Individual and organizational predictors of patient care: A multilevel analysis of the English National Health Service Staff Survey

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Individual and organizational multilevel predictors of patient care: Is doctors' work-related wellbeing the missing link?

Abstract

Growing evidence attests to the importance of doctors' psychosocial working conditions in relation to the provision of good quality patient care. However, few studies have explored the mechanisms of this relationship, including the role of work-related wellbeing as a mediator. Even fewer have done so from a multilevel perspective with organization-level predictors or informed by a theoretical framework. Drawing on the job demands-resources (JD-R) model, we ran multilevel structural equation models to test: (i) whether individual and organization-level psychosocial predictors influence doctors' self-reported perception of care provided; and (ii) whether psychological strain and work engagement mediate these relationships. Data was drawn from a national survey of doctors (n=14,066) and metrics from all 157 English hospital organizations. At the individual level, work overload and job control predicted quality of care, while workplace aggression and manager support did not. Indirect effects were observed for all examined psychosocial predictors and quality of care as mediated by work engagement. At the organization level, only work engagement mediated the relationships between the number of emergency admissions and the quality of organization and individual care. These findings emphasize the importance of positive manifestations of work-related wellbeing and the improvement of hospital working conditions. The JD-R model provides a useful framework at the individual level, although study design limitations may explain its incompatibility at the organization level.

Keywords: psychosocial working conditions, multilevel modelling, quality of care, wellbeing, job demands-resources model

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Increasing demands on health services paired with under-funding and resourcing of these services (Baeten et al., 2018) have resulted in doctors reporting increasingly challenging work environments (Krämer et al., 2016; Royal College of Physicians, 2015). Poor psychosocial working conditions in the healthcare sector has, in turn, facilitated growing concerns regarding doctors' wellbeing and patient care (Kinman & Teoh, 2018; Scheepers et al., 2015). The existing literature on working conditions in healthcare has mainly focused on nursing (Aiken et al., 2008) or multidisciplinary (Hall et al., 2016) samples whose work roles and context differ from doctors. Studies involving doctors has mainly been on burnout (Lee et al., 2013), leading to calls for more research on the impact that doctors' psychosocial working conditions have on their wellbeing and performance (Loerbroks et al., 2016).

There is an inherent assumption that psychosocial working conditions and patient care are linked. Evidenced by a recent systematic review where better working conditions as perceived by doctors were associated with better clinical care and patient safety (Teoh et al., 2019). However, two key methodological and conceptual limitations exist. First, these studies typically lack theoretical underpinning (Scheepers et al., 2015) when published as shorter articles in medical journals. In this study, we utilize the job demands-resources (JD-R) model (Bakker & Demerouti, 2017; Demerouti et al., 2001) as it accounts for mediators in the psychosocial working conditions and performance relationship. This also addresses the paucity of studies attempting to explain the mechanisms underpinning this relationship in relation to the quality of care provided.

As more policy, practice and research attention is placed on a systems perspective that links psychosocial working conditions, doctors' work-related wellbeing, and patient care (de Lange et al., 2020), establishing how these constructs interlink with each other is fundamental

in guiding decision making and enhancing theoretical advancement for the JD-R model. We aim to address this by utilising data derived from a national sample of hospital-based doctors in the English National Health Service (NHS) to test the role of psychological strain and work engagement as mediators between psychosocial working conditions and patient care. Using both positive and negative measures of work-related wellbeing allows a more nuanced view of this construct to examine the inconsistent findings to date of wellbeing as a mediator (Loerbroks et al., 2016; Weigl et al., 2015). It also extends previous research among healthcare workers that has been dominated by burnout (Scheepers et al., 2015).

Second, nearly all of the studies in this area operate at the individual level (Ansmann et al., 2013; Teoh et al., 2019). This is important as doctors' psychosocial working conditions, doctors' work-related wellbeing, and patient care are shaped by wider systems issues (e.g., the demands being placed on the hospital). Ignoring the wider context hinders theoretical understanding and restricts the development of practical interventions. Individual-level studies also do not analytically account for the clustering of doctors within groups (e.g., departments and hospitals), violating the normality assumptions of many statistical tests (Preacher et al., 2010). Therefore, we utilize a multilevel perspective to consider psychosocial working conditions at the individual (e.g., work overload, job control) and organization (e.g., bed occupancy rates, hospital leadership) level and how these relate to individual-level measures of work-related wellbeing and quality of care. In doing so we test the JD-R model from an organizational perspective, which to date has received limited attention compared to intra-individual multilevel analysis (Simbula, 2010). Our choice of measures also respond to calls for more innovation to test the JD-R model (Bakker & Demerouti, 2017), including using objective measures (i.e., organization data) and flexibility in the operationalisation of constructs within the model (i.e., quality of care as a measure of performance).

Applying the job demands-resources model to doctors

The underlying principle of the JD-R model is that different aspects of the psychosocial work environment can be either a demand or resource (Bakker & Demerouti, 2017). Job demands refer to any social, organizational, physical, or psychological aspects of work associated with psychological and/or physiological costs due to sustained effort (Demerouti et al., 2001). In contrast, job resources help (i) reduce job demands, (ii) achieve work goals, and/or (iii) stimulate personal development. Amid a myriad of job demands and resources, we focus here on two types of job demands (work overload, workplace aggression) and resources (job control, manager support) particularly salient to doctors in England (BMA, 2017; Khan et al., 2018; Kinman & Teoh, 2018), and were among the strongest predictors of doctors burnout in a meta-analysis of 65 studies (Lee et al., 2013).

In England, staff shortages, funding cuts, and lack of training time were key contributory factors in perceived increases in workload (Royal College of Physicians, 2015) and is a consistent concern raised by doctors (Royal College of Physicians, 2016). Workload is the most common work predictor (k=19) for doctors' burnout in the earlier mentioned meta-analysis (Lee et al., 2013). Aggression towards doctors has also been identified as a significant issue in England (BMA, 2017). Workplace aggression encompasses a variety of interpersonal and harmful behaviours (Schat & Kevin Kelloway, 2005), which in healthcare can stem from colleagues, patients, and the public. For example, 35.7% of junior doctors in England in 2020 reported being harassed or bullied by patients or the public in the previous year and 22.2% by colleagues. An estimated 18.5% experienced physical violence from patients or the public (NHS Staff Survey Coordination Centre, 2021). Conceptually, workplace aggression overlaps with patient harassment (Xanthopoulou et al., 2007) and interpersonal conflict (Schaufeli, 2015), both of which have been used to operationalize job demands. Crucially, experiencing workplace aggression comes with a psychological, physical, and emotional cost congruent with characteristics of a job demand. Work overload

and workplace aggression have also been associated with doctors reporting higher levels of stress and presenteeism (Teoh et al., 2020) and psychiatric distress (BMA, 2017).

