TELEHEALTH AND OCCUPATIONAL WELL-BEING AMONG FAMILY PHYSICIANS: A STRUCTURAL EQUATION MODEL OF PLEASURE, ENGAGEMENT, AND MEANING

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Abstract

Telehealth has become a routine feature of Canadian primary care, yet its implications for the physicians who deliver it remain underexamined. Drawing on Well-Being Theory and the Job Demands–Resources model, this thesis examines how telehealth usage relates to family physicians' pleasure, engagement, and meaning at work through five mechanisms: work autonomy, technological strain, cognitive overload, relational depth, and interpersonal connection. A cross-sectional survey of 190 Canadian family physicians was analyzed using structural equation modelling. The hypothesized model was rejected, but three of the six indirect effects were supported. Higher telehealth use was associated with lower well-being through greater digital encroachment and exhaustion and through reduced relational depth, which operated as a broad resource across all three well-being dimensions. Implications for the organization of virtual primary care are discussed.

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Finally, I dedicate this thesis to the memory of my grandfather, Ram Deo, who gave me the same advice every time we spoke: keep going.

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Introduction

The practice of medicine has historically been grounded in in-person interactions between physicians and patients. Traditional clinical encounters rely on spoken communication, physical examination, and non-verbal cues, not only for accurate diagnosis, but also for the trust on which the therapeutic relationship depends (Roter & Hall, 2006; Armas et al., 2018). The digital transformation of healthcare, however, has begun to reshape how care is delivered (Morilla et al., 2017). Telehealth has emerged as a key driver of this transformation, enabling physicians to diagnose, treat, and monitor patients through digital platforms (Doraiswamy et al., 2020). Once considered a supplementary form of care, telehealth has become a mainstream component of healthcare delivery, driven by systemic pressures including physician shortages and increasing patient demand (Mahtta et al., 2021). The onset of COVID-19 further accelerated its adoption, prompting rapid and widespread integration across diverse healthcare settings (Greenhalgh et al., 2020).

Although the clinical effectiveness and accessibility benefits of telehealth are well-documented, its impact on family physicians remains underexplored. Family physicians serve as the first point of contact in primary care and build long-term relationships with patients through ongoing, comprehensive care (Hiefner et al., 2022). Many are drawn to the profession because of these enduring relationships, which allow them to support patients across life stages and evolving health concerns (Osborn et al., 2017). Yet the shift to telehealth has reconfigured core aspects of family physicians' practice, from how they interact with patients to how they structure their work and make clinical decisions (Golan-Cohen et al., 2023). These changes have important implications for family physicians' well-being and the future of primary care.

As telehealth becomes a routine feature of primary care, its implications extend beyond clinical efficacy to the well-being of those delivering it. Most prior research treats telehealth usage as a binary or aggregate measure (see Mandal et al., 2024). This study instead measures usage along three dimensions, frequency of use, mode of delivery, and clinical purpose, because different forms of virtual care plausibly reshape physicians' work in different ways. Drawing on Well-Being Theory and the Job Demands–Resources model, the study examines how telehealth usage relates to family physicians' pleasure, engagement, and meaning at work through five mechanisms: work autonomy, technological strain, cognitive overload, relational depth, and interpersonal connection.

Literature review

Telehealth and Work Transformation

Telehealth is not only a way of delivering care but a reorganization of how physicians work. That work now spans synchronous video and telephone consultations, asynchronous messaging within electronic health records (EHRs), and remote patient monitoring (Bashshur et al., 2016). A substantial body of research has examined these modalities, most of it asking what they do for the people receiving care (Doraiswamy et al., 2020). The answers largely favour telehealth. It expands access for rural and underserved populations (Dorsey & Topol, 2016), shortens wait times (Caffery et al., 2016), reduces travel-related barriers (Dullet et al., 2017), and spares patients the time and costs of attending in person (Snoswell et al., 2020). Yet not everyone shares in these gains. Some patients lack the reliable technology or private space the format requires, and diagnostic accuracy can suffer when physicians cannot examine the patient directly (Houser et al., 2023). For physicians, and especially family physicians, the trade-offs are more complex.

Telehealth enhances workflow efficiency (Green et al., 2022), reduces administrative burdens (Haleem et al., 2021), and allows for more flexible work arrangements (Hoff & Lee, 2022), granting physicians greater control over their schedules and work environments. These benefits have positioned telehealth as a promising tool for improving both patient care and physician quality of work life. However, telehealth also introduces new challenges that may affect physicians' work experiences. The first set of challenges is cognitive. The shift from in-person to virtual care has restructured cognitive demands, requiring physicians to navigate multiple digital systems, switching between EHRs, telehealth platforms, and clinical documentation (Alkureishi et al., 2021). This digital multitasking contributes to mental strain and diminished concentration, a phenomenon described in adjacent literatures as cognitive overload (Wajcman & Rose, 2011). Research on remote work and technology use suggests that such fragmented workflows erode task focus and increase exhaustion (Golden, 2009). In addition to these cognitive burdens, some family physicians report that telehealth consultations feel more transactional and depersonalized, reducing opportunities for informal rapport and weakening relational connection (Gordon et al., 2020). Virtual interactions often lack continuity, as patients may consult different providers based on scheduling availability, which reduces the sense of long-term relational meaning that traditionally anchors family practice (Hawe et al., 2023).

While the effects of remote work have been widely studied in other sectors, including knowledge work (Gilson et al., 2015), education (Bond, 2020), legal practice (Susskind, 2023), and therapy (Simpson et al., 2021), fewer studies have examined the work experiences of family physicians delivering telehealth. Telehealth is not remote work in the conventional sense since many physicians deliver virtual care from their clinics. Nevertheless, what it shares with these settings is that the core professional interaction becomes mediated by technology.

Telehealth Adoption in the Canadian Context

Although telehealth is a global phenomenon, its trajectory in Canada has been distinctive. Prior to 2020, virtual care in Canada was a marginal and largely specialized activity (Bhatia et al., 2021). Provincial telemedicine programs, most prominently the Ontario Telemedicine Network, were designed primarily to connect patients in rural, remote, and underserved communities to providers, often through designated host sites (Brown, 2013; Kfrerer et al., 2024). Regulatory, remuneration, and licensing structures reinforced this narrow scope. In most provinces, physicians could not routinely bill for virtual encounters with their own patients, and fewer than one percent of family physician services were delivered virtually through early 2020 (Kfrerer et al., 2024; Mangalamoorthy et al., 2023).

The COVID-19 pandemic dissolved these constraints almost overnight. In March 2020, provincial governments introduced temporary billing codes that allowed physicians to be remunerated for telephone and video visits, in most cases at parity with in-person care (Canadian Institute for Health Information [CIHI], 2022; Glazier et al., 2021). The resulting shift was abrupt and historically unprecedented. In Ontario, virtual encounters rose from approximately one percent of primary care visits before the pandemic to more than seventy percent of visits in the first months of the pandemic (Bhatia et al., 2021; Glazier et al., 2021). Nationally, physicians delivered roughly one third of all services virtually during the first pandemic year, with family physicians showing the highest uptake of any specialty at forty-two percent of their services (CIHI, 2022). Unlike most workplace technology transitions, which unfold gradually and allow for training, workflow redesign, and self-selection, Canadian family physicians adopted virtual care en masse, involuntarily, and with little preparation, a feature of the Canadian case that bears directly on how the demands and resources examined in this thesis were formed.

A second distinctive feature of Canadian adoption is the modality that came to dominate it. In contrast to the United States, where video became the leading virtual format (Lee et al., 2023), the majority of Canadian virtual visits during and after the pandemic were conducted by telephone (Canada Health Infoway, 2022; Canadian Medical Association [CMA], 2022b). Telephone visits strip away visual and contextual cues entirely rather than merely attenuating them, and they impose different cognitive and relational conditions than video encounters (Daft & Lengel, 1986; Hammersley et al., 2019). This heterogeneity is one reason the present study resists treating telehealth usage as a binary or aggregate construct and instead measures it across frequency of use, mode of delivery, and clinical purpose. A physician conducting brief telephone prescription renewals and one conducting video-based chronic disease management are both "using telehealth," yet are plausibly having very different psychological experiences of it.

Following the acute phase of the pandemic, virtual care in Canada settled into a substantial but contested equilibrium. National tracking indicated that virtual modalities fell from a peak of roughly sixty percent of visits in April 2020 to around forty percent by 2021, and have continued to decline gradually while remaining far above pre-pandemic levels (CIHI, 2024; CMA, 2022b). Provinces began converting temporary pandemic codes into permanent fee structures, frequently with conditions attached (Fierlbeck & Wyonch, 2025; Kfrerer et al., 2024). Ontario's 2022 Physician Services Agreement, for example, introduced differentiated compensation that pays comprehensive virtual care within an existing patient–physician relationship at parity while discounting one-off virtual encounters, a structure explicitly designed to discourage episodic "virtual walk-in" care and protect relational continuity (Ontario Ministry of Health, 2022). These decisions suggest that Canadian health systems themselves treat relational continuity as an asset at risk in virtual care.

Finally, Canada's family physician workforce is already in crisis, which raises the stakes of how physicians fare under virtual care. More than one in five Canadians lack regular access to a family physician (Duong & Vogel, 2023), and access continues to deteriorate as physicians retire (Premji et al., 2023), reduce clinical hours (CMA, 2022a), or exit comprehensive practice (Ansari et al., 2025). Physician well-being is an established driver of both retention and care quality (Shanafelt et al., 2017). If telehealth is to remain a permanent, high-volume feature of Canadian primary care, as all current evidence suggests it will, then understanding its psychological consequences for the physicians delivering it is a precondition for designing virtual care models that retain rather than deplete the workforce.

The Well-Being Stakes of Virtual Primary Care

The evidence on physician well-being to date comes largely from research on burnout (e.g., Shanafelt et al., 2017; West et al., 2018), which is a syndrome of emotional exhaustion, depersonalization or cynicism, and diminished personal accomplishment that develops when job demands chronically outstrip the resources available to meet them (Maslach & Jackson, 1981; Maslach et al., 2001). Physicians are consistently identified as an occupational group at elevated risk, with excessive workload and time pressure the leading predictors (West et al., 2018). A growing body of work, however, implicates the digital infrastructure of modern practice specifically. Arndt and colleagues (2017) found that primary care physicians spend on the order of half of their working time interacting with the EHRs, with substantial documentation completed outside clinical hours. Physicians who report high health information technology–related stress, in turn, show markedly higher odds of burnout (Gardner et al., 2019). This literature establishes that the demands theorized in the present model, technological strain and cognitive overload, are well-documented correlates of physician distress, even before telehealth multiplied the number of systems a physician must navigate within a single encounter.

Family physicians occupy a particularly exposed position within this picture. Comparative studies place family medicine among the specialties with the highest burnout prevalence (Shanafelt et al., 2015). Several structural features of the role account for this. Family physicians carry rosters that often exceed a thousand patients, and their responsibility for each one never concludes (College of Family Physicians of Canada, 2025). They are also the first stop for problems. Demand reaches them unfiltered and cannot be declined, whereas specialists see only referred and pre-filtered cases (Starfield et al., 2005). Patient portals and asynchronous messaging have added a continuous electronic inbox of questions, results, and prescription renewal requests, answered largely between and after appointments (Adler-Milstein et al., 2020; Nath et al., 2021). At the same time, the family medicine literature emphasizes that the same longitudinal structure is the role's principal source of reward. Continuity relationships are among the most frequently cited reasons physicians choose and remain in family practice (Osborn et al., 2017). This duality, the relationship as both the load-bearing demand and the central resource, is precisely why a technology that reorganizes the patient encounter warrants scrutiny in this population.

Canadian evidence indicates that these risks are not abstract. The Canadian Medical Association's National Physician Health Survey documented a near doubling of high burnout among physicians, from roughly three in ten respondents in 2017 to fifty-three percent in 2021, alongside a forty-eight percent positive depression screen, seventy-nine percent reporting low professional fulfillment, and nearly half of respondents considering reducing their clinical work within two years (CMA, 2022a). Subsequent waves show only partial recovery, with high burnout remaining well above pre-pandemic baselines (CMA, 2025). While the pandemic context confounds any attribution of these trends to virtual care itself, the period of peak deterioration coincides exactly with the period in which family physicians' work became substantially virtual, underscoring the need for research, such as the present study, that isolates the work-design mechanisms through which telehealth relates to well-being.

The consequences of physician burnout extend well beyond the individual. For patients, meta-analytic evidence links burnout to lower quality of care, reduced satisfaction, and elevated risk of safety incidents (Hodkinson et al., 2022). For the system, it drives turnover intentions and reductions in clinical hours that translate directly into lost capacity (Shanafelt et al., 2017). In the Canadian primary care context described above, where millions of patients already have no family physician, even marginal burnout-driven attrition among family physicians compounds the access crisis.

What this literature says little about is the positive experience of the work itself. No study has asked how virtual care relates to the pleasure, engagement, and meaning family physicians find in practice, even though these experiences are a principal reason physicians are drawn to and stay in the specialty (Osborn et al., 2017). That is the question the present study takes up.

Theoretical Foundation

Early psychological research on well-being primarily focused on dysfunction and prioritized the reduction of negative states rather than the cultivation of positive ones (Maddux, 2008). Seligman's (1972) research on learned helplessness contributed to this perspective by demonstrating how individuals develop passivity and disengagement when they perceive a lack of control over their environment. While influential in understanding psychological distress, this deficit-based model provided limited insight into what enables individuals to thrive in their work and personal lives.

