysis is restricted to a particular pair, then bias may be present. Notable, if these variables are unobserved, related to the outcome, but not to the independent variables, there is no bias of results, but a reduction in the amount of variation explained by the model.

4. EMPIRICAL RESULTS

This study was conducted over six months at a large Integrated Delivery System in the Upper-Midwest United States. The final sample size for the study was 153 unique physicians, 97 at baseline, 91 at 12 week follow-up and 56 at the final 6 month follow-up measurement. The final data set included 244 total responses, an average of 1.6 per unique physician. The survey was administered via Survey Monkey, and delivered electronically via the organization's corporate email system to potential respondents. The organization afforded the potential respondents time during the work day to complete the survey. The survey was electronically available over a 2 week period for completion, and two follow-up emails were sent to potential respondents as a reminder request to complete the survey. The average time to complete the survey was 11 minutes overall, with no statistically significant difference in time to completion ($p > .05$) over the three data collection waves.

4.1 Descriptive Statistics

Overall response rates varied across each wave of data collection, 65.5%, 54.9%, and 58.4% respectively for the baseline, 12 week, and 6 month assessments. These response rates are similar, and higher, than those reported in the literature for physicians, which indicates a median response rate of physicians of 54.6% (Asch et al., 1997) Sample sizes and response rates for physicians in Team Care and Comparison clinics are detailed below in Table 3.

Table 3: Sample Size and Response Rates for physicians

4.1.1 Longitudinal Sample Characteristics

The response pattern represented in the physician sample varied, thus analysis was conducted to determine differences in key study variables. My approach was to include all physician responses in the sample, regardless of response pattern. The resulting data set was relatively unbalanced, in terms of longitudinal responses by physician. This imbalance is depicted below in Table 4, where just 15 percent of the sample included responses at all three measurement intervals, 50 percent of the sample had two or more responses, leaving 50 percent of the sample responding at just one of the measurement periods. This is concerning in terms of potential non-response bias among those responding at only one measurement period. Interestingly, response rates for each measurement period were at or above those reported in the literature (Asch et al., 1997), although the final data set lacked a high level of responses for all physicians across all three measurement waves.

Table 4 – Response Pattern

4.1.2 Key Study Variables

Key Study variables include the six dimensions of AWS, Workload, Control, Values, Fairness, Community and rewards, the three components of burnout, Emotional Exhaustion, Depersonalization, and Self-Efficacy, Team Care assignments, clinic and time. Means and standard deviations for each variable by clinic¹ and time are shown below in Table 5. To assess any potential differences that existed among key study variables, by either clinic or the Team Care assignment groups at baseline, I conducted two ANOVAs of each of the key study variables, one by clinic and another by Team Care assignment. In only one case, Fairness by clinic, was there a significant finding of differences at baseline ($F=2.60$, $p=0.018$).

Table 5: Descriptive Statistics for H2 Study Variables

Further, I conducted a repeated-measures ANOVA for each of the study variables to determine any significant differences in the means of the variables across clinic, time, Team Care assignment, and the interactions between these variables. Repeated measures is required given the longitudinal and nested nature of the data, repeated measures of an physician over time, clustered into clinics in which they practice. Both the repeated measure of the physician and the clinic were entered into the ANOVA. This is an

¹ Team Care clinics = clinics 1-4, comparison clinics = clinics 5-8

important methodological choice, as much organizations research indicates the strong influence of the workgroup on individuals' perception and opinions of their immediate workplace (Bliese, Chan, & Ployhart, 2007; Van Mierlo et al., 2009). This ANOVA analysis is detailed Table 6. If a significant difference is detected for time, clinic, Team Care Assignment, or any of the interactions, the resulting F-statistic and p-value is given in the cell intersecting the study variable and factor variable. Only the AWS variable Community demonstrated no differences across any of the proposed factor variables. Time was the most frequent significant difference, followed by clinic. Fairness was the only study variable to demonstrate a difference by any of the proposed interactions, Team Care by time and Clinic by time. The three way interaction of time by clinic by Team Care was non-significant for all variables, but may have been due in part to the perfect collinearity between clinic and the Team Care assignment variable, which was based on a clinic level assignment of the organizational change. The three burnout components, EE, DEP and SE, showed significant variation by time only. Taken as a group overall, Team Care or Comparison, none of the key study variables showed a significant difference, and only Fairness had a significant difference in Team Care assignment over time.

Table 6: ANOVA for H2 Study variables

4.2 Validity and Reliability of Key Measures

Validity of the key measures, MBI and AWS were assessed following methods suggested by Shadish, Cook, and Campbell (2002), and included calculation of Cronbach's Alpha for the six dimensions of AWS and the three MBI components to examine internal consistency as an estimate of reliability of the test scores. Due to the lack of previous evidence in the literature on validity for the AWS measure among physicians, Confirmatory Factor Analyses (CFA) were conducted for both the AWS and MBI instruments and compared with findings in the literature, for administrative employees, and physician samples respectively. AWS and MBI measures were inspected to determine validity. First all six dimensions of AWS and three dimensions of MBI demonstrate a high level of internal reliability construct fit, with Cronbach's Alphas in excess of the 0.70 established threshold, ranging from 0.72 – 0.88. These values were consistent with established literature on validity of both instruments (Leiter et al., 2010; Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008; Rafferty et al., 1986) Results of the CFA suggest validity of the AWS and MBI measures, as expected based on empirical findings in the literature (Leiter et al., 2010; Leiter & Maslach, 2004; Leiter & Spence Laschinger, 2006; Maslach & Leiter, 2008). The model's Root Mean Square Error of Approximation (RMSEA) was 0.08, at the high end of the range of acceptability 0.05 – 0.08, although the 90% Confidence Interval (CI) lower bound is 0.00, another indication of goodness of fit for the model. Additionally, there were no significant modification indices ($\chi^2 > 3.841$, corresponding to a $p < 0.05$ significance level), indicating

no paths or loadings that would offer an improvement to the specified model for both the AWS and MBI measures.

4.3 Findings from Analyses

4.3.1 Hypothesis #1: Team Care and burnout

The analysis supports hypothesis 1, that Team Care is associated with a reduction in the experience of burnout for physicians (OR=0.115, p=0.032), indicating a protective association of the Team Care organizational change. Table 7 includes the panel-data logistic regression results. Model fit was acceptable with a log likelihood of -75.662 ($\chi^2 = 17.51$, p=0.0006), and the results confirm that the use of a multi-level model was appropriate, specifically the likelihood-ratio test of the null hypothesis that the residual and between-individual variance is zero. ($\chi^2 = 4.65$, p=0.016).

Table 7: Team Care and burnout

Controlling for membership in Team Care or Comparison clinic, the probability of a physician becoming a prevalent case of burnout over time in this study was substantial (OR=5.00, p=0.039). Participating in the Team Care organizational change over time was associated with a 42.5% reduction in the odds of burnout, over each time interval [(5.004*0.115)-1]. The model estimates that just slightly over half, 57.2%, of the variation in burnout prevalence over time is due to within-respondent variation indicating

that both individual characteristics and inclusion in either the Team Care or Comparison clinics were almost equivalent in the explanation of variance. Examining the intra-class association in random-effects evaluated at the median linear predictor, affords further within-respondent variation to be analyzed. These values appear in Table 8.

Table 8: Measures of Within Respondent association in Random effects (at median)

Prevalence of burnout, using the West et al (2009) method was high. In any given time period, the probability of prevalence among all study participants, given by the marginal probability in Table 8 was 0.88 (95% Confidence Interval 0.73-0.95) and the joint probability of being incident during any two time periods was 0.81 (95% confidence interval of 0.66-0.89). Further the odds of being incident burnout, given that an individual was incident at another time period, is 7.58 times as high as an individual with the same group membership (Team Care or Comparison) who was not previously incident (95% CI = 1.98-36.21). Regardless of group membership, previous prevalence of burnout dramatically increases the odds that an individual is incident burnout at another time. By squaring the Pearson's correlation (0.320), we can conclude that incident burnout at a previous time period, alone explains 10.25% of the variation in burnout incident at the subsequent time period.

Over the course of the study, the probability of being an incident case of burnout increased even more substantially for those physicians in the Comparison clinics. This is

best illustrated by inspecting the Odds Ratios for burnout for the Comparison Group versus the Team Care group in Table 9. At baseline, the Odds Ratio for burnout in the Comparison group as compared with that of the Team Care group is not statistically significant, indicating no difference in the probability of burnout between the two groups prior to the implementation of burnout. At 12 week follow-up and again at 6 months, the probability of burnout among those physicians in the Comparison group increases substantially (OR²=16.59, p=0.007 and OR=144, p=0.008).