Support and job control also underpin other models of work-related health (e.g., the job demands-control-support model; Karasek & Theorell, 1990). Job control refers to the degree a worker can control their own work tasks and skill use. The erosion of job control due to bureaucratization and work pressures has been raised as a concern by doctors (Khan et al., 2018; Kinman & Teoh, 2018). This lessens their influence over their work environment or buffer any harmful effect of job demands (Bakker & Demerouti, 2017). Among doctors, reviews involving job control show it is associated with job satisfaction (in 15 of 16 studies Scheurer et al., 2009) and clinical excellence and patient safety in (8 out of 12 relationships; Teoh et al., 2019). This is in addition to better organizational commitment in Finland (Kuusio et al., 2010) and work ability in Germany (Bernburg et al., 2016).

The line manager of doctors are often tasked with clinical supervision, feedback, professional development, and pastoral support (Kilminster & Jolly, 2000). Making manager support a pivotal resource for doctors. In general, supportive managers are crucial in facilitating healthier and more productive work environments as they maintain access to resources, provide informational support, and allocate workloads (Teoh et al., 2016). They can also provide encouragement and emotional support that help meet the need to belong - a key need within self-determination theory (Deci & Ryan, 1985). However, while there is empirical support for it in relation to wellbeing, including burnout (Sochos et al., 2012) and work ability (Mache et al., 2013), not all studies have found manager support to predict these same measures (Bernburg et al., 2016).

Quality of care as an outcome of job demands and resources

According to the JD-R model, workers may ignore vital information and contextual cues as they expend energy and time dealing with their job demands (Jex, 1998). For

example, Landrigan and colleagues (2004) found hospital interns working shifts of at least 24 hours had twice as many attention failures and made 36% more serious medical errors than those working shorter periods. Nurses were also more likely to miss intervention cues when under time pressure (Thompson et al., 2008). Job resources, however, not only alleviate any detrimental impact from job demands but provide resources and support to meet work goals (Bakker & Demerouti, 2017; Deci & Ryan, 1985). Consequently, low job demands and high job resources should lead to better work outcomes.

In healthcare, performance centres on the provision of high-quality patient care. This pertains to clinical excellence and patient safety, which are conceptually and operationally interwoven with international definitions of healthcare quality (Aspden et al., 2004; King's Fund, 2011). Clinical excellence aims to prevent people from dying prematurely, enhance quality of life, and help recovery from ill-health. Patient safety emphasizes a safe environment without avoidable harm. However, good quality care is a different construct to general performance indicators, as doctors do not have influence over all antecedent factors. It also means different things to different people, and positive outcomes are not always possible (Donabedian, 1988; King's Fund, 2011). Therefore, the evidence and theory on performance antecedents may not be transferable where quality of care is an outcome. This aligns with other operationalization approaches to performance (e.g., organizational citizenship behaviour, safety) that do not always observe the same relationships with other constructs within a similar nomological network (Nahrgang et al., 2011; Nielsen et al., 2009).

Nevertheless, reviews highlight some of the antecedent factors to patient care. This includes a review where 25 out of 30 studies found healthcare professionals burnout positively associated with errors (Hall et al., 2016), or where doctors' satisfaction and engagement were associated with one of six different quality of care measures in 14 out 18 included studies (Scheepers et al., 2015). Similarly, Teoh et al.'s (2020) review found a

positive association between doctors perceived working conditions and clinical excellence (in 23 out of 30 relationships) and patient safety (seven out of 11 relationships), but not with patient experience (three out of 12 relationship). Crucially, these reviews highlight a dearth of studies incorporating a theoretical perspective, and that the presence of observed associations varied by the type of quality-of-care measure used.

We recognize the rather a-theoretical research on quality of care, and that such postulations have not yet been tested within the JD-R framework. We focus on three self-reported quality-of-care measures used within the NHS: the care doctors felt they provided, the care they felt their organization provided, and the number of errors seen. These match the clinical excellence and patient safety dimensions of care quality. Crucially, quality at the individual and organization level delineates between what a doctor is able to do against that of the wider organization (Hall et al., 2016; King's Fund, 2011). This is important in understanding performance within the JD-R model from a multilevel perspective manifested across different levels, with potential antecedents factors at both the individual and organization level (Bakker & Demerouti, 2017). Therefore, congruent with the JD-R model (see Figure 1), we hypothesize that:

Hypothesis 1: Job demands (Work overload and workplace aggression) at the individual level will negatively predict the quality of individual (H_{1a}) and organization care (H_{1b}), and positively predict the number of errors seen (H_{1c}).

Hypothesis 2: Job resources (Manager support and job control) at the individual level will positively predict the quality of individual (H_{2a}) and organization care (H_{2b}), and negatively predict the number of errors seen (H_{2c}).

Hypothesis 3: Psychological strain at the individual and organization level will negatively predict the quality of individual (H_{3a}) and organization care (H_{3b}), and positively predict the number of errors seen (H_{3c}).

Hypothesis 4: Work engagement at the individual and organization level will positively predict the quality of individual (H_{4a}) and organization care (H_{4b}), and negatively predict the number of errors seen (H_{4c}).

[Insert Figure 1 here]

Work-related wellbeing as a mediator

Within the JD-R model, the *health-impairment process* stipulates that job demands predict performance through strain, which can manifest as burnout, stress or health exhaustion, among other ill-health measures (Bakker & Demerouti, 2017). Job demands arouse a stress process that leads to energy depletion (van Emmerik et al., 2009), requiring a greater effort that comes at a higher psychological and physical cost to the individual. In turn, workers who are exhausted or experiencing ill-health lack the capacity or resources to achieve their work goals. In contrast, according to the *motivational process*, job resources influence performance via motivation. Motivation here is an umbrella term representing positive measures, including work engagement and job satisfaction. As job resources allow workers to tap into energy and enthusiasm, as well as facilitating goal-orientated behaviour, this is associated with better performance.

