Doctors' working conditions, wellbeing and trust quality of care: A multilevel analysis

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Abstract

Introduction Doctors' wellbeing is postulated to mediate the relationship between their working conditions and patient care although few studies have tested this. Even fewer have incorporated a multilevel perspective that considers the antecedents of quality of care at the hospital. This study draws on the job demands-resource model to test the associations between hospital-level care (mortality, patient safety incidents, patient satisfaction) with hospital-level demands (e.g. emergency admissions) and self-reported doctors' job demands, job resources and wellbeing.

Method Multilevel structural equation models were used to test the proposed associations using secondary data involving 13,239 doctors from 139 acute hospitals in England.

Results Doctors' work engagement was associated with higher levels of job control, better manager support, higher bed occupancy rates, and lower levels of emergency admissions. Presenteeism among doctors was linked with higher work overload and emergency admissions. Doctors' work-related stress was associated with higher levels of work overload. Patient satisfaction with their doctor was associated with doctors' level of work overload and job control, as well as bed occupancy rates. Work overload predicted patient safety incidents, while the number of emergency admission predicted mortality rates. Doctors' wellbeing did not mediate any relationship.

Conclusion Better working conditions for hospital doctors were associated with high levels of work engagement and lower levels of work-related stress and presenteeism, necessitating a focus on their work environment to improve wellbeing. The relationships among doctors' working conditions, wellbeing and patient care were not clear, highlighting the importance of considering both statistical and methodological issues in future research.

Keywords: Patient care, patient safety, work engagement, presenteeism, job demands, job resources

DOCTORS' WORKING CONDITIONS, WELLBEING AND HOSPITAL QUALITY OF CARE: A MULTILEVEL ANALYSIS

1. Introduction

Increasing demands on hospitals have led to concerns around the working conditions and wellbeing of doctors, and their subsequent impact on patient care (Kinman & Teoh, 2018; Royal College of Physicians, 2016). Although wellbeing (e.g., burnout, work-related stress, job satisfaction) is typically posited as a mediator between the work environment and the quality of patient care (Montgomery et al., 2011), few studies have explicitly tested this (Teoh et al., 2019). Instead, much of the evidence stems from literature that separately links healthcare workers' working conditions with their wellbeing (Imo, 2017; Lee et al., 2013; Prins et al., 2007); and, in turn, between their wellbeing and the quality of care that patients receives (Hall et al., 2016; Panagioti et al., 2018). Where studies have examined these three areas together this has been exclusively at the individual level, ignoring the clustering of doctors within hospitals and quality-of-care outcomes at the organisation level (e.g., hospital mortality rates, infection rates, admission duration, patient satisfaction) (Krämer et al., 2016; Loerbroks et al., 2016; Weigl et al., 2015). This also neglects the complex systems in which hospital doctors work, where their wellbeing and performance is a product of the interaction between themselves as individuals, and the wider organisation and system that they operate in (Teoh & Hassard, 2020). As such, we utilise a multilevel perspective to address some of these identified methodological shortcomings concerning the perceived working conditions and wellbeing of hospital-based doctors and their subsequent impact on Hospital-level quality of care.

In comparison to individual-level quality of care, substantially fewer studies have empirically linked self-rated wellbeing of healthcare staff and organisational-level quality-of-

care outcomes (Pinder et al., 2013; Welp et al., 2015). Much of this data is routinely collected, highlighting its importance as indicators of patient care (Powell et al., 2014; Topakas et al., 2010b). Using organisational-level quality-of-care outcomes in research is important to overcome issues of common method variance (Podsakoff et al., 2003). Moreover, by potentially affirming anticipated relationships between a particular outcome measure and with related measures we develop a measures' nomological network. This enhances its validity and may inform evidence-based policy making (Medical Research Council, 2014; Nuffield Council on Bioethics, 2015; Welcome Trust, 2014). As such, identifying antecedents to particular outcome measures not only reinforces the value of these measures but provides areas that can be targeted to improve the quality of care provided.

Where organisational-level quality-of-care outcomes have been examined the findings have been inconsistent. Mortality rates have been predicted by staff burnout in Switzerland (Welp et al., 2015) but not work engagement, work-related stress, presenteeism, or general health in England (Powell et al., 2014; Topakas et al., 2010a, 2010b). In terms of patient satisfaction, work engagement, and job satisfaction from the 2007 (Dawson, 2009), 2009 (Topakas et al., 2010a) and 2011 (Powell et al., 2014) NHS Staff Surveys all positively predicted patient satisfaction; although work-related stress and presenteeism did not (Powell et al., 2014; Topakas et al., 2010b). However, little explanation is provided for the presence, and perhaps, more importantly, the absence, of such relationships.

Crucially, the aggregation of individual-level wellbeing data to the organisational level to correlate with organisational-level outcome measures violates the compatibility principle (Ajzen, 2005) that requires all variables within a model to operate at the same level of specificity. This is a problem when trying to capture the complexity of work environments by considering measures across different levels (e.g., individual, ward, hospital). For example, the doctors' wellbeing is influenced by work factors at both the individual and

organisational level (Kinman & Teoh, 2018; Teoh et al., 2018). Equally, doctors' wellbeing is postulated to influence both their performance and that of their organisation (Panagioti et al., 2018; Royal College of Physicians, 2016). However, most research to date overcomes the discrepancy between individual (e.g., wellbeing) and organisational (e.g., mortality rates) measures by either: (i) aggregating all individuals' responses within a group to create one group score; or, (ii) using the same group score for each member of that group (Heck & Thomas, 2015). The former fails to account for any individual-level variation (Duncan et al., 1996; Kozlowski & Klein, 2000); while the latter inflates standard error scores and parameter estimates, which increases the probability for Type I errors (B. O. Muthén & Satorra, 1995). A multilevel perspective counteracts this by summarising variability at the higher (i.e., between-group) level, as well as within-group variability at the lower individual level (Byrne, 2012; Heck & Thomas, 2015). This allows for interactions between the individual and organisational perspective (Ryu, 2015), recognising that doctors are influenced by, as well influencing, the system around them. Such understanding is essential in focusing responsibility and intervention towards the appropriate drivers of both individual and organisational performance and wellbeing (Powell et al., 2014; Teoh & Hassard, 2020).

