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**Doctors' perceived working conditions and the quality of patient care: A systematic
review**

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Abstract

Numerous reports advocate improving doctors' working conditions as an important part of initiatives to enhance the quality of patient care. However, the research literature is not clear on this underlying relationship. This systematic review examines the evidence on the relationship between the working conditions perceived by doctors and the quality of patient care. Seven electronic databases were searched, with 21 studies from six countries included in the review. The findings highlight the questions how quality of care is constructed and measured as the presence of these relationships varied by the outcome measure used. A greater number of significant relationships were observed for clinical excellence and patient safety than patient experience. The reviewed literature reflects a lack of theoretical underpinning and consideration of the mechanisms underlying pathways between doctors' perceived working conditions and quality of care. It also does not capture the complexities within the healthcare sector, nor the wider theoretical and empirical developments in the field. Therefore, a definitive relationship between doctors' perceived working conditions and the quality of patient care should be considered with caution. Future research should account for the observed methodological and theoretical limitations to better understand the nuances within this complex, but important relationship.

Introduction

In the aftermath of patient care scandals in the United Kingdom, there has been a re-examination of healthcare staff's role in the delivery of care (Francis, 2013; Keogh, 2013). Moreover, recent changes to the healthcare sector in the United Kingdom have seen, among other things, an increase in staff shortages, funding cuts, reductions in training time and increased exposure to patients with complex medical issues (Royal College of Physicians, 2015). These changes have raised concerns, as doctors report poorer psychosocial working conditions than the general working population (Fuß, Nübling, Hasselhorn, Schwappach, & Rieger, 2008; Hayes, Prihodova, Walsh, Doyle, & Doherty, 2017). Against this backdrop, there is renewed interest in doctors' working conditions, with particular concern on its impact on patient care (Ahmed, Ahmed, Ellis, Parry, & Catto, 2015). Although many advocate the improvement of hospital doctors' working conditions as a means to improve the provision of patient care (Royal College of Physicians, 2016), very little is currently understood about the presence and nature of this relationship.

The relationship between perceived working conditions and performance in the general working population has been the focus of much empirical examination (Jex, 1998; Nielsen et al., 2017). However, these relationships may not necessarily generalise to the healthcare sector for two key reasons. First, the taxonomy of doctors' exposure to working conditions is different and unique to them. For example, doctors have been found to report higher and more frequent exposure to emotional demands (Mache, Danzer, Klapp, & Groneberg, 2013), violence (Teoh, Hassard, & Cox, 2018), quantitative demands and lack of job control (Fuß et al., 2008). Repeated publications highlight the need for increased sector and occupation-specific research examining the nature of such postulated relationships and to test the validity of key theories (Bakker & Demerouti, 2017; Nahrgang, Morgeson, & Hofmann, 2011). Second, quality of care is a unique sector-specific measure of performance,

which merits unique and independent investigation. Consequently, while the accrued evidence examining the relationship between perceived working conditions and performance outcomes among the general working population provides a useful basis of knowledge rationalisation, we cannot conclude that such observed relationships continue to exist in relation to quality of care.

In this review, we focus on doctors. This not only recognises the political interest in their working conditions (Ahmed et al., 2015) but that they are a key source of influence in the healthcare sector with clinical leadership and responsibility at the ‘sharp-end’ of patient care (Godlee, 2008). Moreover, a dearth of research exists examining doctors as a unique occupation, independent from other medical or healthcare professionals (Khan, Teoh, Islam, & Hassard, 2018). For example, reviews already exist examining the antecedents of quality of care in nursing (Krueger, Funk, Green, & Kuznar, 2013; Wong & Cummings, 2007) and within multidisciplinary samples (Hall, Johnson, Watt, Tsipa, & O’Connor, 2016; Hoff, Jameson, Hannan, & Flink, 2004).

As the roles of doctors differ from other medical or healthcare professionals, both in terms of their content and context, there have been increasing calls for more research examining the relationship between doctors’ perceived working conditions and quality of care (Klein, Frie, Blum, & von dem Knesebeck, 2011). This paper, therefore, seeks to address this gap in knowledge; and aims to systematically review, summarise and evaluate quantitative investigations of the association between doctors’ perceived working conditions and quality of care outcomes. In so doing, we hope the results contribute to existing policy-level discussions regarding healthcare sector reforms; inform sector-specific theory development in this domain; and support the development of appropriate and targeted organisational-level interventions.

Conceptualising Quality of Care

Unlike performance indicators in other settings, with quality of care, positive outcomes are not always possible; it is interlinked with human experience and suffering; and doctors often have little control over antecedent factors (Donabedian, 1988). However, the variable nature of patient care makes the definition and assessment of ‘quality’ within the healthcare sector a complex issue (King’s Fund, 2011; Klein et al., 2011). The Department of Health (2008; 2010) in the United Kingdom defines quality of care as a macro-level construct consisting of three core sub-facets: clinical excellence, patient safety, and the experience of patients. *Clinical excellence* is defined as preventing premature deaths, enhancing quality of life, and assisting recovery. This sub-facet of quality of care can be viewed as a core performance indicator within the healthcare sector and can be construed as in-role performance. The second core aspect - *patient safety* - aims to provide a safe care environment without avoidable harm, and is related to aspects of safety performance. The final defining sub-facet of quality of care is *patient experience*; which refers to the patient’s experience of their personal care and treatment. Patient experience is comparable, in some regards, to broadly measures of performance through customer satisfaction. All three are crucial in the delivery of good care and, therefore, are collectively and independently a useful sector-specific indicator of performance for doctors. However, it is important to consider that the distinction between such core sub-facets may be important. Especially given that the relationships involving performance have been found to differ depending on the type of performance measure used (Cerasoli, Nicklin, & Ford, 2014; Jex, 1998; Taris, 2006).

Doctors’ Perceived Working Conditions and Quality of Care: A Theoretical Framework

Anecdotal evidence and lobbying efforts suggest that improving doctors’ working conditions will result in better quality of care (Royal College of Physicians, 2015). However,

the research that underpins this argument often stems from non-healthcare sectors (e.g., Gilboa, Shirom, Fried, & Cooper, 2008; Nahrgang et al., 2011), which does not examine the unique psychosocial antecedents or associations unique to doctors' work content or context. However, evidence derived from qualitative studies provides some preliminary evidentiary weight to such postulations. For example, interviews with Irish (McGowan, Humphries, Burke, Conry, & Morgan, 2013) and German (Groß et al., 2014) doctors both observed participants felt poor working conditions compromised their delivery of patient care due to factors such as limited consultation time with the patient, fatigue and poor workflow. Alternatively, the relationship is inferred from separate studies examining the influence of perceived working conditions on healthcare professionals' work-related health and attitudes (Rabatin et al., 2015; Visser, Smets, Oort, & de Haes, 2003), and, in turn, between their self-reported work-related health and attitudes (e.g., burnout, work engagement, job satisfaction) with quality of patient care (Hall et al., 2016; Scheepers, Boerebach, Arah, Heineman, & Lombarts, 2015).

There is broad consensus within the literature that the relationship between perceived working conditions and performance is complex (Nahrgang et al., 2011; Szymanski & Henard, 2001). Of particular interest in this review, is the role of doctors' work-related health, wellbeing, and attitudes in facilitating or altering the nature of this association. Previous research, for example, has observed burnout (Bakker, Demerouti, & Verbeke, 2004) or work engagement (Bakker & Bal, 2010; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009) to mediate the relationship between perceived working conditions and performance. The potential role of moderators in influencing the strength, presence, and direction of this relationship has also been previously highlighted (Nahrgang et al., 2011; Teoh et al., 2018), and may meaningful contribute to our empirical understanding of the association between doctors' perceived working conditions and quality of care. For example, a strong professional

identity (Rabow & McPhee, 2001) and collaboration with colleagues (Groß et al., 2014) have been observed as important work resources for doctors, negating some of the detrimental impact of poor working conditions. Within the field of Occupational Health Psychology, numerous theoretical frameworks provide an empirical rationale for the existence and nature of such direct, indirect, and moderated pathways between worker's perceived working conditions, their work-related health, attitudes, and performance (e.g., Conservation Resource Theory, (Hobfoll, 1989, 2002); Job Demand-Resources Model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001); and Effort-Reward Imbalance; (Siegrist, 1996). While it is beyond this introduction to provide an overview of such theories, we acknowledge their conceptual contribution to our theoretical understanding of the postulated direct and indirect pathways between doctors' perceived working conditions and quality of care. It is these pathways that we seek to summarise, map and critically evaluate in our systematic review at the level of each sub-facet of quality of care: clinical excellence, patient safety, and patient experience.