Table 9: Odds Ratio for burnout, given Comparison Group over Time

The entry point for burnout is Emotional Exhaustion (Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach et al., 2001), and burnout diffuses through this dimension to the remaining two, depersonalization and self-efficacy. Additionally, Maslach (2003) indicates that when applied to health care workers, Emotional Exhaustion is the key component of experienced burnout. To this end, the potential protective association between the Team Care organizational change and burnout prevalence could differ based on the starting level of Emotional Exhaustion. The MBI Manual indicates cut-points for high and low values of EE for health care workers. These cut-points are

² Due to the challenge in interpreting extremely small Odds Ratios, the calculation was inverted to report the Odds Ratio associated with membership in the Comparison Group, versus the previously reported Odds Ratios which follow the convention of reporting the Odds Ratio associated with Team Care membership.

High (≥ 27) and Low (≤ 16) values for Emotional Exhaustion (Maslach et al., 1996), which were used to assign a dummy-coded variable for each respondent indicating high and low categories of Emotional Exhaustion. These values were entered into the original regression to determine the impact of the starting value of Emotional Exhaustion on the Team Care Association. This analysis is summarized in Tables 10 (High Value) and 11 (Low Value).

Table 10: Team Care Association with burnout based on Emotional Exhaustion Starting Values

Table 11: Team Care Association with burnout based on Emotional Exhaustion Starting Values

For respondents in either High or Low Emotional Exhaustion, a large proportion of the variation across time can be explained as within-person variation, 66.6% and 38.1% respectively, which differs from the overall sample, where the inter-class correlation is 57.1%. Essentially, the starting condition of High was the strongest predictor of burnout prevalence over time in both the Team Care and Comparison clinics. In fact, the interaction term of Team Care and Time in the case of those starting High was non-significant, leaving just the High group assignment as the only significant variable. Odds Ratio results from both models are presented in Tables 9 and 10. Those with an Emotional Exhaustion value considered high, have 183 times the odds (OR=183.019,

p=0.018) for being incident compared to those who started as medium or low on Emotional Exhaustion. The opposite is also true for those whose starting value for Emotional Exhaustion is low, where the odds ratio is nearly zero (OR=0.186, p=0.006). Across the entire sample, a majority, 61.8%, of physicians had a starting Emotional Exhaustion Score that was in the high range, while only 17.6% were categorized as low.

4.3.2 Fit of Areas of Worklife Model for Burnout

Tests of fit of the data to the model proposed in Hypothesis 2 utilized nine key study variables, six representing the AWS, and the three components of burnout from the MBI. Hypothesis 2, that the model presented by Maslach & Leiter (2004) and tested here with a primary care physician sample, was supported by the data. This conclusion is based upon inspection of goodness-of-fit measures: RMSEA was 0.059; $\chi^2/df=2.39<3$; CFI=0.838; TLI=0.830; 90% lower bound of RMSEA = 0.00, and indicates acceptable model fit for these purposes, and as an initial test of the model in a new context, primary care physicians. Inspection of modification indices found no significance ($p<0.05$, $\chi^2>3.841$), indicating no additional paths that would have improved the specified model. In addition, the model was tested for stability over both time, and Team Care assignment, by comparing the specified model to each of two additional models individually, a model with time and a model with Team Care assignment. Using the difference in chi-squared method (Yuan & Bentler, 2004), both revised models failed to demonstrate a statistically significant change in χ^2 from the original model at the $p=0.05$ significance level. This is an indicator of relative stability in the model across measurement wave and between Tea,

Care and comparison clinics. Performing this analysis by clinic failed estimation due to small sample sizes within clinic over time.

Direct and Total Effects were computed for the model and displayed below in Figure 3 and Table 12. Beginning with the direct effects, we find a similar pattern in significance and direction of effects as compared to the Maslach & Leiter (2004) original presentation of the model. Although we can conclude the model fits the data based on inspection of the goodness of fit measures, one direct path, that of reward's effect on values (Figure 4), which was supported in previous literature findings, was not supported by these data, ($p=0.380$). The largest direct effects determined by this analysis were the AWS dimensions of Workload and Values consistent with the original discussion of the model by Maslach & Leiter (2004).

Figure 3: Direct Effects

Total Effects followed the same pattern as previous studies, and demonstrate the large total effect of Control, mediated through Workload, Rewards, Community and Fairness, and ultimately Values, indicating its central role in the nature of the workplace, and in the etiology of the three burnout Components.

Table 12: Model Total Effects

4.3.3 Additional, Post-Hoc Analyses of Team Care and Areas of Worklife

While not included in the original specification of hypotheses, I examined the association of Team Care with Areas of Worklife, namely as improvements in physician's assessments of Workload, and Control, significant AWS dimensions, demonstrated in testing of hypothesis two. The rationale for this additional analysis was to explore a potential pathway by which the Team Care organizational change may have been acting to reduce the prevalence of burnout.

Both Workload and Control have been shown to be important aspects in the study of physician worklife (Linzer et al., 2005; Linzer et al., 2000; Linzer et al., 2009b; Williams et al., 2002; Williams et al., 2010; Williams et al., 2007); support of these constructs in the AWS model provides greater credibility to the use of the model in future physician research. Physicians, and providers in general, are no strangers to demanding levels of workload present in caring for patients, but this familiarity does not offer protection from its impact on burnout. Starting in medical school and residency training and continuing throughout their careers, physicians work long hours and deal with complex problems. The attendant fatigue, sleep deprivation, broken relationships, neglect of personal needs and high stress level are major contributors to burnout. An aging patient population and their increased care needs will put even more pressure on physicians' time and personal resources. The balance between long, stressful hours of work and attention to family and personal needs—work/life balance—is critical to burnout prevention (Balch & Copeland, 2007; Contag et al., 2010; Cossman & Street,

2009a, b; Gander, Briar, Garden, Purnell, & Woodward, 2010; Keeton, Fenner, Johnson, & Hayward, 2007; Leiter et al., 2009; Shanafelt et al., 2003; Weiner et al., 2001), yet long work hours alone are insufficient to explain the symptoms of burnout. There is ample evidence showing that burnout still exists in physicians who work part time, (Gander et al., 2010; Hartwell, 2010) and the traditional responses to managing work overload may actually make the problem worse (Jones, 2009; Wallace et al., 2009).

Control or autonomy (the ability have some control over one's environment) has been repeatedly identified as a driver of both motivation and worker satisfaction (Maslach & Leiter, 1997; Pink, 2009) and is primarily about having the ability to make choices consistent with training and personal and professional ethics. For many physicians, the perceived restrictions on clinical decision-making, (Cossman & Street, 2009a) practice model design, (Hartwell, 2010; Okie, 2008) and organizational structure (Scheurer et al., 2009) are seen as a direct challenge to autonomy and can lead to dissatisfaction and burnout. In fact, physicians who have the least control over their work environment were 11 times more likely to experience dissatisfaction and burnout than those who felt that they had a high level of control over their work 40 (Leiter et al., 2009). Control over practice environment is an important factor in determining organizational commitment and professional satisfaction (Freeborn, 1998). This feeling is exacerbated when the personal values behind the choices (decisions) (Clever, 2001) come in conflict with the organizational values of the system in which physicians practice (Leiter et al., 2009; Shanafelt et al., 2003).

In order to explore this possibility, I conducted three additional analyses; first, adding Team Care to the model tested in hypothesis two (refer to Figure 1) with direct paths from Team Care to Workload, and Team Care to Control, and comparing this revised model to the model tested in hypothesis two; second regressing Team Care (by time and the interaction of team care by time) on Workload, and third, repeating the second analysis substituting Control for Workload.

To assess the first analysis, adding Team Care to the model tested in hypothesis two, I used the chi-squared differences approach recommended by Yuan and Bentler (2004), wherein the difference between the chi-square value of both models (and corresponding degrees of freedom) is calculated, then used as a chi-squared critical value to test the hypothesis that the chi-squared difference is significant (Yuan & Bentler, 2004). Results of this approach are summarized in Table 13. Adding Team Care and the direct paths resulted in a $\chi^2(25) = 172.98$ compared with the original model from hypothesis two, $\chi^2(18) = 154.67$, a $\Delta\chi^2(7)$ equal to 18.31. Taking the difference in chi-squares as a chi-squared random variable with 25 minus 18 degrees of freedom, the critical value relates to a p-value of 0.01, therefore rejecting the null hypothesis that the chi-squared difference between the models is zero. Given that the revised model with Team Care and direct paths added resulted in a higher chi-squared value, I conclude that the revised model does not improve the theoretical model (Yuan & Bentler, 2004). While disappointing, this result could have been due to a number of conditions, including the unbalanced response pattern in the data, and the lack of casual robustness of the study

design, and as a post-hoc analysis, was not contemplated in the original specification of hypotheses for this dissertation.