We frame our hypotheses according to the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2017; Demerouti et al., 2001) which postulates that at the individual-level the work environment consists of job demands and job resources. The former refers to those aspects of work that require sustained effort and come with physical, mental, or emotional costs. Examples of these include workload, emotional labour, and work-life conflict. Job resources encompass aspects of work that help achieve work tasks, mitigate job demands, and stimulate personal growth and development. These include social support, job autonomy, and effective leadership.

According to the JD-R model, job demands are associated with increased levels of strain (e.g., burnout, work-related stress), which in turn reduces performance (i.e., the health-impairment process). Job resources lead to positive wellbeing (e.g., work engagement, job satisfaction, motivation) that leads to better performance (i.e., the motivational process). While job demands can have a detrimental impact on positive wellbeing, high levels of job resources are not associated with lower levels of strain (Bakker & Demerouti, 2017). Research has consistently shown higher levels of job demands and lower levels of job resources to associate with poor wellbeing of doctors (Khan et al., 2018; Lee et al., 2013; Teoh et al., 2018). However, their subsequent impact on organisational-level quality of care is not established. Therefore, in line with the JD-R model, we hypothesise that (Figure 1):

H_1: Job demands (operationalised as work overload and workplace aggression), job resources (operationalised as manager support and job control) and wellbeing (operationalised as work engagement, work-related stress, presenteeism) will predict hospital-level quality of care (operationalised as hospital mortality, patient safety incidents, patient satisfaction).

H_2: Work-related stress and presenteeism will mediate the relationship between job demands and hospital quality-of-care outcomes.

H_3: Work engagement will mediate the relationship between job resources (i.e., manager support and job control) with hospital quality-of-care outcomes.

Given that increased bed occupancy and number of hospital admissions have been associated with lower doctor wellbeing (Teoh, Hassard, & Cox, 2020) and increased hospital mortality rates (Aiken et al., 2008; Boden et al., 2016; Madsen et al., 2014), it is anticipated that both hospital-level predictors will influence the quality-of-care outcomes. The inclusion of hospital-level demands is important in recognising the wider system that doctors are

situated within and also serves to better understand the routine statistics collected within this environment (Lowe & Chan, 2010; Powell et al., 2014). Hospital-level demands should function similarly to doctors' job demands (Schaufeli & Taris, 2014); therefore, we hypothesise that:

> H_4: Hospital-level demands (i.e., the number of emergency admissions and bed occupancy rates) will positively predict hospital mortality and patient safety incidents, and negatively predict patient satisfaction.
>
> H_5: Hospital-level demands' relationship with hospital quality-of-care outcomes will be mediated by wellbeing.

[Insert Figure 1]

2. Methods

This was a secondary analysis of routinely collected data about staff experiences at work and quality of care in acute hospital in England from September 2014 to September 2015

2.1. Data sources

Doctors' perception of their work environment and their wellbeing were obtained from the 2014 NHS Staff Survey, where items originate from established measures in the field of occupational psychology (NHS Staff Survey Coordination Centre, 2019). For example, the three items relating to work engagement were drawn from the Utrecht Work Engagement Survey while the job control items were based on the Job Content Questionnaire (Shantz et al., 2016). The survey had a response rate of 42% and we restricted the study sample to acute hospitals (n=139) and the doctors that worked within them (n=13,239). The mean number of

doctors per hospital was 82.55 (*SD*=48.75) with a median of 81 doctors. Due to data protection laws, neither gender nor age was available for analysis.

Work overload (two items; e.g., "I do not have adequate materials, supplies and equipment to do my work") and *workplace aggression* (three items; e.g., "in the last 12 months how many times have you personally experienced harassment, bullying or abuse at work from a manager/team leader or other colleagues") were used to operationalise job demands. Two types of job resources were examined: *job control* (four items; e.g., "I am able to make suggestions to improve the work of my team/department") and *manager support* (five items; e.g., "my immediate manager can be counted on to help me with a difficult task at work").

Three measures of wellbeing were included. One item each measured *perceived stress* ("during the last 12 months have you felt unwell as a result of work-related stress") and *presenteeism* ("in the last three months have you ever come to work despite not feeling well enough to perform your duties?"). Both these measures are indicators of ill-health. The third measure *work engagement* (three items, e.g., "time passes quickly when I am working") represents a positive manifestation of wellbeing.

Bed occupancy rates and *emergency admissions* were used as proxies for hospital-level demands. The former comprised of the mean overnight bed occupancy rates within the Hospital between October and December 2014 (NHS England, 2015a), while the latter represented the mean number of weekly emergency admissions to the hospital between October to December 2014 (NHS England, 2015b).