The JD-R model emphasizes the independence of the dual processes, with studies across several occupations supporting this assertion (Demerouti et al., 2001; Hakanen et al., 2008). However, contradictory evidence also exists, including a meta-analysis of 203 safety-related studies (Nahrgang et al., 2011) where job demands (e.g., complexity, risks and hazards) and job resources (e.g., autonomy, knowledge, social support, safety climate) both predicted work engagement (r=.61 & .67 respectively) and burnout (r=.13 & .23 respectively). Similarly, a meta-analysis of 65 studies found job resources, such as autonomy (k=6, r=-.36), professional development (k=6, r=-.31), and safety culture (k=7, r=-.34), to be among the most consistent predictors of emotional exhaustion in doctors (Lee et al., 2013).

Within the healthcare literature, where the mediating role of work-related wellbeing has been tested among doctors there is either evidence of cross-paths (Loerbroks et al., 2016; Weigl et al., 2015) or that work-related wellbeing is not a mediator (Krämer et al., 2016). Moreover, these studies use burnout and depression as mediators, neglecting any positive wellbeing measures. Hence, despite evidence from other occupational groups (e.g., dentists in Finland ,Hakanen et al., 2008; and teachers in Italy, Simbula, 2010) for separate health-impairment and motivational processes, these may not be completely independent and some cross-paths can still occur. Nevertheless, drawing on the JD-R model, we hypothesize that:

Hypothesis 5: Psychological strain will mediate the relationship between job demands (work overload and workplace aggression) and quality of individual (H_{5a}), quality of organization care (H_{5b}), and the number of errors seen (H_{5c}).

Hypothesis 6: Work engagement will mediate the relationship between job resources (manager support and job control) and quality of individual (H_{6a}), quality of organization care (H_{6b}), and the number of errors seen (H_{6c}).

A multilevel perspective of the JD-R model

The flexibility of the JD-R model allows it to incorporate measures across various levels although most multilevel examinations have been at micro (i.e., intra-individual) rather than macro (i.e., team, organization) levels (Bakker & Demerouti, 2017; Schaufeli & Taris, 2014). The latter is particularly important for wider systems- and organization- level research that acknowledge the limitations of individual-level research. This includes neglecting the wider context in which doctors operate in, where their work-related wellbeing or the quality of care they provide are influenced by antecedents at the societal, organization, and group level (Lowe & Chan, 2010). Doctors are also situated within teams, specialities, and hospitals and their exposure over time to a similar work environment results in them becoming less alike to their out-group and more akin to their in-group (Croon & van Veldhoven, 2007). This

violates the assumptions of normality for most statistical tests which requires data to be independent of each other (Preacher et al., 2010). Considering that to date the psychosocial working conditions of doctors and quality of care relationship has been examined at the individual level (Teoh et al., 2019), employing a multilevel perspective yields a better understanding of this relationship.

While demands and resources can be accrued at different levels (Ghezzi et al., 2020), what is less known is what these might be and whether they have the same influence on wellbeing and performance at the individual level. Where the validity of the JD-R model has been tested at a group level, results have been inconclusive. For example, burnout among teachers was predicted by school-level demands and resources (González-Morales et al., 2012), although teamwork effectiveness among nurses from seven European countries predicted work engagement but not burnout (Montgomery et al., 2015). Crucially, none of these predicted individual-level outcomes related to performance.

Congruent with the JD-R's motivational process, tests of individual work-related wellbeing as a mediator between organization-level measures and individual-level outcomes primarily focus on work engagement. This is seen where it mediated the relationship between human resources practices (e.g., training and development opportunities) and organizational citizenship behaviour among service sector workers (Alfes et al., 2013), and between support-autonomy climate and performance among gas station workers (Chen et al., 2018). This ignores the health-impairment process of the JD-R model, and is of concern given that ill-health and positive health are separate constructs (Bakker & Schaufeli, 2008). Research examining doctors has almost exclusively focused on ill-health measures (Brady et al., 2018).

There is, therefore, a need to test the validity of the JD-R model's postulations at, and across, different levels. Where the JD-R model has been tested at the group level, its measures have typically consisted of shared perceptions of psychological constructs using

self-reported measures, including psychosocial safety climate (Krasniqi et al., 2019), social support (Pap et al., 2020), and production climate (Ghezzi et al., 2020). However, we use routinely collected organization data as proxies for organizational demands and resources. This not only addresses common method bias and endogeneity concerns (Podsakoff et al., 2003), but by examining their predictive validity reinforces the value of what are crucial metrics in the healthcare sector (Powell et al., 2014; Sizmur & Raleigh, 2018)

We postulate that the two organizational demands examined here – the number of emergency admissions and the proportion of beds occupied – meet the definition of a job demand described earlier. Crucially, both measures are indicators of the pressure faced by the NHS (Baker, 2018). This also aligns with the operationalization of job demands at the organization level as production pressure climate, which correlated with risky safety behaviours across 33 Italian and American organizations (r=.46) (Ghezzi et al., 2020). High bed occupancy rates in the United Kingdom is related to higher levels of hospital infections (r=.46) (Cunningham et al., 2006), psychological strain in healthcare workers (r=.11) (Sizmur & Raleigh, 2018), and lower likelihood of emergency departments meeting performance targets (Friebel & Juarez, 2020). Similarly, a reduction in the number of emergency admissions resulted in a decrease in hospital mortality rates in a quasi-experimental design of English hospitals (Boyle et al., 2012). Therefore, we predict that:

Hypothesis 7: Organization demands (Number of emergency admissions and bed occupancy rates) will negatively predict the quality of individual (H_{7a}) and organization care (H_{7b}), and positively predict the number of errors seen (H_{7c}).

Hypothesis 8: That the relationships in Hypothesis 7 will be mediated by psychological strain (H_{8a} to $H8_{c}$ respectively).

Finally, we use hospital leadership and bed-to-doctor ratios as two indicators of organizational resources. The former draws on a rating by the Care Quality Commission

(2020), the English healthcare regulator, on how well-led the hospital organization is in relation to the provision of care and the development of an open, supportive, innovative, and fair culture. This definition overlaps with various climate constructs, with psychosocial safety climate linked to lower levels of emotional exhaustion in school teachers (Dollard & Bakker, 2010) and fewer injuries in healthcare workers (Zadow et al., 2017). Meta-analytical evidence observes safety climate is associated with fewer accidents (k=28, r=.13) and better safety compliance (k=12, r=.43) (Clarke, 2006). Leadership itself has been identified as a key antecedent to employee wellbeing, although extant research has primarily focused on performance instead (Inceoglu et al., 2018). The ratio of staff to beds represents a sector wide standard on the level of resources, with evidence linking it to patient care and staff wellbeing (Sizmur & Raleigh, 2018). For example, English hospitals with the lowest number of nurses-to-bed ratios had a 7% higher likelihood of post-emergency surgery death than hospitals with the highest ratio (Ozdemir et al., 2016). Having more staff also supports the completion of work tasks and alleviates job demands, which are key characteristics of job resources (Demerouti et al., 2001). Consequently, we postulate that:

> *Hypothesis 9:* Organization resources (Hospital leadership and bed-to-doctor ratios) will positively predict the quality of individual (H_{9a}) and organizational care (H_{9b}), and negatively predict the number of errors seen (H_{9c}).
>
> *Hypothesis 10:* That the relationships in Hypothesis 9 will be mediated by work engagement (H_{10a} to H_{10c} respectively).