Recognizing this gap, Seligman and Csikszentmihalyi (2000) introduced Positive Psychology Theory, shifting attention toward the role of positive experiences and intrinsic motivation. This perspective asserted that well-being is not merely the absence of distress but the presence of fulfilling and meaningful experiences. Building on these insights, Schueller and Seligman (2010) developed Well-Being Theory, which conceptualizes well-being as a multidimensional construct comprising pleasure (positive affect and enjoyment), engagement (deep psychological involvement in one's work), and meaning (a sense of purpose and value derived from one's role). These three dimensions function as independent yet interrelated contributors to both subjective well-being and long-term professional fulfillment. In occupational research, this framework has been widely applied to assess how different work conditions foster or hinder these aspects of well-being (e.g., Li et al., 2021; Proyer et al., 2012). Consistent with this approach, the present study models pleasure, engagement, and meaning as distinct psychological outcomes and asks how telehealth relates to each.

Seligman (2011) later expanded Well-Being Theory into the PERMA model, adding positive relationships and accomplishment as fourth and fifth dimensions of flourishing. This study retains the original three-dimension version for two reasons. First, relationships already have a place in this study's model, but as an explanatory mechanism rather than an outcome. Relational depth and interpersonal connection are theorized as the channels that carry telehealth's effects, not as forms of well-being in their own right. Adopting PERMA would place relationships on both sides of the model at once, as cause and as outcome, and the mediational logic of the study depends on keeping those roles separate. Second, the path model already links five mediators to three outcomes in a sample of 190 physicians. Adding further outcome dimensions would strain estimation without serving the research question, since accomplishment is not something telehealth is theorized to change.

In the context of family medicine, Well-Being Theory offers a particularly relevant lens for examining family physicians' work experiences. The elements of practice that physicians value most align closely with the theory's core dimensions, namely meaningful relationships with patients (Osborn et al., 2017), cognitive stimulation from clinical decision-making (Satish & Streufert, 2002), and moments of enjoyment and autonomy in daily work (Tyssen et al., 2013). As telehealth reshapes how these experiences unfold, this framework allows for an analysis of how virtual care may support or undermine key sources of well-being.

While Well-Being Theory specifies the outcomes that telehealth may shape, it does not explain why telehealth would shape them. To explain this, the study draws on the Job Demands–Resources model, which holds that the features of a job sort into demands, the aspects that require sustained effort and carry psychological or physiological costs, and resources, the aspects that help workers accomplish tasks, reduce demands, or support growth (Demerouti et al., 2001). Demands and resources operate through distinct processes (Demerouti et al., 2001; Schaufeli & Bakker, 2004). Sustained demands deplete workers' energy and gradually erode their health, a pathway the model terms the *health-impairment process*. Resources, by contrast, supply the motivation and engagement that sustain well-being, a pathway it terms the *motivational process*. The mediators in this study correspond to this distinction. Work autonomy, relational depth, and interpersonal connection act as resources, whereas technological strain and cognitive overload act as demands. The present study proposes that telehealth alters both at once, expanding certain resources while introducing new demands. Where telehealth strengthens a resource such as autonomy, well-being should rise through the motivational process; where it raises demands such as technological strain and cognitive overload, well-being should fall through the health-impairment process. Combining the Job Demands–Resources model, which differentiates the mediators, with Well-Being Theory, which specifies the pleasure, engagement, and meaning they produce, grounds the hypotheses in a shared dual-process account.

The Job Demands–Resources model is not the only framework that links features of work to worker well-being. The most established alternative, the Job Characteristics Model (Hackman & Oldham, 1976), identifies five task attributes, namely skill variety, task identity, task significance, autonomy, and feedback, that foster internal work motivation. The model was not adopted here because it is exclusively motivational. It explains how well-designed work lifts workers up, but it does not explain how features of work wear workers down. Half of the present theorizing concerns exactly that, since technological strain and cognitive overload are expected to erode well-being. The Job Demands–Resources model supplies the missing pathway through its health-impairment process. Moreover, the Job Characteristics Model describes attributes of the task itself, whereas several constructs central to virtual care are not task attributes at all. Relational depth with patients, for example, arises from the physician–patient interaction rather than from the task. Because the Job Demands–Resources model accepts any demand or resource relevant to a given occupation (Demerouti et al., 2001), it accommodates the relational features of virtual care that the Job Characteristics Model cannot.

Pleasure

In Schueller and Seligman's (2010) Well-Being Theory, pleasure refers to the experience of positive affect, enjoyment, and stress reduction in one's work (see Table 1). For family physicians, pleasurable work experiences are often associated with the ability to exercise clinical autonomy, namely control over decision-making, scheduling, and care delivery (Weber, 2012). Telehealth has reshaped the conditions under which such autonomy is exercised. On one hand, virtual care offers physicians increased control over how and when they engage with patients, including more flexible scheduling, fewer workplace interruptions, and reduced commuting time (Gajarawala & Pelkowski, 2021; Hollander & Carr, 2020). Research on remote and hybrid work settings suggests that this kind of autonomy enhances momentary work enjoyment and alleviates stress, particularly when workers retain discretion over their workflow (Golden et al., 2008; Parker et al., 2021).

At the same time, these affective benefits may be undermined by emerging digital stressors. Physicians often encounter slow, disjointed systems and unreliable connectivity, issues that contribute to technological strain, especially during patient care interactions (Brooks et al., 2013; Hudgins et al., 2024). Compounding these frustrations is cognitive overload, as physicians are required to juggle multiple digital systems simultaneously, often under time pressure. This overload may produce emotional fatigue and a diminished sense of enjoyment, even in otherwise routine clinical encounters (Wajcman & Rose, 2011).

Together, these forces describe a dual process. Telehealth expands a key job resource, work autonomy, while also introducing job demands in the form of technological strain and cognitive overload. The resource pathway is expected to raise work-related pleasure, and the demand pathway to lower it. Therefore, this study proposes:

Hypothesis 1a (H1a): Telehealth usage is positively associated with the pleasure experienced by family physicians, such that greater perceived work autonomy mediates this relationship.

Hypothesis 1b (H1b): Telehealth usage is negatively associated with family physicians' experience of pleasure, such that higher technological strain and cognitive overload mediate this relationship.

Engagement

Engagement refers to the psychological state of being energetically, emotionally, and cognitively invested in one's work (Schaufeli et al., 2006). It comprises three key dimensions, vigour (sustained energy and persistence), dedication (a sense of significance and enthusiasm), and absorption (deep immersion in work tasks). These dimensions are essential for sustaining motivation and performance in cognitively demanding occupations such as medicine (Shanafelt et al., 2017).

In traditional family medicine, engagement is often fostered through face-to-face patient interactions, collaborative decision-making, and varied task content, all of which promote relational connection and cognitive stimulation (Silverman et al., 2013). The shift to telehealth, however, may alter the structure of clinical work in ways that may impede these engagement-supportive conditions. Physicians frequently toggle between video interfaces, EHRs, and digital intake forms, often within tight time constraints (Alkureishi et al., 2021). This fragmented digital environment gives rise to cognitive overload, a state of mental strain that impairs focus and undermines the flow state critical to deep engagement (Breton et al., 2021; Luebstorf et al., 2023). In addition, virtual consultations limit non-verbal communication and interpersonal warmth, which may reduce emotional investment and enthusiasm (Shanafelt et al., 2017). The result is a depletion of vigour and diminished capacity to sustain attention and motivation throughout the workday.

Taken together, these factors suggest that telehealth may hinder engagement such that increased cognitive overload reduces family physicians' ability to concentrate, persist, and immerse themselves in their clinical work. Accordingly, I hypothesize:

Hypothesis 2 (H2): Telehealth usage is negatively associated with family physicians' engagement, such that increased cognitive overload mediates this relationship.

Meaning

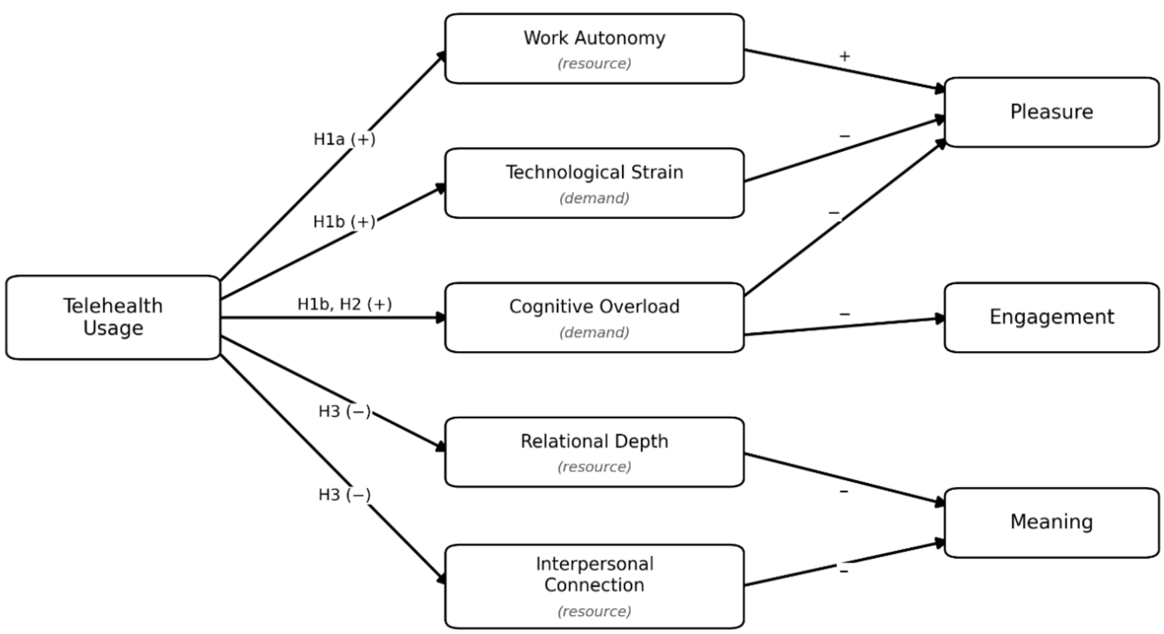
Meaning refers to the perception that one's work is significant, purposeful, and contributes to something larger than the self (Allan et al., 2019). Within the context of family medicine, sustained relationships with patients are a key source of meaning, as they allow physicians to witness the progression of patients' lives and build trust over time (Osborn et al., 2017). The introduction of telehealth may disrupt this relational source of meaning. Virtual consultations often lack key elements that foster emotional connection, including non-verbal cues, shared physical space, and spontaneous interpersonal moments. These limitations can impair the formation of mutual understanding and weaken the perceived interpersonal connection between physicians and patients (Henry et al., 2017; Breton et al., 2021). Beyond this everyday rapport, the same constraints may reduce relational depth, namely, the experience of moments of profound contact and engagement in which each party is fully present to the other and understood at more than a surface level (Mearns & Cooper, 2005). In caring professions, such moments anchor practitioners' sense that their relational work matters (Di Malta et al., 2020).

The erosion of both relational depth and interpersonal connection may challenge physicians' ability to construct meaning from their work, such that diminished relational depth and interpersonal connection reduce family physicians' sense of meaning. Similar patterns have been observed in other relationally intensive professions, such as palliative care and social work, where virtual delivery formats have been associated with reduced moral fulfilment and diminished perceived impact (Kirby et al., 2025; Pascoe, 2022). While other meaning sources, such as competence or contribution to public health, may persist, the weakening of interpersonal bonds remains a salient threat to meaningfulness in telehealth settings. Accordingly, I propose:

Hypothesis 3 (H3): Telehealth usage is negatively associated with family physicians' sense of meaning, such that lower relational depth and diminished interpersonal connection mediate this relationship.

The full hypothesized model is shown in Figure 1.

Figure 1
Conceptual Model of the Hypothesized Relationships Among Telehealth Usage, Mediating Mechanisms, and Well-Being Outcomes



Note. Arrows indicate hypothesized relationships. A plus sign (+) represents a positive association (e.g., telehealth usage is expected to increase cognitive overload), while a minus sign (–) represents a negative association (e.g., cognitive overload is expected to decrease engagement).

Table 1

Key Theoretical Constructs and Definitions

Construct	Definition
Pleasure	The experience of enjoyment, positive affect, or reduced stress during work activities (Schueller & Seligman, 2010).
Engagement	A motivational state marked by energy, concentration, and psychological involvement in work tasks (Schaufeli et al., 2006).
Meaning	The perception that one's work is purposeful, significant, and contributes to a broader social good (Steger et al., 2012).
Work Autonomy	The degree of control individuals perceive over their scheduling, decision-making, and task execution (Weber, 2012; Parker et al., 2021).
Technological Strain	Psychological stress arising from the use of fragmented, unreliable, or inefficient digital systems (Brooks et al., 2013; Hudgins et al., 2024).
Cognitive Overload	A state of mental strain resulting from excessive multitasking or divided attention in digital environments (Wajcman & Rose, 2011; Alkureishi et al., 2021).
Relational Depth	The experience of moments of profound contact and engagement between physician and patient during clinical encounters (Mearns & Cooper, 2005; Di Malta et al., 2020).
Interpersonal Connection	The sense of emotional rapport, trust, and mutual understanding experienced during patient interactions (Henry et al., 2017; Gordon et al., 2020).

