

A balanced approach involving hard and soft factors for internalizing Lean Management and Six Sigma in hospitals

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Abstract

Purpose – This study examines the theoretical and empirical relationships between LM&SS, human resource management (HRM), climate for LM&SS and outcomes (employee well-being and performance) in hospitals. As part of this research, the authors examine the interplay between “hard” and “soft” practices for LM&SS and “soft” HR practices.

Design/methodology/approach – A cross-sectional, multisite survey study covering all internal service units at all eight Dutch university hospitals was conducted (42 units, $N = 218$ supervisors, $N = 1,668$ employees), and multivariate multilevel regression analyses were performed.

Findings – A systems approach involving “soft” LM&SS practices that are specifically HR-related has a positive effect (β is 0.46) on a climate for LM&SS. A climate for LM&SS is not related to perceived performance or employee health. It is, however, positively related to employee happiness and trusting relationships (both β s are 0.33). We did not find that a climate for LM&SS had a mediating effect.

Research limitations/implications – This study shows that a balanced approach involving both “hard” and “soft” factors is crucial to achieving the desired breadth and depth of LM&SS adoption at the macro, meso, and micro levels. The authors found that a climate for LM&SS positively affects employee well-being in hospitals.

Practical implications – In their attempt to create mutual gains for both their organization and their employees, hospitals that adopt LM&SS should foster a climate for LM&SS by embracing a balanced approach consisting of both “hard” and “soft” practices, thereby internalizing LM&SS at the macro, meso, and micro levels.

Originality/value – This is one of the first studies to examine in-depth the impact of “hard” and “soft” LM&SS on both employee well-being (subdivided into different components) and performance in healthcare, as well as the role of “soft” HRM in this relationship. Linking LM&SS, HRM and outcomes to a climate for LM&SS is relatively a new approach and has led to a deeper understanding of the mechanisms underpinning the internalization of LM&SS in healthcare.

Keywords Lean Six Sigma, Human resource management, Healthcare, Climate, Outcomes

Paper type Research paper



1. Introduction

The COVID-19 pandemic has highlighted strengths, weaknesses, opportunities and challenges within healthcare systems across the globe (Bhat *et al.*, 2022). Changed circumstances lead to different value trade-offs. For example, during the coronavirus crisis we started to look differently at lean approaches to organizing care, using as few supplies as possible (also called just-in-time management) (De Graaff *et al.*, 2021; Kuiper *et al.*, 2021). Other existing issues were put on edge by the crisis. Consider the challenges of access to healthcare services and of enhancing the quality of care and patient safety while reducing costs (Hundal *et al.*, 2021; McDermott *et al.*, 2021).

These challenges, amplified during the COVID-19 pandemic, make healthcare an attractive domain for operations management (Barjis, 2011). The Lean Management and Six Sigma (LM&SS) approach has taken a central role in healthcare quality management (Antony *et al.*, 2019; Niñerola *et al.*, 2020; Bhat *et al.*, 2022) within the larger framework of TQM (Klefsjö *et al.*, 2001). There is, however, a need for more empirical research on the application of LM&SS in healthcare (Bertolaccini *et al.*, 2015; Ko *et al.*, 2016; Da Silva *et al.*, 2018; Wilson *et al.*, 2018; Anthony *et al.*, 2018; Bhat *et al.*, 2022). One of the main gaps in studies on LM&SS in healthcare is that they fail to address the interplay between its “hard” and “soft” factors (Lau and Idris, 2001; Ershadi *et al.*, 2019; Khalili *et al.*, 2019). For example, although research shows that “soft” practices, i.e. those concerning people and relationships (Mamata *et al.*, 2015), are crucial for achieving superior performance, LM&SS is often perceived as a set of “hard” practices, i.e. practices involving tools and techniques for improving processes (e.g. Poksinska, 2010; Stamatis, 2011), especially in healthcare. This study distinguishes itself from earlier research by examining a systems approach that encompasses interrelated “hard” and “soft” LM&SS practices (Bortolotti *et al.*, 2015; De Koeijer *et al.*, 2022) adapted from manufacturing.