Figure 1 provides a visual representation of such postulated direct and indirect pathways, acknowledging the presence of possible moderators. Within this theoretical framework, we define and categorise doctors' perceived working conditions in relation to either job demand (e.g., work pace, emotional demands) or job resources (e.g., social support from colleagues and supervisors, performance feedback, and autonomy; (Bakker & Demerouti, 2017). We postulate a direct effect between doctors' perceived working conditions in relation to one or several sub-facets of quality of care; but acknowledge that the doctors' health and work-related attitudes may change the nature, direction or strength of this association (Demerouti et al., 2001; Karasek & Theorell, 1990). Such postulated pathways aim to provide a theoretical framework in which to collate, summarise, map and evaluate the

identified evidence for the examined sub-facets of quality care independently and as a global macro-level measure of quality of care.

[Insert Figure 1 here]

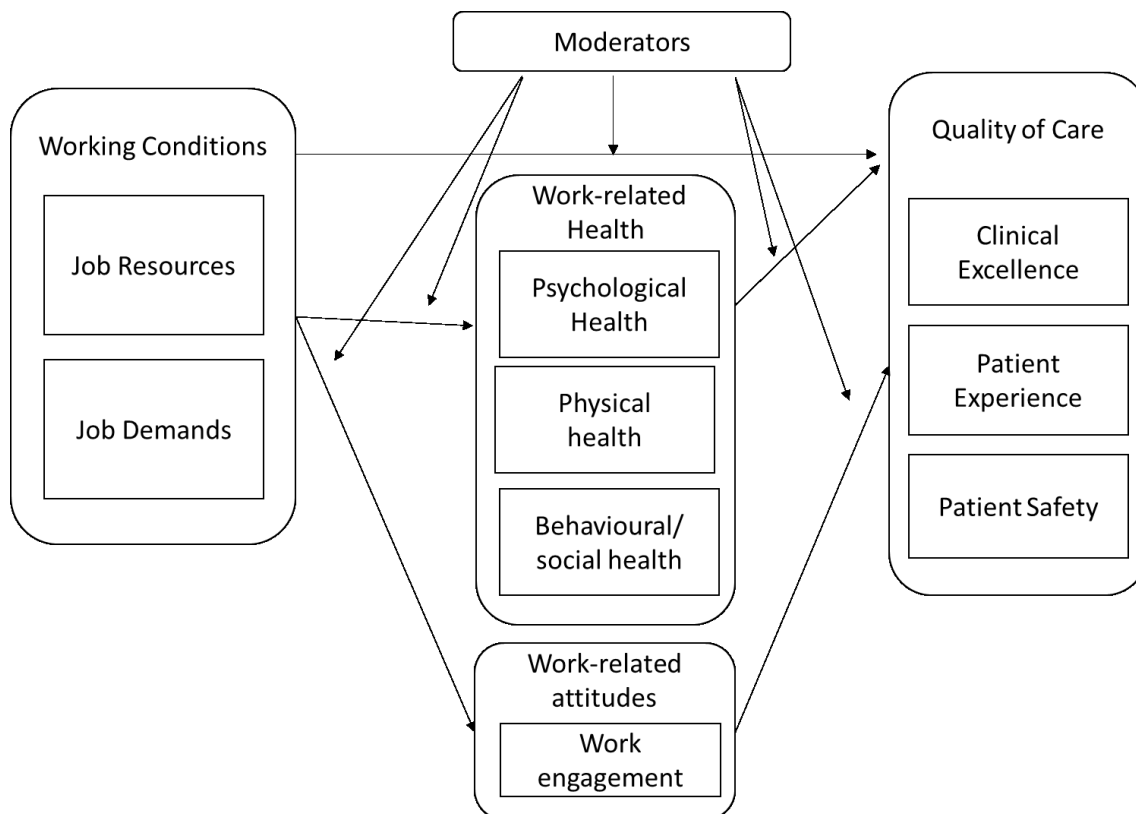


Figure 1. Mapping the perceived working conditions and quality of care relationship

Study Aims

Despite the increasing political and research focus on doctors' working conditions and patient care (Ahmed et al., 2015; Rabatin et al., 2015), there remains much ambiguity within this topic. Additional clarity on the current research evidence would help direct further researchers, inform policy discussions by stakeholders in the medical and healthcare community, and support the development of evidence-based interventions. Therefore, the central objective of this systematic review is to collate, review and synthesise quantitative

studies examining the relationship between doctors' perceived working conditions and indicators of quality of patient care, namely: clinical excellence, patient safety and patient experiences (Figure 1). More specifically, the systematic review aims to: (i) describe the identified studies; (ii) classify and categorise them according to the type of quality of care measure used; (iii) summarise and critically review observed findings; and (iv) to draw key conclusions for future research and consider implications for the field.

Methods

The systematic review was structured according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). Prior to beginning, a review protocol was pre-registered on a prospective register of systematic reviews (Reference anonymised).

Data Sources and Search Terms

Seven electronic databases were searched: Medline; HMIC; CINAHL Plus; EMBASE; EBSCO; Science Direct; and Web of Science. Search terms focused on variants of the three basic elements of the research question: perceived working conditions (e.g., job demand, job resource), quality of patient care (e.g., patient safety, patient satisfaction) and doctors (e.g., physician, house officer). The inclusion period was specified from the start of the database until April 19th, 2017. To examine the grey literature Google and Google Scholar were also searched. The reference lists of reviewed articles and the articles that cited the included articles were also searched for additional relevant studies.

Inclusion Criteria

Five inclusion criteria and exclusion criteria were applied to the identified studies. First, the predictor variable under investigation must be a perceived working condition (e.g.,

job demand or job resource); while objective aspects of the work environment (e.g., work schedule) were, conversely, excluded. Second, studies that examined quality of patient care (defined as clinical excellence, patient satisfaction, and patient safety) as their dependent measure were included. Third, only studies utilising a quantitative research paradigm were included, with qualitative studies excluded from this review. Fourth, included studies must have examined doctors exclusively or independently from other healthcare professionals. Studies examining other healthcare professionals specifically (e.g., nurses), healthcare professionals as a homogenous group or the general work population were excluded from this review. Finally, only studies reported in English were included for review.

Search Strategy

The search strategy contained three stages (See Figure 2). The database search yielded 4,269 hits. In stage one all titles were reviewed; with duplicates (n=1,517) removed and articles that did not refer to healthcare (n=40) excluded. Subsequently, each abstract was assessed (stage two; n=2,712) against all five inclusion criteria. In total, 2,618 articles did not meet the specified criteria and were removed. Where the reviewer was uncertain the abstract was moved onto the subsequent stage to allow a full-text review. In stage three, a full-text review was conducted (n=94). Fifteen studies were identified from the non-database searches and were also assessed at this stage of the review. The first author conducted the review process. In line with best practice, a random selection of 20% of identified studies was independently and blindly reviewed by the second author at both stages two (abstract) and three (full text-review). Strong inter-observer agreement was found (K=.833 and K=1 respectively).