Method

Survey Background and Study Sample

The study sample was drawn from the 2014 NHS Staff Survey in England, a nationally representative survey assessing the work experience and wellbeing of NHS staff. The survey was completed by 255,150 employees from 287 English NHS organizations (i.e.,

Trusts), a 42% response rate. For this study, we focused on the 14,066 medical doctors that worked across the 157 Acute or Specialist Hospital Trusts. Specialist Trusts refer to hospitals that focus on one area (e.g., oncology, paediatrics). Mean number of doctors per organization was 89.59 (*SD*=94.76) with a median of 41 (range 11–458). Neither gender nor age were available due to data protection laws. Based on past research (Powell et al., 2014) we controlled for organization tenure at the individual level as well as organization size (i.e., the number of beds available) and Specialist Trust status at the organization level.

Individual-level items were drawn from the 2014 NHS Staff Survey. All items, unless otherwise specified, used a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items are based on existing measures and theoretical frameworks, undergoing cognitive testing and annual psychometric analysis (Powell et al., 2014).

Job demands

Work overload, measured with two items (α=.72), refers to not being able to meet work tasks due to a lack of resources (e.g., "I do not have adequate materials, supplies and equipment to do my work"). Three items measured *workplace aggression* (α=.75). Participants self-reported whether in the previous 12 months they had experienced physical violence or harassment from colleagues and from patients and their families on a five-point frequency scale ("1=*never*", "5=*more than 10 times*").

Job resources

Four items measured *job control* (e.g., "I am able to make suggestions to improve the work of my department"; α=.90). *Manager support* used five items (α=.93; "My immediate manager can be counted on to help me with a difficult task at work"). Items here are based on those measuring healthcare workers' perceived work characterises (Haynes et al., 1999).

Work-related wellbeing

Work engagement was measured with three items (α=.84) based on Schaufeli and Bakker's (2003) Utrecht Work Engagement Scale with one item each presenting vigor, dedication and absorption. One-item measured *psychological strain* ("during the last 12 months have you felt unwell as a result of work-related stress?") with a binary "*yes"* and *"no"* response. This feeling unwell is a strain response in relation to the challenges and demands from the work environment (Schaufeli & Taris, 2014).

Quality of care

Quality of organization care (α=.80) reflected how doctors perceived the overall care their organization provided (e.g., "If a friend or relative needed treatment, I would be happy with the standard of care provided by this organization"). *Quality of individual care* (α=.82) measured the care doctors themselves were able to provide (e.g., "I am able to deliver the patient care I aspire to"). Both measures used three items. *Errors seen* used two items to record whether doctors had in the previous month seen any errors, near misses, or incidents that could hurt patients or staff. Each item was responded with a dichotomous "yes" or "no".

Organizational demands

Two forms of routinely collected data covering October to December 2014 were used as proxies for organizational demands: (i) *bed occupancy rates* (NHS England, 2015a) which represented the average overnight bed occupancy rates within the hospital organization, and (ii) the *number of emergency admissions* to the hospital organization (NHS England, 2015b). A higher proportion represented more demands placed onto the hospital organization.

Organizational resources

We used two measures from the Care Quality Commission's (2020) inspection of hospital organizations, carried out between 2014 and 2015. *Quality of hospital leadership* reflected a four-point rating scale (1=inadequate, 4=outstanding) on how well-led a hospital organization is. The rating is provided by inspection teams on the basis of interviews, review

of organization documents and metrics on criteria that include ability to manage risk, issues and performance; vision clarity and credible strategy; and leadership capacity and capability (Care Quality Commission, 2020b). As part of inspections, the *ratio of beds per doctor* are also reported, with a lower number representing fewer beds per doctor.

Analysis

We tested the study hypotheses[1] using multilevel structural equation modelling in MPlus 8 by building a series of models from the bottom up[2]. This allows for doctors to be clustered and for variables at different levels to be integrated into one model. This involves summarising variability at the lower level (i.e., within-group) along with between-group variability at higher levels (Heck & Thomas, 2015). The lowest level of measurement, known as Level-1, is in this study the individual doctor; the next level up (Level-2) is the hospital organization. Organization-level predictors were grand-mean centred while individual-level predictors were group-mean centred.

After the multilevel factor structure indicated a good overall fit of the measurement model (χ^2=22447.08; *df*=351; *p*<.001; RMSEA=.07; CFI=.96; TLI=.95), the first step determined the unconditional model. The second model added the control variables, with subsequent models testing the impact that individual- (Model 3; $H_1 – H_4$) and organization-level (Model 4; H_7, H_9) predictors had on quality of care. These map onto the direct relationships in Figure 1. The fifth model examined the indirect effects between job demands and resources with quality of care (H_5, H_6). Here, as all variables existed at the individual level, the within-variance components were the focus of the analyses. The sixth and final model tested whether work-related wellbeing mediated the relationship between

[1] A conservative level of significance was used for individual-level analyses (p<.01) and observations had to have at least a small effect size for standardized correlation and regression coefficients (>.10).
[2] Models were compared with Wald chi-square test of parameter equalities as chi-square difference testing is not usable with the weighted least square (WLSMv) estimator. We used WLSMv as it can handle dichotomous and ordinal variables, and provides a more conservative and robust approach compared to other estimators (Asparouhov & Muthén, 2013).

organization-level demands and resources with quality of care ($H_{8,}$ H_{10}). The organization-level predictors operated at the organization level, with work-related wellbeing and quality of care at the individual level. As Level-2 variables were being used, to prevent variance conflation only the between- organization variance components on all variables were used in this model (Zhang et al., 2009). Indirect effects were estimated using parametric bootstrapping with 20,000 samples at 95% confidence intervals (Preacher et al., 2010).