Table 13: Chi-Squared Difference from Adding Team Care to H2 Model

Continuing to explore the relationship between Team Care and potential paths of association through AWS elements, I perform post-hoc analyses two and three, where Team Care was regressed on Workload and Control individually. Results from these analysis are shown below in Tables 14 and 15. Team Care is associated with a 0.22 unit improvement in Workload assessment for physicians in Team Care clinics ($p=0.047$), an initial indication of a potential pathway for Team Care to burnout. Interestingly, a similar within-person variation is reported in this analysis, as seen in the previous analyses; 58.4% of the variation in Workload is within person over time. Analysis of Team Care association with Control was non-informative, where no coefficients were statistically significant.

Table 14: Team Care Association with Workload

Table 15: Team Care Association with Control

While the post-hoc analysis failed to demonstrate improvement with the inclusion of Team Care into the model tested in hypothesis two, this non-finding does offer some value and contribution. Two potential explanations for the lack of model improvement with the inclusion of Team Care are a lack of precision in measurement and the design and fidelity of the organizational change. Measurement of both AWS and MBI use standard validated measures from the literature developed for a wide variety of occupational classes and were not specifically developed for physicians or the primary care practice context. While well-established general measures, these may lack precision in terms of the work experience of physicians. This finding can help motivate the development of context-specific measures of the workplace and the experience of burnout. A second plausible explanation is that the organizational change, Team Care, was not designed to impact burnout, rather it was essentially a workload reduction or re-balancing change, and therefore it is unlikely to have an effect on burnout, through workload, and did not have a mechanism to change any perceptions of control for physicians. Thus, the significant association with Workload in the regression, and the

lack of association with Control, demonstrates these possibilities; essentially limitations to the overall organization change.

4.3.4 Modeling of Trajectory for Burnout Components

Hypothesis #3, that the trajectory for the three burnout components, Emotional Exhaustion, Depersonalization, and reduced Self-Efficacy take curvilinear forms, was supported by the data. In order to test this hypothesis, the empirical model was repeated three times, once for each of the three burnout components, Emotional Exhaustion, Depersonalization, and reduced Self-Efficacy. One nuance of the MBI instrument is the interpretation of the Self-Efficacy dimension. While Emotional Exhaustion and Depersonalization are interpreted as worse for higher values, the Self-Efficacy dimension is actually reduced Self-Efficacy, therefore, lower values indicate a worsening of the dimension (Maslach & Jackson, 1981). This is important when interpreting the forms these dimensions take over time.

As indicated in the above section regarding empirical models, I followed the procedure used by Bliese and Polyhart (2002) to model the functional form of the MBI dimensions over time. Beginning with Emotional Exhaustion, the fixed effect model indicated 60.8% of the variation was attributable to between-individual, the interclass correlation (ICC). The inclusion of the Team Care dummy-coded variable as a covariate controlled for the effect of the Team Care organizational change on the form of the MBI component over time, although in the final model, the term is not significant ($p=0.056$). The fixed effect form of the model showed a significant ($p<0.000$) linear and quadratic

term for time. The model fit improved with the inclusion of a random intercept, linear and quadratic term, and the use of an unstructured error structure, $\chi^2(1)=147.14$, $p<0.000$. The results of the final model are summarized in Table 16 below.

Table 16: Burnout Trajectory – Emotional Exhaustion

The resulting model for Emotional Exhaustion has a negative linear term (-7.327, $p=0.005$) for time and a positive quadratic term (4.206, $p=0.002$), indicating a concave out shape, where Emotional Exhaustion decreases from time zero, baseline measurement, to time one, at twelve weeks, and then increases through time three measurement at six months. The resulting level of Emotional Exhaustion at time three is higher than the starting value at baseline. This finding suggests that Emotional Exhaustion has some degree of variability in the short term that does not ameliorate the overall rising trajectory of Emotional Exhaustion in the sample.

Depersonalization, or Cynicism, shows a different form from that of Emotional Exhaustion. Between-individual variation accounts for 46.6% of the overall variation in Depersonalization over time, somewhat lower than Emotional Exhaustion. Both linear and quadratic terms for time are significant ($p<0.000$) in the initial fixed effects specification. Similar to Emotional Exhaustion, model fit improves with a random intercept, linear and quadratic term and the specification of an unstructured error structure, indicated by $\chi^2(1)=15.40$, $p<0.000$. The model results are given below in Table 17, and indicate a concave in curvilinear form, with a positive linear term (10.489,

p<0.000) and a negative quadratic term (-5.294, p<0.000). Again, the Team Care dummy-coded variable has been included to control for the effect of participating in the Team Care organizational change over time, and is significant (p<0.000), indicating an intercept shift of -6.339 units in Depersonalization for those physicians participating in the Team Care organizational change. A decrease of 6.339 units indicates a reduction in depersonalization for those in Team Care. Overall, the trajectory of Depersonalization worsens over the baseline to time one, 12 week, period, then improves through time two, at six months. The ending value at time two is approximately the same as baseline.

Table 17: Burnout Trajectory – Depersonalization

Following the same procedure again, reduced Self-Efficacy is modeled over time. As indicated above, Self-Efficacy has an inverse interpretation as higher values represent reductions in self-efficacy, whereas in the previous two dimensions higher values represent poorer evaluations of one's performance. Between-individual differences accounted for 55.2% of the variation in Self-Efficacy over time, almost the midpoint in the ICC for the previous two dimensions of burnout. Fixed effects specifications yielded significant linear and quadratic terms. Model fit was also improved with the addition of random intercept, linear and quadratic terms and the employment of unstructured error structures, resulting in a model with $\chi^2(1)=30.99$, p<0.000. The final model is summarized below in Table 18. A negative linear (-26.414, p<0.000) and positive quadratic term (14.032, p<0.000) indicate a concave out form for Self-Efficacy, but a

different interpretation than that for Emotional Exhaustion. Assessment of Self-Efficacy decreases (poorer assessment of one's efficacy) over the period, baseline to time one at twelve weeks, then improves from twelve weeks through the six month measurement. Team Care is significant in the model for Self-Efficacy ($p=0.002$) and is essentially equivalent to an intercept shift of 5.425 units, a reduction in Self-Efficacy assessment. This is curious result given that Team Care is not significant in the model for Emotional Exhaustion, and is significant in the model for Depersonalization, but offers an improvement. Essentially, this finding suggests that physicians in Team Care clinics had lower assessments of Self-Efficacy across the three measurement periods.

Table 18: Burnout Trajectory – Depersonalization

The resulting functional forms and trajectories for the three burnout components paint a somewhat confusing picture. Emotional Exhaustion improves from baseline to twelve weeks, then worsens through the next six months. Depersonalization worsens, then improves over the same time periods, and assessments of Self-Efficacy worsen, then improve. The inconsistency between these assessments over time, and among the three elements has been suggested to be indicative of a worsening overall condition of burnout in several recent studies (Leiter et al., 2012; Schaufeli et al., 2011), although both assessed burnout over significantly longer time periods, ten and twelve years respectively. Earlier studies suggest that burnout dimensions should be relatively stable over shorter intervals (Leiter & Maslach, 2004; Leiter & Spence Laschinger, 2006),

which challenges these findings, given the range of the changes over similar short intervals.