[Insert Figure 2 here]

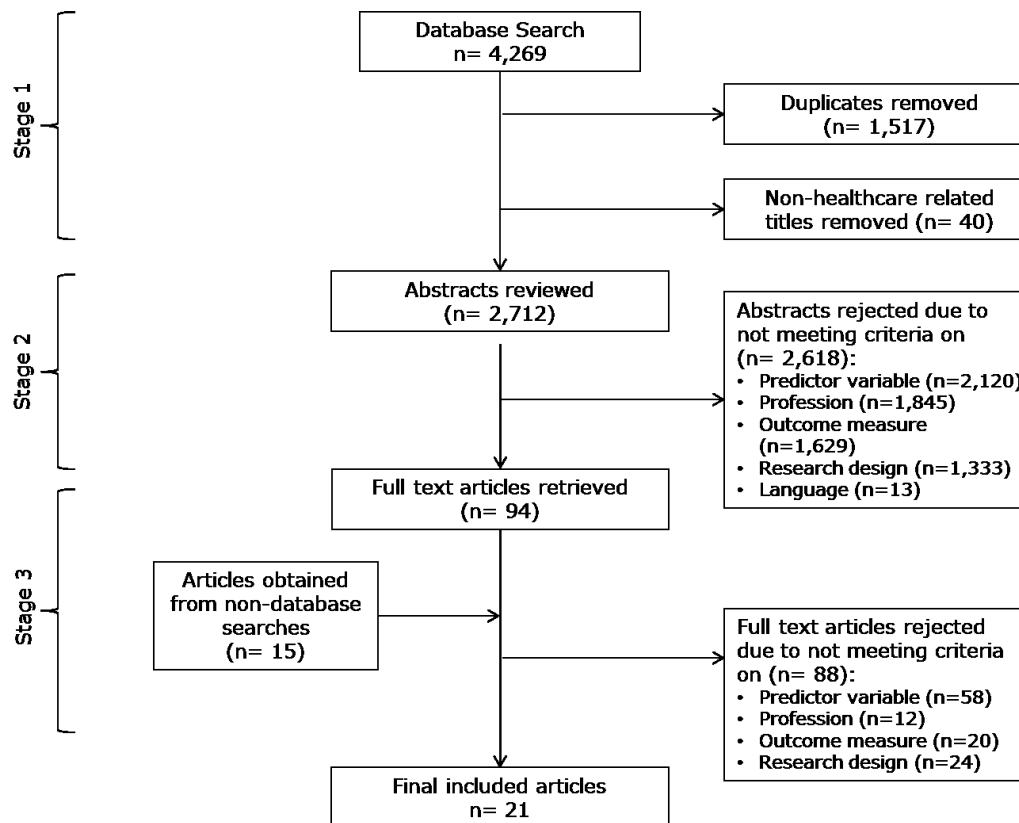


Figure 2. Flow chart of study selection process

Data Extraction and Quality Assessment

A data extraction template was developed and piloted *a priori*. This was to standardise the data extraction process. Data extraction was carried out by the first author. All completed extraction forms were independently reviewed by the second author to ensure the accuracy of the extracted information. This process was conducted independently but was not blinded. Any disagreements were resolved in discussion between both reviewers.

The Medical Education Research Study Quality Instrument was used to evaluate study quality (Reed et al., 2007). Its ten-items assess study design, number of study sites, response rate, type of data, internal structure, content and criterion validity of measures used, appropriateness of data analysis and outcome levels. The ten-items are organised into six

domains, each with a maximum score of three points per domain. The maximum possible score per article is eighteen points, with higher scores indicating stronger quality.

Results

Study Characteristics and Quality

Twenty-one studies met the inclusion criteria (Table 1). The studies derived from six countries: Germany (n=8), the United States (US; n=6), Israel (n=3), the United Kingdom (n=2), the Netherlands (n=1) and Sweden (n=1). Study quality scores (Table 2) ranged from 8.5 to 13.5 (mean=11.54, SD=1.34). This observed mean is slightly higher than those reported in previously published reviews using this indicator (Reed, Fletcher, & Arora, 2010; Scheepers et al., 2015). Table 2 maps each included study against the ten quality criteria. Common patterns of methodological weakness in this group of studies include the dominance of cross-sectional designs involving a single group of participants; the absence of any studies considering clinical outcomes; and only four studies reporting the internal reliability, content validity and criterion validity for their perceived working condition measure. Other common patterns were the recruitment of doctors from multiple institutions; and that studies used either outcomes based on behaviours or ‘satisfaction, attitudes and perceptions’.

[Insert Table 1 here]

[Insert Table 2 here]

All included studies were categorised based on their examined quality of care measure (Department of Health, 2008): (i) clinical excellence (including, subjective work performance, chart audits and self-rated care quality of care provided); (ii) patient safety,

represented by the number of self-reported or observer-assessed errors; and, (iii) patient experience (e.g., patient satisfaction, patient-rated quality of care).

Are Doctors' Perceived Working Conditions Associated with Clinical Excellence?

In total, 30 relationships tested a relationship between doctors' perceived working conditions and clinical excellence. Fifteen of these relationships, derived from ten studies, involved six perceived working conditions considered job demands (Table 3). These job demands were perceived workload^{5,7,14-17}, emotional demands^{5,10,14} and higher-order job demands^{12,14,20}, time pressure¹⁰⁻¹¹, demanding patients¹ and social conflict¹⁰. Three studies^{12,14,20} examined higher-order job demands. This represents a latent second-order factor of multiple facets of job demands. In the first study, job demands comprised of quantitative, emotional, demands for hiding emotions and cognitive demands¹⁴, with the remaining two both measuring time pressure, interruptions, physical demands, and long working hours^{12,20}.

The remaining fifteen relationships focused on six types of job resources: autonomy^{5,14,20}, job control^{5,11,14}, learning and development^{5,14}, support from colleagues^{5,14}, support from supervisors^{5,14}, and higher-order job resources^{5,14,20}. For higher-order job resources, Mache et al. (2013)¹⁴ examined eight types of job resources (possibilities for development, degree of freedom, influence at work, sense of community, social support, quality of leadership, feedback at work). For Weigl et al. (2015)²⁰ and Loerbroks et al. (2016)¹² higher-order job resources consisted of perceived salary, promotion prospects, esteem, and job security.

Findings. Overall, 23 out of the 30 relationships (77%) reported a positive association between perceived working conditions and clinical excellence. Higher-order job demands, perceived workload, job autonomy, higher-order job resources, learning and development and

support from colleagues were the only perceived working conditions where all studies reported the proposed relationship with clinical excellence. Eleven of the fifteen relationships (73%) involving job demands demonstrated the proposed negative relationship; with 13 out of the 15 (87%) relationships involving job resources having a positive association with clinical excellence (Table 3). Emotional demands¹⁰ had three relationships with clinical excellence, two which were negative in direction. Similarly, two of the three relationships involving job control¹¹ positively associated with clinical excellence. There were two relationships each involving time pressure¹¹, demanding patients¹, social conflict¹⁰, and supervisor support⁵ as a predictor, and in each case, only one was associated with clinical excellence.

[Insert Table 3 here]

Type of clinical excellence measure. While 30 relationships focused on clinical excellence, according to the MERSQI quality assessments this outcome measure can be further distinguished into four categories: clinical/patient outcomes; behaviours; knowledge/skill; and satisfaction, attitudes, and perception (Reed et al., 2007). None of these studies examined any form of clinical/patient outcomes or knowledge/skill outcomes related to clinical excellence. Instead, four relationships used behaviourally-based clinical excellence measured through chart audits^{1,11} and observer-rated performance⁷. The remaining 26 relationships drew on self-reported ‘satisfaction, attitudes and perception’ measures, namely work ability^{5,14} and quality of care^{6,7,10,12,17,20}. Table 3 indicates that how clinical excellence was measured may be a factor in the six relationships that did not report a perceived working conditions and clinical excellence relationship. These include three out of the four relationships that used behaviour-type outcome measures, as well as two out of the three relationships that were the only ones to consider changes to longitudinal ‘satisfaction, attitudes and perception’ outcomes one year later¹⁰.

Understanding the perceived working conditions and clinical excellence

relationship. Beyond linear relationships, one study⁷ found perceived workload to have a downward curvilinear relationship with both self-rated and observer-rated performance. indicating additional performance deterioration as perceived workload increased. Four studies^{10,12,17,20} tested whether psychological health mediated the relationship between perceived working conditions and clinical excellence. More specifically, burnout functioned as a partial mediator where work overload, autonomy, and effort-reward imbalance^{17,20} were predictors of clinical excellence. Similarly, depressive symptoms¹², but not irritation¹⁰, operated as a mediator. Two studies examined moderators; although neither over-commitment¹² nor socio-demographic factors (gender, year of residency and speciality)¹⁷ moderated the relationship between perceived working conditions and clinical excellence.