Note. Definitions reflect construct usage within the context of this study's theoretical model.

Contribution

As telehealth becomes a central component of healthcare delivery, its implications extend beyond clinical outcomes and into family physicians' daily work experiences. While prior research has focused on telehealth's role in improving access and patient outcomes (Snoswell et al., 2023), its psychological and motivational effects on the family physicians who deliver care remain underexamined. This study addresses that gap by identifying how telehealth use relates to family physicians' pleasure, engagement, and meaning at work.

This study also contributes to applied workforce research by examining a high-impact occupation currently facing critical talent shortages and rising burnout (Malko & Huckfeldt, 2017). This is especially salient within the Canadian context, where more than one in five Canadians lack regular access to a family physician (Duong & Vogel, 2023), and where family medicine is among the specialties least chosen by Canadian medical graduates (CBC News, 2024). By identifying how telehealth shapes core psychological experiences, this study offers actionable insight into how work can be redesigned to improve retention and, by protecting the experiences that make the work rewarding, bears on the specialty's ability to attract as well as retain physicians in an overburdened primary care system.

Finally, this study speaks to a broader transformation in professional work. Across fields such as mental health care, education, and social work, core tasks once conducted face to face are moving to virtual channels, reconfiguring the demands and resources that shape well-being at work. Family medicine is one such case, and what this study learns from family physicians may inform how it is understood in the other professions undergoing it.

Method

Research Design

This study used a cross-sectional, correlational survey design in which telehealth usage, the five mediating mechanisms, the three well-being outcomes, and the control variables were measured at a single point in time. The design suited the rapidly changing nature of telehealth adoption and the need for timely evidence on its occupational consequences. Given this design, the hypothesized direct and indirect relationships were tested as patterns of association rather than as experimentally manipulated effects (Spector, 2019). Reporting is guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional studies (von Elm et al., 2007), and causal language is avoided when interpreting the results.

Sample and Setting

The target population was practising family physicians in Canada with recent telehealth experience. Because the study concerns how variation in telehealth usage relates to well-being, recruitment sought the full range of usage rather than frequent users alone. Physicians were eligible if they held a licence to practice family medicine in Canada, were in active clinical practice, and had used telehealth at least once within the preceding twelve months, regardless of their current volume. Residents and other trainees not yet in independent practice and those who were retired were excluded. Participants were recruited through convenience sampling (Etikan et al., 2016). Invitations were distributed through provincial and territorial medical associations that agreed to circulate the study to their members through newsletters and social media and were supplemented by direct outreach to family medicine clinics identified across the provinces and contacted by email. The resulting sample spanned a range of geographic settings (urban, suburban, and rural) and practice structures (solo, group, hospital-affiliated, and interdisciplinary).

Data were collected through an online survey administered in Qualtrics between September 2025 and May 2026. The survey was started by 216 respondents, of whom 190 provided complete responses and formed the analytic sample. Of these, 22 were recruited through the association postings and the remaining 168 through direct outreach to clinics. Because the invitation was distributed through these channels rather than to a fixed list of identifiable recipients, the number of physicians who received it is unknown, and a response rate could not be computed. Sample characteristics are summarized in Table 2.

Table 2

Sample Characteristics (N = 190)

Characteristic	***n* (%)**
Age (years)	*M* = 35.7, *SD* = 9.7, range 24–66
Gender	
Male	82 (43.2)
Female	108 (56.8)
Years in practice	
0–5	141 (74.2)
6–10	7 (3.7)
11–15	17 (8.9)
16–20	8 (4.2)
26–30	10 (5.3)
41–45	7 (3.7)
Province or territory	
Ontario	81 (42.6)
Alberta	34 (17.9)
British Columbia	30 (15.8)
Quebec	14 (7.4)
Prefer not to answer	31 (16.3)
Practice location	
Urban	136 (71.6)
Suburban	26 (13.7)
Rural	25 (13.2)
Remote, northern, or isolated	3 (1.6)
Telehealth frequency	
None currently	10 (5.3)
1–2 times per month	32 (16.8)
3–5 times per month	52 (27.4)
6–10 times per month	44 (23.2)
11–20 times per month	30 (15.8)
More than 20 times per month	22 (11.6)
Telehealth modality used	
Telephone	147 (77.4)
Video	117 (61.6)
Secure messaging	141 (74.2)

Other	14 (7.4)

Note. $N = 190$. Percentages are column percentages and may not sum to 100 due to rounding. Telehealth modality was a check-all-that-apply item, so its categories are not mutually exclusive and do not sum to 100%. "None currently" denotes physicians with telehealth experience in the preceding twelve months who reported no telehealth visits in a typical current week. Years-in-practice bands with no respondents are omitted.

Ethics

The study was reviewed and approved by the University of Ottawa Research Ethics Board before any data were collected (file number: S-07-25-11649). All participants provided informed consent at the start of the survey after being told that participation was voluntary, anonymous, and confidential, that they could withdraw at any time without penalty, and how their data would be stored and used. No personally identifying information was collected, and the data were accessible only to the research team.

Measures

All constructs were measured with multi-item self-report scales, and a mean-score composite was computed for each for use in the structural model. Unless otherwise noted, items were rated on a five-point Likert scale, with higher scores indicating more of the named construct. Established instruments were used where one mapped directly onto a construct. Where no validated instrument existed, items were adapted from prior work and pilot-tested, with internal consistency reported before hypothesis testing. For the present sample, the internal consistency of every composite is reported in the Results before the structural model is estimated (Table 3), where reliabilities are presented alongside the measurement-refinement steps they motivated. Several composites required refinement, and a number remained below the conventional .70 threshold even after refinement, so their reliabilities are reported alongside those analyses.

Telehealth Usage

Telehealth usage was the independent variable, capturing the extent to which family physicians integrated telehealth into clinical practice along three dimensions: frequency of use (the average number of telehealth consultations per week), mode of delivery (video, telephone, and other virtual methods), and clinical purpose (diagnosis, patient follow-up, chronic disease management, and acute triage). These dimensions are causal contributors to usage rather than interchangeable indicators of a single underlying trait, so they were standardized and combined into a single formative telehealth usage index rather than modelled as a reflective scale (Moore et al., 2017; Saiyed et al., 2021). Because the index aggregates causal indicators, internal-consistency statistics do not apply to it and are not reported. Its adequacy was judged by the contribution and stability of its components.

Work Autonomy

Work autonomy was measured with the nine-item autonomy scale of the Work Design Questionnaire (WDQ; Morgeson & Humphrey, 2006), which spans work-scheduling, decision-making, and work-methods autonomy and captures the discretion physicians perceive over how they organize and carry out their work. A representative item asks the extent to which the job allows them to make their own decisions about how to schedule their work. The scale has shown strong internal consistency in prior occupational research, with the three autonomy subscales ranging from .85 to .88 (Morgeson & Humphrey, 2006). This measure operationalized the autonomy pathway in H1a.

Technological Strain

Technological strain was measured with a 13-item scale adapted to the telehealth context from the technostress creators instrument (Tarafdar et al., 2007; Ragu-Nathan et al., 2008), capturing the stress that arises from fragmented, unreliable, or inefficient digital systems (Brooks et al., 2013; Hudgins et al., 2024). The retained items span techno-overload, techno-invasion, techno-complexity, and techno-insecurity, the facets that index the personal experience of strain (full item wording in Appendix A). A techno-uncertainty subscale was administered but dropped from the composite because techno-uncertainty captures the pace of change in the technology rather than the experience of strain itself, and its items loaded poorly with the retained set. Dropping this block, together with the narrowing of the cognitive overload composite described below, separated the two demand mediators so that they no longer measured the same thing. A representative item asks how often the technology used for virtual care is unreliable or difficult to work with. Because the item set was adapted rather than drawn intact from a validated instrument, its internal consistency is reported in the Results (Table 3) before the structural model is estimated. This measure operationalized the technological-strain component of H1b.

Cognitive Overload

Cognitive overload was measured with the Digital Stress Scale (Argyriadi et al., 2025), administered as a twenty-item pool spanning four subscales: digital fatigue, technostress, digital disengagement, and work-life digital boundaries (Appendix A). Because the pooled item set proved multidimensional, a measurement-refinement procedure (described in the Results) reduced it to a five-item digital encroachment and exhaustion scale, comprising the definitional exhaustion item from the digital fatigue subscale (Q21_1) and four work-life digital boundary items (Q24_2–Q24_5) capturing difficulty disconnecting, sleep disruption, expected availability, and reduced self-care. The construct as measured is therefore narrower than broad cognitive overload, and all results involving this composite are labelled digital encroachment/exhaustion.

This measure operationalized the cognitive-overload pathway shared by H1b and H2, tested with this narrower instrument.

Relational Depth

Relational depth was measured with frequency-rated items adapted to the physician–patient encounter from the Relational Depth Frequency Scale (RDFS). The present study drew on the longer 20-item development version of the scale (Di Malta et al., 2020), of which 19 items were fielded, and a representative item asks how often the physician experiences moments of real connection with patients during consultations. In its development, this item set resolved into two correlated dimensions, moments of relational depth and enduring relational depth (Di Malta et al., 2020). The items were combined into a single composite, with retention based on corrected item-rest correlations. This measure operationalized the relational-depth pathway in H3.

Interpersonal Connection

Interpersonal connection was measured with an adapted version of the Connection Index (CI-12; Puder et al., 2022), a brief scale developed from working-alliance and therapeutic-alliance instruments to capture the felt quality of connection within a clinical dyad. The items reflect the physician's sense of being heard, respected, and understood by patients and the clarity of communication between them. A representative item asks whether the physician feels heard and understood by patients. Interpersonal connection was retained as a mediator distinct from relational depth. The two composites correlated at $r = .12$ in the present data, indicating that the intensity of in-the-moment connection and the sense of being heard and understood in routine exchanges were separate relational experiences rather than redundant indicators of one construct. This measure operationalized the interpersonal-connection pathway in H3.

Outcome Variables: Pleasure, Engagement, and Meaning

Pleasure was measured with the five-item Work Pleasure scale of the QEEW2.0 (Van Veldhoven et al., 2015), which captures the enjoyment and positive affect physicians experience in their work. Physicians rated each item on a five-point agreement scale ranging from strongly disagree to strongly agree. A representative item asks how much the physician enjoys the work they do. Van Veldhoven et al. (2015) report a reliability of .85 for this scale in a large Dutch validation sample, estimated with Tarkkonen's rho (ρT), which is a generalization of coefficient alpha appropriate for multidimensional scales (Tarkkonen & Vehkalahti, 2005). This measure operationalized the pleasure outcome in H1a and H1b.

Engagement was measured with the nine-item Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006), which captures occupational engagement through vigour, dedication, and absorption on a five-point scale ranging from never to always. Consistent with established practice in organizational research, a composite score was used to represent overall engagement in keeping with the study's mediational design and model parsimony (Bakker et al., 2004; Salanova et al., 2005). A representative item asks how often the physician feels full of energy at work. Schaufeli et al. (2006) report a scale reliability ranging from $\alpha = .85$ to .92 (median = .92) across their multinational validation samples. This measure operationalized the engagement outcome in H2.

Meaning was measured with the ten-item Work and Meaning Inventory (WAMI; Steger et al., 2012), which assesses positive meaning, meaning-making through work, and greater-good motivations. A composite total score represented overall work meaning, consistent with prior empirical applications (Allan et al., 2019). Responses ranged from 1 (absolutely untrue) to 5 (absolutely true), and a representative item asks whether the physician has found work with a satisfying purpose. Steger et al. (2012) report a scale reliability of $\alpha = .93$ in their validation work. This measure operationalized the meaning outcome in H3.

Control Variables

Several individual and practice characteristics are associated with both telehealth adoption and well-being (Bhatia et al., 2021; CMA, 2025; Glazier et al., 2021), and the following were collected for this reason: physician age, years in practice, gender, and urban versus rural practice location (Table 2). These characteristics are routinely treated as controls in physician and health-workforce well-being research (West et al., 2018). To decide which warranted inclusion, their zero-order associations with the study variables were examined (Appendix B). Age, years in practice, and practice location each correlated with at least one model variable, but their associations fell almost entirely on work autonomy and technological strain. None related to relational depth or to meaning, and only age related to digital encroachment/exhaustion. Gender, by contrast, related to technological strain, digital encroachment/exhaustion, and interpersonal connection, and is the characteristic most consistently documented in this literature (CMA, 2025; West et al., 2018). Gender was therefore entered as a covariate on every mediator and outcome in the estimated models. The sample size constrained how many further covariates could be entered on every equation (Kline, 2016). The potential influence of age, years in practice, and practice location were instead examined directly in a sensitivity analysis (reported below), in which each was entered as a covariate on the equations where it correlated with a model variable.

Statistical Analysis

The sample was 190 family physicians, a figure that reflects physicians' high clinical workloads and the ongoing primary care shortage. At this size the hypothesized relationships were estimated as a single composite path model, with all structural equations estimated simultaneously, in which each construct was represented by one mean-score composite rather than as a latent factor with multiple indicators. Representing the eight reflective constructs as latent factors would require estimating a loading and a residual variance for each of the study's many retained indicators, which $N = 190$ could not support.