4.3.5 Summary of Empirical Results

All three hypotheses specified in this dissertation were supported by the data. Team Care demonstrated a protective association with burnout, reducing the odds of burnout for physicians by 42.5% over three measurement periods. This is an important finding as it further suggests the potential of organizational interventions in addition to the large number of self-care interventions that are presented in the literature, a point made in a recent review article by Maslach and colleagues (Maslach et al., 2011). An etiological model for burnout, specifically the Areas of Worklife, originally tested among administrative employees at a large university, was tested and determined to fit the data for physicians in the employed, primary care setting. The importance of this finding cannot be understated; recent literature on physician burnout focuses heavily on assessing the prevalence and details between specialties, and the consequences of burnout for various constituencies, but does little to inform researchers and practitioners about the potential causes of burnout, especially the workplace related drivers of misfits between resources and demands faced in the workplace. The third hypothesis, relating to the functional form of burnout over time, was also supported. The general form was curvilinear or quadratic, as hypothesized. Emotional Exhaustion demonstrated a concave out form, indicating a decreasing rate to a point of inflection at twelve weeks, then an increasing rate through six months. Both Depersonalization and Self-Efficacy took on a

concave in form, where the symptoms worsened to a point of inflection at twelve weeks, then improved through 6 months. This suggests the potential for the diffusion of burnout from Emotional Exhaustion through the other two dimensions, as noted by many other researchers (Golembiewski et al., 1986; Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001)

5. DISCUSSION & CONCLUSIONS

This dissertation successfully addressed the three specific aims, (1) examining the relationship between an organizational intervention and experienced burnout, (2) testing a workplace-based model for burnout, and (3) analyzing the trajectory of burnout and presenting an assessment of its functional form. In spite of the fact that this dissertation is based on the observation of a natural experiment which lacks the rigor and design required for strong causal conclusions, it offers a contribution to the burnout literature in general and more so, to the literature concerning burnout among physicians. Each of the specific aims helps to inform the growing concern regarding the changing nature of work for physicians, coinciding with some of the most significant changes, and hopefully improvements, in health care delivery in the United States in a generation. The striking contrast is a significant prevalence of burnout and work stress at the intersection with significant changes systemically (e.g. Patient Protection and Accountable Care Act), and within the practice and delivery of medicine (e.g. Evidence-based medicine, Electronic Medical Records) (Linzer et al., 2005; Shanafelt et al., 2012)

5.1 Team Care

Team Care, the organizational change, was shown to have a protective association, that is, a reduction in the experience of burnout for the physicians who participated in the organizational change. As previously mentioned, there are few comparisons in the literature from which to evaluate this change in a greater context.

Two such studies are reported in the literature, Legacy Clinic in Portland, OR (Dunn et al., 2007) and Group Health Cooperative in Seattle, WA (Reid et al., 2010). Both studies sought to examine the effects of organizational improvements on provider well-being generally, and included some measure of physician burnout. The advantage in these comparisons is that Dunn et al (2007) and Reid et al (2010) employed the full MBI instrument at each time interval across their respective studies, affording a direct comparison of results. Table 19 depicts a comparison of results from the Team Care and those reported by Reid et al (2010) and Dunn et al (2007).

Table 19: Comparison of Organizational Changes reported in the literature

While a relatively small sample at each of five measurements over five years (22-32 per time period), Dunn et al (2007) demonstrated an improvement in Emotional Exhaustion (EE) and Self-Efficacy (SE) as a result of (1) including physician well-being as a scorecard metric for clinics, and (2) a series of mainly process improvement efforts over the course of five years (Dunn et al., 2007). Means for EE improved from 27, in year one, the cut-point on the MBI for High, to 21, in year five, in the mid-range for EE. This was the only statistically significant decrease reported ($p=0.002$) by Dunn and colleagues (2007). The Group Health Cooperative project (Reid et al., 2010) included a similar design to that used in this dissertation, in that an organizational change, the implementation of a prototype medical home model, was conducted in a designated

clinic, and two additional clinics were identified as controls. The medical home model was essentially a series of process improvement efforts and reallocation of staffing, similar to that of Team Care. The implementation occurred over the course of a year, and the paper reports results over the course of two additional years. Again, sample sizes were quite small, (n=48), compared to the Team Care evaluation (n=153), but there were statistically significant results for burnout components, improvements in EE ($p<0.01$) and Depersonalization (DEP) ($p=0.03$), but no statistically significant change in the SE dimension of burnout.

Two important differences exist between these studies and the results herein. First, these studies examined burnout over a much longer time frame, five years and two years, and measured burnout at annual intervals. The Team Care evaluation, examined burnout over 90 day intervals. The detection of any changes at such a short interval is quite surprising, since burnout is believed to be a relative stable phenomenon (Leiter & Maslach, 2004; Leiter & Spence Laschinger, 2006). Second, the Team Care evaluation specified prevalence of burnout and examined the reductions associated with burnout. This specification, based on the West et al (2009) method makes comparisons more difficult. Post-hoc analysis was conducted to replicate the analysis in Dunn et al (2007) and Reid et al (2010), and shows statistically significant improvements in EE ($p=0.004$), DEP ($P<0.00$) and SE ($p=0.01$). While Dunn et al (2007) found only a result for EE, and Reid et al (2010) determined results for EE and DEP, the Team Care findings are consistent, and find an additional effect for SE. The larger sample size in Team Care

evaluation (n=153) could also be responsible for additional findings, undetectable in the comparison studies due to smaller sample sizes.

5.2 The Areas of Worklife Model and the Primary Care Physician Context

The AWS model for burnout focuses on workplace conditions as causes of burnout, which is consistent with the notion that burnout characterizes a condition that is specific to the relationship one has with their work. The data collected in the Team Care evaluation fits the model presented first by Leiter & Maslach (2004), with one curious difference, the non-significance of the direct path from Rewards to Emotional Exhaustion, and subsequently the lack of a total effect of Rewards on Depersonalization of Self-Efficacy. The rationale for the Rewards to Emotional Exhaustion path described originally by Leiter & Maslach (2004) was that the assessment of rewards in the workplace was an important component of the COR theory, stating that the extension of resources against a demand, that failed to result in the desired outcome, rewards being one desired outcome of work, was depleting, and caused stress reactions, similar to that of emotional exhaustion. This rationale although was developed as a general work life model applicable to all occupational classes, and specific to none. Further, the original test of the model was among administrative employees in a university setting, clearly a more hierarchically organized occupational class. The lack of a significant finding in the physician sample suggests that this calculation of resources extended and the rewards received, must be due to one of several conditions (1) it does not occur for physicians, (2) does not result in a depletion stress response, or (3) perhaps the rewards dimension does

not measure all rewards that physicians receive from their work. Inspection of the questions comprising the rewards dimension of AWS, reveals a strongly compensation related conceptualization of rewards. While physicians, and professionals in general, certainly must value compensation rewards, consideration of their professional status suggests there are other, more intrinsic rewards they seek from their occupation (Abbott, 1988; Freidson, 2001; Starr, 1982). The lack of specificity of the rewards dimension of AWS to the physician context offers the richest rationale for the lack of significant path from rewards to emotional exhaustions illustrated in the test of hypothesis two. Unfortunately, while this finding departs from the model specified by Leiter & Maslach (2004), no additional analytics or insights can be garnered from the data. To further confound this issue, replications of the Leiter & Maslach (2004) model do not exist in the literature as of the writing of this dissertation, in either a general context or a health care/primary care setting.

One study using a reduced model, (Leiter et al., 2010), focused on the Control, Workload, Fairness and Values AWS constructs to determine the three burnout components for nurses and physicians in Spain. Results from this reduced model demonstrated a similar relationship among the four AWS variables included and the three components of burnout. The authors were able to separate models for nurse and physicians, therefore affording some comparison. Specifically, the results confirmed the important influence of control, as exogenous to the system, and its large total effects on the three burnout dimensions for physicians, as well as the large direct effect of workload

on EE (Leiter et al., 2010). While not a perfect comparison, the Leiter and colleagues (2010) findings support the conclusion that the AWS model is appropriate in a health care context, although the differences in model specification and the country/system-specific context differences are important caveats to this conclusion.

Three additional Post-Hoc analyses were conducted to explore the potential for associations between Team Care and Control/Workload, in an effort to inform future organizational change work. Again, the design does not support any causal conclusions or explorations and these were post-hoc, beyond the scope of the original hypotheses. Only one relationship, Team Care and Workload showed a statistically significant association, wherein Team Care was associated with an improvement in Workload assessment by physicians over time ($p=0.047$). This begins to inform future work to explore how such organizational changes reduce burnout. Following Maslach & Leiter's (2011) assertion that organizational interventions need to be evaluated and further understood.

5.3 Burnout Trajectory over time

Studies of burnout over time have tended to either examine the predictability of burnout in a later time based on previous measures of burnout (Leiter et al., 2012; Schaufeli et al., 2011), or have modeled burnout trajectory over a longer period of time, two years (Dunford et al., 2012). The literature is sparse regarding modeling the functional form of burnout over time, save for Dunford et al (2012). Other studies of burnout over time utilize a structural equation modeling approach that relies on previous

measures to predict changes in future burnout assessments, and include workplace related covariates (Leiter et al., 2012; Maslach & Leiter, 2008; Schaufeli et al., 2011).