Only five studies made reference to a theoretical framework, namely the JD-R^{5,10}, the ERI^{12,20}, and the person-environment fit¹⁷ models. However, two^{5,17} of these studies did not test any specific aspect of these theoretical frameworks. Contrary to the JD-R model, Krämer et al. (2016)¹⁰ did not find that irritation mediated the job demands and clinical excellence relationship. However, clinical excellence did predict time pressure at follow-up, suggesting that quality of care could also reversely influence perception of the work environment. The two studies from Germany^{12,20} that used the model considered the imbalance between effort and reward, which was a stronger predictor of clinical excellence than individual components of effort and rewards. These relationships were also mediated by burnout²⁰ and depressive symptoms¹². Loerbroks et al. (2016)¹² also found over-commitment to be a weak predictor of clinical excellence, but it did not moderate the relationships that effort and rewards had with clinical excellence.

Are Doctors' Perceived Working Conditions Associated with Patient Safety?

In total, eleven relationships tested for a relationship between perceived working conditions and patient safety (Table 4). Job demands were examined across five studies. These consist of perceived workload^{4,8,21}, demanding patients¹ and time pressure¹¹. Six job resources (autonomy^{16,18}, job control^{11,19}, and learning and development^{4,16}) and patient safety relationships were examined across five studies.

Findings. Seven out of the eleven (64%) relationships found better-perceived working conditions were associated with better patient safety. Three out of the five relationships between job demands and patient safety observed a negative association as postulated (60%); while four of the six relationships (67%) involving job resources reported the expected positive direction. Table 4 presents that all the relationships pertaining to perceived workload^{4,8,21} and learning and development^{4,16} reported the anticipated association with patient safety. Findings involving job control and autonomy were mixed, as each of these only had one out of two studies reporting the anticipated relationship. Neither study that tested time pressure¹ or demanding patients¹¹ negatively associated with patient safety. In fact, doctors who reported high exposure to demanding patients had lower error rates than doctors in the low-exposure group¹.

[Insert Table 4 here]

Type of patient safety measure. As was the case with clinical excellence, no relationships examined any clinical/ patient outcomes or knowledge/skill outcomes. Five relationships used ‘satisfaction, attitudes and perception’ outcomes, consisting of self-rated concern for patient safety¹⁹, as well as self⁴ and colleague perceived error rates¹⁶. Four of these reported a positive association between perceived working conditions and patient safety. The remaining six relationships, therefore, used behavioural outcomes. Self-reported adverse event⁸ and nurse-reported errors¹⁸, as well as one of the four relationships that used

chart audits^{1,11,21}, made up the three relationships where perceived working conditions observed the expected positive relationship with patient safety.

Understanding the perceived working conditions and patient safety relationship.

In the only study¹ to examine mediation, neither burnout nor job satisfaction mediated the relationship between the number of difficult patient encounters and general practitioners' error rates. The impact of moderators was examined by two studies^{16,18}, where more complex interactions were observed. This included three-way interactions where autonomy interacted with year of residency and specialisation¹⁶. Here, a positive correlation was observed among surgery residents between error rate and autonomy. However, no such relationship was found for internal residents. Stern et al. (2008)¹⁸ also found a curvilinear relationship between autonomy and error rate, which interacted with situational learning. This meant that as the levels of autonomy increased the rate of errors decreased at an increasing rate – but only when these residents were in an environment that encouraged learning. None of the studies examining patient safety used a theoretical framework. Finally, Dollarhide et al.'s (2013) study⁸ also suggests that perceived working conditions may precede patient safety. Here, US hospital physicians completed surveys on a handheld device at random intervals, with results indicating that on days where a medical event (e.g., administration error, near miss) occurred, higher workloads was recorded than on non-event days.

Are Doctors' Perceived Working Conditions Associated with Patient Experience?

Twelve relationships, from five studies, examined the perceived working conditions and patient experience relationship (Table 5). Six relationships focused on job demands: perceived workload^{2,3,9}, time pressure², physical demands³, and higher-order job demands¹³. For the latter, higher-order job demands comprised of quantitative demands, emotional demands and demands for hiding emotion. Four types of job resources from three

studies^{3,13,15} were tested; these were job control^{3,15}, colleague support^{3,15}, supervisor support³, and higher-order job resources (comprising influence at work, degree of freedom of work, possibilities for development, quality of leadership, social support, feedback at work, social relations and sense of community)¹⁵.

[Insert Table 5 here]

Findings. Little evidence was found supporting a perceived working conditions and patient experience relationship. Only three out of twelve relationships (25%) reported such findings. Time pressure², higher-order job demands¹³, and higher-order job resources¹³ were the only perceived working conditions to predict patient experience (Table 5). None of the other job demands (perceived workload & physical demands) or job resources (job control, colleague support & supervisor support) were associated with patient experience. This meant that only two (33%) of the six relationships involving job demands and patient experience demonstrated the anticipated negative association. For job resources, one¹³ out of the six relationships reported that job resources positively predicted and patient experience (17%).

Type of patient safety measure. Unlike the clinical excellence and patient safety outcomes above, patient experience was solely reflected as patient satisfaction^{9,13}, satisfaction with quality of care received¹⁵, and patient satisfaction with support from their doctors^{2,3}. These all were considered outcomes relating to ‘satisfaction, attitudes and perception’.

Understanding the perceived working conditions and patient safety relationship. No study here tested for any curvilinear relationship, nor mediation or moderation effects. Ansmann et al. (2014)³ was the only study to refer to a theoretical framework - the demand-control-support (DC-S) model. However, only the direct effects that demand and control have on patients’ perception of support from their physician were observed. The buffering role of control was not examined

Discussion

The central aim of this systematic review was to collate, review and synthesise the evidence examining the relationship between doctors' perceived working conditions and a unique sector-specific measure of performance - quality of patient care. In total, 21 studies were found. The majority of studies observed a positive association between doctors' perceived working conditions and two examined quality of care outcomes: *clinical excellence* and *patient safety*. However, limited evidence was observed in relation to *patient experience*. The review observed some evidence that psychological health mediates the relationship between perceived working conditions and quality of care. However, minimal attempt has been made to test moderators and theoretical frameworks within the identified studies.

Our findings suggest a relationship between doctors' perceived working conditions and quality of care. However, several notable methodological and conceptual limitations elucidate the complexity of this relationship. These, are important in advancing theory, practice and policy in the healthcare sector. This should be of relevance not only to researchers, but to policymakers, practitioners, and even the general public as we seek to understand the antecedents to patient care. More specifically, we focus on three points apparent within the existing literature: (i) the problems with measuring quality of care; (ii) the focus on linear and individual-level relationships; and (iii) the relevance of theory within this relationship. A visual representation of these points is presented in Figure 3, contrasting that of Figure 1. This highlights that the extant research and theory on doctors' perceived working conditions and quality of care (Figure 3), does not match with that of the wider occupational health psychology literature. The following sections offer a more in-depth discussion on each of these three points.

[Insert Figure 3 here]