Analysis proceeded in stages. The data were first screened for missingness, normality, outliers, and multicollinearity. Within the same stage, I screened for data-integrity threats. A reverse-coding audit computed the corrected item-rest correlation for every item within its assigned construct, and careless responding was screened with four person-level indicators drawn from Curran (2016), each applied with a prespecified flagging threshold. The first, longstring, is the length of the longest run of identical consecutive responses. A respondent was flagged when this run reached 10 or more, a length exceeding the longest block of consecutive same-scale items in the questionnaire. The second, intra-individual response variability, is the standard deviation of a respondent's answers across items, for which unusually low values signal undifferentiated responding. Respondents in the bottom 5% of this distribution were flagged. The third, the person-total correlation, is the correlation between a respondent's pattern of answers and the sample's average response profile. Respondents correlating below .10 were flagged. The fourth, Mahalanobis distance, is a multivariate index of how far a respondent's overall response pattern falls from the sample centroid. Respondents were flagged at $p < .001$. Respondents were excluded only when flagged on two or more of these indicators, following Curran's (2016) recommendation against single-indicator exclusion. Following the logic of the two-step approach (Anderson & Gerbing, 1988), measurement adequacy was established before the structural model was estimated. Each reflective composite was assessed through internal consistency (Cronbach's alpha and McDonald's omega, with values of .70 or higher considered acceptable) and, where indicated, a single-construct confirmatory factor analysis to verify that items loaded on their intended factor, while the formative telehealth usage index was judged by the contribution and stability of its components rather than by internal-consistency statistics. The hypothesized relationships were then estimated as a single composite-based path model using maximum likelihood estimation in lavaan 0.6-21 (Rosseel, 2012) in R 4.3.3, with all estimates independently cross-validated in semopy (Python), parameter estimates agreeing to the third decimal place and all bootstrap inferences reproduced, and with telehealth usage as the exogenous predictor, the five mechanisms as mediators, the three well-being dimensions as outcomes, and gender entered as a covariate on the mediators and outcomes.

Overall model fit was evaluated against established thresholds. The comparative fit index (CFI) and Tucker-Lewis index (TLI) at or above .95 for good fit and .90 for acceptable fit, the root mean square error of approximation (RMSEA) at or below .06 for good fit and .08 for acceptable fit, and the standardized root mean square residual (SRMR) at or below .08 (Hu & Bentler, 1999; Ullman & Bentler, 2012). The indirect effects that constitute the mediation hypotheses were tested using percentile bootstrap confidence intervals based on 5,000 resamples, with an indirect effect considered statistically significant when its 95% confidence interval excluded zero, because the product of two coefficients is not normally distributed. Because all constructs were measured by physician self-report from a single source, common method variance was assessed and reported using Harman's single-factor test as an initial screen (Podsakoff et al., 2003).

Results

Data Screening and Integrity

Responses from 190 family physicians were collected through the Qualtrics survey described above. The data contained no missing values across the 101 administered Likert items, all responses fell within the 1–5 range, and the prespecified recode of the one reverse-worded item (Q15_8) was verified as correct for all cases. Before the measurement and structural models were estimated, the data were also examined for two integrity threats that can distort item-level performance, namely reverse-coding errors and careless responding. First, a reverse-coding audit computed the corrected item-rest correlation for every item within its assigned construct and tested, for each negatively correlating item, whether reflection improved the construct's internal consistency. The audit identified a single such item (Q21_4, item-rest $r = -.11$). Review of the questionnaire wording confirmed that the item is positively worded for its construct, indicating a substantive problem rather than a coding problem, and the item was referred to the measurement-refinement stage rather than recoded. No missed reverse-codes were found.

Second, careless responding was screened using four person-level indicators and the two-or-more-flag exclusion criterion specified in the analysis plan, computed over the full item sequence in questionnaire order. A fifth planned indicator, psychometric synonyms, was not computable because no within-construct item pair correlated above .55, itself a symptom of the weak scales addressed below. No respondent was flagged on two or more indicators, so none were excluded. Eighteen respondents were flagged on exactly one indicator each (eight on longstring, ten on intra-individual response variability, with no overlap), and were retained in the primary analysis, with their influence examined in the sensitivity analyses reported below.

Measurement Refinement

Following the two-step logic of Anderson and Gerbing (1988), measurement adequacy was established before the structural model was estimated. For each reflective construct, the corrected item-rest correlations and the alpha-if-item-deleted values were examined. An item was flagged for removal when its corrected item–rest correlation fell below .30, the lower bound for an item's contribution to a reflective scale, and its deletion did not reduce the construct's internal consistency. Flagged items were removed unless an item was needed to preserve construct content not captured by the retained items, in which case it was retained and is marked in Appendix A. Dimensionality was assessed separately with parallel analysis (Hayton et al., 2004; Horn, 1965), a more conservative alternative to the eigenvalue-greater-than-one rule that compares the observed eigenvalues against those expected from random data of the same size. For each construct, 1,000 random datasets matching the observed data in number of cases and variables were generated, and a factor was retained only when its observed eigenvalue exceeded the 95th-percentile eigenvalue across those datasets. This was supplemented by exploratory factor analysis with oblimin rotation where a pool proved multidimensional. This dimensional assessment, rather than the item-level criteria, governed the treatment of the cognitive overload pool, described below. In total, 22 of the 95 analyzed items were removed, and every removal is documented item by item, with its justification, in Appendix A. The most consequential decision concerned cognitive overload. The twenty-item pool drawn from four subscales did not behave as the single construct the design assumed, and it could not be salvaged as its intended subscales either. Parallel analysis indicated four factors rather than one, so the pool was multidimensional, but these emergent factors did not reproduce the four a priori subscales, so the original subscale structure did not hold in these data. The four candidate dimensions were therefore examined directly, and two were unusable on independent grounds. The technostress subscale was internally incoherent ($\alpha = -.04$), and the digital disengagement subscale overlapped conceptually with relational depth, creating a discriminant-validity risk. This left one coherent and conceptually distinct dimension, defined by the definitional exhaustion item (Q21_1) and the four work-life boundary items (Q24_2–Q24_5), which capture difficulty disconnecting, sleep disruption, expected availability, and reduced self-care. The pool was therefore reduced to this five-item digital encroachment and exhaustion scale, and the remaining fifteen items were dropped (documented item by item in Appendix A). Because the refined scale captures digital encroachment and exhaustion specifically rather than broad cognitive overload, the hypotheses are retained exactly as originally stated, but Hypotheses 1b and 2 are tested with a narrower instrument than intended, and the construct is labelled digital encroachment/exhaustion in all results that follow. Internal consistency before and after refinement is reported in Table 3. Refinement brought engagement ($\omega = .70$), work autonomy ($\omega = .70$), technological strain ($\omega = .73$), and relational depth ($\omega = .78$) to or above the .70 criterion, but four constructs remained below it: pleasure ($\omega = .65$), meaning ($\omega = .66$), interpersonal connection ($\omega = .66$), and digital encroachment/exhaustion ($\omega = .69$). Reaching .70 for these constructs was not achievable without over-pruning to two or three items at the cost of coverage, so the values are reported as they stand. Structural coefficients involving these constructs are attenuated by measurement error and biased toward zero, and they are interpreted with this constraint stated explicitly. One further measurement finding places limits on the interpretation that follows. An exploratory factor analysis of the 21 retained outcome items was conducted. Parallel analysis retained two factors rather than three, though the third factor fell only marginally below the retention threshold (the first three observed eigenvalues were 5.19, 1.73, and 1.48, against random 95th-percentile values of 1.76, 1.62, and 1.51). In the two-factor oblimin solution, the engagement items defined one factor while the pleasure and meaning items loaded on the other (interfactor correlation = .41; loadings in Appendix C). The absence of a distinct meaning factor appears to reflect weak measurement rather than redundancy with pleasure. The meaning items were only modestly intercorrelated (mean inter-item r = .19) and did not cohere into a separate factor even when three were extracted, consistent with the construct's below-threshold reliability (ω = .66). Findings that distinguish pleasure from meaning, and meaning-specific results in particular, are therefore interpreted with caution.

Table 3

Internal Consistency of the Study Composites Before and After Measurement Refinement

Composite	**k (orig.)**	**k (final)**	**α / ω (orig.)**	**α / ω (final)**	**Items removed**
Pleasure	5	5	.647 / .650	.647 / .650	None
Engagement	9	8	.676 / .687	.691 / .704	Q12_4
Meaning	9	8	.540 / .631	.646 / .662	Q15_8 (reversed)
Work autonomy	9	9	.695 / .701	.695 / .701	None
Technological strain	13	11	.706 / .715	.728 / .733	Q17_4, Q18_7
Digital encroachment/exhaustion [a]	20	5	.632 / .642	.683 / .692	Q21_2–Q21_5, Q22_1–Q22_5, Q23_1–Q23_5, Q24_1
Relational depth	19	18	.779 / .780	.781 / .784	Q25_2
Interpersonal connection	11	9	.637 / .640	.657 / .663	Q28_1, Q28_6

Note. N = 190. Values are Cronbach’s alpha / McDonald’s omega. Item-level diagnostic justifications for every removal appear in Appendix A.

[a] Originally administered as the cognitive overload pool; respecified at the measurement stage as described in the text. Items retained: Q21_1, Q24_2–Q24_5.

Finally, because all constructs are physician self-reports gathered from a single source, Harman’s single-factor test was conducted on the 73 retained items as an initial screen for common method variance. The first unrotated factor accounted for 12.8% of the total variance, well below the 50% threshold conventionally taken to indicate a dominant method factor

(Podsakoff et al., 2003). This screen does not rule out method variance, but it indicates that no single common factor drives the observed correlations.

Descriptive Statistics and Correlations

Means, standard deviations, and zero-order correlations among the telehealth usage index, the five mediator composites, the three outcome composites, and gender are reported in Table 4. The telehealth usage index is scored 0–1 (M = .49, SD = .13). Consistent with the hypothesized direction of the demand pathway, telehealth usage correlated most strongly with digital encroachment/exhaustion (r = .29). Its zero-order correlations with work autonomy (r = −.02) and meaning (r = −.02) were essentially zero.

Table 4

Descriptive Statistics and Zero-Order Correlations Among the Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Telehealth usage	0.49	0.13	—								
2. Pleasure	4.16	0.50	−.08	—							
3. Engagement	3.67	0.45	−.19	.52	—						
4. Meaning	4.20	0.42	−.02	.61	.60	—					
5. Work autonomy	3.94	0.42	−.02	.01	.24	−.15	—				
6. Technological strain	2.65	0.55	.11	−.25	−.20	−.02	−.02	—			
7. Encroachment/exhaustion	3.39	0.74	.29	−.41	−.51	−.21	−.11	.39	—		
8. Relational depth	3.34	0.37	−.15	.42	.50	.40	.24	.13	−.35	—	
9. Interpersonal connection	3.85	0.40	−.14	.21	.37	.04	.38	−.42	−.43	.12	—
10. Gender	—	—	.04	.04	−.14	.06	−.00	.20	.28	−.01	−.21

Note. N = 190. Gender coded 1 = male (n = 82), 2 = female (n = 108). Gender correlations are point-biserial. Correlations of $|r| \geq .15$ are significant at $p < .05$ (two-tailed). The telehealth usage index is a formative index scored 0–1.

Confirmatory Test of the Hypothesized Model

The hypothesized composite path model (Model A) was estimated with maximum likelihood on the refined composites, with the telehealth usage index as the exogenous predictor, the five mediators, the three well-being outcomes, gender entered as a control on every mediator and outcome, and residual covariances permitted among the mediators and among the outcomes. Each mediator was constrained to its theoretically assigned outcome(s) only, exactly as hypothesized. Model A was rejected on every global index: $\chi^2(9) = 102.47$, $p < .001$, CFI = .827, TLI = .156, RMSEA = .234, SRMR = .104, all outside the thresholds set out in the analysis plan. Because the data-integrity audit and the measurement refinement had already been completed, this rejection cannot be attributed to coding, careless responding, or item-level noise. It reflects restrictions in the hypothesized structure itself, namely the assignment of specific mediators to specific outcomes. Model A constitutes the confirmatory test of Hypotheses 1 through 3 as a system, and that test failed.

Standardized estimates are reported in Table 5 and displayed in Figure 2. Telehealth usage was positively associated with digital encroachment/exhaustion ($\beta = .278$, $p < .001$) and negatively associated with relational depth ($\beta = -.147$, $p = .041$). It was unrelated to work autonomy ($\beta = -.015$, $p = .833$) and technological strain, and the association with interpersonal connection did not reach significance ($\beta = -.129$, $p = .066$). On the outcome side, digital encroachment/exhaustion predicted lower pleasure ($\beta = -.289$, $p < .001$) and lower engagement ($\beta = -.362$, $p < .001$), and technological strain predicted lower pleasure ($\beta = -.135$, $p = .028$). Work autonomy, relational depth, and interpersonal connection were unrelated to their assigned outcomes at conventional thresholds. No direct path from telehealth usage to any outcome was significant. Among the control paths, female physicians reported higher technological strain (β =

.200, p = .005), higher digital encroachment/exhaustion (β = .267, $p < .001$), and lower interpersonal connection (β = −.206, p = .003).