There are certainly limitations to the approach employed to test this hypothesis, a simple longitudinal growth curve model, versus other, more robust trajectory approaches, but the state of the data in this study, relatively small, sparse, and unbalanced across data collection waves, limit the use of other methods. These limitations are discussed further in section 5.5.2. There are advantages to using the Bliese and Polyhart (2002) approach to modeling the functional form of change over time in burnout components. It offers the ability to compare findings to those reported in the literature, namely Dunford et al (2012). The literature is sparse on this topic, as noted by Dunford and colleagues (2012) and Leiter (2004), due to the challenges in obtaining multiple measures of burnout and cooperation of organizations. Further, this approach builds on the existing literature in this area to establish some base of understanding with relatively simple growth modeling, that then may extended further with more robust approaches, such as those identified in section 5.5.2. Pragmatically, the data collected in this evaluation, a small number of respondents (n=153), over a relatively short period of time (6 months) does not support more advanced trajectory modeling, nor does the post-hoc reality of a sparse, unbalanced data set.

The data collected in the Team Care evaluation, three measurements over six months, provided an opportunity to model changes in burnout components over a relatively short period of time, and test the notion of stability over short time periods.

This analysis controlled for the effect of the Team Care organizational change, in an effort to model the background trajectory of burnout occurring among physicians within the primary care practice. The analysis concluded that there was a significant trajectory among the physicians on each of the three burnout components. Similar to the findings in Dunford et al (2012), the trajectory took on a quadratic form for all three components. Emotional Exhaustion improved between baseline and 12 weeks, and then decline through 6 months. Depersonalization worsened through 12 weeks and then improved by 6 months, as did Self-Efficacy. This is an interesting pattern that supports the notion that there is a temporal diffusion through the three burnout components. Emotional Exhaustion is considered the gateway dimension for burnout and is impacted first, in this case improving then declining. Depersonalization and Self-Efficacy lag to some degree, declining, and then improve over the second time frame, twelve weeks to six months. Again, these results control for the influence of the Team Care assignment, and depict the natural trajectory of burnout components in the entire sample over the three measurement periods.

While these results are similar to Dunford et al (2012) there are a few notable differences. First, the sample from Dunford et al (2012) included all employees from a large hospital system in the Southeast United States and does not report results separately for physicians. Second, the authors find quadratic forms, but the functions and forms differ greatly from the conclusions in this study. Additionally, several additional study variables are present in the Dunford et al (2012) reported results that make direct

comparisons difficult, because the authors do not present a model with only linear and quadratic terms for time; all reported results include specific study variable not available in the Team Care evaluation data set. While not a perfect comparison, the Dunford et al (2012) results provide a reasonable comparison to explore. This comparison is summarized in Table 20.

Table 20: Comparison of Team Care and Dunford et al (2012) Trajectory Results

Emotional Exhaustion takes on the reverse form, worsening then improving; Depersonalization worsens over the entire time period of their study; and Self-Efficacy declines as well (Dunford et al., 2012). These differences are likely due to the substantial differences in the composition of the sample, and, in the case of Dunford et al (2012), additional measures over a greater time period, five and two years respectively. The conclusion of greatest impact is the notion that burnout components are not static overtime. It is less clear from these results or those from Dunford et al (2012) whether the temporal diffusion effect exists among the three components as theorized, by many (Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach & Leiter, 2008; Maslach et al., 2001), but not tested.

5.5 Additional limitations after considering results

This study is not without limitations, in addition to those noted earlier in section 3.4. Several important limitations are of note, and should be considered when evaluating the conclusions reached in the specific aims and comparisons in the discussion.

5.5.1 Study Design

As discussed in section 3.5, the overall design, the observation of a natural experiment that lacks randomization of physicians to the Team Care organizational change, and additional variables that could have provided econometric fixes for the lack of randomization, or acted as a substitute or updating to the treatment variable. The direct result of this limitation is the conclusion of an association between Team Care and the reduction in burnout among participating physicians, rather than a causal effect. Beyond the design of the study, the lack of additional data from administrative systems or the survey instrument, severely limited the application of econometric fixes for randomization, the most likely of which would have been the utilization of the propensity score approach reviewed in section 3.4.

5.5.2 Longitudinal Data and Modeling Approaches

The pattern of longitudinal responses is concerning and threatens external validity of the results. As previously noted, only 15 percent of the sample included responses at all three measurement intervals, and 50 percent of the sample had two or more responses, leaving 50 percent of the sample responding at just one of the measurement periods. This is concerning in terms of potential non-response bias among those responding at only one

measurement period. Response rates for each measurement period were at or above those reported in the literature (Asch et al., 1997). The response pattern limited to use two methods that, if employed, may have led to stronger results in the assessment of Team Care's association (or even effect) in hypothesis one, and a more robust and reliable assessment of trajectory for burnout components. For the assessment of Team Care, a post-hoc application of a Differences in Differences approach (Greene, 2007), which would allow each individual physician to serve as his or her own control, and model the differences within an individual over time and compare individuals in the Team Care and Comparison groups, would have been preferable. The relative unbalanced nature of the sample, with only 50 percent of the sample with two or more observations prevented this approach from offering a more insightful analysis, and a potentially stronger associative conclusion (Greene, 2007). Although the Bliese and Polyhart (2002) approach is widely employed in organizational research (Bliese et al., 2007), the method offered by Nagin and colleagues (Haviland, Jones, & Nagin, 2011; Jones & Nagin, 2007; JONES, NAGIN, & ROEDER, 2001; Nagin, 1999; Nagin & Tremblay, 2001), offers a considerable improvement. It's attractiveness stems from the ability to model attrition in the data set over the course of multiple measurement periods, and reduce the effects of unbalanced and sparse data. The challenge in its application in this context is twofold; (1) the small percentage of the sample that completed all three waves of data collection, 15%, and (2) the relatively few measurement periods, three (Haviland et al., 2011; Nagin, 1999; Nagin & Tremblay, 2001). Given the nature of the data set collected for this evaluation, several

improved methods of analysis were unavailable for use, in post-hoc analyses that could have improved the explanation of both the Team Care organizational change and the trajectory of burnout components over time. Ideally, modeling the trajectories using both the Bliese and Polyhart (2002) method and the Nagin (1999) approach would have been most desirable, and likely offered a broader and more robust contribution. In spite of these limitations however, this dissertation does make contributions to the literature in these domains.

5.5.3 Fidelity of Team Care

Although there was an extensive two week training program for Team Care participants prior to implementation, fidelity of the implementation and Team Care approach could have been compromised during the study. Trainers from the corporate implementation team for Team Care were present in the clinics during the implementation period, and were available to support clinic managers and participants throughout the post-implementation time period. All attempts were made by the implementation team to standardize the training and implementation, and qualitative observations were made to ensure a standardized approach. That said, it is likely that fidelity breaches among small teams post-implementation occurred, which could potentially threaten external validity.

5.5.4 Study Context

This study was conducted in a somewhat unique context, the Minnesota health care market place, which has several market features that are not found in other markets

in the United States, and thus may limit the generalizability of the findings contain herein. The physician marketplace in this study is highly integrated with large health care system, leaving few independent physician practices (Minnesota Medical Association, 2012; Minnesota Hospital Association, 2012). Therefore these findings are likely to generalize to employed primary care physicians, practicing in large metropolitan areas with highly concentrated, integrated delivery systems. Market-by-market variation in physician practice needs to be considered when comparing these results or using these findings to guide further research or managerial decision making.

5.6 Conclusions

While there are many conclusions to be drawn from this study, and have been discussed in previous sections, I wish to amplify three that I regard as the most important contributions of this dissertation. First, whatever the actual prevalence of burnout among physicians, 30-70% as reported by Shanafelt and colleagues (2003), or the high levels reported in this study, exceeding 80%, the current state is unsustainable, if one is to believe the literature regarding the consequences of burnout to all stakeholders, physicians, organization and patients.

Second is that although difficult to implement and evaluate, organizational changes that bear in mind or are designed to reduce burnout have the potential for improving this work experience for physicians. Interventions reported in the literature and designed to reduce burnout have tended to be self-care in nature, essentially teaching

individuals coping skills, in hopes of reducing their experience of burnout (Awa et al., 2010; Maslach et al., 2011). This is at odds with the theoretical construction of burnout, as a stress reaction specific to the relationship one has with their work (Maslach & Jackson, 1981; Maslach & Leiter, 1997; Maslach et al., 2001). Essentially, self-care or coping skills interventions attempt to increase an individual's capability to cope with, or endure work environments that produce stress specifically burnout symptoms, as a result of an imbalance between resources and demands, explained by Conservation of Resources theory. This is perhaps the greatest inconsistency in the study of burnout, and it is my hope that this dissertation may motivate more focus on the benefits of organizational interventions, which are essentially initiatives to improve the workplace itself to combat burnout. By motivating the relationship between the work place and burnout, through the test of the areas of work life, and the association of an intentional organizational improvement and reductions in burnout, one hopes that leaders will consider the impact of the workplace itself on the individual workers, in addition to the focus on the results or outcomes produced by the workplace. Nowhere is this more important than health care in general, and primary care in particular; where any number of process and quality improvement programs are underway to reduce costs, improve quality and the patient experience, but where the well-being of those engaged in the practice of medicine is rarely a priority. Whatever the current reasons or historical rationale, this situation is unsustainable, for all the reasons previously indicated.