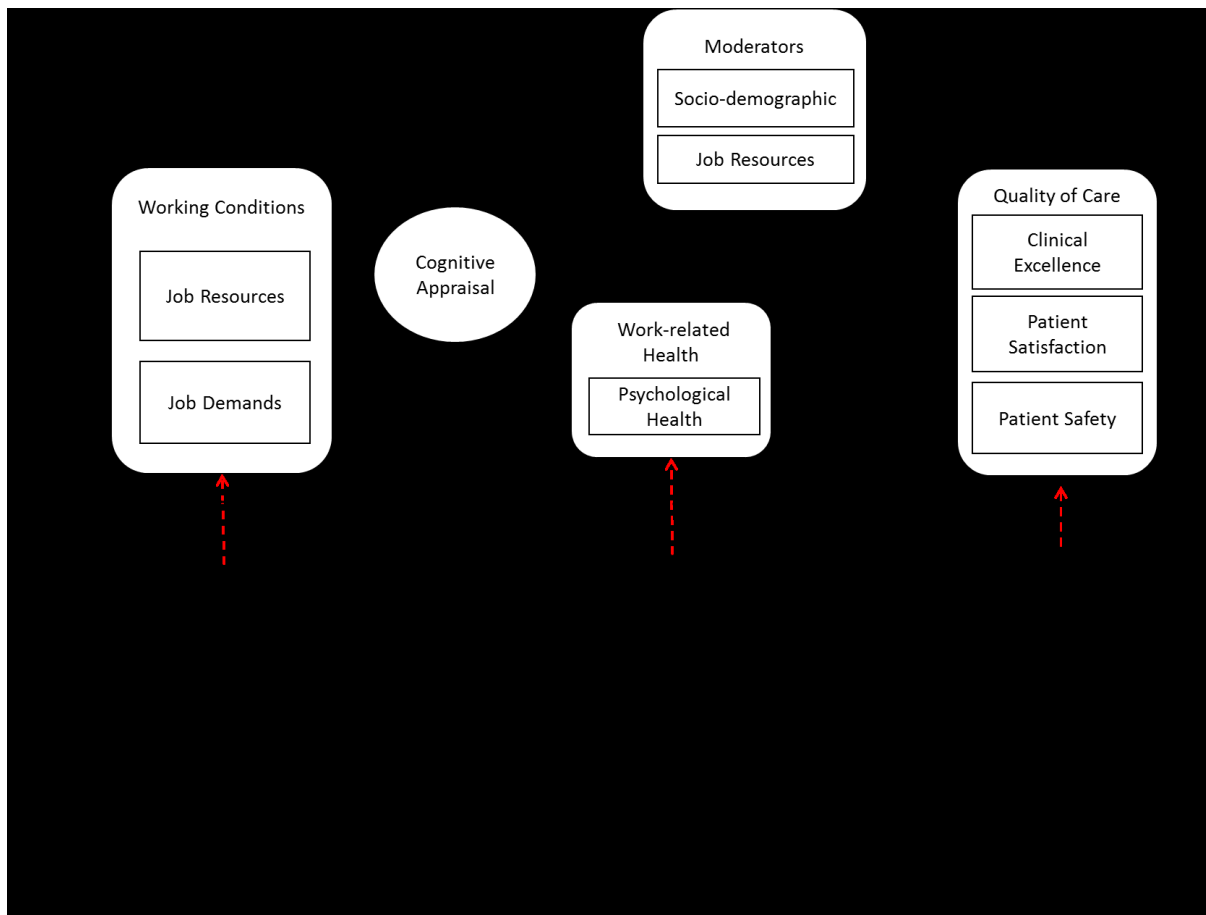


Figure 3. Overview of the complexity of the perceived working conditions and quality of care relationship

Problems with Measures of Quality of Patient Care

Fewer expected relationships involving patient experience were observed in this review (compared to clinical excellence and patient safety). This is congruent with the inconsistency of patient experience in the wider research literature as an outcome of staff health and perceived working conditions (Salisbury, Wallace, & Montgomery, 2010).

Relationships involving patient experience may, therefore, be more complex than those involving clinical excellence or error outcomes. This raises a separate discussion about the utility of measuring patient experience measures, with issues including inconsistency in conceptualising what this represents; and its poor links with other forms of quality measures (Crow et al., 2002; Salisbury et al., 2010).

For example, patient experience arguably captures the patient's attitudes and expectations about the service received (Crow et al., 2002). This also matches concerns, more generally, about the validity of customer satisfaction as a performance measure; which reflect process-related factors rather than outcomes of employee behaviours (Taris, 2006). It is also possible that doctors' professional standards mean they attempt to overcompensate in their delivery to still deliver, or appear to deliver, appropriate levels of care (Ratanawongsa et al., 2008). These factors that predict patient experience need to be better understood because if doctors are overexerting themselves to maintain adequate levels of care, this will have ramifications for their long term health.

The findings involving self-rated clinical excellence and patient safety could also be subjected to common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). It was not possible in this review to compare effect sizes across self-rated and other-rated outcome measures. However, in those studies where clinical excellence and patient safety outcomes were obtained from third-parties (e.g., colleagues, records) only about half of the relationships reported anticipated effects – fewer than relationships with self-reported outcomes. Similarly, the distinction between those outcomes that are behavioural or 'satisfaction, attitudes and perception' is important (Reed et al., 2007). Although the former is typically preceded by the latter, a change in the attitude or perception does not automatically translate into behavioural change (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). Therefore, it is likely that stronger (and more frequent) relationships are

observed in relation to attitudinal or perception based, rather than with behavioural quality of care outcomes.

How quality of care is measured therefore matters. While there are parallels to performance measures from other sectors, the review demonstrates that quality of care is a complex and multifaceted outcome measure. The conceptualisation and operationalisation of quality of care (or job performance in general) as an outcome measure will likely have an impact on the presence and strength of the relationship in question. Crucially, the findings here suggest that the utility of patient experience as an indicator of quality of care warrants reconsideration. Surprisingly, none of the studies considered clinical and health outcomes that would have provided clearer practical significance (Reed et al., 2007). Instead, studies used behavioural or attitudinal outcome measures that were self, observer or patient-rated. For those in research and practice, a greater awareness of the limitations and validity of quality of care (or performance) measures is needed, particularly when key workforce or performance standards are evaluated.

The Complexity of the Perceived Working Conditions and Quality of Care Relationship

The negative relationship between job demands and quality of care can be attributed to overloaded doctors wasting energy and time coping with their working conditions. This diverts limited personal resources away from performance-related behaviours (Jex, 1998). Furthermore, doctors struggling with emotionally demanding work or patients may be more prone to burnout; which, subsequently, can reduce the quality of care provided (Hall et al., 2016; Weigl et al., 2015). Where job resources positively related with quality of care, job control and autonomy function to provide more opportunities to cope with challenging situations (Bakker & Demerouti, 2017; Shirom, Nirel, & Vinokur, 2006). Social support is also useful as a source of information and emotional support (Teoh, Coyne, Devonish,

Leather, & Zarola, 2016), particularly from managers who are typically better placed to influence work patterns and access to resources.

From the review, it is evident that the relationship between doctors' perceived working conditions and quality of care is influenced by a variety of complex and dynamic systems. The complexity of the healthcare context means other factors should be considered, including curvilinear effects, and moderating and mediating variables. Failure to account for these limits our understanding of how all aspects of the perceived work environment potentially relates to quality of care indicators. For example, curvilinear properties were observed in the present studies for mental workload (Bertram et al., 1992) and autonomy (Stern, Katz-Navon, & Naveh, 2008); where increasingly high scores on either correspond with an initial increase, followed by a progressive decline in performance. The focus on mediators, such as burnout and depressive symptoms, suggests that the perceived working conditions and quality of care relationship is predominately viewed from a psychological health perspective. When other motivational (e.g., work engagement), behavioural (e.g., job crafting) or individual states (e.g., optimism) may help to further explain the nature of this relationship. Similarly, the finding that job autonomy interacted with learning environment (Stern et al., 2008) highlights how different perceived working conditions are affected not just by each other, but by other personal and socio-demographic factors. That few studies considered moderations suggests little is understood about other potential factors that may explain the influence the perceived working conditions and quality of care relationship.

It is also plausible that doctors in environments with lower standards of care perceive it to be more demanding and less resourceful, with reciprocal relationships between these constructs. Longitudinal studies support this, where doctors' error rates have predicted future levels of depressive symptoms (Shanafelt et al., 2010). Within our review, Krämer et al. (2016) reported that quality of care predicted time pressure, but not social conflict or

emotional demands one year later. Aside from this, none of the included studies considered a reverse or cyclical relationship. However, Dollarhide et al.'s (2013) findings that hospital physicians reported higher levels of task load prior to medical events occurring provides some evidence that job demands precede quality of care outcomes.

Finally, considering the complexity of the healthcare sector, the specific perceived working condition being examined matters as well. The most consistent predictors of quality of care were measures of higher-order job demands and resources. This is not surprising considering these capture a wider and more comprehensive picture of the work environment (Wellens & Smith, 2006). It has also been argued that the specificity of an outcome should match that of the predictor (Ironson, Smith, Brannick, Gibson, & Paul, 1989), meaning a narrower and more specific measure of the work environment would require an equivalent measure of quality of care to demonstrate an effect. As such, quality of care initiatives that target specific aspects of work may fail to address the underlying problems within the system or may only yield improvements on specific outcomes.