Table 5

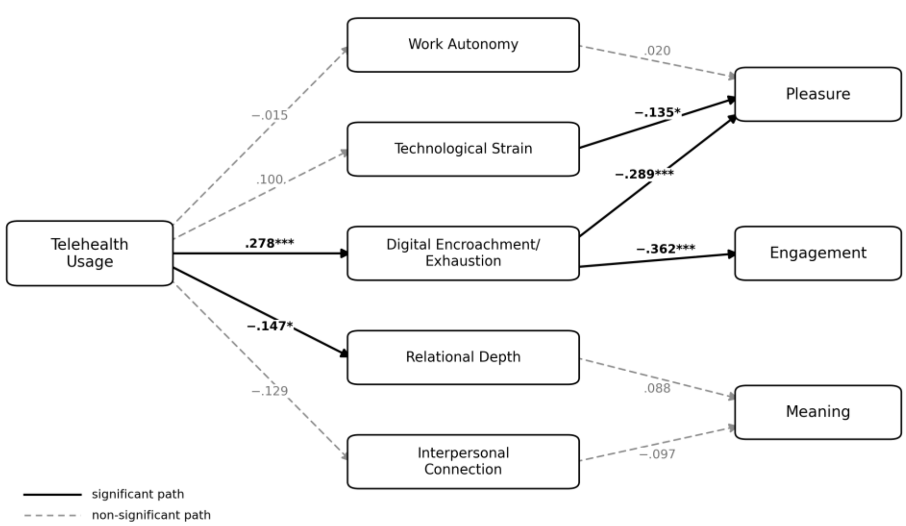
Model A (Hypothesized Model): Standardized Structural Path Estimates

Path	β	p
Telehealth usage → work autonomy	−.015	.833
Telehealth usage → technological strain	.100	.158
Telehealth usage → digital encroachment/exhaustion	.278	< .001
Telehealth usage → relational depth	−.147	.041
Telehealth usage → interpersonal connection	−.129	.066
Work autonomy → pleasure	.020	.722
Technological strain → pleasure	−.135	.028
Digital encroachment/exhaustion → pleasure	−.289	< .001
Telehealth usage → pleasure (direct)	.008	.912
Digital encroachment/exhaustion → engagement	−.362	< .001
Telehealth usage → engagement (direct)	−.097	.156
Relational depth → meaning	.088	.099
Interpersonal connection → meaning	−.097	.083
Telehealth usage → meaning (direct)	−.020	.782

Note. N = 190. Gender (1 = male, 2 = female) was entered as a control on all mediators and outcomes; gender paths are summarized in the text. Model fit: $\chi^2(9) = 102.47$, $p < .001$, CFI = .827, TLI = .156, RMSEA = .234, SRMR = .104.

Figure 2

Model A (Hypothesized Model): Standardized Path Estimates



Note. $N = 190$. Coefficients are standardized estimates. Solid lines indicate paths significant at $p < .05$, dashed lines indicate non-significant paths. *$p < .05$. ***$p < .001$. Gender was entered as a control on all mediators and outcomes, and direct paths from telehealth usage to each outcome were estimated. These paths are omitted from the figure for clarity (all non-significant; see Table 5).

Post Hoc Decomposition of the Misfit

To identify where the hypothesized restrictions failed without saturating the model, the modification indices from Model A were examined, and the fixed mediator-to-outcome path with the largest index was freed and the model refit, repeating until global fit became acceptable. Four paths were freed in this way (Model B): work autonomy to engagement (modification index = 33.85), relational depth to engagement (27.98), relational depth to pleasure (15.01), and work autonomy to meaning (13.06). Model B fit the data well, $\chi^2(5) = 12.58$, CFI = .992, TLI = .950, RMSEA = .055, and improved significantly on Model A, $\Delta\chi^2(4) = 89.90$, $p < .001$. Unlike a saturated decomposition, which frees every path and therefore cannot be disconfirmed, this model remains falsifiable and frees only the paths the data strongly support. It is nonetheless a data-driven respecification that capitalizes on chance characteristics of the sample (MacCallum et al., 1992), so its estimates are hypothesis-generating and require replication in an independent sample before substantive weight is placed on them.

The freed paths, reported in Table 6, localize the misfit. Relational depth predicted pleasure ($\beta = .42$, $p < .001$) and engagement ($\beta = .37$, $p < .001$), relationships excluded by the hypothesized routing, which restricted relational depth to the meaning pathway. Work autonomy showed a small positive association with engagement ($\beta = .12$, $p = .040$) and an unexpected negative association with meaning ($\beta = -.25$, $p < .001$). The dominant omission in the hypothesized model, in other words, was the restriction of relational depth to the meaning pathway when its strongest associations in these data are with pleasure and engagement.

Table 6

Model B (Respecified Model): Standardized Structural Path Estimates

Path	β	*p*
Telehealth usage → work autonomy	−.016	.830
Telehealth usage → technological strain	.100	.157
Telehealth usage → digital encroachment/exhaustion	.278	< .001
Telehealth usage → relational depth	−.147	.041
Telehealth usage → interpersonal connection	−.130	.066
Work autonomy → pleasure	−.120	.056
Technological strain → pleasure	−.211	< .001
Digital encroachment/exhaustion → pleasure	−.207	.002
Relational depth → pleasure [a]	.419	< .001
Telehealth usage → pleasure (direct)	.053	.398
Digital encroachment/exhaustion → engagement	−.280	< .001
Work autonomy → engagement [a]	.122	.040
Relational depth → engagement [a]	.371	< .001
Telehealth usage → engagement (direct)	−.058	.335
Relational depth → meaning	.471	< .001
Interpersonal connection → meaning	−.012	.823
Work autonomy → meaning [a]	−.254	< .001
Telehealth usage → meaning (direct)	.043	.505

Note. $N = 190$. Standardized estimates from Model B, obtained by freeing four paths from Model A through a modification-index search. [a] Path freed from Model A; all other structural paths were retained from Model A and re-estimated in Model B. Gender was entered as a control on every mediator and outcome. Female physicians reported higher technological strain ($\beta = .200$), higher digital encroachment/exhaustion ($\beta = .267$), lower interpersonal connection ($\beta = -.206$), and higher pleasure ($\beta = .137$). Model fit: $\chi^2(5) = 12.58$, CFI = .992, TLI = .950, RMSEA = .055. As a data-driven respecification, these estimates are hypothesis-generating pending replication.

Indirect Effects

The mediation hypotheses were evaluated within Model B using unstandardized indirect effects with percentile bootstrap 95% confidence intervals based on 5,000 resamples (Table 7). Because Model B fits the data well and frees only the paths the data support, it provides a more appropriate basis for estimating the indirect effects than either the rejected Model A or a saturated decomposition. Of the six hypothesized indirect effects, three excluded zero. Consistent with the encroachment branch of Hypothesis 1b, the indirect effect of telehealth usage on pleasure through digital encroachment/exhaustion was negative (estimate = −.270, 95% CI [−.504, −.102]), consistent with Hypothesis 2, the parallel effect on engagement was negative (estimate = −.332, 95% CI [−.586, −.147]), and consistent with the relational depth branch of Hypothesis 3, the indirect effect on meaning through relational depth was negative (estimate = −.219, 95% CI [−.445, −.016]). The autonomy route (Hypothesis 1a), the technological strain branch of Hypothesis 1b, and the interpersonal connection branch of Hypothesis 3 were not significant. Because the telehealth usage–autonomy path was essentially zero ($\beta = -.015$), the absence of the autonomy route reflects a missing first stage rather than a weak second stage. Although work autonomy was directly associated with engagement (positively) and meaning (negatively) in Model B, telehealth did not operate through it. Both constructs in the connection–meaning route were measured with $\omega < .70$, so a true null cannot be separated from attenuation due to unreliability.

Two unhypothesized indirect effects, both through relational depth, also excluded zero. Telehealth usage was associated with lower pleasure (estimate = −.224, 95% CI [−.483, −.015]) and lower engagement (estimate = −.169, 95% CI [−.346, −.011]) through reduced relational depth. At the level of total effects, only engagement was reliably associated with telehealth usage (total effect = −.640, 95% CI [−1.117, −.162]). The total effects on pleasure and meaning did not exclude zero, although their total indirect components did, indicating offsetting direct and indirect components. Given the imperfect empirical separation of pleasure and meaning noted above, the parallel encroachment–pleasure and depth–meaning findings should not be over-interpreted as outcome-specific mechanisms.

Table 7

Indirect and Total Effects of Telehealth Usage with Percentile Bootstrap Confidence Intervals (Model B)

Path	Hyp.	Estimate	95% CI	Sig.
TH → autonomy → pleasure	H1a	.007	[−.067, .096]	No
TH → strain → pleasure	H1b	−.094	[−.240, .031]	No
TH → encroachment → pleasure	H1b	−.270	[−.504, −.102]	Yes
TH → depth → pleasure	—	−.224	[−.483, −.015]	Yes
TH → encroachment → engagement	H2	−.332	[−.586, −.147]	Yes
TH → autonomy → engagement	—	−.006	[−.074, .065]	No
TH → depth → engagement	—	−.169	[−.346, −.011]	Yes
TH → depth → meaning	H3	−.219	[−.445, −.016]	Yes
TH → connection → meaning	H3	−.049	[−.163, .019]	No
TH → autonomy → meaning	—	.015	[−.122, .180]	No
Total indirect → pleasure	—	−.582	[−.957, −.257]	Yes
Total effect → pleasure	—	−.323	[−.866, .178]	No
Total indirect → engagement	—	−.511	[−.825, −.225]	Yes
Total effect → engagement	—	−.640	[−1.117, −.162]	Yes
Total indirect → meaning	—	−.250	[−.517, −.003]	Yes
Total effect → meaning	—	−.065	[−.531, .411]	No

Note. TH = Telehealth usage index. Encroachment = Digital encroachment/exhaustion. Depth = relational depth. Estimates are unstandardized. Intervals are percentile bootstrap 95% CIs based on 5,000 resamples. “Sig.” indicates whether the interval excludes zero. Indirect effects through mediator-to-outcome paths not freed in Model B (e.g., connection → pleasure) are fixed at zero and not estimated. Estimates derive from the respecified Model B and are hypothesis-generating pending replication.

Sensitivity Analyses

Three sensitivity analyses examined the stability of these conclusions (Table 8). First, excluding the eighteen respondents flagged on a single careless-responding indicator (n = 172) reproduced every conclusion. Model A remained rejected with nearly identical fit, and the same three hypothesized indirect effects, and only those three, excluded zero. Second, re-estimating both models with the original unpruned composites preserved the overall pattern, namely the rejection of Model A (CFI = .755, RMSEA = .278) and negative indirect pathways through digital encroachment/exhaustion and relational depth, but shifted which individual branches of Hypotheses 1b and 3 crossed the significance threshold. With unpruned composites, the strain–pleasure and connection–meaning routes were significant while the encroachment–pleasure route was not. The connection–meaning interval in that run only marginally excluded zero (95% CI [−.246, −.002]), so its significance is fragile and should not be leaned on. Third, because the telehealth usage index aggregates frequency, modality, and clinical purpose, the model was re-estimated three-times, with frequency of use, modality breadth, and clinical purpose each entered as the sole predictor. Only frequency of use reproduced the supported indirect effects and the reliable total effect on engagement. Modality breadth and clinical-purpose breadth, entered alone, reproduced none of them, with all bootstrap confidence intervals including zero. These single-component analyses are exploratory and were not part of the original hypotheses. They indicate that the supported pattern is carried by the frequency component of the index rather than by its modality or clinical-purpose components. Fourth, the remaining candidate control variables were entered directly. Age was the only one related to both telehealth usage and a supported mediator, digital encroachment/exhaustion, which made it the strongest confounder candidate for the focal pathways. Years in practice and practice location related only to work autonomy and technological strain, the mediators that carried no supported effect. Entering each control on the equations where it correlated with a model variable left all three supported indirect effects unchanged in sign and significance. The indirect effect of telehealth usage on pleasure through digital encroachment/exhaustion was −.256 (95% CI [−.499, −.090]), on engagement through the same mediator −.316 (95% CI [−.570, −.134]), and on meaning through relational depth −.220 (95% CI [−.445, −.016]). The supported pathways therefore do not depend on the decision to enter gender as the sole covariate in the primary model.

Table 8

Sensitivity of Model Fit and Hypothesized Indirect Effects to Analytic Decisions

Dataset	**n**	**Model A $\chi^2(9)$**	**CFI**	**RMSEA**	**Hypothesized branches supported**
Primary (refined composites)	190	102.47	.827	.234	H1b (encroachment), H2, H3 (depth)
Excluding flagged respondents	172	93.24	.823	.233	H1b (encroachment), H2, H3 (depth)
Original unpruned composites	190	141.39	.755	.278	H1b (strain), H2, H3 (depth and connection)
Frequency of use only	190	104.92	.826	.230	H1b (encroachment), H2, H3 (depth)

Note. All Model A estimations rejected on every global index. Supported branches are hypothesized indirect effects whose percentile bootstrap 95% CIs excluded zero in the corresponding Model B estimation.