5.7 Future Research Priorities

This dissertation provides evidence that organizational changes, designed to improve work processes, can also attend to the individuals delivering care, the physicians. These two aims are not mutually exclusive. Further, these changes provide guidance for improving the experience of burnout, potentially through changes in the key drivers of burnout, especially workload, control and values. In order to further demonstrate the potential of organizational changes, more research is required. Three priority areas could prove important to furthering the pursuit of reducing burnout for physicians, a considerable problem. First, more robust program evaluations need to be prospectively designed and/or in conjunction with organizational changes in order to provide a stronger design that will support causal conclusions for organizational changes that reduce burnout among all in the care giving professions, and for the causal mechanism for this change through workplace domains, such as those presented by the AWS model. Due to the volume of process improvement, quality and organizational design changes occurring in health care and specifically primary care, there are no shortage of opportunities to conduct these studies, just the need for leaders to be convinced of the merits. Second, replications of the AWS model for burnout need more attention in order to further substantiate the model in primary care, and broader health care contexts, and to inform the necessity of a context specific instrument to be designed in the future. The advantage of further confirmation of the AWS model is the generalizability to multiple work contexts. Lastly, if primary care, and health care

overall, are truly focused on contributing to improving the triple aim (Berwick et al., 2008), then research on the relationship between burnout and care, and costs and experience needs to be conducted and widely reported. The acceptance of the triple aim by most health care organizations almost guarantees an elevated concern and focus on burnout and overall care giver well-being, provided such evidence is presented to leaders, policy makers and patients. This is my hope as a result of intense study in *The Experience of burnout among Primary Care physicians*.

6. Bibliography

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7. APPENDIX

Figure 1: AWS – MBI Causal Model (Maslach & Leiter, 2004)

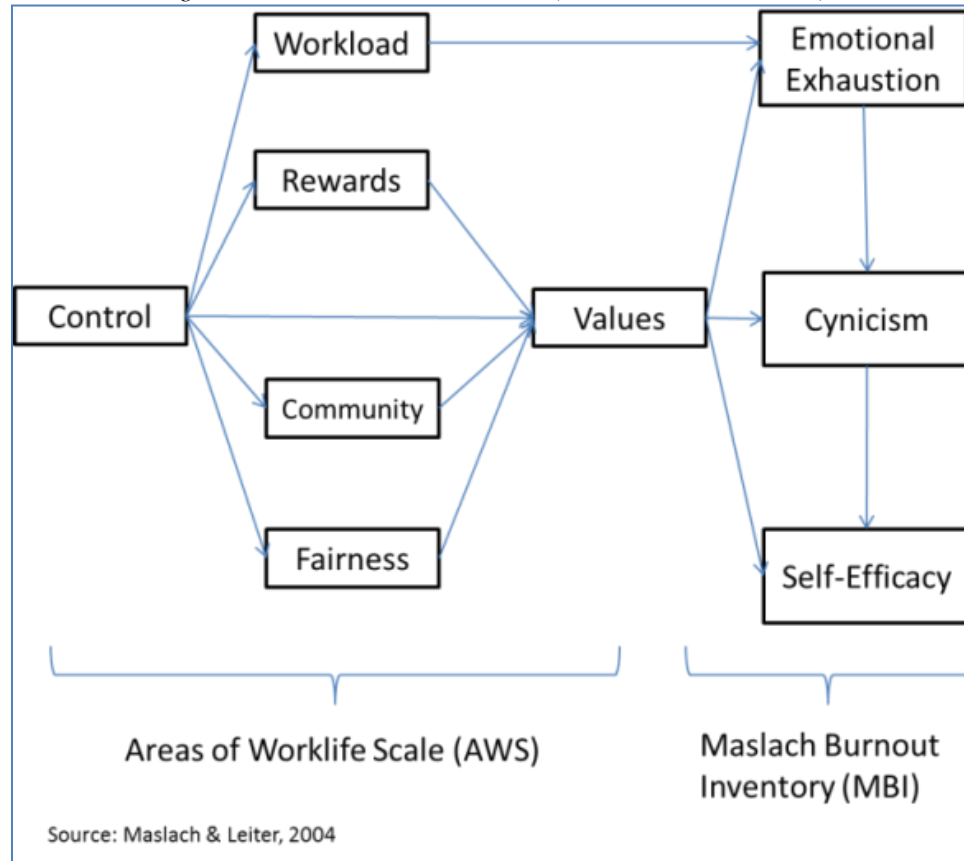


Figure 2: Overall Research Design

| | | | | | |
|------------|----|----|---|----|----|
| Team Care: | NR | Y0 | X | Y1 | Y2 |
| Control: | NR | Y0 | | Y1 | Y2 |

Figure 3: Direct Effects

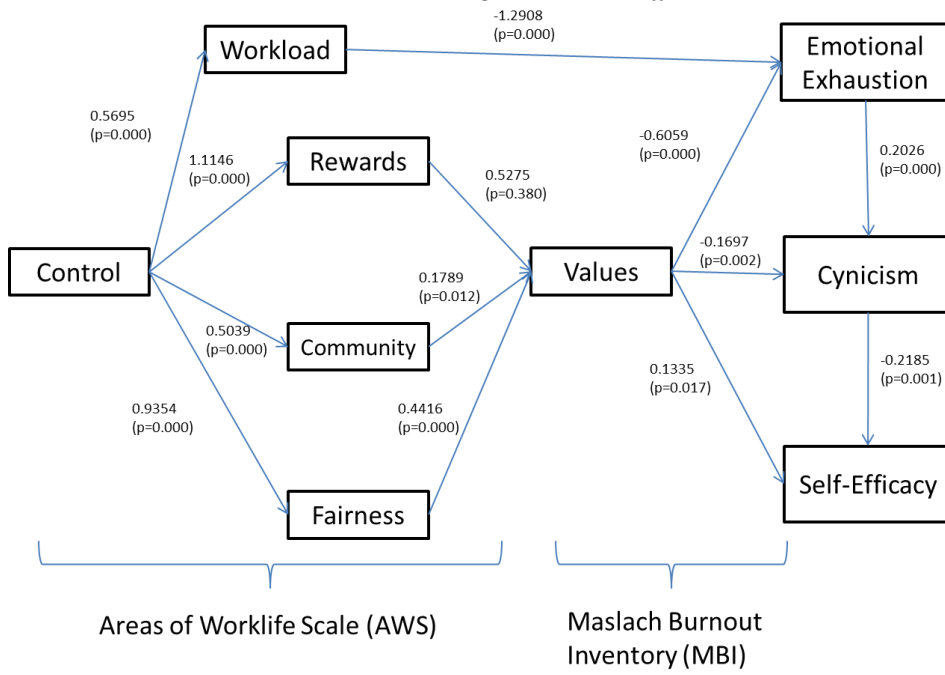


Table 1: Constructs and Key Study Variables

| Construct | Description | Unit of Analysis | Variables | Timing | Specific Aim |
|-------------------------|---|--|---|--|--------------|
| Burnout | Maslach burnout Inventory. 22-question battery | Collected at the individual-level for physicians | Prevalence (1/0) Severity Emotional Exhaustion Cynicism Self-efficacy | Baseline Time 1 (12 week follow-up) Time 2 (6 month) | 1,2,3 |
| Areas of Worklife Scale | Six dimensions of work life | Collected at the individual-level for physicians | Control Workload Fairness Community Values Rewards | Baseline Time 1 (12 week follow-up) Time 2 (6 month) | 2 |
| Team Care | Dummy-coded variable representing individuals in clinics that received the intervention | Collected at the individual-level for physicians | (1=Team Care, 0=Control) | | 1,3 |
| Time | Dummy-coded variable representing the data collection wave | Collected at the individual-level for physicians | (0=Baseline, 1=12 weeks, 2=6 months) | Baseline Time 1 (12 week follow-up) Time 2 (6 month) | 1,2,3 |

Table 2: SEM Fit Statistics

| Fit Statistic | Threshold of Acceptability |
|--|-----------------------------------|
| Root Mean Squared Error of Approximation (RMSEA) | 0.05<0.08 |
| 90% CI, lower bound of RMSEA | > 0.05 |
| χ^2 / degrees of freedom | < 3 |
| Comparative Fit Index (CFI) | >.9 |
| Tucker-Lewis Index (TLI) | >.9 |
| Goodness of Fit Index (GFI) | >.9 |