Future research should move beyond a linear and bi-variable relationship between perceived working conditions and quality of care (and even performance more generally) that functions at the individual level. Advancements in data techniques and statistical software allow more complex analyses such as multilevel or longitudinal designs, as well as mediating and moderating variables. This would present a more realistic interpretation of this relationship. For policymakers, practitioners and hospital management, these findings indicate that any changes to the working conditions of doctors should consider how they influence the working conditions perceived by doctors as they may have ramifications on patient care. Moreover, they reinforce the argument that interventions should not only focus on the reduction of job demands but also includes the strengthening of job resources (Nielsen et al., 2017). However, few studies (e.g., Benning et al., 2011) have evaluated workplace-

based psychosocial interventions in healthcare, highlighting the need to complement the growing literature on interventions targeting the individual.

The Role of Theory

The issues above highlight the importance of theory, not only in explaining how or why doctors' perceived working conditions influences quality of care; but also to account for confounding factors, the possibility of reverse causality and to inform the design of interventions. A theory-driven approach provides the basis to move our understanding of this relationship from a descriptive level (i.e., does this relationship exist?) to a more in-depth explanation for the existence of this relationship (i.e., why and how does this relationship function?).

Only six studies in this review made reference to a theoretical model. Moreover, most of these did not test specific theoretical postulations or explain the observed relationships. For example, both the DC-S (Karasek & Theorell, 1990) and JD-R (Bakker & Demerouti, 2017) models propose interactions between job demands and job resources to predict health; while the latter also postulates separate health-impairment and motivational pathways. Not testing these relationships hinders attempts to examine the validity and relevance of these models in specific occupational groups or sectors. Instead, the role of theory within these studies appears primarily to identify the working conditions to measure. By doing so, those models that specify specific working conditions (e.g., DC-S model) are restricted in the range of possible predictors. This could also explain why other psychosocial constructs prevalent in the healthcare sector (e.g., cognitive demands, role conflict) were not observed in this review.

While it may not always be possible to test entire models, focusing on specific aspects of it may still yield new insight. More practically, the myriad of data collected in the healthcare sector allows theory to provide a framework to identify relevant constructs. It also

informs the postulation of relationships, preventing the a-theoretical examination of data. Building on an earlier point on the role of psychosocial interventions (Benning et al., 2011), theory allows better change initiatives by identifying pathways and work aspects that warrant change. In trying to move beyond the bi-variable linear relationship discussed above, it is imperative that appropriate theoretical frameworks structure investigations and explain empirical findings. Otherwise, there is a danger of not meaningfully engaging the complexity within this relationship.

Limitations of Current Review

Within this review, doctors were treated as a homogenous group. The reality is that doctors are a heterogeneous profession and the included studies here involved doctors from various specialities and levels. This heterogeneity is compounded by the representation of multiple countries operating different health, social and welfare systems. These have implications for the nature of the work being conducted and the types of working conditions that doctors are exposed to. Moreover, how quality of care is perceived across different specialities and nations may also confound the relationship. Due to the absence of sufficient studies representing each relationship it was not possible to carry out the initially planned meta-analysis. Finally, we did not integrate our quality assessment within the evidence syntheses. Nevertheless, the MERSQI allows us to assess the methodological quality of the included studies and to highlight collective limitations within this field (e.g., the absence of clinical outcomes, the dominance of self-report measures and reliance of cross-sectional studies).

Conclusion

This systematic review contributes to an important research and practice area – the delivery of high-quality patient care. Better perceived working conditions appear to be associated with better clinical excellence and patient safety. This has implications for quality

of care as a construct, as the type of quality of care outcome and how it is measured is important. However, it is crucial to highlight that this review does not capture the magnitude of this relationship. While this review focused on perceived working conditions, it does not mean that the focus of interventions should be on the individual. Instead, changes in actual working conditions are pivotal. Consequently, managers and policymakers should acknowledge that changes to doctors' working conditions could impact patient care and that relevant quality of care interventions should target wider organisational factors as well. To advance both research and practice, the examination of this relationship needs to recognise that it functions as more than a linear relationship between two constructs. More longitudinal and multilevel designs are needed. These should be set within stronger conceptual frameworks, and account for the methodological and measurement challenges highlighted within this review. This is essential to understand the extent to which and how perceived working conditions enhance or hinder doctors' ability to provide quality care. Only then will it be possible to better understand this complex relationship for the benefit of the doctors working in the healthcare sector, and the general public in need of care. More generally, these implications are of equal relevance to researchers and practitioners from other sectors or domains of occupational health psychology.

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Table 1: Key characteristics of included studies

Author	Sample	Country	Perceived working condition	Quality of care measurement	Theoretical framework
¹ An <i>et al.</i> (2013)	422 general internists and family physicians, and 1384 patients	USA	Burden of difficult encounters (eight items)	Quality of care for hypertension (Chart audit of blood pressure control); Quality of care for diabetes (Chart audit for control of haemoglobin A1c and blood pressure); Errors for hypertension and diabetes (Chart audit of guideline non-adherence and missed opportunities for prevention or management)	None
² Ansmann <i>et al.</i> (2013)	864 oncologists and 1462 patients	Germany	Work overload (one item); Time pressure (one item)	Patient satisfaction (Cologne Patient Questionnaire; three items)	None
³ Ansmann <i>et al.</i> (2014)	348 hospital physicians and 1844 patients	Germany	Decision latitude, psychological job demands, physical demands, and work postures demands (Job Content Questionnaire, unspecified number of items) Social support from colleagues (Unspecified number of items)	Patient satisfaction with support (Cologne Patient Questionnaire; three items)	Demand-control
⁴ Baldwin <i>et al.</i> (1997)	142 junior doctors	United Kingdom	Feeling overwhelmed (Four items from the Attitude to Work Scale) Effective learning and skill use (Four items from the Attitude to Work Scale)	Subjective work performance (Number of mistakes made in the previous year)	None
⁵ Bernburg <i>et al.</i> (2016)	435 hospital doctors	Germany	Job demands (Quantitative, emotional); Job resources (Influence at work, possibilities for development, degree of freedom at work, sense of community, feedback, quality of leadership, social support, social relationships); assessed by the Copenhagen Psychosocial Questionnaire (items not reported)	Work ability (7 items)	Job demands-resources
⁶ Bertram <i>et al.</i> (1990)	48 internal medicine physicians	USA	Task mental workload (Ten items)	Physician satisfaction with care provided (one item); Physician self-rated quality of care (one item)	None
⁷ Bertram <i>et al.</i> (1992)	22 residents in ambulatory care	USA	Task mental workload (Six items)	Physician self-rated satisfaction with care provided (one item); Physician observer-rated quality of care (one item); Personal interaction performance score (Chart audit); Technical performance score (Chart audit)	None
⁸ Dollarhide <i>et al.</i> (2013)	185 hospital physicians	USA	Workload (NASA Task Load Index with six items)	Medical events (self-reporting electronic tool which collects data on type and severity of a medication event.	None
⁹ Feddock <i>et al.</i> (2005)	42 internal medicine residents with 168 matched patient resident dyads	USA	Workload (One item)	Patient satisfaction (Seven items)	None