To assess quality-of-care we used the Department of Health's (2008, 2010) definition of three core aspects: clinical excellence, patient safety, and the experience of patients. One proxy measure was selected for each of these three aspects and obtained from publicly

available data relating to hospital performance. *Summary hospital-level mortality indicator* (SHMI) was used for clinical excellence and is widely used as a performance indicator (Howell et al., 2015; Topakas et al., 2010a, 2010b; Welp et al., 2015). This represented the ratio between the number of hospital patient deaths and the expected number of deaths based on the average in England accounting for patient characteristics (NHS Digital, 2017). This includes deaths in hospital and within 30 days of discharge. The SHMI reflected the period between October 2014 and September 2015.

Patient safety was measured using the number of *patient safety incidents* (PSI) obtained from the NHS National Reporting and Learning System (NHS National Reporting and Learning System, 2015). A PSI is any "unintended or unexpected incident which could have, or did, lead to harm for one or more patients receiving NHS-funded healthcare" (pg. 1). The data here encompassed six months from October 1st, 2014 to March 31st, 2015. The mean number of PSIs per month was 751.30 (*SD*=376.71). However, the variance of this measure exceeded the maximum variance allowed for analysis in Mplus; as such, it was divided by a 400 to reduce the scaling of the measure (L. K. Muthén & Muthén, 2017).

Patient experience was captured through the 2015 National Inpatient Survey (Care Quality Commission, 2016). This is an annual survey of adult inpatients that spent at least one night in a hospital in June 2015. To more accurately reflect *patients' satisfaction* with their doctors, only the three items relating to doctors were used for analyses (e.g., "when you had important questions to ask a doctor, did you get answers that you could understand?").

2.2. Analysis

Multilevel structural equation modelling was carried out using Mplus 8 (L. K. Muthén & Muthén, 2017). As the three quality-of-care indicators were at the hospital-level analysis this involved the between-hospital variance components (Preacher et al., 2010). This

represented a 1-1-2 mediation design for the hypotheses involving work overload, workplace aggression, job control, and manager support. This means that the predictor and mediator variables operate at the first, individual, level (Level 1) while the outcome variables operate at the second, group, level (Level 2). Where hospital-level demands were used, this was a 2-1-2 mediation design as these measures were at the second, group, level (Level 2). Here, the mediators remain at the first level (Level 1) and the outcomes at the second level (Level 2).

To test whether a between-hospital sample size of 139 had sufficient power for the proposed analyses a Monte Carlo analysis tested the power of individual parameters (L. K. Muthén & Muthén, 2002). Here, a series of duplications was run using population parameter estimates which average the parameter values and standard errors, allowing the calculation of the extent to which the proposed population model is covered. The test model focused on the work engagement pathway, with three predictors (job control, manager support, work overload) and hospital quality-of-care outcomes (SHMI, PSI, patient satisfaction). Model estimation was repeated 500 times using population parameter values drawn from this proposed model. The sample size was set as 13,344 with 139 groups of 96 participants. Although all 15 parameters at the between-hospital level were within the acceptable 95% coverage range, nearly all of the parameter (14/15) and standard errors (12/15) indicated bias above the recommended 10% (L. K. Muthén & Muthén, 2002).

As it was not possible to increase the number of hospitals, we simplified the model by investigating multiple, smaller, concurrent models. A second Monte Carlo simulation was conducted using a simpler model involving job control, work engagement, and the three quality-of-care outcomes (SHMI, PSI, patient satisfaction). Again, all parameter estimates at the between-hospital level were within the recommended 0.91 and 0.98 range. This time only two of the nine parameter estimates, and none of the standard errors, were biased by more than 10%.

After confirming the factor structure of all the measures used, six separate models were proposed to test the individual pathways between job demands and resources with doctors' wellbeing and the quality-of-care outcomes. More specifically these six models tested the following antecedents: (1) job control and work engagement; (2) manager support and work engagement; (3) work overload and work-related stress; (4) work overload and presenteeism; (5) workplace aggression and work-related stress; and (6) workplace aggression and presenteeism. After the direct effects were tested, we ran mediation analyses within each of the six models. To test the hospital-level demands a seventh model was tested involving both hospital-level predictors (number of emergency admissions, bed occupancy rates), the three wellbeing measures, and all three quality-of-care outcomes. The wellbeing measures were then again tested as mediators.

We used the WLSMv estimator as it handles both ordinal and dichotomous data, and as is more conservative and robust compared to other estimators (Asparouhov & Muthén, 2013; Hox et al., 2010). However, the WLSMv estimator is vulnerable to produce biased estimates when dealing with missing data within multilevel modelling; as such, five datasets were imputed to replace missing data (Asparouhov & Muthén, 2010). We compared models using Wald chi-square test of parameter equalities. Hospital-level predictors were grand-mean centred. As the number of PSIs was expected to strongly correlate with the size of the hospital, we controlled for the number of beds within the hospital. Finally, bootstrapping (set at 20,000 at 95% confidence intervals) using Selig and Preacher's (2008) programme simulated the sampling distribution of the indirect effects.

3. Results

Table 1 presents the descriptive statistics, correlations, and internal reliabilities for the individual and hospital-level measures used in this study.

[Table 1]

3.1. Confirmatory factor analysis

The proposed confirmatory factor model had good fit (Byrne, 2012; Hu & Bentler, 1998) (RMSEA=.03; CFI=.99; TLI=.99) although chi-square (χ^2=3091.47; *df*=218; *p*<.001) was significant. At the within-hospital level, one workplace aggression item did not have an acceptable standardised loading, while at the between-hospital level all three workplace aggression items did not meet minimum loadings. Therefore, it was decided to remove workplace aggression altogether from this study. All other individual-level items surpassed the recommended threshold of .7 for standardised loadings. A revised CFA without the workplace aggression items was conducted that met all indicators of good model fit. RMSEA was .05, while CFI (.98) and TLI (.98) both exceeded the recommended .95 (χ^2=4500.21; *df*=142; *p*<.001).