Table 3: Sample Size and Response Rates for physicians

| | T0 (Baseline) | T1 (12 Weeks) | T2 (6 Months) |
|------------|---------------|---------------|---------------|
| n | 97 | 91 | 63 |
| Overall | 65.5% | 54.9% | 58.4% |
| Team Care | 58.3% | 48.6% | 53.9% |
| Comparison | 72.3% | 60.4% | 62.3% |

Table 4 – Response Pattern Bias Analysis

| Pattern (X=Response) | N | Percent of Responses | Cumulative Percent |
|-------------------------|-----|----------------------|--------------------|
| X00 | 34 | 22.2 | 22.2 |
| XX0 | 31 | 20.3 | 42.5 |
| 0X0 | 25 | 16.3 | 58.8 |
| XXX | 23 | 15.0 | 73.9 |
| 00X | 19 | 12.4 | 86.3 |
| 0XX | 12 | 7.8 | 94.1 |
| X0X | 9 | 5.9 | 100.0 |
| Total | 153 | 100.0 | |

Table 5: Means and Standard Deviations for H2 Study Variables

| Clinic | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Workload T0 | 2.99 | 2.79 | 3.14 | 3.62 | 2.90 | 2.80 | 3.00 | 3.05 |
| | .825 | .924 | 1.01 | .781 | .788 | .830 | .879 | .801 |
| Control | 3.11 | 3.03 | 3.06 | 3.32 | 3.05 | 2.90 | 3.52 | 3.20 |
| | .856 | .626 | .855 | .758 | .904 | .932 | .757 | .820 |
| Values | 3.76 | 3.69 | 3.82 | 3.93 | 3.88 | 3.63 | 4.05 | 3.67 |
| | .606 | .547 | .533 | .499 | .482 | .647 | .464 | .597 |
| Fairness | 3.17 | 3.00 | 2.93 | 3.17 | 3.04 | 2.77 | 3.56 | 2.97 |
| | .770 | .707 | .683 | .676 | .797 | .734 | .564 | .712 |
| Rewards | 3.33 | 3.14 | 3.03 | 3.21 | 3.30 | 2.90 | 3.55 | 3.31 |
| | .859 | .916 | .997 | .785 | 1.01 | .866 | .723 | .830 |
| Community | 3.57 | 3.62 | 3.43 | 3.66 | 3.39 | 3.54 | 3.78 | 3.72 |
| | .737 | .569 | .780 | .812 | .794 | .731 | .572 | .715 |
| EE | 32.44 | 28.75 | 24.60 | 31.50 | 31.33 | 37.67 | 31.60 | 31.58 |
| | 11.68 | 15.04 | 6.11 | 11.74 | 10.29 | 12.73 | 10.41 | 16.08 |
| DEP | 11.56 | 9.44 | 7.80 | 10.83 | 10.17 | 12.11 | 10.60 | 10.12 |
| | 4.12 | 6.60 | 3.11 | 6.62 | 6.40 | 5.75 | 5.68 | 7.01 |
| SE | 50.56 | 44.19 | 50.80 | 49.58 | 51.33 | 50.00 | 47.00 | 48.50 |
| | 4.77 | 17.60 | 4.66 | 6.96 | 2.88 | 3.64 | 5.96 | 11.10 |
| Workload T1 | 3.30 | 3.21 | 3.42 | 3.29 | 2.69 | 2.77 | 2.64 | 3.04 |
| | .722 | .960 | .875 | .643 | .907 | .853 | 1.14 | .698 |
| Control | 3.19 | 2.80 | 3.27 | 3.34 | 2.87 | 2.98 | 3.17 | 3.19 |
| | .864 | .820 | .822 | .820 | .990 | .988 | .842 | .741 |
| Values | 3.85 | 3.63 | 3.77 | 3.95 | 3.13 | 3.04 | 3.15 | 3.05 |
| | .556 | .369 | .629 | .521 | .299 | .307 | .331 | .274 |
| Fairness | 3.38 | 2.93 | 3.09 | 3.26 | 2.82 | 2.76 | 2.90 | 2.83 |
| | .665 | .553 | .555 | .638 | .349 | .402 | .339 | .335 |
| Rewards | 3.61 | 2.95 | 3.40 | 3.25 | 3.14 | 3.15 | 3.28 | 3.31 |
| | .795 | .979 | .705 | .785 | .850 | .824 | .861 | .737 |
| Community | 3.64 | 3.67 | 3.76 | 3.79 | 3.46 | 3.54 | 3.59 | 3.68 |
| | .681 | .864 | .581 | .716 | .873 | .731 | .724 | .742 |
| EE | 20.56 | 27.63 | 18.6 | 32.46 | 28.33 | 28.67 | 34.17 | 30.76 |
| | 14.69 | 20.44 | 11.26 | 15.96 | 3.31 | 12.75 | 19.53 | 8.08 |
| DEP | 8.00 | 6.63 | 5.40 | 11.18 | 24.50 | 20.94 | 19.83 | 23.43 |
| | 6.84 | 5.15 | 3.29 | 8.27 | 1.05 | 7.88 | 9.75 | 1.69 |
| SE | 43.75 | 38.34 | 41.20 | 46.00 | 30.17 | 28.28 | 28.83 | 30.95 |
| | 21.80 | 23.93 | 23.39 | 16.49 | 2.99 | 11.32 | 14.99 | 3.99 |
| Workload T2 | 2.98 | 2.77 | 2.88 | 2.82 | 2.79 | 2.62 | 2.56 | 2.44 |
| | .926 | 1.16 | .986 | .854 | .862 | 1.11 | .910 | .782 |
| Control | 3.28 | 3.18 | 3.00 | 3.29 | 3.28 | 3.02 | 3.05 | 2.84 |
| | .883 | .745 | .914 | .851 | .764 | .878 | .854 | .915 |
| Values | 3.89 | 3.63 | 3.64 | 3.76 | 3.69 | 3.80 | 3.61 | 3.73 |
| | .605 | .788 | .862 | .724 | .742 | .439 | .714 | .744 |
| Fairness | 3.02 | 2.69 | 2.60 | 2.91 | 2.84 | 2.82 | 2.51 | 2.47 |
| | .900 | .849 | .971 | .951 | .874 | 1.02 | .811 | .980 |
| Rewards | 2.89 | 2.89 | 2.70 | 3.71 | 2.93 | 2.98 | 2.57 | 2.66 |
| | 1.04 | 1.01 | 1.16 | 1.11 | 1.08 | .983 | .972 | 1.04 |
| Community | 3.74 | 2.94 | 3.88 | 3.86 | 3.66 | 3.34 | 3.40 | 3.55 |
| | .824 | .931 | .975 | .766 | .862 | 1.09 | .864 | .907 |
| EE | 19.00 | 26.33 | 48.00 | 35.75 | 30.84 | 52.00 | 40.08 | 34.33 |
| | 1.41 | 5.13 | 0 | 11.87 | 11.04 | 10.36 | 13.80 | 10.14 |
| DEP | 7.00 | 10.00 | 6.00 | 11.7 | 12.42 | 22.00 | 14.00 | 10.00 |
| | 2.83 | 6.25 | 0 | 3.30 | 6.62 | 10.55 | .673 | 4.56 |
| SE | 52.00 | 53.33 | 50.00 | 50.5 | 50.89 | 40.25 | 50.38 | 48.75 |
| | 4.24 | 1.15 | 0 | 3.11 | 4.26 | 6.40 | 4.54 | 3.77 |

Table 6: ANOVA of Key Study Variables

| | Workload | Control | Values | Fairness | Rewards | Community | EE | DEP | SE |
|--------------------------------|----------------|----------------|----------------|----------------|----------------|-----------|----------------|-----------------|-----------------|
| Time (2 d.f.) | n.s. | n.s. | F=6.45, p=0.00 | F=4.42, p=0.01 | F=6.66, p=0.00 | n.s. | F=3.30, p=0.04 | F=17.30, p=0.00 | F=36.13, p=0.00 |
| Clinic (7 d.f.) | F=2.65, p=0.01 | F=2.61, p=0.01 | F=3.80, p=0.00 | F=4.79, p=0.00 | F=2.07, p=0.05 | n.s. | n.s. | n.s. | n.s. |
| Team Care (1 d.f.) | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |
| Team Care*Time (1 d.f.) | n.s. | n.s. | n.s. | F=7.55, p=0.01 | n.s. | n.s. | n.s. | n.s. | n.s. |
| Clinic*Time (1 d.f.) | n.s. | n.s. | n.s. | F=4.72, p=0.03 | n.s. | n.s. | n.s. | n.s. | n.s. |
| Time*Clinic*Team Care (1 d.f.) | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. | n.s. |