¹⁰ Krämer <i>et al.</i> (2016)	95 hospital physicians	Germany	Patient demands (5 items); time pressure (5 items); social stressors (3 items)	Quality of care (Three items)	Job demands-resources
¹¹ Linzer <i>et al.</i> (2009)	422 general internists and family physicians and 1795 patients	USA	Time pressure (Recorded average time allocated for examinations vs. estimated time needed to provide quality care); Office pace (One item); Work control (14 item Physician Worklife Study)	Quality of care: Control of blood pressure for hypertension, control of haemoglobin A1c and blood pressure for diabetes, stability of signs and symptoms for heart failure (audio-recorded visits) Treatment errors: missed treatment opportunities, inattention to behavioural factors, guideline non-adherence and defined prevention errors (audio-recorded visits)	None
¹² Loerbroks <i>et al.</i> (2016)	416 junior physicians	Germany	Effort and rewards (23 item)	Self-reported perceived quality of care (8 items)	Effort Reward Imbalance
¹³ Mache <i>et al.</i> (2012)	98 surgeons and 122 of their patients	Germany	Job demands (Quantitative, emotional and demands hiding emotion); Job resources (Possibilities for development, degree of freedom, influence at work, sense of community, social support, quality of leadership, feedback at work); assessed by the Copenhagen Psychosocial Questionnaire (items not reported)	Patient satisfaction (12 items)	None
¹⁴ Mache <i>et al.</i> (2013)	123 surgeons	Germany	Job demands (Quantitative, emotional, cognitive and demands for hiding emotion); Job resources (Possibilities for development, degree of freedom, influence at work, social relationships, social support, quality of leadership, feedback at work); assessed by the Copenhagen Psychosocial Questionnaire (items not reported)	Work ability (7 items)	None
¹⁵ McKinstry <i>et al.</i> (2007)	198 GPs and an average of 49.6 patients per GP	United Kingdom	Work control and support (each measured by one item from the 13-item Morale Assessment in General Practice Index)	Patient satisfaction dimensions on quality of communication and enablement (from the General Practice Assessment Questionnaire; items not reported)	None
¹⁶ Naveh <i>et al.</i> (2015)	142 residents	Israel	Autonomy (three items); Consultation with physicians (two items)	Perceived error rate (four items)	None
¹⁷ Shirom <i>et al.</i> (2006)	890 specialists	Israel	Autonomy (Ten items) Overload (Nine items)	Quality of care (15 items from the original 22 item Service Quality Scale)	Person environment fit & Conservation of resources
¹⁸ Stern <i>et al.</i> (2008)	123 residents	Israel	Autonomy (Four items)	Treatment errors rated by senior nurse (Number of 12 different types of mistakes)	None
¹⁹ Tucker <i>et al.</i> (2012)	1534 doctors	Sweden	Work time control (One item)	Concerns on patient safety (One item) Prevention and disease management performance (11 items)	None
²⁰ Weigl <i>et al.</i> (2015)	88 paediatricians	Germany	Effort and rewards (23 item)	Self-reported perceived quality of care (Two items)	Effort Reward Imbalance
²¹ Zwaan (2012)	210 patients and attending resident	Netherlands	Subjective workload (one item)	Number of patient harm incidents or diagnostic errors in patient charts	None

Table 2: *MERSQI* criteria for included studies

Study	Study Design (Number of Institutions)	Response Rate	Validity of Psychosocial Measure			Type of Output Data	Data Analyses			MERSQI Score
			Internal	Content	Criterion		Appropriate	Sophistication	Outcomes	
1	Single group cross-sectional (119 practices)	59.8%	NR	NR	Reported	Chart audits	Y	Cluster analysis	Behaviours	12.5
2	Single group cross-sectional (31 hospitals)	46.4%	NA	Reported	NR	Assessment by patient	Y	Multilevel modelling	Satisfaction, attitudes, perception	11.6
3	Single group cross-sectional (35 hospitals)	46%	NR	Reported	NR	Assessment by patient	Y	Multilevel modelling	Satisfaction, attitudes, perception	11
4	Single group cross-sectional (1 hospital)	95%	Reported	NR	Reported	Assessment by doctor	Y	Correlations	Satisfaction, attitudes, perception	10
5	Single group cross-sectional (12 departments)	61.8%	Reported	Reported	NR	Assessment by doctor	Y	Regressions	Satisfaction, attitudes, perception	10.5
6	Single group cross-sectional (2 clinics)	98%	Reported	NR	Reported	Assessment by doctor	Y	Correlations	Satisfaction, attitudes, perception	10.5
7	Single group cross-sectional (1 clinic)	100%	Reported	NR	Reported	Assessment by evaluator & doctor	Y	Correlations	Behaviours	13
8	Non-randomised two groups (4 hospitals)	75.8%	NR	Reported	NR	Assessment by doctor	Y	Regressions	Behaviours	12
9	Single group cross-sectional (1 clinic)	NR	NA	NR	NR	Assessment by patient	N	Regressions	Satisfaction, attitudes, perception	8.5
10	Single group longitudinal design (2 hospitals)	Time 1 53%; Time 2 47%	Reported	Reported	Reported	Assessment by doctor	Y	Path models	Satisfaction, attitudes, perception	11.5
11	Single group cross-sectional (119 practices)	59.6%	Reported	NR	Reported	Chart audits	Y	Regressions	Behaviours	13.5
12	Single group cross-sectional (Multiple hospitals)	69%	Reported	Reported	Reported	Assessment by doctor	Y	Path models	Satisfaction, attitudes, perception	11.5
13	Single group cross-sectional (7 hospitals)	55%	Reported	Reported	Reported	Assessment by patient	Y	Correlations	Satisfaction, attitudes, perception	13.5

14	Single group cross-sectional (10 hospitals)	63%	Reported	Reported	NR	Assessment by doctor	Y	Regressions	Satisfaction, attitudes, perception	11.5
15	Single group cross-sectional (Multiple practices)	62%	NR	Reported	NR	Assessment by patient	N	Correlations	Satisfaction, attitudes, perception	10.5
16	Single group cross-sectional (2 teaching hospitals)	80%	Reported	NR	Reported	Assessment by senior physicians	Y	Regressions	Satisfaction, attitudes, perception	12.5
17	Single group cross-sectional (Multiple settings)	63%	Reported	Reported	Reported	Assessment by doctor	Y	Structural equation modelling	Satisfaction, attitudes, perception	11.5
18	Single group cross-sectional (2 teaching hospitals)	80%	Reported	NR	Reported	Assessment by nurse	Y	Multilevel modelling	Behaviours	13.5
19	Single group cross-sectional (Multiple settings)	53.1%	NA	NR	Reported	Assessment by doctor	Y	Regressions	Satisfaction, attitudes, perception	10
20	Single group cross-sectional (1 hospital)	73.8%	NR	Reported	Reported	Assessment by doctor	Y	Regressions	Satisfaction, attitudes, perception	10.5
21	Single group cross-sectional (5 hospitals)	80.4%	NA	NR	Reported	Chart audits	Y	Regressions	Behaviours	12.7

Note: NR = not reported. NA = not applicable. Y = yes. N = no.

Table 3: *Perceived working conditions' relationship with clinical excellence*

Author	Main Findings	Outcome rated by	Data analysis	Type of outcome	Relationship Found
Job Demands and Clinical Excellence					
<i>Perceived Workload</i>					
¹⁴ Mache <i>et al.</i> (2013)	Quantitative demands ($r=-.18$) and cognitive demands ($r=-.31$) both negatively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁶ Bertram <i>et al.</i> (1990)	Mental workload negatively associated with quality of care ($r=-.46$).	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁷ Bertram <i>et al.</i> (1992)	Mental workload and mental workload squared curvilinear associated with self-rated performance ($r=-.67$) and observer-rated technical performance ($r=-.38$; $r=.45$).	Evaluator & self-report	Correlations	Behaviours	Yes
¹⁷ Shirom <i>et al.</i> (2006)	Overload negatively associated with quality of care ($\beta=-.15$).	Self-report	Structural equation modelling	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Quantitative demands ($r=-.28$) negatively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
<i>Demanding Patients</i>					
¹ An <i>et al.</i> (2013)	Physicians with a high burden of difficult encounters had a 7.68% lower quality care rate than those with a lower burden. No significant differences for specific error quality of care for diabetes and hypertension.	Chart audits by researchers	Cluster analysis	Behaviours	Mixed
<i>Time Pressure</i>					
¹⁰ Krämer <i>et al.</i> (2016)	Time pressure at positively predicted quality of care one year later ($\beta=-.19$).	Self-report	Path models	Satisfaction, attitudes, perception	Yes
¹¹ Linzer <i>et al.</i> (2009)	Only two out of nine relationships between time pressure and quality of care were significant.	Chart audits by researchers	Regressions	Behaviours	Mixed
<i>Emotional Demands</i>					
¹⁴ Mache <i>et al.</i> (2013)	Emotional demands ($r=-.21$) and demands hiding emotion ($r=-.19$) both negatively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Emotional demands ($r=-.20$) negatively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
¹⁰ Krämer <i>et al.</i> (2016)	Emotional demands did not predict quality of care one year later.	Self-report	Path models	Satisfaction, attitudes, perception	No
<i>Social Conflict</i>					
¹⁰ Krämer <i>et al.</i> (2016)	Social conflict predicted quality of care one year later ($\beta=-.15$).	Self-report	Path models	Satisfaction, attitudes, perception	No
<i>Higher-Order Job Demands</i>					
²⁰ Weigl <i>et al.</i> (2015)	Effort negatively predicted quality of care ($\beta=-.49$).	Self-report	Regressions	Satisfaction, attitudes, perception	Yes
¹² Loerbroks <i>et al.</i> (2016)	Effort negatively predicted quality of care ($\beta=-.24$).	Self-report	Path models	Satisfaction, attitudes, perception	Yes
¹⁴ Mache <i>et al.</i> (2013)	Latent factor of four job demands explained an additional 10% of the variance towards work ability.	Self-report	Regressions	Satisfaction, attitudes, perception	Yes