Another gap in the literature on LM&SS is the inconsistent evidence regarding the effect of these “hard” and “soft” LM&SS factors on outcomes (Abdullah and Tari, 2017). Some studies suggest a positive effect between “hard” practices and performance (Kaynak, 2003; Rahman and Bullock, 2005), while other studies state the opposite (Ho *et al.*, 2001; Parast *et al.*, 2011). In addition, few studies have attempted to assess how implementing LM&SS in hospitals impacts outcomes (Antony *et al.*, 2019). This study is one of the first to examine in detail the impact of a systems approach encompassing interrelated “hard” and “soft” LM&SS practices on both employee well-being and performance in hospitals.

Finally, there is a dearth of research investigating the organizational patterns (routines) that LM&SS implementation may enable (Antony *et al.*, 2019). Adopting LM&SS in such a way that it becomes a permanent part of the organization’s routines can be described as internalization (Kostova and Roth, 2002). Although growing research on LM&SS internalization underlines the importance of “soft” human resource (HR) practices (e.g. Schneider, 1975; Ostroff and Bowen, 2000; Veld *et al.*, 2010; Thirkell and Ashman, 2014), empirical evidence is lacking. Whereas most studies consider HR practices as part of the LM&SS systems approach, we constructed a separate HRM systems approach for “soft” LM&SS practices that are specifically HR-related, such as teamwork, participation and training. This is relevant in light of researchers’ disagreement about the interplay between different “soft” practices in establishing a commitment to organizational excellence (Durairatnam *et al.*, 2021). Such considerations call for additional research that clarifies the importance of “soft” HR practices in enacting an organizational climate supportive of a quality orientation (Cavallone and Palumbo, 2021). The present study is unique in that it focuses on both the role of “soft” HR practices and climate as related to “hard” and “soft” LM&SS factors and outcomes in healthcare. The main research question is therefore: *Is a balanced approach involving “hard” and “soft” LM&SS practices combined with “soft” HR practices positively related to a climate for LM&SS, and is a climate for LM&SS positively related to outcomes in hospitals?*

The article is organized as follows: [Section 2](#) discusses the literature study that inspired our research and helped us articulate the research hypotheses. [Section 3](#) presents the research methods and provides information on the sample used in our empirical analysis. [Section 4](#) reports on the data analysis and findings, which are discussed in [Section 5](#). Lastly, [Section 6](#) concludes the paper by summarizing its main implications for theory and practice and by discussing limitations of the study and an agenda for future research.

2. Theoretical background and research hypotheses

2.1 *Lean Management and Six Sigma in healthcare*

Total quality management (TQM) has been widely adopted by the healthcare systems of many countries and stresses quality across all processes and procedures in health-care delivery ([Alzoubi et al., 2019](#)). TQM is an overarching description for a set of related organizational interventions ([Hackman and Wageman, 1995](#)), such as Lean Management and Six Sigma (LM&SS) ([Juran and Godfrey, 1998](#); [Dahlgaard et al., 2001](#); [Andersson et al., 2006](#)). This article will focus on LM&SS as an approach within the larger framework of TQM ([Klefsjö et al., 2001](#)). LM&SS represents one chapter in a long history of quality improvement ([Waring and Bishop, 2010](#)), starting in the early twentieth century with mass production and the influence of Henry Ford and others ([Womack et al., 1990](#)), followed by the Toyota Production System (TPS) in the Japanese automotive industry ([Spear and Bowen, 1999](#)) and, since 1980, embraced in the Western world as Lean Management (LM) ([Womack and Jones, 2003](#); [Stamatis, 2011](#)). Around the same time that LM was introduced, many large companies, including Motorola and General Electric, implemented Six Sigma (SS) with a view to reducing errors and minimizing variability. While the definitions of LM and SS differ, both serve the aim of reducing waste and resources while improving customer satisfaction and financial results ([Andersson et al., 2006](#)) and organizations increasingly combine these methods into a single approach, LM&SS ([Glasgow et al., 2010](#)).