Table 7: Team Care and Burnout

| | Odds Ratio | Standard Error | z | P>z | 95% Confidence Interval |
|-----------|------------|----------------|-------|-------|-------------------------|
| Team Care | 4.554 | 7.149 | 0.97 | 0.334 | 0.210 – 98.763 |
| Time | 5.004 | 3.910 | 2.06 | 0.039 | 1.082 – 23.147 |
| TC*Time | 0.115 | 0.116 | -2.14 | 0.032 | 0.016 – 0.831 |
| ICC | 0.572 | | | | |

Table 8: Estimates for Within Respondent association in Random effects (at median)

| Measure | Estimate | 95% CI |
|----------------------|----------|----------------|
| Marginal Probability | 0.880 | 0.726 – 0.947 |
| Joint Probability | 0.809 | 0.664 – 0.899 |
| Odds Ratio | 7.576 | 1.981 – 32.210 |
| Pearson Correlation | 0.320 | 0.450 – 0.687 |
| Yule's Q | 0.767 | 0.329 – 0.946 |

Table 9: Odds Ratio for burnout, given Comparison Group over Time

| | Baseline | Time 1 (12 weeks) | Time 2 (6 Months) |
|---------------------------------|----------|-------------------|-------------------|
| Odds Ratio for Comparison Group | (n.s.) | 16.59 (p=0.007) | 144.27 (p=0.008) |

Table 10: Team Care Association with burnout based on Emotional Exhaustion Starting Values

| | Odds Ratio | Standard Error | z | P>z | 95% Confidence Interval |
|------------|------------|----------------|-------|-------|-------------------------|
| Team Care | 0.402 | 0.495 | -0.74 | 0.459 | |
| Time | 23.211 | 30.230 | 2.41 | 0.016 | 1.807-298.055 |
| TC*Time | 0.999 | 0.133 | -1.73 | 0.083 | |
| Start-High | 183.019 | 402.365 | 2.37 | 0.018 | 2.461 – 13609.85 |
| ICC | 0.666 | | | | |

Table 11: Team Care Association with burnout based on Emotional Exhaustion Starting Values

| | Odds Ratio | Standard Error | z | P>z | 95% Confidence Interval |
|-----------|------------|----------------|-------|-------|-------------------------|
| Team Care | 0.647 | 0.512 | -0.55 | 0.582 | |
| Time | 2.959 | 2.046 | 1.57 | 0.117 | |
| TC*Time | 0.143 | 0.134 | -2.09 | 0.037 | 0.023 – 0.889 |
| EE-Low | 0.019 | 0.027 | -2.74 | 0.006 | 0.001 – 0.321 |
| ICC | 0.381 | | | | |

Table 12: Model Total Effects

| MBI Dimension | | Total Effect | P>z |
|----------------------|----------------------|--------------|------|
| Emotional Exhaustion | Workload | -1.29 | 0.00 |
| | Reward | n.s. | 0.38 |
| | Community | -0.11 | 0.01 |
| | Fairness | -0.27 | 0.00 |
| | Values | -0.61 | 0.00 |
| | Control | -1.10 | 0.00 |
| Depersonalization | Workload | -0.26 | 0.00 |
| | Reward | n.s. | 0.38 |
| | Community | -0.05 | 0.01 |
| | Fairness | -0.13 | 0.00 |
| | Values | -0.29 | 0.00 |
| | Control | -0.31 | 0.00 |
| Self-Efficacy | Emotional Exhaustion | 0.20 | 0.00 |
| | Workload | 0.06 | 0.00 |
| | Reward | n.s. | 0.38 |
| | Community | 0.04 | 0.01 |
| | Fairness | 0.09 | 0.00 |
| | Values | -0.20 | 0.00 |
| | Control | 0.14 | 0.00 |
| | Emotional Exhaustion | -0.04 | 0.00 |
| Depersonalization | -0.22 | 0.00 | |

Table 13: Chi-Squared Difference from adding Team Care to H2 model

| | H2 Model | H2 Model with Team Care |
|-------------------|----------|-------------------------|
| $\chi^2(18)$ | 154.67 | |
| $\chi^2(25)$ | | 172.98 |
| $\Delta\chi^2(7)$ | | 18.31, p=0.01 |

Table 14: Team Care Association with Workload

| | Coefficient | Standard Error | z | P>z | 95% Confidence Interval |
|-----------|-------------|----------------|-------|-------|-------------------------|
| Team Care | 0.111 | 0.153 | 0.73 | 0.467 | |
| Time | -0.138 | 0.064 | -2.14 | 0.032 | -0.264 – -0.012 |
| TC*Time | 0.220 | 0.111 | 1.98 | 0.047 | 0.003 – 0.437 |
| ICC | 0.584 | | | | |

Table 15: Team Care Association with Control

| | Coefficient | Standard Error | z | P>z | 95% Confidence Interval |
|-----------|-------------|----------------|-------|-------|-------------------------|
| Team Care | -2.132 | 2.512 | -0.85 | 0.396 | |
| Time | 1.504 | 1.049 | 1.43 | 0.152 | |
| TC*Time | -3.165 | 1.867 | 17.82 | 0.090 | |
| ICC | 0.602 | | | | |

Table 16: Burnout Trajectory Results – Emotional Exhaustion

| | Coefficient | Standard Error | z | P>z | 95% Confidence Interval |
|----------------------|-------------|----------------|-------|-------|-------------------------|
| Emotional Exhaustion | | | | | |
| Constant | 33.143 | 1.647 | 20.13 | 0.000 | 29.915 – 36.370 |
| Time | -7.327 | 2.626 | -2.79 | 0.005 | -12.474 - -2.179 |
| Time ² | 4.206 | 1.332 | 3.16 | 0.002 | 1.595 – 6.818 |
| Team Care | -3.993 | | -1.91 | 0.056 | |
| ICC | 0.608 | | | | |

Table 17: Burnout Trajectory Results - Depersonalization

| | Coefficient | Standard Error | z | P>z | 95% Confidence Interval |
|-------------------|-------------|----------------|-------|-------|-------------------------|
| Depersonalization | | | | | |
| Constant | 13.816 | 0.873 | 15.82 | 0.000 | 12.104 – 15.527 |
| Time | 10.489 | 1.767 | 5.94 | 0.000 | 7.027-13.952 |
| Time ² | -5.284 | 0.892 | -5.93 | 0.000 | -7.031 - -3.536 |
| Team Care | -6.339 | 0.993 | -6.38 | 0.000 | -8.285 - -4.392 |
| ICC | 0.466 | | | | |

Table 18: Burnout Trajectory Results – Self-Efficacy

| | Coefficient | Standard Error | z | P>z | 95% Confidence Interval |
|-------------------|-------------|----------------|-------|-------|-------------------------|
| Self-Efficacy | | | | | |
| Constant | 45.662 | 1.492 | 30.61 | 0.000 | 42.738 – 48.585 |
| Time | -26.414 | 2.943 | -8.97 | 0.000 | -32.183 - -20.645 |
| Time ² | 14.032 | 1.493 | 9.40 | 0.000 | 11.106 – 16.959 |
| Team Care | 5.425 | 1.724 | 3.15 | 0.002 | 2.046 – 8.804 |
| ICC | 0.552 | | | | |

Table 19: Comparison of Organizational Changes from the literature

| | Team Care (n=153) | Group Health (Reid et al, 2010) (n=48) | Legacy Health (Dunn et al, 2007) (n=32) |
|----------------------|----------------------|--|---|
| Emotional Exhaustion | -2.1, p=0.05 | -12.2, p=0.01 | -6, p=0.002 |
| Depersonalization | -4.2, p=0.00 | -2.4, p=0.03 | n.s. |
| Self-Efficacy | 4.9, p=0.05 | n.s. | n.s. |

Table 20: Comparison of Team Care and Dunford et al (2012) Trajectory Results

| | Team Care (n=153) | | | Dunford et al (2012) (n=4104) | | |
|-----------|----------------------|-------------------|---------------|-------------------------------------|-------------------|---------------|
| | Emotional Exhaustion | Depersonalization | Self-Efficacy | Emotional Exhaustion | Depersonalization | Self-Efficacy |
| Intercept | + | + | + | + | + | + |
| Linear | - | + | - | + | + | - |
| Quadratic | + | - | + | - | + | - |