3.2. Direct effects of job demands, job resources, and wellbeing on quality of care

Four separate models were analysed to examine the direct effect of job demands and resources and wellbeing on hospital quality-of-care outcomes. Each model had one job demand or resource, and one wellbeing measure (Table 2). The same table also demonstrates that all four models demonstrated good fit.

[Table 2]

[Table 3]

At the within-hospital level, job demands and resources predicted doctors' wellbeing. As seen in Table 3, work engagement was predicted by job control (β=.57) and manager

support (β=.46). Work overload also positively predicted doctors' work-related stress (β=.41) and presenteeism (β=.26).

[Table 4]

Table 4 displays the direct effects involving hospital quality-of-care outcomes. Levels of job control reported by doctors positively predicted patient satisfaction (β=.37), but not SHMI or the number of PSIs. The relationship between work overload and hospital quality-of-care outcomes was each tested twice. Here, work overload negatively predicted patient satisfaction (β=-.78) and PSI (β=.13) only once. Although no significant relationships were observed here, examination of the 95% confidence intervals suggests that lack of power may be a contributing factor. Work overload did not predict SHMI. Manager support, presenteeism, and work-related stress did not predict any of the three hospital outcome measures. Work engagement not only failed to predict SHMI and PSI, it surprisingly predicted patient satisfaction in the opposite direction than predicted (β=-.34; β=-.37).

3.3. The indirect effects for job demands and resources

Each model subsequently had three mediation analyses added to it, involving a job demand or resource, a wellbeing measure, and the three hospital quality-of-care outcomes. In total, twelve indirect effects were calculated and none were significant. None of the four models demonstrated a significant change of chi-square on the Wald Test, reflected by the model fit indices being identical to those reported on in Table 2. It is worth noting that at the 90% confidence interval level, work engagement mediated the relationship between job control and manager support with patient experience with doctors; and work-related stress also mediated the relationship between work overload and patient satisfaction.

[Table 5]

3.4. Direct effects of hospital demands onto hospital quality of care

At the between hospital-level, a new model was included to test bed occupancy and the number of emergency admissions as predictors of doctors' wellbeing and the three hospital quality-of-care outcomes. However, the proposed model demonstrated poor fit (RMSEA= .13; CFI=.94; TLI=.88; χ^2=7300, *df*=32, *p*<.001). We then ran two additional models with work engagement and either work-related stress (RMSEA=.15; CFI=.94; TLI=.88; χ^2=6694.83, *df*=23, *p*<.001) and presenteeism (RMSEA=.07; CFI=.99; TLI= .97; χ^2=1585.18, *df*=23, *p*<.001). Fit indices indicated that the model with work engagement and presenteeism demonstrated better fit and was retained.

High emergency admissions predicted low work engagement (β=-.49) and high presenteeism (β=.60) amongst hospital doctors (Table 5). Work engagement was also positively predicted by bed occupancy (β=.23). The predictors of hospital quality-of-care outcomes are presented in Table 5. Here, bed occupancy rate only predicted patient satisfaction (β=-.17), while the number of emergency admissions predicted hospital mortality (β=.41).

3.5. Indirect effects between job demands and resources onto hospital quality of care

Twelve mediation pathways were specified involving the two hospital-level demands, two wellbeing measures (work engagement, presenteeism), and three hospital quality-of-care outcomes. Model fit statistics were identical to the previous model (RMSEA=.05; CFI=.99; TLI=.97) and therefore retained good fit. However, the Wald Test revealed no significant change on chi-square of the indirect effect model, indicating no indirect effects.

4. Discussion

The complexity of the healthcare sector is such that the work experience of individuals, in this case hospital doctors, can be shaped by wider contextual factors, including: the economy, political decisions, funding, resource allocation, and organisational pressures, amongst others (Lowe & Chan, 2010; Montgomery et al., 2011; Powell et al., 2014). These experiences of individual doctors impact their individual performance levels, which could influence the performance of an entire hospital when a large proportion of the workforce have similar work experiences. Although multilevel studies have increasingly started to explore the JD-R model at the micro level (i.e., within-individual; Breevaart, Bakker, Demerouti, & Derks, 2016), questions remain as to the relevance of the JD-R model to incorporate organisational demands and outcomes (Bakker & Demerouti, 2017; Schaufeli & Taris, 2014).

As anticipated, the five individual and two hospital-level measures of hospital doctors' working environments were associated with their wellbeing. At the individual level, this is congruent with the JD-R model's (Bakker & Demerouti, 2017; Demerouti et al., 2001) proposition that job demands are associated with manifestations of poor wellbeing (i.e., the health impairment process) and that job resources are associated with manifestations of positive wellbeing (i.e., the motivational process). However, both working conditions and wellbeing had a limited impact on the three hospital quality-of-care outcomes examined. Patient satisfaction with their doctor was influenced by doctors' perceived level of work overload and job control, as well as hospital-level bed occupancy rates. Work overload also negatively predicted patient safety incidents, while hospital-level number of emergency admission predicted mortality rates. The lack of results involving the quality-of-care outcomes are surprising, and we offer three possible explanations as to why these anticipated relationships were not observed before reflecting on the implications for the JD-R model.