Job Resources and Clinical Excellence*Autonomy*

¹⁴ Mache <i>et al.</i> (2013)	Degree of freedom ($r=.32$) correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Degree of freedom ($r=.15$) positively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
¹⁷ Shirom <i>et al.</i> (2006)	Job autonomy positively correlated with quality of care ($\beta=.37$).	Self-report	Structural equation modelling	Satisfaction, attitudes, perception	Yes

Job Control

¹⁴ Mache <i>et al.</i> (2013)	Influence at work ($r=.39$) correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Influence at work ($r=.15$) positively correlated with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
¹¹ Linzer <i>et al.</i> (2009)	Work control was significantly associated with diabetes quality of care ($\beta=8.41$) but not with hypertension or overall quality of care.	Chart audits by researchers	Regressions	Behaviours	Mixed

Learning and Development

¹⁴ Mache <i>et al.</i> (2013)	Possibilities for development ($r=.36$) and feedback at work ($r=.27$) both correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Possibilities for development ($r=.14$) and feedback at work ($r=.12$) both correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes

Social support - Colleagues

¹⁴ Mache <i>et al.</i> (2013)	Social relationships ($r=.20$) and social support ($r=.41$) both correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Social relationships ($r=.11$) and social support ($r=.15$) both correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes

Supervisor support

¹⁴ Mache <i>et al.</i> (2013)	Quality of leadership ($r=.25$) correlated positively with work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
⁵ Bernburg <i>et al.</i> (2016)	Quality of leadership ($\beta=.06$) did not predict work ability.	Self-report	Correlations	Satisfaction, attitudes, perception	No

Higher-order job resources

²⁰ Weigl <i>et al.</i> (2015)	Rewards (perceived salary, promotion prospects, esteem, and job security) was positively correlated with quality of care ($\beta=.44$).	Self-report	Regressions	Satisfaction, attitudes, perception	Yes
¹⁴ Mache <i>et al.</i> (2013)	Latent factor of eight job resources (influence at work, degree of freedom of work, possibilities for development, quality of leadership, social support, feedback at work, social relations, & sense of community) explained an additional 18% of the variance towards work ability.	Self-report	Regressions	Satisfaction, attitudes, perception	Yes
¹² Loerbroks <i>et al.</i> (2016)	Rewards (perceived salary, promotion prospects, esteem, and job security) was positively correlated with quality of care ($\beta=.20$).	Self-report	Path models	Satisfaction, attitudes, perception	Yes

Table 4: *Perceived working conditions' relationship with patient safety*

Author	Main Findings	Outcome rated by	Data analysis	Type of outcome	Relationship Found
Job Demands and Patient Safety					
<i>Perceived Workload</i>					
⁸ Dollarhide <i>et al.</i> (2013)	Perceived workload higher on a medication event day (M=35.9) than a medication non-event day (M=26.6).	Self-report	Regressions	Behaviours	Yes
⁴ Baldwin <i>et al.</i> (1997)	Feeling overwhelmed ($r=.22$) was associated with the number of mistakes made in the previous year.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes
²¹ Zwaan (2012)	Residents who reported higher subjective workload were associated with more adverse outcomes (OR=1.10).	Chart audits by researchers	Regressions	Behaviours	Yes
<i>Demanding Patients</i>					
¹ An <i>et al.</i> (2013)	Physicians with a high burden of difficult encounters had a 5.57% lower error rate than those with a lower burden. No significant differences for specific error rates for diabetes and hypertension.	Chart audits by researchers	Cluster analysis	Behaviours	Mixed
<i>Time Pressure</i>					
¹¹ Linzer <i>et al.</i> (2009)	Neither time pressure nor pace were associated with any of the outcome measures.	Chart audits by researchers	Regressions	Behaviours	Mixed
Job Resources and Patient Safety					
<i>Autonomy</i>					
¹⁶ Naveh <i>et al.</i> (2015)	Autonomy ($r=-.01$) was not significantly related with error rate.	Senior physician Nurse	Regressions	Satisfaction, attitudes, perception	No
¹⁸ Stern <i>et al.</i> (2008)	Autonomy predicted treatment errors ($\beta=-3.28$).		Multilevel modelling	Behaviours	Yes
<i>Job control</i>					
¹⁹ Tucker <i>et al.</i> (2012)	Work time control predicted concerns on patient safety ($\beta=-.18$).	Self-report	Regressions	Satisfaction, attitudes, perception	Yes
¹¹ Linzer <i>et al.</i> (2009)	Work control was not correlated with any of the four error measures	Chart audits by researchers	Regressions	Behaviours	No
<i>Learning and Development</i>					
¹⁶ Naveh <i>et al.</i> (2015)	Consultation with physicians was correlated with error rate ($r=-.14$).	Senior physicians	Regressions	Satisfaction, attitudes, perception	Yes
⁴ Baldwin <i>et al.</i> (1997)	Effective learning and skill use ($r=-.180$) were associated with the number of mistakes made in the previous year.	Self-report	Correlations	Satisfaction, attitudes, perception	Yes

Table 5: *Perceived working conditions' relationship with patient experience*

Author	Main Findings	Outcome rated by	Data analysis	Type of outcome	Relationship Found
Job Demands and Patient Experience					
<i>Perceived Workload</i>					
⁹ Feddock <i>et al.</i> (2005)	Patient satisfaction with clinic visit lower when seen by a resident with heavier workload than one with a lighter workload on two out of the seven items.	Patient	Regressions	Satisfaction, attitudes, perception	Mixed
² Ansmann <i>et al.</i> (2013)	No relationship was observed between work overload and patient satisfaction.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	No
³ Ansmann <i>et al.</i> (2014)	No relationship between psychological job demands and patient satisfaction with support.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	No
<i>Time Pressure</i>					
² Ansmann <i>et al.</i> (2013)	Perceived lack of time for patient care was negatively associated with patient satisfaction (OR 1.62).	Patient	Multilevel modelling	Satisfaction, attitudes, perception	Yes
<i>Perceived Physical Job Demands</i>					
³ Ansmann <i>et al.</i> (2014)	Perceived physical activity demands ($\beta=-0.44$), but not work posture demands, was correlated with patient satisfaction with support.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	Mixed
<i>Higher-order Job Demands</i>					
¹³ Mache <i>et al.</i> (2012)	Latent factor of three job demands negatively correlated with patient satisfaction ($r=-.38$)	Patient	Correlations	Satisfaction, attitudes, perception	Yes
Job Resources and Patient Experience					
<i>Job control</i>					
³ Ansmann <i>et al.</i> (2014)	No relationship between decision latitude and patient satisfaction with support.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	No
¹⁵ McKinstry <i>et al.</i> (2007)	Work control not related with patient satisfaction with communication or enablement.	Patient	Correlations	Satisfaction, attitudes, perception	No
<i>Social support - Colleagues</i>					
³ Ansmann <i>et al.</i> (2014)	Social capital ($\beta=0.279$), but not social support from colleagues, was associated with patient satisfaction.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	Mixed
¹⁵ McKinstry <i>et al.</i> (2007)	Support not related with patient satisfaction with communication or enablement	Patient	Correlations	Satisfaction, attitudes, perception	No
<i>Supervisor support</i>					
³ Ansmann <i>et al.</i> (2014)	Supervisor support ($r=.137$) not associated with patient satisfaction.	Patient	Multilevel modelling	Satisfaction, attitudes, perception	No
<i>Higher-order Job Resources</i>					
¹³ Mache <i>et al.</i> (2012)	Latent factor of eight job resources (influence at work, degree of freedom of work, possibilities for development, quality of leadership, social support, feedback at work, social relations, & sense of community) positively correlated with patient satisfaction ($r=.420$).	Patient	Correlations	Satisfaction, attitudes, perception	Yes