An approach that integrates Lean Management and Six Sigma is essential to efforts to reduce errors and maintain results in healthcare settings ([Noronha et al., 2021](#); [Leite et al., 2018](#); [Furterer, 2018](#); [Zwetsloot et al., 2018](#); [Deithorn and Kovach, 2018](#); [Bhat et al., 2022](#)). Most research on LM&SS in healthcare is conceptual rather than empirical in nature, however ([Seidl and Newhouse, 2012](#)). There is also little uniformity in the theoretical conceptualizations of LM&SS in healthcare ([D'Andreamatteo et al., 2015](#); [Aboelmaged, 2015](#)). The LM&SS toolbox that healthcare organizations deploy tends to be filled with “hard” LM&SS practices focusing on process improvements ([Poksinska, 2010](#); [Stamatis, 2011](#); [Radnor et al., 2012](#); [De Koeijer et al., 2022](#)). For example, the systematic review by [Henrique and Filho \(2020\)](#) shows that the most common techniques used in healthcare are VSM, Standardization of Work, and Visual Management. The outcomes of healthcare organizations depend, on the one hand, on routine and standardized processes and, on the other hand, on employees with the right customer mindset and ability to anticipate changing demands from their customers ([De Koeijer et al., 2022](#)). “Hard” and “soft” LM&SS practices should thus go hand in hand: a singular focus on a “hard” approach to optimizing processes neglects the human factor, while a one-dimensional focus on a “soft” approach complicates the attainment of performance outcomes. It is important to examine the effects of multiple dimensions of LM&SS empirically ([Wright and Boswell, 2002](#); [Shah and Ward, 2003](#)) and that is why we have included LM&SS in our research as a systems approach consisting of interrelated “soft” and “hard” LM&SS practices ([Table 1](#)).

2.2 *LM&SS and Human Resource Management*

Although systematic reviews by [D'Andreamatteo et al. \(2015\)](#) and [Moraros et al. \(2016\)](#) mention both efficiency and employee goals as drivers for applying LM&SS in healthcare

LM&SS practices that are part of the systems approach	Description (Cua <i>et al.</i> , 2001; McKone <i>et al.</i> , 2001; Zu <i>et al.</i> , 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts	Managers and physicians together form top management
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers	Customers are not only patients, but also family members, caregivers, decision-makers and insurers
Quality information	Timely collected quality data are available to managers and employees, and must be used for improvement	Delivering care is a complex process. Collecting accurate and reliable information is a challenge
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is an emphasis on mistake-proof process design	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques	Professionals are trained to act with autonomy. Too much emphasis on standardization could evoke resistance
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments

Table 1.
LM&SS systems approach

organizations, the narrow focus on “hard” LM&SS practices disregards issues concerning people and relationships (Radnor *et al.*, 2012; Mamata *et al.*, 2015). For example, studies by Chung and Kwon (2016), Begeen *et al.* (2016) and Cardon and Bribiescas (2015) on LM&SS in healthcare emphasize supply chain principles and cost reduction while largely ignoring the human side. A recent study by De Koeijer *et al.* (2022) shows that a combination of LM&SS and HRM positively impacts both performance and employee well-being in hospitals. Although the evidence suggests that HRM is important for a successful implementation of LM&SS (e.g. Jørgensen *et al.*, 2007; Zacharatos *et al.*, 2007), little research has been done on this topic in the context of healthcare (Hasle *et al.*, 2012; Cullinane *et al.*, 2014), or the outcomes of research are contradictory (e.g. Seppälä and Klemola, 2004; Bonavia and Marin-Garcia, 2011).