Results

The same patten of anticipated correlations relationships were observed at both the individual and organization level (Table 1), with better self-rated perceptions of psychosocial working conditions correlated with better wellbeing and better quality of care. Fewer correlations were found involving organizational demands and resources, with quality of organization care the only one to relate with all organization-level predictors. Between them, only bed occupancy rate had correlations with emergency admissions (r=.30) and beds-per-doctor ratio (r=.28).

[Insert Table 1 here]

Model 1: The unconditional model

The specified unconditional model involved all three outcome variables. We first examined this model's *deff* score, which determines the amount of variance due to between-group variation in relation to cluster size. All three outcome variables exceeded the threshold of 2, indicating sufficient variation at the between-group level to necessitate a multilevel perspective (Muthén & Satorra, 1995): quality of organization care (7.62), quality of individual care (3.44), and errors seen (2.32). The fit of the unconditional model was good (χ^2=1947.01; df=34; RMSEA=.06; CFI=.99; TLI=.98).

Model 2: Control variables on quality of care

Adding two control variables (tenure, organization status) to the basic model resulted in a significant change on the Wald Test (χ^2=81.22; df=2; p<.001). The model fit was good

(χ^2=574.97; *df*=47; RMSEA=.03; CFI=.99; TLI=.99). Table 2 shows that tenure was the only predictor of quality of organization care that had at least a small effect size.

Model 3: Individual-level predictors on quality of care

The inclusion of the individual-level predictors resulted in a good fitting (χ^2=6138.98; *df*=358; RMSEA=.03; CFI=.99; TLI=.99) and improved model (χ^2=2384.07; *df*=2; *p*<.001). H_1 was supported (Table 2) for work overload which predicted all three quality-of-care measures (see Table 3 for an overview). Workplace aggression predicted number of errors seen (H_{1c}). Partial support is obtained for H_{2a} as only job control predicted individual care while both manager support and job control predicted the quality of organization care (H_{2b}). Psychological strain only predicted quality of individual and organization care at the organization level, partially supporting H_{3a} and H_{3c}. Consistent with H_{4a} and H_{4b}, work engagement positively predicted quality of organization and individual care.

Model 4: Direct effects of organization-level predictors onto quality of care

Two organizational demands (mean weekly emergency admissions, bed occupancy rates) and two resources (hospital leadership, doctor-to-bed ratio) were added to form Model 4. This resulted in good fitting model (χ^2=4743.15; *df*=375; RMSEA=.03; CFI=.99; TLI=.99) although the Wald Test showed no improved model (χ^2=0.26; *df*=2; *p*=.88). We therefore tested two alternative models. The first presumed no independent processes, meaning that organizational demands and resources both predicted psychological strain and work engagement. This model had a good fit (χ^2=6186.31; *df*=375; RMSEA=.03; CFI=.99; TLI=.98) and improved Model 3 (χ^2=10.98; *df*=4; *p*<.05). The second alternative model tested whether organizational demands predicted work engagement in addition to the hypothesized model, reflecting the findings of work engagement as a mediator between organizational factors and individual level performance (Alfes et al., 2013). This was good

fitting model (χ^2=6189.80; *df*=377; RMSEA=.03; CFI=.99; TLI=.98) that improved Model 3 (χ^2=10.98; *df*=4; *p*<.05).

Comparing the two alterative models, the addition of a link between organizational resources and psychological strain (the first alternative model) did not improve on the second alternative model (χ^2=3.69; *df*=1; *p*>.05). Therefore, the second alternative model was retained. No support was found for H_7 or H_9 as the only predicted relationship found was hospital leadership (H_{9b}) positively predicting quality of organization care (Table 2).

[Insert Table 2 here]

Model 5: Indirect effects between job demands and resources with quality of care

Twelve mediation pathways were included resulting in a good fitting (χ^2=6189.79; *df*=377; RMSEA=.03; CFI= .99; TLI=.98) and improved model (χ^2=6659.68; *df*=10; *p*<.001). Congruent with H_6, work engagement mediated all six hypothesized relationships (Table 4). H_5 is rejected as psychological strain only mediated, in the opposite anticipated direction, the relationship that work overload and workplace aggression had with organization care.

Model 6: Indirect effects between organizational demands and resources with care

Nine pathways were specified to test the indirect effects of work engagement and psychological strain at the organization level. This resulted in a good fitting model (χ^2=4703.82; *df*=373; RMSEA=.03; CFI= .99; TLI= .99) with significant change on the Wald Test (χ^2=40.15; *df*=6; *p*<.001). This, therefore, is accepted as the final and best fitting model. No support was found for H_8 and H_{10} as the only indirect effects observed were where work engagement mediated the relationships between the number of emergency admissions and both quality of organization and individual-level care (Table 4).

[Insert Table 3 here]

[Insert Figure 2 here]

Discussion

This study tested individual and organization-level psychosocial predictors of three self-reported quality of care measures in a national sample of doctors from English hospitals (n=14,066), and whether work-related wellbeing mediated these relationships. This addresses a paucity of research considering the following gaps in knowledge: clustering of participants, a theoretical perspective, work-related wellbeing as a mediator, and measures at the organization level. Table 3 presents the acceptance and rejection of each hypothesis and shows that at the individual level, work overload and job control predicted self-rated quality of care, but workplace aggression and manager support did not . Only work engagement mediated these relationships (Figure 2). At the organization level, the only observed relationships were where work engagement mediated the relationships between number of emergency admissions and the quality of organization and individual care. These findings provide some support for the JD-R model although not all its postulations are supported within this given sample hospital doctors or from this multilevel perspective.

Research and theoretical implications at the individual level

Accounting for the clustering of hospital doctors, in line with the JD-R model, at the individual level work overload and workplace aggression predicted psychological strain, while job control predicted work engagement (Figure 2). The motivational process was supported as work engagement mediated the relationship between both job resources and all three self-reported quality-of-care measures. Nevertheless, we discuss three incongruent observations, namely the lack of support for (i) manager support; (ii) the health impairment process; and (iii) number of errors seen. For manager support, the line management structure for hospital doctors is often opaque and could refer to the medical director, administrative managers, or clinical supervisors (Kilminster & Jolly, 2000). Moreover, managers in workplaces have limited ability to influence staff working conditions due to organizational policies and structure (Dollard & Bakker, 2010). Therefore, manager support may refer to the

wider organization, explaining why the outcome of care being provided by the organization was the only quality-of-care measure to relate with manager support. Despite this, manager support did predict work engagement (β=.08, under the pre-set threshold of β>.10). Work engagement mediated the relationship between manager support and all three quality of care measures, suggesting that manager support does have some influence.