Summary of Results

Taken together, the hypothesized model failed as a whole, but the respecified model identifies an alternative that can be tested in future samples. The data-integrity audit and measurement refinement established that the rejection is not an artifact of coding errors, careless responding, or item-level noise. The confirmatory test then traced the failure to the theoretical routing of mediators to outcomes, and the respecified model identified the dominant omission as relational depth’s associations with pleasure and engagement. These results await replication. With that caveat, the data indicate that higher telehealth use was associated with lower physician well-being primarily through greater digital encroachment and exhaustion and through reduced relational depth, with relational depth operating as a broad resource across all three well-being dimensions rather than a meaning-specific one. The hypothesized autonomy route is absent at its first stage, and only the total effect on engagement is reliably different from zero. Nothing in the post hoc model confirms this revised picture. Instead, it specifies what a replication study with stronger measures must test.

Discussion

This study examined how telehealth usage relates to three dimensions of family physicians' occupational well-being, pleasure, engagement, and meaning (Schueller & Seligman, 2010). Drawing on the Job Demands–Resources model (Bakker et al., 2004), it traced those relationships through five mechanisms grouped along three pathways. Work autonomy, relational depth, and interpersonal connection operated as job resources. Technological strain and cognitive overload, the latter operationalized after measurement was refined as digital encroachment/exhaustion, operated as job demands. The confirmatory test rejected the hypothesized model taken as a whole, and that rejection is a finding in its own right. The misfit did not come from the data. Coding errors, careless responding, and item-level noise had each been checked and ruled out before estimation. The problem lay in the theory, specifically in how the model routed particular mediators to particular outcomes. At the same time, the respecified model showed that the model had failed in a specific place rather than everywhere at once. Three of the six hypothesized indirect effects were supported, and the misfit concentrated in a single location, the restriction of relational depth to the meaning pathway. In substance, higher telehealth use is associated with lower physician well-being through two channels, greater digital encroachment and exhaustion and reduced relational depth, while the hypothesized benefit route through work autonomy never materialized.

The discussion that follows interprets these findings in three parts. The first works through the results hypothesis by hypothesis, examining the demand pathway that was supported, the resource pathway that was not, and the relational mechanism whose effects took a different form than hypothesized. The second draws out the implications for Well-Being Theory and the Job Demands–Resources model. The third translates the findings into practical guidance for the organization of virtual primary care in Canada.

Interpretation of Findings

The Digital Encroachment and Exhaustion Pathway (Hypotheses 1b and 2)

The clearest and most robust finding in this study concerns the demand pathway. Telehealth usage was positively associated with digital encroachment/exhaustion ($\beta = .278$), which in turn predicted lower pleasure ($\beta = -.289$) and lower engagement ($\beta = -.362$), the two largest mediator-to-outcome coefficients in the hypothesized model. The corresponding indirect effects, telehealth usage on pleasure (estimate = −.270, 95% CI [−.504, −.102]) and on engagement (estimate = −.332, 95% CI [−.586, −.147]), excluded zero, supporting the encroachment branch of Hypothesis 1b and Hypothesis 2. These conclusions were also the most stable in the study. Notably, they survived the exclusion of all respondents flagged on any careless-responding indicator and, at the system level, the substitution of the original unpruned composites. Among all the relationships tested, the proposition that telehealth use erodes well-being through a digital demand pathway is the one these data assert with the greatest confidence.

What is notable is the specific character of the demand that carried this effect. The cognitive overload construct was originally conceived as in-the-moment attentional fragmentation, such as the mental strain of toggling through EHRs, video platforms, and documentation under time pressure (Alkureishi et al., 2021; Wajcman & Rose, 2011). The measurement refinement, however, identified the empirically coherent core of the item pool not in momentary task strain but in boundary erosion, specifically difficulty disconnecting from work, sleep disruption, the expectation of constant availability, and reduced self-care. The demand that telehealth most reliably amplifies in this sample, in other words, is not the friction of any single virtual encounter but the way digitally mediated practice extends the workday and dissolves the perimeter between professional and personal life. This pattern is consistent with research on remote work more broadly, in which the flexibility of digital arrangements is accompanied by an "autonomy paradox" of expanding availability and increased exhaustion (Golden, 2009; Parker et al., 2021). It suggests that the encounter-level frustrations of virtual care, the frozen video and the switching between screens, may be the wrong place to look for its effect on well-being. For family physicians, the cost is the ambient one, such as the difficulty of disconnecting once the last appointment ends and the sense of being perpetually available.

The fate of the technological strain branch of Hypothesis 1b makes the same point from the other direction. Technological strain did predict lower pleasure ($\beta = -.135$), so the frustrations of fragmented and unreliable systems are not irrelevant to physicians' affective experience. But the first-stage path from telehealth usage to technological strain did not reach significance ($\beta = .100$), and the indirect effect through strain did not exclude zero (95% CI [−.240, .031]). Strain, in these data, is a correlate of diminished pleasure but not a conduit through which telehealth usage transmits its effects. Two readings of this are offered. The substantive reading is that technological strain in contemporary primary care is largely a fixed feature of digitized practice, driven by EHR burden and system fragmentation that affect physicians regardless of how much care they deliver virtually, so that variation in telehealth volume adds little to it. The statistical reading is that the study was powered to detect medium rather than small indirect effects, so a modest strain pathway cannot be ruled out. Under the analysis plan this branch is treated as inconclusive rather than disconfirmed. The sensitivity analysis reinforces the need for caution in adjudicating between the two demand branches, since with unpruned composites the strain route crossed the significance threshold while the encroachment route did not, even as the overall negative demand pathway persisted in both specifications. The system-level conclusion, that telehealth harms pleasure and engagement outcomes through digital demands, is robust. However, the precise division of labour between strain and encroachment requires replication with stronger measures.

The Absent Autonomy Route (Hypothesis 1a)

Hypothesis 1a proposed that telehealth would enhance pleasure by expanding work autonomy, the central resource-side prediction of the model and the principal benefit attributed to virtual care in the literature on physician work redesign (Gajarawala & Pelkowski, 2021; Hoff & Lee, 2022). The hypothesis failed, and it failed in a diagnostically informative way. The path from telehealth usage to work autonomy was essentially zero ($\beta = -.015$), as was the zero-order correlation ($r = -.02$), and the second-stage path from autonomy to pleasure was likewise negligible ($\beta = .020$). This is a first-stage failure. Telehealth usage simply did not move physicians' perceptions of autonomy in either direction. Importantly, this null cannot be attributed to the measurement problems that qualify other branches of the model, because the work autonomy composite met the reliability criterion ($\omega = .70$) and showed interpretable internal facets. Among the non-significant findings in this study, the autonomy route is the one most plausibly read as a true absence rather than an attenuation artifact.

Why might the flexibility benefits so prominently documented in remote work fail to emerge here? One explanation is that the autonomy gains documented in general remote work research accrue to workers who gain discretion over when and how tasks are performed (Golden et al., 2008; Parker et al., 2021). Canadian family physicians delivering virtual care, by contrast, typically remain embedded in fixed appointment schedules, fee-for-service or capitation billing structures, and EHR documentation requirements that are indifferent to the modality of the encounter. In other words, telehealth may relocate the work without redistributing control over it. The physician conducts the appointment from a different room, but the schedule, the pace, and the administrative obligations are unchanged. A second explanation is that the Work Design Questionnaire autonomy scale (Morgeson & Humphrey, 2006) captures global perceptions of scheduling, decision-making, and methods autonomy across the job as a whole, and modality-specific flexibility, such as the option to take an afternoon of virtual visits from home, may be too local an affordance to shift those global perceptions. Either way, the finding cautions against assuming that the autonomy mechanism that operates in other forms of remote knowledge work transfers automatically to primary care.

The post hoc decomposition added one unexpected result involving autonomy that deserves brief comment. Freed of the hypothesized routing, work autonomy was negatively associated with meaning ($\beta = -.25$). Because this estimate derives from a data-driven respecification (Model B), it is hypothesis-generating only, and the imperfect empirical separation of pleasure and meaning in this sample requires additional caution. Still, the direction is provocative. It may indicate that, within this sample, physicians reporting the greatest discretion over their work are those in practice arrangements that are also relationally thinner, or that autonomy exercised in the service of efficiency and self-protection trades off against the other-directed sources of significance that anchor meaning in family medicine (Osborn et al., 2017). A replication that measures the practice-structure correlates of autonomy directly would be needed before any substantive weight is placed on this path.

Relational Depth as a Broad Resource (Hypothesis 3 and the Rejected Routing)

Hypothesis 3 received partial support on its own terms. Telehealth usage was associated with lower relational depth ($\beta = -.147$), and the indirect effect of telehealth usage on meaning through relational depth was negative and excluded zero (estimate = −.219, 95% CI [−.445, −.016]). These data are consistent with the mechanism theorized in the person-centred literature, in which virtual mediation leaves less room for the moments of profound contact that make relational work feel significant (Mearns & Cooper, 2005; Di Malta et al., 2020). The interpersonal connection branch of the hypothesis, by contrast, was not supported. The first-stage path fell just short of significance ($\beta = -.129$, $p = .066$) and the indirect effect on meaning did not exclude zero. This null, however, sits in a very different evidentiary position than the autonomy null. Both interpersonal connection ($\omega = .66$) and meaning ($\omega = .66$) were measured below the reliability criterion, so the structural coefficients linking them are attenuated toward zero, and the absence of this route cannot be distinguished from a measurement artifact. Indeed, in the unpruned-composite sensitivity analysis the connection–meaning route marginally crossed the significance threshold, underscoring how fragile branch-level verdicts are at this level of measurement precision. The connection pathway is best described as untested rather than disconfirmed.

The more consequential result, however, is not what relational depth did within its assigned pathway but what it did outside it. The decomposition of Model A's misfit traced the dominant omission to relational depth. Its strongest associations in these data were with pleasure ($\beta = .42$) and engagement ($\beta = .37$), paths the hypothesized model fixed to zero, and the corresponding unhypothesized indirect effects of telehealth usage through depth on pleasure (estimate = −.224, 95% CI [−.483, −.015]) and engagement (estimate = −.169, 95% CI [−.346,

−.011]) both excluded zero. The hypothesized routing treated relational depth as a meaning-specific mechanism on the logic that deep contact with patients feeds the sense that one's work matters. The data instead describe relational depth as a broad resource that feeds all three well-being dimensions, and feeds the pleasure and engagement dimensions most strongly. In retrospect, this result is less surprising than it first appears. Moments of sincere contact with patients are not only significance-conferring, they are, in the language of engagement research, energizing and absorbing (Schaufeli et al., 2006), and they are among the most immediately enjoyable experiences the clinical day offers (Horowitz et al., 2003). For family physicians, who report entering the specialty precisely for these relationships (Osborn et al., 2017), the depth of patient contact may function less like a specialized input to meaning and more like the day's primary source of vitality.

Two qualifications apply. First, all estimates from the respecified Model B are descriptive of this sample and capitalize on its chance characteristics (MacCallum et al., 1992). The broad-resource account of relational depth is a hypothesis these data generate, not one they confirm. Second, the outcome measures themselves did not fully cooperate with the three-dimensional structure of Well-Being Theory. Pleasure and meaning failed to separate at the item level (composite $r = .61$), so claims that depth predicts pleasure specifically, as opposed to a fused hedonic–eudaimonic factor, exceed what the measurement supports. What can be said with reasonable confidence is the conjunction of the confirmatory and decompositional results. Namely, telehealth use is associated with reduced relational depth, and reduced relational depth is associated with lower well-being across the board, not within the meaning channel alone. This breadth is itself what a basic-need view of relational depth would predict. To the extent the construct captures the relatedness or belonging that self-determination theory treats as a basic psychological need (Ryan & Deci, 2000; Van den Broeck et al., 2010), its satisfaction would be expected to support well-being generally rather than any single dimension. It is also worth noting that relational depth and interpersonal connection were essentially uncorrelated ($r = .12$), supporting the decision to model them as distinct constructs and suggesting that the modality may threaten the profound, in-the-moment register of connection even where everyday rapport survives the screen.

Theoretical Implications

The findings carry implications for both of the theories the study stacked together, and the most interesting of these flow from the model's rejection rather than from its supported branches. For Well-Being Theory (Schueller & Seligman, 2010), the results challenge two assumptions. The first is the separability of the outcome dimensions. Engagement behaved as a distinct outcome throughout, but pleasure and meaning did not separate empirically in this sample, either at the item level or in their pattern of correlates. This does not impugn the conceptual distinction, which is well established (Steger et al., 2012; Diener et al., 2017), but it suggests that in a single-occupation sample of practitioners whose enjoyment of work is substantially constituted by its significance, the hedonic and eudaimonic dimensions may be experienced as one. The second assumption is the mapping of specific antecedents to specific dimensions. The hypothesized model embodied a matching logic, relational mechanisms to meaning, autonomy to pleasure, attentional demands to engagement, and the data rejected the matching while retaining the mechanisms. Well-being research that routes each workplace condition to a single dimension of flourishing may be imposing more specificity than the phenomenon possesses. Conditions like relational depth appear to be domain-general inputs.

For the Job Demands–Resources model (Bakker et al., 2004), the study offers a case of asymmetric support for its dual processes, a pattern with precedent in the healthcare literature. The health-impairment process was clearly operative. Telehealth functioned as a demand-amplifier, and the demand it amplified transmitted reliably to lower pleasure and engagement. The motivational process was also visible, but not where the model placed it. The resource that carried telehealth's effects was not autonomy, the resource the remote-work literature foregrounds, but relational depth, and telehealth's relationship to that resource was erosive rather than generative, so that the motivational process appeared in the data as a loss pathway. Kohnen et al. (2024) similarly found, among hospital nurses, that one half of a hypothesized dual-process structure carried the model while branches involving the other half dropped to non-significance, and concluded that the value of the Job Demands–Resources framework lies partly in its capacity to localize which processes operate for which populations. The present study extends that lesson to physicians and to technology-mediated work. For family physicians in this sample, telehealth use was associated with higher demands and diminished relational resources, and showed no association with autonomy in either direction.