4.1. Distal predictors and outcomes

The first explanation to consider is that the three hospital quality-of-care outcomes were too distal to accurately reflect changes within the predictors. As the distance between two variables of interest grows further apart, there is an increase in the number of competing causes, links in the causal chain, and other factors that influence the relationship (Shrout & Bolger, 2002). The quality-of-care measures here are influenced by numerous other factors beyond the experiences of one occupational group, including for example patient characteristics, the experiences of other professional groups, staffing, senior leadership, and political factors (Powell et al., 2014; Taris, 2006). For example, it has been argued that hospital mortality is too blunt a measure to represent quality of care (Bottle et al., 2011) and that it is not sensitive enough to relate with staff wellbeing (Powell et al., 2014). This is evident in the wider literature where when healthcare staff wellbeing preceded mortality this has been at a more local unit level (Welp et al., 2015), while where it did not mortality was at a more distal organisation level (Powell et al., 2014; Topakas et al., 2010a, 2010b). This does not mean that distal outcomes (e.g., hospital mortality) are redundant, but more research is needed to explore how to theoretically and empirically close the gap between distal measures. One approach here is to reduce the group-level analyses from the organisational level, down to a lower level, such as the ward or department. This should result in an individual's working environment having a stronger impact on group-level outcome measures.

Despite the JD-R literature advocating further research involving objective and distal outcomes to validate the theory (Schaufeli & Bakker, 2004), to date most of this research has not focused on organisational outcomes. While relationships have been established with objective measures such as sickness absence records (Schaufeli et al., 2009) and team outputs (Costa et al., 2015), these relationships have smaller effect sizes than with more proximal measures. Even when Xanthopoulou et al. (2009) demonstrated that fast food workers' work engagement had a relationship with same and next day financial performance, this outcome

measure represented shift financial performance that involved the performance of four employees. This could still be considered a proximal outcome compared to the hospital outcome measures here that reflect the collective performance of hundreds, if not thousands, of healthcare workers within hospitals. Therefore, although theoretically it is likely that doctors' job demands and resources and work-related wellbeing would influence organisation performance, in practice this distal outcome would likely present as a small effect size.

Nevertheless, relationships were observed for the number of emergency admissions with hospital mortality and bed occupancy with patient satisfaction. Research involving emergency room crowding has shown patient satisfaction to be inversely related to crowding due to longer wait times to be seen, treated, and admitted (Hillier et al., 2009; Pines et al., 2008). Therefore, while bed occupancy may have limited impact on clinical outcomes it could impair patients' experience of their care. As anticipated, the number of emergency admissions positively predicted hospital mortality. When the number of emergency admissions increases this could result in higher workloads for doctors which, in turn, can lead to a backlog of cases, the postponement and cancellation of procedures, overspill into other wards and departments, and the increased likelihood of staff taking shortcuts. All of which may compromise the quality of care being delivered (College of Emergency Medicine, 2014; Madsen et al., 2014; Schilling et al., 2010). The absence of further relationships may be a function of the validity of these outcome measures, and/or issues with statistical power. Both are reviewed in the sections below.

4.2. The validity of hospital quality-of-care measures

Although we selected the most appropriate hospital quality-of-care measures, concerns have been highlighted about all three measures' validity. Not only are patient safety incidents infrequent events, but they are often underreported as staff fear reprisal (Probst &

Estrada, 2010). However, high error reporting has also been observed to reflect a mature safety culture (Raleigh et al., 2009). For example, Howell et al. (Howell et al., 2015) found that staff safety initiatives and confidentiality around error reporting positively correlated with patient safety incident reporting. Patient safety incident rates in that study also did not correlate with patient satisfaction or mortality rates leading to the conclusion that using these incidents as a measure of patient safety may be inaccurate. Similarly, hospital mortality data can be susceptible to mistakes (Howell et al., 2015). Even within its calculation, there is disagreement as to how deaths are coded, such as where it has been argued that not-for-resuscitation and palliative care deaths should be exempt from calculations when these were the main admissions reasons (Bottle et al., 2011).

Finally, the concern with patient satisfaction measures lies in the difficulty conceptualising what this represents and its poor links with other quality indicators (Crow et al., 2002; Salisbury et al., 2010; Teoh et al., 2019). Despite these concerns, patient satisfaction with their doctors significantly correlated with doctors' levels of job control and perception of insufficient demands, as well as trust bed occupancy rate. While these findings are expected, surprisingly doctors' work engagement was negatively associated with patient satisfaction. This counters the positive relationships where patient satisfaction was the outcome measure (Powell et al., 2014; Topakas et al., 2010a). The rationale for this finding is not clear and is something that warrants future examination.

This demonstrates the messiness of collecting routine data within complex systems which hampers our understanding and management of the situation (Garavan et al., 2019). Ultimately, these findings raise questions about the quality-of-care outcomes used and suggest that the validity of these measures is reliant on the context of the study. Therefore, rather than outright accepting or rejecting the suitability of these measures, a more appropriate intervention should consider when and where is it right to use them. Recognition

for the strengths and limitations of each hospital quality-of-care measure needs to be made clear and understood so that this can be accounted for when decisions are made in relation to these metrics – and if there are substantial concerns about a measures' validity then it should be ceased to be used altogether.