The relationship between the job resources and the quality-of-care measures was only mediated by work engagement. Therefore, while job control utilizes direct and indirect effects to influence quality of care, manager support does so indirectly. Our findings, however, are incongruent with the JD-R model's health-impairment process. This is likely due to the absence of a relationship between psychological strain and quality of care at the individual level. A methodological explanation here is the binary response of psychological strain makes it vulnerable to measurement error, and does not reflect the complex construct it represents (Heck & Thomas, 2015). Conceptually, doctors strive to deliver good care for their patients even when struggling with their own wellbeing (Larson & Yao, 2005). For example, where doctors with burnout have longer consultations with patients (Zantinge et al., 2009) or where stressed doctors use more patient-centred styles of communication (Howie et al., 1992). Such a strong sense of standards and duty towards their patients also likely reinforces work engagement and quality of care (i.e., the motivation process), and helps explain the evidence that work engagement may be a stronger predictor of performance than negative work-related measures (Schaufeli & Taris, 2014).

Measuring self-reported errors is equally problematic as they can be underreported as workers fear reprisal (Probst & Estrada, 2010). Moreover, some researchers argue that increased reporting of errors reflects a mature safety culture (Raleigh et al., 2009). For example, previous studies using the same error items from this study, albeit with an earlier dataset, observed that more errors reported were correlated with lower infection rates (West

et al., 2011) and better patient experience (Raleigh et al., 2009). These inconsistencies may explain the mixed patterns in the relationships involving the number of errors seen.

These findings show that relevant constructs need to be identified and operationalized with caution when the JD-R model is applied in different contexts. Here, psychological strain, manager support, and number of errors seen through its measurement introduced error (e.g., binary response) or were conceptually less clear. For manager support, a more explicit referent as to who the manager is, or other sources of support, would have likely yielded stronger relationships. Similarly, the process between different forms of doctors' wellbeing and patient care remains poorly understood, particularly what factors possibly buffer, mitigate, or attenuate these relationships (Larson & Yao, 2005). The role of personal values and professional standards is another area ripe for exploration, with value congruence and work engagement not only strongly correlated in Swedish psychologists but predictive of their subsequent commitment and retention (Huhtala & Feldt, 2016).

Research and theoretical implications at the organization level

Our organization-level predictors meets calls for more research using objective measures of job demands and resources (Bakker & Demerouti, 2017). However, only hospital leadership and emergency admissions predicted work engagement while there were only two direct relationships between organization predictors and quality of care (Figure 2). Previous use of objective job demands focussed on more immediate individual-level demands (e.g., number of customers served; Panari et al., 2012) or the distance between home village and work (Qin et al., 2014). The predictors in this study are far more distal, meaning that they could be proxies for or confounded by, other more salient factors (Kaier et al., 2012; Volpe et al., 2013). These include the presence of specialist wards, physical distribution of beds and wards, and quality of staff training. It is conceivable that these organization predictors are a better representation of the climate that doctors work in and, like psychosocial safety climate

(Dollard & Bakker, 2010), may be an antecedent to individual-level job demands and resources, rather than having a direct impact on work-related wellbeing.

The utility of intermediary measures is seen with work engagement being a full mediator between emergency admissions and quality of individual and organization care, which were the only indirect effects observed at this level. The absence of the health-impairment process here can be attributed to the same explanations at the individual level, while the lack of indirect effects involving organizational resources may be due to them being too distal to work engagement. Although the evidence reviewed earlier supports a relationship between these organization predictors and quality of care, all these studies examined hospital-level quality-of-care outcomes in the United Kingdom, including: levels of hospital infections (Cunningham et al., 2006), hospital mortality rates (Boyle et al., 2012; Ozdemir et al., 2016), and emergency room performance (Friebel & Juarez, 2020). Generalizing these relationships to this study assumes the existence of a relationship between self-reported measures of quality of care and hospital statistics when the evidence here has been inconclusive (Aiken et al., 2008; Howell et al., 2015). It may be that doctors' perception of the quality of care being provided is influenced by other individual factors, such as their working conditions or work-related wellbeing.

The fact that work engagement mediated the relationships between organizational demands and the quality of individual and organizational care is inconsistent with the JD-R model. This finding is not unique and was highlighted earlier as an outcome of group-level demands (González-Morales et al., 2012; Montgomery et al., 2015). When aggregated, work engagement represents a collective group measure that may operate differently than at the individual level (Schaufeli, 2012). Strong levels of work engagement (and psychological strain) may reflect a shared emotional contagion that strengthens them further (Bakker et al., 2006; Schaufeli, 2012), which, in turn, can have a stronger influence on work performance

(Bakker et al., 2011). This possibly explains why comparable relationships between work-related wellbeing and quality of care were stronger at the organization than at the individual level (Figure 2). Therefore, the saliency of work engagement at the organization level may not only result in stronger relationships with quality of care, but also increase the likelihood of cross-paths occurring with organizational demands.

Future examinations of the JD-R model at the organization level should consider appropriate intermediate constructs to be modelled, particularly around the perception of individual workers, when using objective demands and resources. Building on calls for better matching of job demands and resources (Chen et al., 2018; Schaufeli & Taris, 2014), there is also a gap as to how at the individual level they interact with those at the organization level to predict wellbeing. Crucially, these findings elucidate how complex the relationships at the organization and individual level are involving quality of care, and how extending a construct from one level to another has implications for a theory's validity. This does not suggest that the JD-R model is not suitable at the organization level, but instead that the measures used in this study may not be as appropriate. Nevertheless, as we move towards more interdisciplinary perspectives, researchers may want to consider whether organizational science theories (Nilsen, 2015) may be better positioned to explain the context within the healthcare sector or organizations more generally.

Implications for Practice

Efforts to improve the work-related wellbeing of hospital doctors must recognize the influence of wider organization and systems factors, along with the importance of primary interventions. Poor work-related wellbeing, and in particular burnout, dominates the attention of policymakers in the healthcare sector (Scheepers et al., 2015). However, our findings emphasize the importance of not only measuring or preventing ill-health, but on creating work environments that allow hospital doctors to thrive and flourish. More practically, the

salience of work engagement at the individual and organization level means interventions should be focusing on boosting levels of job resources in the workplace (Knight et al., 2017). The measures here are indicators of performance within the English NHS, and the identified limitations undermines evidence-based decision making and interventions. Improvements need to be made to these indicators, and discussions of this data needs to be framed in relation to these issues. As more data is being collected and used in analysis this applies to other sectors too. Here, theory provides a useful framework to structure and explain analysis.