The study also contributes a measurement-level insight to the technostress and digital-work literatures (Brooks et al., 2013; Wajcman & Rose, 2011). The broad cognitive overload construct, as operationalized through a multi-facet digital stress pool, did not cohere as a single dimension, and its empirically stable core was boundary encroachment and exhaustion rather than attentional fragmentation. If this pattern replicates, it implies that the digital demands most consequential for clinician well-being are temporal and territorial, where work ends and whether it ever does, rather than purely cognitive. Instruments built around momentary multitasking strain would then be measuring the component of digital demand that matters least, leaving the more damaging one, the erosion of boundaries and recovery, largely uncaptured. Finally, the formative, three-dimensional telehealth usage index employed here, spanning frequency, mode, and clinical purpose, moves beyond the binary adoption measures that dominate prior work, although the present analysis aggregated the index and leaves the decomposition of which dimensions drive which effects to future research.

Practical Implications

The practical implications of these findings apply most directly to the Canadian primary care system they were drawn from. More than one in five Canadians lack regular access to a family physician (Duong & Vogel, 2023). A system this short of physicians cannot afford to lose the ones it has, and physician well-being is an established driver of both retention and care quality (Shanafelt et al., 2017). In this study, higher telehealth usage was reliably associated with lower engagement overall. Nothing in these results argues for scaling back virtual care. The effect is not inherent to virtual care, it operates through two specific channels, both of which are open to redesign.

The first channel to address is digital encroachment. What wore on these physicians was not the friction of the visits themselves but the way virtual care stretched the workday. This took the form of difficulty disconnecting, an expectation of constant availability, disrupted sleep, and reduced self-care. The solution therefore lies in when work ends, not in how well the software runs. Clinics and health authorities adopting or expanding virtual care should treat after-hours digital availability as a managed workload rather than an ambient expectation. In practice, this means giving virtual visits dedicated time within the clinic schedule rather than adding them on top of a full day of in-person appointments, and setting explicit norms for how quickly physicians are expected to respond to patient messages. Disconnection outside those hours also needs concrete supports, and what those look like will depend on the practice model. A team-based clinic might have staff triage incoming messages, answering administrative requests directly and batching the clinical ones for the physician to work through at a scheduled point in the day rather than as they arrive. A solo practice might instead state a response window in the portal so that patients know when to expect a reply. And where the compensation model treats inbox work as unpaid, the encroachment is built into the payment structure itself. Reforms such as British Columbia's longitudinal family physician payment model, which compensates indirect patient care time, change that structure directly (British Columbia Ministry of Health, 2026; McCracken et al., 2025). The gender pattern in the control paths adds an equity dimension to this recommendation. Female physicians reported higher technological strain, higher digital encroachment and exhaustion, and lower interpersonal connection. If those reports reflect real differences in load, the costs of poorly bounded virtual care are not evenly distributed, and containment policies will do the most good for the female physicians already carrying more of it.

The second channel is the protection of relational depth. Because depth emerged as a broad resource feeding pleasure and engagement as well as meaning, its erosion is not a sentimental cost but a direct drain on the experiences that sustain physicians in practice. The question, then, is not how much virtual care to offer but which care to offer virtually. Encounters whose value is mainly informational, such as routine follow-up, results review, stable chronic disease monitoring, are natural candidates for the virtual format, which leaves in-person capacity for the visits where the relationship itself carries the clinical work. Scheduling matters as well. Where possible, virtual visits might be booked with the patient's own physician rather than with whoever is available, since distributing visits by availability is a practice the literature links to weakened continuity in family practice (Hawe et al., 2023). Hybrid models that alternate modalities within ongoing physician–patient relationships may allow the access benefits of telehealth to be captured while keeping the moments of sincere contact that these data identify as important for well-being.

A final implication concerns how telehealth is presented to physicians themselves. The flexibility and autonomy benefits that feature prominently in the case for virtual care did not appear in this sample. Recruitment and change-management messaging that promises greater autonomy may therefore set expectations that implementation does not meet. If autonomy is to become a resource of telehealth, it will have to be designed in deliberately, through real physician discretion over virtual scheduling, modality choice, and location, rather than assumed as an automatic by-product of the technology.

Limitations and Future Research

The conclusions above must be read against the limitations of the design and the measures, several of which were documented as they arose and are consolidated here. First, the study is cross-sectional and correlational, so no causal ordering can be established. The mediation model imposes a directional structure that the data cannot verify, and plausible reverse pathways exist. Exhausted or disengaged physicians may select into heavier telehealth use. Alternatively, low well-being may shape how physicians perceive and report their digital environment, producing associations in the measures rather than in the work itself. Consistent with this, causal language has been avoided, but the substantive account remains a causal hypothesis tested against associational evidence. Second, all constructs were measured by physician self-report from a single source at a single time, raising the possibility of common method variance (Podsakoff et al., 2003). Harman's single-factor screen was reassuring, with the first unrotated factor accounting for 12.8% of variance, but this screen is weak, and markervariable assessment (Lindell & Whitney, 2001) remains a priority for future administrations. Third, the sample of 190 physicians was recruited through convenience sampling, so its representativeness of Canadian family physicians cannot be established, and the design was powered for medium indirect effects only. The non-significant strain and connection branches are accordingly inconclusive rather than disconfirmed.

The measurement limitations require particular candour because they condition which conclusions the study can support. Four of the eight reflective composites, pleasure ($\omega = .65$), meaning ($\omega = .66$), interpersonal connection ($\omega = .66$), and digital encroachment/exhaustion ($\omega = .69$), fell below the .70 reliability criterion even after refinement, and raising them further was not possible without sacrificing content coverage. Structural coefficients involving these constructs are attenuated toward zero, which means the supported pathways involving them are, if anything, conservative estimates, but also that null results involving them, most notably the connection–meaning route, cannot be interpreted. The outcome battery yielded a two-factor rather than three-factor structure, with pleasure and meaning fused at the item level, so outcome-specific claims are tentative throughout. The cognitive overload construct was respecified at the measurement stage to a five-item digital encroachment/exhaustion core, which means Hypotheses 1b and 2 were tested with a narrower instrument than intended and the original attentional-fragmentation construct remains untested. Relatedly, no measure of relational continuity over time was fielded, so the relational findings speak to the depth of in-the-moment contact, not to the longitudinal continuity that also anchors family practice. Finally, all estimates from the respecified Model B, including the broad-resource behaviour of relational depth and the negative autonomy–meaning path, are post hoc, capitalize on sample-specific variation (MacCallum et al., 1992), and carry no confirmatory weight.

These limitations give rise to a research agenda. The post hoc model states exactly what a replication must test. The first priority is a replication in an independent sample of a revised model in which digital encroachment/exhaustion predicts pleasure and engagement and relational depth predicts all three well-being dimensions. The replication should also carry strengthened measures, including a purpose-built encroachment scale developed from the five-item core identified here, a rapport instrument capable of exceeding the reliability criterion, and outcome scales constructed to maximize the discriminability of pleasure and meaning. A larger sample would permit full latent-variable estimation, removing the attenuation that composite modelling cannot correct. Second, longitudinal and experience-sampling designs are needed to establish temporal ordering and to capture the daily processes through which encroachment plausibly builds, for example whether an evening of heavy inbox work predicts poorer overnight recovery and lower well-being the next day. Measuring telehealth use from system records, the number and duration of virtual visits, portal message volume, time logged in the EHR after hours, rather than from self-report would also address the single-source limitation, since the predictor would no longer come from the same questionnaire as the outcomes. Third, the formative telehealth usage index would benefit from fuller decomposition. The exploratory single-component analyses reported above suggest the supported pathways are carried by the volume of virtual care rather than its modality mix or clinical scope, but those measures captured the breadth of use rather than intensity within any single modality, and their restricted distributions limit the power of that comparison, so the contrast is suggestive rather than conclusive. Entering frequency, mode, and clinical purpose simultaneously, each with its several check-all indicators, would require estimating more parameters than $N = 190$ can support. A larger sample would permit that full decomposition and a finer contrast among specific modalities, such as telephone versus video. Fourth, a continuity measure should be fielded alongside the Relational Depth Frequency Scale to separate the modality's effects on momentary contact from its effects on long-term relational structure. Finally, the unexpected negative autonomy–meaning association warrants investigation, as do the moderating roles of practice structure, payment model, and physician characteristics such as the gender differences observed here.

Conclusion

This study set out to test a dual-pathway model of how telehealth shapes family physicians' pleasure, engagement, and meaning at work. The data rejected the model as a whole, while several of its mechanisms held in a different arrangement than the one specified. Higher telehealth use was associated with lower well-being through two channels, the encroachment of digital work into the boundaries of life and the thinning of deep relational contact with patients, and the second of these operated not as the meaning-specific mechanism theorized but as a broad resource sustaining every dimension of well-being measured. The greater autonomy on which the case for virtual care often rests never materialized. Pending replication with stronger measures, these findings suggest that the well-being consequences of telehealth are decided less by how much virtual care physicians deliver than by how it is organized. What matters is whether work stays within the workday, and whether the encounter itself preserves the moments of sincere contact that drew family physicians to their work in the first place.

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Appendix A

Administered Items and Item-Level Reliability Diagnostics for All 95 Analyzed Items

The tables below report every multi-item scale as administered, grouped by construct. For each item, the corrected item–rest correlation and the alpha-if-item-deleted value were computed within the construct on the full sample (*N* = 190) prior to structural estimation. Each construct's internal consistency for the administered item set is reported in its heading, so that each alpha-if-item-deleted value can be compared with the construct's overall alpha. An item was removed during measurement refinement when its corrected item–rest correlation fell below the retention threshold (i.e., item–rest $r < .30$) and its deletion did not reduce the construct's internal consistency, unless the item was retained to preserve content coverage (noted b). The cognitive overload pool is the exception and was reduced on dimensional rather than item-level grounds, as detailed in its section below.

Pleasure
Source. Work Pleasure scale, QEEW2.0 (Van Veldhoven et al., 2015).
Response format. 5-point agreement (1 = strongly disagree to 5 = strongly agree).
Internal consistency, administered set. α = .647, ω = .650.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q11_1	I enjoy my work	0.413	0.589	Retained
Q11_2	I still feel good doing my work	0.345	0.62	Retained
Q11_3	I am enthusiastic about my work	0.408	0.592	Retained
Q11_4	My work inspires me	0.439	0.576	Retained
Q11_5	My work gives me a lot of satisfaction	0.401	0.595	Retained

Engagement
Source. Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006).
Response format. 5-point frequency (1 = never to 5 = always).
Internal consistency, administered set. α = .676, ω = .687.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q12_1	At my work, I feel bursting with energy	0.431	0.634	Retained
Q12_2	At my job, I feel strong and vigorous	0.415	0.642	Retained

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q12_3	I am enthusiastic about my job	0.47	0.62	Retained
Q12_4	My job inspires me	0.126	0.691	Removed
Q12_5	When I get up in the morning, I feel like going to work	0.257	0.675	Retained
Q12_6	I feel happy when I am working intensely	0.406	0.637	Retained
Q12_7	I am proud of the work that I do	0.335	0.653	Retained
Q12_8	I am immersed in my work	0.385	0.643	Retained
Q12_9	I get carried away when I'm working	0.37	0.646	Retained

Meaning

Source. Work and Meaning Inventory (WAMI; Steger et al., 2012). Q15_8 is reverse-worded.
Response format. 5-point truth (1 = absolutely untrue to 5 = absolutely true).
Internal consistency, administered set. α = .540, ω = .631.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q15_1	I have found a meaningful career	0.153	0.536	Retained [b]
Q15_2	My work helps me better understand myself	0.342	0.476	Retained
Q15_3	I know my work makes a positive difference in the world	0.359	0.482	Retained
Q15_4	I understand how my work contributes to my life's meaning	0.5	0.44	Retained
Q15_5	I have a good sense of what makes my job meaningful	0.331	0.502	Retained
Q15_6	My work helps me make sense of the world around me	0.151	0.534	Retained [b]
Q15_7	I have discovered work that has a satisfying purpose	0.39	0.467	Retained

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q15_8_R	My work really makes no difference to the world	0.001	0.646	Removed
Q15_9	The work I do serves a greater purpose	0.29	0.494	Retained

Work autonomy
Source. Autonomy scale, Work Design Questionnaire (Morgeson & Humphrey, 2006); blocks Q16 and Q33.
Response format. 5-point agreement (1 = strongly disagree to 5 = strongly agree).
Internal consistency, administered set. α = .695, ω = .701.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q16_1	The job allows me to make my own decisions about how to schedule my work	0.391	0.667	Retained
Q16_2	The job allows me to decide on the order in which things are done on the job	0.498	0.642	Retained
Q16_3	The job allows me to plan how my work is to be performed	0.439	0.654	Retained
Q16_4	The job gives me a chance to use my personal initiative or judgment in carrying out the work	0.275	0.686	Retained
Q16_5	The job allows me to make a lot of decisions on my own	0.357	0.675	Retained
Q33_1	The job provides me with significant autonomy in making decisions	0.392	0.667	Retained
Q33_2	The job allows me to decide on the methods to use in carrying out work tasks	0.382	0.667	Retained
Q33_3	The job gives me considerable opportunity for independence and freedom in how I do the work	0.227	0.696	Retained [b]
Q33_4	The job allows me to make decisions about what procedures to use	0.39	0.665	Retained

Technological strain

Source. Technostress creators (Tarafdar et al., 2007; Ragu-Nathan et al., 2008), adapted to the telehealth context; blocks Q17 and Q18.