4.3. Statistical power

The third explanation revolves around the possible lack of statistical power due to the fixed number of acute hospitals in the country. Recognising the distal hospital outcome measures, this would have required strong power to find significant relationships. Although a simpler model was specified based on the Monte Carlo analyses, the recommended 80% level for high power (Cohen, 1980) was not achieved. The power level was only between 35% and 55% for hospital mortality, 10% and 60% for patient safety incidents, and 60% and 80% for patient satisfaction. This difference in power levels may also explain why most significant relationships were reported with patient satisfaction. Similarly, had a 90% confidence interval (rather than 95%) be used it would have presented additional indirect effects. This links in with similar issues involving transnational research which are limited by the number of countries in the world (Meuleman & Billiet, 2009). Post-hoc modelling involving a single predictor, mediator and outcome revealed little change to the findings observed here. Therefore, researchers should consider the implications that distal variables may have on the effect size and in turn, the required statistical power. Power calculations are imperative in such analyses and where there is a lack of power than less complex multilevel models should be developed. Alternatively, researcher may want to consider looking at lower levels of the group hierarchy (e.g. teams, departments) where it may be possible to obtain a larger sample size and allow for the examination of measures that are more proximal to the individual being surveyed..

4.4. The validity of a multilevel JDR model among hospital doctors

The findings of a link between organisational-level demands and the work-related wellbeing of doctors here is not completely consistent with the JD-R model (Bakker & Demerouti, 2017). More specifically, that work engagement was predicted by organisational-level demands is contrary to the motivational process. Drawing on the distinction between challenge and hindrance demands (LePine et al., 2005), this is evident where work engagement was positively related with bed occupancy rates and negatively correlated with the number of emergency admissions. This is seen in at the individual level in a longitudinal survey of hospital physicians in Germany (Schneider et al., 2017), where challenge demands positively, and hindrance demands negatively, associated with work engagement at three time points. Consequently, just as job demands at the individual-level can be construed as something that hinders or enhances work productivity and motivation, measures at the organisation level can also be construed in the same way. Therefore, it cannot be expected that demands, resources, wellbeing, and performance at the organisation level function in the same manner as postulated by the JD-R model at the individual level. Equally, contrary to the JD-R model, no mediational effects were observed. In the same way that Bakker and Demerouti (2017) attributed the presence of cross-paths within the JD-R model to suboptimal research designs, the absence of mediational effects for these specific outcome measures may be a reflection of the methodological challenges discussed above.

At the individual level, support for the health-impairment and motivational processes highlights the importance of recognising that work-related wellbeing extends beyond just negative wellbeing measures, and that it is important to understand what the antecedents to positive work-related wellbeing are. These findings reinforce the argument that interventions should not only attempt to reduce job demands but to also strengthen job resources in the workplace (Knight et al., 2017; Nielsen et al., 2017). This is important in recognising that an

individual's performance and wellbeing is the result of numerous interactions between the individual and the system that they are situated in (Teoh, Hassard, & Kinman, 2020). Moreover, by using multilevel modelling to link between-organisation variance to individual-level work-related wellbeing and job demands and resources, and also to with organisation-level outcomes, the study is able to respond to the call for more research involving objective outcomes (Bakker & Demerouti, 2014; Schaufeli & Bakker, 2004), address issues around common method bias (Podsakoff et al., 2003), and provide important guidance for future research using the JD-R model at the organisational level and in more complex environments.

4.5. Limitations

In addition to the three discussion points above, it is worth noting that the sample in this study was treated as a homogenous group when hospital doctors represent different specialties and grades that have very different work environments. A more focused, local, examination of groups at doctors, perhaps at specialty levels may yield more precise findings when relevant metrics of the same level are used. Nevertheless, understanding how doctors perceive their work environment is still crucial in developing a comprehensive picture of working conditions with hospitals, and the collective experiences of this crucial occupational group would be expected to influence performance outcomes of the organisation itself. After all, studies involving nurses have found working conditions and work-related wellbeing linked to patient safety outcomes, mortality, and patient satisfaction (Aiken et al., 2017; Fagerström et al., 2018; Laschinger & Leiter, 2006). Equally, the work-related wellbeing of healthcare workers have been found to predict hospital mortality rates (Virtanen et al., 2009; Welp et al., 2015), infection rates, and hospitals' financial performance and absenteeism rates (Topakas et al., 2010a, 2010b). This only serves to reinforce the importance of systems thinking, where changes need to target multiple aspects of the work, including different professional groups. Moreover, single-item measures used for presenteeism and work-related

stress are vulnerable to measurement error and potentially fail to accurately capture the broad and complex constructs that they represent (Heck & Thomas, 2015). One further limitation is the timing of when and the duration that the quality-of-care measures were recorded for. The 2014 NHS Staff Survey was a cross-sectional survey collected between October and December 2014. However, the three outcome measures represented different durations and time of the year that could be vulnerable to seasonal changes. For example, the demands on the NHS over the winter months place additional pressures on the system and the staff within it (Boden et al., 2016). As such, had the data from the different sources covered the same annual period as hospital mortality this may have yielded very different results altogether.

4.6. Conclusion

Using a multilevel perspective, better working conditions at both the individual and hospital-level were associated with better doctors' wellbeing (work-related stress, presenteeism, work engagement). However, the findings at the organisational level were not congruent with the main propositions from the JD-R model (Bakker & Demerouti, 2017; Demerouti et al., 2001) at the organisational level. These inconsistencies may not be due to the JD-R per se, but rather with the study design and are important reflections towards future testing of the model at the macro level. The findings do highlight the importance of a systems approach in addressing the wellbeing of doctors, where solely focusing on individual-level interventions (e.g., mindfulness, resilience training) is insufficient (Regehr et al., 2014). Although doctors' working environment and wellbeing had limited influence on quality of care at the hospital-level there are crucial lessons for research and practice. As we strive for more complex models that better reflect the complexity of the work environment, future researchers need to not only account for a multilevel perspective; but recognise and consider issues around distal hospital-level outcomes and their validity as well as restricted sample sizes. This also potentially explains previous inconsistent findings involving organisational-level quality-of-

care outcomes. Equally, as we move towards evidence-based decision making, decisions can only be as good as the data available – necessitating a better understanding of the relevance and the validity of the hospital-level quality-of-care outcomes currently available.