Limitations

As a cross-sectional study, it is not possible to infer any form of causality. It is equally plausible that poor care being provided results in poorer working conditions and work-related wellbeing. In using secondary data, other measures of job demands (e.g., role conflict) and job resources (e.g., social support) salient to hospital doctors (Kinman & Teoh, 2018) were not included as it was not part of the dataset. It also meant that less appropriate measures with more measurement error (e.g., psychological strain) were used. We were also not able to include a suitable organization-level measure of quality of care (e.g., mortality rates). Consequently, limiting the examination of the JD-R model from a multilevel perspective. Finally, although hospital doctors are a heterogeneous population, we were not able to distinguish between, or control for, their specialty or seniority.

Conclusion

From a multilevel perspective, hospital doctors' psychosocial working conditions are associated with self-reported quality of care provided. This indicates that doctors' work-related wellbeing and the care they provide is linked with wider organization and system factors. Interventions should, therefore, focus on the improvement of working conditions within hospitals. The JD-R model provides a useful framework at the individual level to understand these relationships. Nevertheless, contextual nuances need to be acknowledged,

including: recognising the saliency of specific job demands and resources to a particular sample; the operationalization of constructs; or where occupational characteristics potentially undermine the health-impairment process. As we strive to better understand how individuals are affected by the system in which they operate, further research is needed to understand the validity of the JD-R model at the organizational level.

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Table 1
Descriptive statistics and correlations

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Tenure	1	-.05***	.15***	-.16***	-.03**	.06***	-.07***	-.21***	-.03***	.04***			
2. Workplace aggression	-.11	1	.19***	-.10***	-.11***	.21***	-.16***	-.15***	-.15***	.24***			
3. Work overload	-.16	.42***	1	-.40***	-.41***	.29***	-.40***	-.51***	-.43***	.27***			
4. Manager support	-.11	-.21**	-.58***	1	.57***	-.26***	.42***	.52***	.31***	-.15***			
5. Job control	-.05	-.29***	-.61***	.65***	1	-.26***	.51***	.54***	.38***	-.11***			
6. Psychological strain	.03	.34***	.56***	-.47***	-.38***	1	-.36***	-.25***	-.23***	.19***			
7. Work engagement	-.10	-.35***	-.53***	.60***	.52***	-.60***	1	.49***	.44***	-.17***			
8. Quality of organization care	-.02	-.37***	-.76***	.63***	.68***	-.52***	.54***	1	.45***	-.23***			
9. Quality of individual care	.03	-.39***	-.68***	.46***	.51***	-.44***	.55***	.58***	1	-.20***			
10. Number of errors seen	.04	.38***	.51***	-.36***	-.23**	.46***	-.37***	-.46***	-.55***	1			
11. Bed occupancy rate	-.08	.16*	.23**	-.11	-.12	.13	-.06	-.23***	-.12	.08	1		
12. Emergency admissions	-.03	.15	.30***	-.27***	-.32***	.05	-.22**	-.37***	-.30***	.18*	.30**	1	
13. Hospital leadership	-.04	-.16**	-.35**	.20**	.30**	-.22**	.11	.45**	.17*	-.16	-.10	-.06	1
14. Beds-per-doctor ratio	.02	.09	.04	-.13*	-.18*	.01	-.12	.21**	.05	.08	.28**	-.12	-.13

Note. ***p<.001; **p<.01; *p<.05. Correlations above the diagonal are individual-level (Level 1) correlations. Correlations below the diagonal are organization-level (Level 2) correlations were calculated with the mean score for all doctors from an organization on a particular measure (N=157).

Table 2

Standardized and unstandardized coefficients for direct effects onto quality of care

Predictor	Psychological strain		Work engagement		Organization care		Individual care		Errors Seen	
	β	b (95% CI)	β	b (95% CI)	β	b (95% CI)	β	b (95% CI)	β	b (95% CI)
Individual level (Level 1)										
Tenure	.08	-0.05*** (0.04, 0.07)	-.07	-0.10*** (-0.12, -0.07)	-.10	-0.11*** (-0.13, -0.09)	.01	0.01 (-0.02, 0.02)	.06	0.06*** (0.04, 0.08)
Work overload	.26	0.26*** (0.22, 0.29)	-.26	-0.49*** (-0.54, -0.43)	-.33	-0.52*** (-0.57, -0.47)	-.39	-0.59*** (-0.64, -0.54)	.32	0.46*** (0.37, 0.55)
Workplace aggression	.37	0.71*** (0.62, 0.79)	-.17	-0.60*** (-0.70, -0.50)	-.03	-0.09 (-0.32, 0.13)	-.04	-0.11* (-0.20, -0.02)	.41	1.11*** (0.87, 1.34)
Job control	-.12	-0.10*** (-0.13, -0.08)	.36	0.56*** (0.52, 0.60)	.22	0.29*** (0.25, 0.33)	.13	0.16*** (0.13, 0.19)	.11	0.13*** (0.09, 0.17)
Manager support	-.05	-0.03** (-0.04, -0.01)	.08	0.09*** (0.06, 0.11)	.21	0.19*** (0.17, 0.22)	-.04	-0.03*** (-0.05, -0.02)	-.04	-0.04** (-0.06, -0.01)
Work engagement						0.14*** (0.11, 0.17)	.29	0.23*** (0.21, 0.25)	.04	0.03* (0.01, 0.06)
Psychological strain						0.10*** (0.04, 0.17)	.01	0.02 (-0.04, 0.07)	.01	0.01 (-0.06, 0.06)
Individual-level R^2		.365		.447		.536		.459		.317
Organization level (Level 2)										
Specialist trust	-.20	-0.10 (-0.40, 0.21)	.25	0.29 (-0.21, 0.79)	-.05	-0.12 (-1.12, 0.88)	-.14	-0.18 (-0.87, 0.51)	-.16	-0.17 (-0.58, 0.24)
Bed occupancy rate	-.10	-0.16 (-0.94, 0.63)	.29	1.10 (-0.16, 2.35)	-.17	-1.41 (-4.47, 1.65)	-.24	-1.04 (-2.86, 0.78)	-.08	-0.28 (-1.64, 1.08)
Emergency admissions	.07	0.01 (-0.01, 0.01)	-.36	-0.01* (-0.01, -0.01)	-.13	-0.01 (-0.01, 0.01)	-.19	-0.01 (-0.01, 0.01)	.01	0.01 (-0.01, 0.01)
Work engagement					.52	1.14*** (0.49, 1.10)	.71	0.81*** (-0.60, 1.80)	-.35	-0.32* (-0.58, 0.03)
Psychological strain					-.64	-3.37*** (-5.03, -1.71)	-.57	-1.56*** (-2.47, -0.65)	.40	0.86* (0.04, 1.70)
Hospital leadership			.10	0.04* (0.05, 0.13)	.38	0.32*** (0.20, 0.43)	-.01	-0.01 (-0.08, 0.07)	-.10	-0.03 (-0.12, 0.05)
Bed-per-doctor ratio			-.02	-0.01 (-0.06, 0.05)	-.01	-0.01 (-0.07, 0.07)	.29	0.07** (0.02, 0.12)	-.07	-0.01 (-0.06, 0.03)
Organization-level R^2		.046		.254		.513		.698		.407

Note. *β* = standardized beta coefficients; b = unstandardized beta coefficients; *p<.05; **p<.01; ***p<.001.