Response format. 5-point agreement (1 = strongly disagree to 5 = strongly agree).

Internal consistency, administered set. α = .706, ω = .715.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q17_1	I am forced by telehealth technology to work much faster	0.304	0.692	Retained
Q17_2	I am forced by telehealth technology to do more work than I can handle	0.453	0.673	Retained
Q17_3	I am forced by telehealth technology to work with very tight time schedules	0.379	0.684	Retained
Q17_4	I have to be in touch with my work even during vacation because of telehealth technology	0.135	0.717	Removed
Q17_5	I spend less time with my family due to telehealth-related tasks	0.488	0.665	Retained
Q17_6	I feel my personal life is being invaded by telehealth technology	0.337	0.688	Retained
Q18_1	I am forced to change my work habits to adapt to new telehealth technologies	0.512	0.666	Retained
Q18_2	I have a higher workload because of increased telehealth technology complexity	0.467	0.668	Retained
Q18_3	I do not know enough about telehealth technology to handle my work satisfactorily	0.278	0.695	Retained
Q18_4	I need a long time to understand and use new telehealth technologies	0.284	0.695	Retained
Q18_5	I do not find enough time to study and upgrade my telehealth technology skills	0.299	0.693	Retained
Q18_6	I often find it too complex to understand and use new telehealth technologies	0.287	0.694	Retained

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q18_7	I feel constant pressure from telehealth technology to keep up with changing systems	0.096	0.716	Removed

Relational depth

Source. Relational Depth Frequency Scale, 20-item development version (Di Malta et al., 2020), 19 items fielded; blocks Q25–Q27.

Response format. Frequency-rated (how often each kind of moment is experienced).

Internal consistency, administered set. α = .779, ω = .780.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q25_1	I experienced an intense connection with my patients	0.27	0.776	Retained [b]
Q25_2	I experienced a very profound engagement with my patients	0.133	0.781	Removed
Q25_3	I felt we were both completely genuine with each other	0.321	0.772	Retained
Q25_4	I felt mutual acceptance in my interactions with patients	0.405	0.766	Retained
Q25_5	We were deeply connected to one another	0.311	0.772	Retained
Q25_6	I felt we were accepting of one another	0.314	0.771	Retained
Q26_1	We really understood each other clearly in the moment	0.462	0.762	Retained
Q26_2	I felt a general sense of warmth in my patient relationships	0.381	0.767	Retained
Q26_3	We were immersed in the present moment	0.199	0.778	Retained [b]
Q26_4	There was a deep understanding between us	0.338	0.77	Retained
Q26_5	The moment felt meaningful to both of us—not just something I did for them	0.39	0.767	Retained
Q26_6	I felt we deeply trusted each other	0.328	0.771	Retained

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q26_7	I felt we connected on a human level	0.426	0.763	Retained
Q27_1	I had moments where I truly connected with my patients beyond surface-level conversation	0.516	0.757	Retained
Q27_2	I experienced a meeting that was beyond words	0.419	0.764	Retained
Q27_3	I felt like we were totally in-the-moment together	0.34	0.77	Retained
Q27_4	I felt a strong sense of closeness in my relationships with patients	0.228	0.777	Retained [b]
Q27_5	I felt we truly acknowledged each other at a very deep level	0.387	0.766	Retained
Q27_6	I experienced complete openness in my patient relationships	0.428	0.763	Retained

Interpersonal connection

Source. Connection Index (CI-12; Puder et al., 2022), adapted to the physician–patient encounter; blocks Q28 and Q29.

Response format. Extent to which each statement describes the physician's typical experience.

Internal consistency, administered set. α = .637, ω = .640.

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q28_1	I would voice my concerns or questions with my patients	0.06	0.649	Removed
Q28_2	I felt free to express the things that worry me	0.488	0.563	Retained
Q28_3	I feel free to ask for more information about my patients' decisions or actions	0.3	0.616	Retained
Q28_4	The way we communicated was clear or helpful to our goals	0.317	0.613	Retained

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q28_5	My patients seemed to respect me even when I made mistakes	0.381	0.594	Retained
Q28_6	I often felt grateful to work with my patients	0.126	0.644	Removed
Q29_1	I felt heard and understood by my patients	0.368	0.605	Retained
Q29_2	I felt understood and heard based on my patients' body language, nonverbal cues, and facial expressions	0.228	0.627	Retained [b]
Q29_3	My patients were in tune with my perceptions and concerns	0.296	0.614	Retained
Q29_4	My patients explained their thought processes when making decisions	0.252	0.624	Retained
Q29_5	I was given space in my patient interactions to reflect and reach my own conclusions	0.388	0.595	Retained

Cognitive overload

Source. Digital Stress Scale (Argyriadi et al., 2025), administered as a 20-item pool (blocks Q21–Q24).

Response format. 5-point agreement (1 = strongly disagree to 5 = strongly agree).

Internal consistency, administered pool. α = .632, ω = .642.

Refinement basis. Unlike the other constructs, this pool was reduced on dimensional grounds. Parallel analysis (Horn, 1965) retained four factors that did not align with the four administered subscales, so the pool did not function as a unidimensional scale and was respecified as the five-item digital encroachment/exhaustion core (Q21_1, Q24_2–Q24_5). The item–rest and alpha-if-deleted values shown are descriptive and did not determine the respecification.

Parallel analysis of the 20-item pool (observed vs. random eigenvalues)

Factor	Observed eigenvalue	Random 95th percentile	Decision
1	3.20	1.74	Retained
2	2.30	1.60	Retained
3	2.06	1.49	Retained
4	1.48	1.40	Retained

Factor	Observed eigenvalue	Random 95th percentile	Decision
5	1.21	1.33	Not retained

Administered items (20-item pool)

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q21_1	I feel mentally exhausted after prolonged use of electronic medical records (EMRs) and other digital systems	0.478	0.595	Core
Q21_2	Using multiple digital platforms in my work is overwhelming	0.248	0.618	Removed
Q21_3	Digital tasks reduce my focus on direct patient care	0.26	0.615	Removed
Q21_4	I experience physical strain (e.g., headaches, eye fatigue) due to screen exposure	-0.11	0.664	Removed
Q21_5	I would prefer paper documentation over digital methods	0.217	0.621	Removed
Q22_1	I feel stressed when I have to learn new digital systems	0.082	0.639	Removed
Q22_2	Frequent software updates disrupt my workflow	0.06	0.638	Removed
Q22_3	Technical problems with digital systems cause frustration	0.02	0.641	Removed
Q22_4	I receive too many digital alerts or notifications during work	0.025	0.639	Removed
Q22_5	I have not received adequate training to use digital tools effectively	0.432	0.59	Removed
Q23_1	Digital tools reduce the human connection in my interactions with patients	0.271	0.613	Removed
Q23_2	I spend more time on screens than interacting with patients	0.216	0.621	Removed

Item	Item (as administered)	Item–rest r	α if deleted	Decision
Q23_3	I sometimes feel emotionally detached due to digital documentation	0.47	0.586	Removed
Q23_4	Telehealth feels less personal than in-person care	0.042	0.642	Removed
Q23_5	Technology limits my ability to provide holistic care	0.199	0.622	Removed
Q24_1	I check work-related emails or messages outside of my shifts	0.069	0.635	Removed
Q24_2	Digital communications make it hard to disconnect from work	0.415	0.594	Core
Q24_3	Digital demands negatively affect my sleep	0.43	0.587	Core
Q24_4	I feel expected to be digitally available even outside work hours	0.222	0.62	Core [b]
Q24_5	Digital work reduces the time I have for self-care	0.402	0.594	Core

Techno-uncertainty (administered, excluded before analysis)

Source. Techno-uncertainty block (Q20) of the adapted technostress instrument. Administered but dropped from the technological strain composite before analysis because it indexes the pace of technological change rather than the experience of strain; these items are not among the 95 analyzed items and carry no diagnostics.

Item	Item (as administered)
Q20_1	I am threatened by colleagues who know more about telehealth technologies than I do
Q20_2	There are always new developments in the telehealth technologies we use in our practice
Q20_3	There are constant changes in telehealth software in our practice
Q20_4	There are constant changes in telehealth hardware in our practice
Q20_5	There are frequent upgrades in telehealth platforms in our practice

Item	Item (as administered)
Q20_6	I am uncertain about which telehealth technologies will become standard in the future

Note. $N = 190$. Item codes correspond to the survey blocks referenced in the Method and Results and to the "Items removed" column of Table 3. Corrected item–rest correlations and alpha-if-item-deleted values were computed within each construct prior to structural estimation. Internal-consistency values in the headings are for the administered (pre-refinement) item set, against which the alpha-if-item-deleted values should be read.

[b] Met a single diagnostic flag but was retained to preserve content coverage, as described in the Results.

Appendix B

Zero-Order Correlations Between the Candidate Control Variables and the Study Variables

Variable	Age	Years in practice	Urban vs rural	Gender
Telehealth usage	-.17*	-.01	.11	.04
Pleasure	-.13	-.13	-.11	.03
Engagement	.03	-.01	-.13	-.14
Meaning	-.10	-.07	-.01	.06
Work autonomy	.29***	.28***	-.18*	.00
Technological strain	-.08	.14*	.24**	.20**
Digital encroachment/exhaustion	-.15*	.02	.14	.28***
Relational depth	.08	.01	-.11	-.01
Interpersonal connection	.10	.16*	-.08	-.21**

Note. $N = 190$. Cell entries are zero-order correlations between each candidate control variable and the study variables. Coefficients for age are Pearson correlations. Coefficients for the years-in-practice band are Spearman rank correlations. Coefficients for urban versus rural practice location and for gender are point-biserial correlations (urban coded 1, all other locations 0; gender coded 1 = male, 2 = female). Gender was entered as a covariate in the estimated models and also appears in Table 4. Age, years in practice, and urban versus rural practice location were not entered in the primary model, and their influence was examined in a sensitivity analysis. Correlations were used to decide which controls warranted inclusion, on the principle that a covariate is informative only when it relates to the variables it might confound.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix C

Exploratory Factor Analysis of the Retained Outcome Items

An exploratory factor analysis was conducted on the 21 retained outcome items (pleasure, engagement, and meaning) on the full sample (N = 190), using minimum-residual extraction with oblimin rotation. The number of factors was determined by parallel analysis, which retains a factor only when its eigenvalue exceeds the corresponding 95th-percentile eigenvalue from random data of the same dimensions (1,000 replications). Two factors were retained. The interfactor correlation was .41.

Table B1

Parallel Analysis of the Outcome Items (Observed vs. Random Eigenvalues)

Factor	Observed eigenvalue	Random 95th percentile	Decision
1	5.19	1.76	Retained
2	1.73	1.62	Retained
3	1.48	1.51	Not retained
4	1.30	1.43	Not retained
5	1.17	1.35	Not retained

Table B2

Two-Factor Pattern Matrix (Oblimin Rotation)

Item	Item (as administered)	Factor 1	Factor 2
Pleasure			
Q11_1	I enjoy my work	**0.50**	0.10
Q11_2	I still feel good doing my work	**0.35**	0.05
Q11_3	I am enthusiastic about my work	**0.53**	0.09
Q11_4	My work inspires me	**0.57**	−0.16
Q11_5	My work gives me a lot of satisfaction	**0.46**	0.12
Engagement			
Q12_1	At my work, I feel bursting with energy	0.09	**0.58**

Item	Item (as administered)	Factor 1	Factor 2
Q12_2	At my job, I feel strong and vigorous	−0.04	**0.60**
Q12_3	I am enthusiastic about my job	**0.48**	0.24
Q12_5	When I get up in the morning, I feel like going to work	0.13	0.26
Q12_6	I feel happy when I am working intensely	0.26	**0.30**
Q12_7	I am proud of the work that I do	0.15	**0.38**
Q12_8	I am immersed in my work	**0.47**	0.17
Q12_9	I get carried away when I'm working	0.03	**0.43**
Meaning			
Q15_1	I have found a meaningful career	0.18	0.18
Q15_2	My work helps me better understand myself	**0.35**	0.29
Q15_3	I know my work makes a positive difference in the world	0.20	**0.45**
Q15_4	I understand how my work contributes to my life's meaning	**0.64**	−0.04
Q15_5	I have a good sense of what makes my job meaningful	0.28	0.21
Q15_6	My work helps me make sense of the world around me	**0.48**	**−0.37**
Q15_7	I have discovered work that has a satisfying purpose	**0.52**	0.05
Q15_9	The work I do serves a greater purpose	**0.46**	0.02

Note. $N = 190$. Loadings are from a two-factor minimum-residual extraction with oblimin rotation. Salient loadings (≥ .30 in absolute value) are in bold. The interfactor correlation was .41. Pleasure and meaning items load on the first factor and engagement items on the second; pleasure and meaning do not separate at the item level.