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Figure

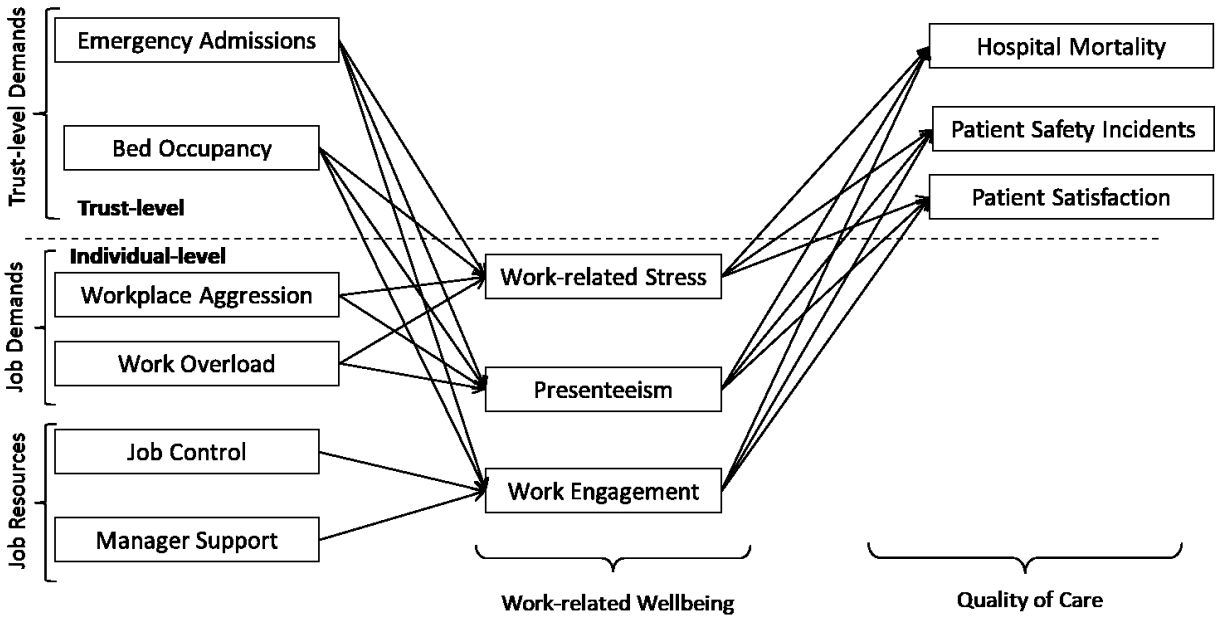

Figure 1: Wellbeing as mediators between working conditions and hospital quality-of-care outcomes

Table 1: *Descriptive statistics and correlations*

Measure	*N*	*M*	*SD*	α	1	2	3	4	5	6	7	8	9	10	11
1. Workplace aggression	12900	3.61	1.09	.37	-	.19**	-.10**	-.11**	.21**	.18**	-.15**				
2. Work overload	13075	6.09	2.00	.72	.30**	-	-.40**	-.40**	.29**	.21**	-.40**				
3. Manager support	12770	17.64	4.63	.92	-.14	-.55**	-	.57**	-.25**	-.18**	.42**				
4. Job control	13019	14.44	3.67	.90	-.18*	-.57**	.63**	-	-.25**	-.18**	.50**				
5. Work-related stress	12998	0.33	0.47	-	.29**	.54**	-.45**	-.36**	-	.29**	-.36**				
6. Presenteeism	11423	0.51	0.50	-	.26**	.26**	-.25**	-.24**	-.21*	-	-.21**				
7. Work engagement	13091	11.82	2.38	.84	-.26**	-.54**	.59**	.48**	-.58**	-.33**	-				
8. Bed occupancy	139	89.88	5.62	-	.14	.07	.08	.08	-.04	.08	.10	-			
9. Emergency admissions	139	730.58	340.24	-	.09	.20*	-.17*	-.24**	.01	-.03	-.17*	.07	-		
10. SHMI	139	1.00	0.09	-	.02	-.15	-.01	-.02	-.10	.04	.10	.08	.02	-	
11. Patient safety incidents	139	73.8	847.94	-	.06	.06	-.05	-.02	.04	.03	-.02	.03	.02	-.07	-
12. Patient satisfaction	139	8.56	0.22	-	-.14	-.19*	.05	.08	.06	-.13	-.07	-.23	-.07	-.10	.01

Note. **p<.01; *p<.05. Correlations above the diagonal are individual-level correlations. Correlations below the diagonal are hospital-level correlations, with individual-level measures aggregated to the hospital level (N=139); SHMI: Summary Hospital Mortality Indicator.

Table 2: *Fit indices for the direct effects onto hospital quality-of-care outcomes*

Model	Measure	RMSEA	CFI	TLI	χ^2
1	Job control - Work engagement	0.06	0.99	0.97	3180.31***
2	Manager support - Work engagement	0.03	0.99	0.99	622.08***
3	Work overload - Work-related stress	0.01	0.99	0.99	32.09***
4	Work overload - Presenteeism	0.01	0.99	0.99	30.40***

Note. ***p<.001.