Table 3

Standardized and unstandardized coefficients for indirect effects of psychological strain and work engagement between psychosocial factors and quality of care

		Organization care		Individual Care		Errors Seen	
Predictor	Mediator	β	b (95% CI)	β	b (95% CI)	β	b (95% CI)
Individual level (Level 1)							
Work overload	Psychological strain	.03	0.04*** (0.02, 0.05)	.01	0.01 (-0.01, 0.02)	.01	0.01 (-0.014, 0.02)
Workplace aggression	Psychological strain	.04	0.10*** (0.07, 0.13)	.01	0.01 (-0.04, 0.04)	.01	0.01 (-0.037, 0.05)
Job control	Work engagement	.08	0.05*** (0.04, 0.07)	.18	0.13*** (0.12, 0.15)	.15	0.03*** (0.013,
Manager support	Work engagement	.02	0.01*** (0.01, 0.01)	.29	0.02* (0.01, 0.03)	.02	0.01* (0.001, 0.06)
Organization level (Level 2)							
Emergency admissions	Work engagement	-.04	-0.01* (-0.01, -0.01)	-.03	-0.01* (-0.01, -0.01)	.05	0.01 (-0.01, 0.01)
Bed occupancy	Work engagement	.05	1.26 (-0.24, 2.77)	.03	0.90 (-0.21, 2.01)	-.04	-0.36 (-0.88, 0.18)
Hospital leadership	Work engagement	-.04	-0.13 (0.43, 0.17)	-.02	-0.06 (-0.20, 0.08)	.03	0.03 (-0.05, 0.12)

Note. *p<.05; **p<.01; ***p<.001

Figure 1: Conceptual Multilevel Model with Work-related Wellbeing as Mediator

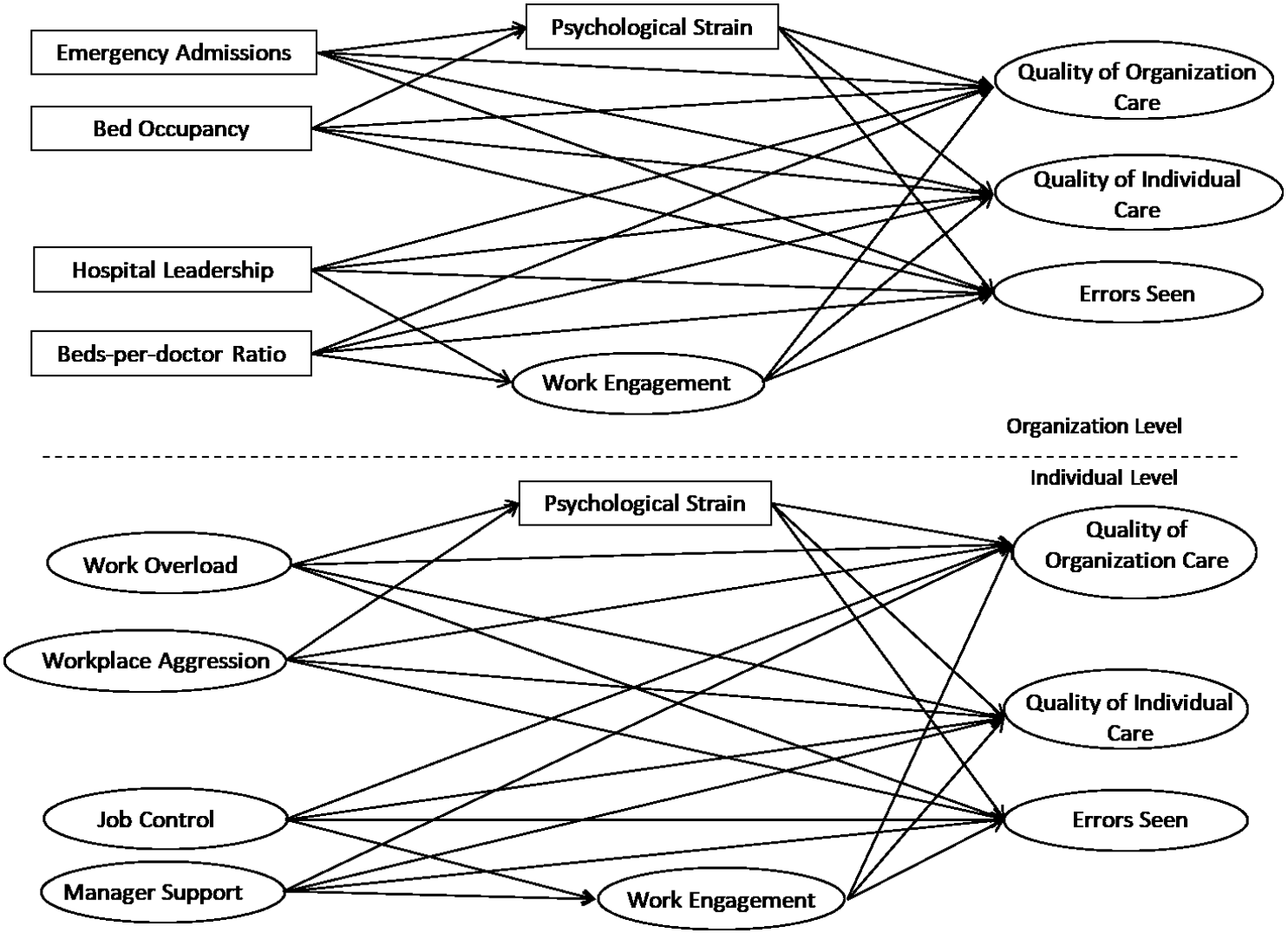

Figure 2: Hypothesized direct effects of the final model