Table 3: *Standardised and unstandardised coefficients for direct effects of job demands and resources onto wellbeing*

Measure		Work engagement	Work-related stress	Presenteeism
Within-hospital				
Job control	*β*	.57*** (.56, .59)		
	b	0.81*** (0.77, 0.85)		
Manager support	*β*	.46*** (.45, .48)		
	b	0.47*** (0.44, 0.46)		
Work overload	*β*		.41*** (.38, .43)	.26** (.24, .28)
	b		0.44*** (0.40, 0.47)	0.25*** (0.21, 0.29)
Between-hospital				
Job control	*β*	.64*** (.43, .85)		
	b	0.77*** (0.40, 1.13)		
Manager support	*β*	.69*** (.50, .87)		
	b	0.54*** (0.31, 0.76)		
Work overload	*β*		.77*** (.59, .96)	.33** (.07, .58)
	b		0.36*** (0.21, 0.51)	0.14* (0.02, 0.27)

Note. ***p<.001; **p<.01; *p<.05. *β* = standardised beta coefficients; b = unstandardised beta coefficients; parentheses represent 95% confidence intervals

Table 4: *Standardised and unstandardised coefficients for between-hospital direct effects onto hospital quality-of-care outcomes*

		SHMI		Patient Safety Incidents		Patient Satisfaction	
Model	Measure	*β*	b	*β*	b	*β*	b
1	Job control	-.23 (-.55, .09)	-0.09 (-0.22, 0.04)	.03 (-.17, .27)	0.14 (-0.69, 0.97)	**.37*** (.02, .72)	0.36* (0.02, 0.72)
	Work engagement	.18 (-.16, .53)	0.06 (-0.06, 0.18)	-.06 (-.27, .15)	-0.21 (-0.94, 0.53)	-.**34*** (-.68, -.01)	-0.28 (-0.57, 0.01)
2	Manager support	-.16 (-.53, .22)	-0.04 (-0.13, 0.84)	.10 (-.13, .32)	0.26 (-0.33, 0.84)	.38 (-.03, .80)	0.24 (-0.03, 0.51)
	Work engagement	.14 (-.25, .54)	0.05 (-0.08, 0.49)	-.11 (-.36, .14)	-0.36 (-1.20, 0.49)	-.**37*** (-.74, -.01)	-0.30 (-0.61, 0.02)
3	Work overload	-.17 (-.75, .41)	-0.17 (-0.75, 0.42)	.26 (-.09, .60)	0.98 (-0.32, 2.08)	-.78* (-.1.43, -.14)	-0.72 (-1.32, -0.15)
	Work-related stress	-.02 (-.58, .55)	-0.01 (-0.46, 0.43)	-.22 (-.64, .20)	-1.81 (-5.37, 1.74)	.68 (-.04, 1.39)	1.33 (-0.20, 2.87)
4	Work overload	-.25 (-.52, .03)	-0.09 (-0.18, 0.01)	.**13*** (.02, .24)	0.47* (0.05, 0.89)	-.21 (-.42, .01)	-0.18 (-0.37, 0.01)
	Presenteeism	.18 (-.22, .58)	0.15 (-0.18, 0.48)	-.13* (-.28, .02)	-1.14 (-2.44, 0.17)	-.16 (-.48, .16)	-0.33 (-1.01, 0.35)

Note. ****p*<.001; ***p*<.01; **p*<.05. *β* = standardised beta coefficients; b = unstandardised beta coefficients; parentheses represents 95% confidence intervals; SHMI: Summary Hospital Mortality Indicator.

Table 5: *Standardised and unstandardised coefficients for direct effects of hospital demands on wellbeing and quality-of-care outcomes*

Measure		Work engagement	Presenteeism	SHMI	Patient Safety Indicators	Patient Satisfaction
Bed occupancy	*β*	.23* (.02, .44)	.06 (-.24, .36)	.01 (-.19, .20)	.04 (-.06, .13)	-.17* (-.35, -.01)
	b	1.02 (-0.33, 2.37)	0.13 (-0.51, 0.77)	0.01 (-0.32, 0.33)	0.61 (-0.93, 2.15)	-0.70* (-1.41, -0.02)
Emergency admissions	*β*	-.49* (-.88, -.09)	.60** (.21, .99)	.41* (.03, .79)	.10 (-.14, .34)	-.14 (-.57, .29)
	b	-0.01 (-0.01, 0.01)	0.01* (0.01, 0.01)	0.01 (0.01, 0.01)	0.01 (-0.01, 0.01)	-0.01 (-0.01, 0.01)
Work engagement	*β*			.10 (-.17, .37)	-.05 (-.21, .11)	-.15 (-.37, .07)
	b			0.04 (-0.07, 0.15)	-0.19 (-0.80, 0.42)	-0.14 (-0.35, 0.07)
Presenteeism	*β*			.03 (-.39, .45)	-.15 (-.33, -.04)	-.17 (-.56, .23)
	b			0.01 (-0.30, 0.37)	-1.17 (-2.60, 0.27)	-0.35 (-1.08, 0.37)

Note. ***p<.001; **p<.01; *p<.05. *β* = standardised beta coefficients; b = unstandardised beta coefficients; parentheses represent 95% confidence intervals; SHMI: Summary Hospital Mortality Indicator.