Unlike previous research in which HR practices are often regarded as part of the LM&SS systems approach, we constructed a separate HRM systems approach for those “soft”

LM&SS practices that are specifically HR-related. For example, cross-functional teams could help to generate ideas for science-based, systematic quality initiatives (Näslund, 2013). Performance appraisal and rewards could also function as morale boosters and encourage employee engagement (Sreedharan *et al.*, 2018; Sony *et al.*, 2020; Clegg *et al.*, 2010; Manville *et al.*, 2012). In addition, training and development are crucial to getting skilled and motivated people to work on LM&SS projects (Sanders and Karr, 2015; Anthony *et al.*, 2018). Employee participation and engagement in decision-making and problem-solving can also help inspire commitment to organizational excellence (Cavallone and Palumbo, 2021).

The rationale behind constructing an HRM systems approach is threefold. First, the growing critique of the negative effect of LM&SS on employees argued for the HR side to be viewed separately (Holden, 2011; Moraros *et al.*, 2016; Goodridge *et al.*, 2015). Second, LM&SS practices such as process management and the focus on metrics appear to be of a different order than, for example, LM&SS practices such as training and teamwork. Where the first two practices are usually related directly to the adoption of LM&SS, the latter two are likely to have been standard in healthcare organizations for quite some time. More specifically, while LM&SS is often programmatic and temporary in nature, HRM is often a consistent component in a hospital's business operations. Third, research on the interplay between "soft" HR practices and "soft" and "hard" LM&SS practices is scarce. To gain a thorough understanding of the relationship between "soft" LM&SS practices that are specifically HR-related and the internalization of LM&SS, we follow Wright and Boswell (2002) in including an HRM systems approach in our research (see Table 2).

2.3 LM&SS, HRM and climate

Radnor *et al.* (2012) argue that the narrow focus on "hard" LM&SS practices, such as "focus on metrics" and "process management", has led healthcare to neglect activities that encourage employees to develop shared perceptions of LM&SS. These shared perceptions are important for the internalization of LM&SS interventions (Taylor *et al.*, 2013). For the effects of LM&SS to become visible and measurable, a process of routinization must take place in which professionals adopt these new work practices and adapt their existing organizational routines accordingly. Adopting LM&SS in such a way that it becomes a permanent part of the organization's daily routine can be described as internalization (Kostova and Roth, 2002). New routines cannot be sustained in a setting that does not support and enable their performance, however. For example, unless the LM&SS climate reflects employees' belief in the real value of LM&SS for their organization, there is a significant risk that LM&SS will never be internalized (Tolbert and Zucker, 1996). This risk is particularly acute in healthcare because healthcare professionals fear that adopting LM&SS will lead to over-standardization (Holden, 2011) and that LM&SS redirects clinical practice away from patient care towards more administrative and management tasks (e.g. Radnor, 2011). Shared perceptions support employees in their drive to sustain quality improvement initiatives (Tan *et al.*, 2014) and in their commitment to accomplishing organizational excellence (Beraldin *et al.*, 2020; Cavallone and Palumbo, 2021). Creating a climate for LM&SS that reflects positive shared perceptions of employees about LM&SS practices and their commitment to them is therefore crucial to the internalization of LM&SS (Kostova and Roth, 2002; Ostroff *et al.*, 2003; Patterson *et al.*, 2005).

Climate is consistently conceptualized as employees' shared perceptions about the nature of their organization in terms of events, policies, practices, and procedures (Ostroff *et al.*, 2003; Patterson *et al.*, 2005). Internally, climate is often considered actionable, i.e. management can try to shape climate to pursue organizational goals and influence performance (Denison, 1996; Haakonsson *et al.*, 2008). Like climate in the general sense, the climate for LM&SS can be conceptualized in two different ways. First, there is the individual level or psychological climate, which refers to the individual's perceptions of organizational practices and

HR practices that are part of the systems approach	Generic description (Boon <i>et al.</i> , 2011)	Specific description	Special aspects in a healthcare setting
Participation and job design	Employees are involved in decisions and have the opportunity to take responsibility for their own tasks	Employees are involved in quality decisions and have the opportunity to take responsibility for their own tasks (e.g. Dal Pont <i>et al.</i> , 2008; Zu and Fredendall, 2009)	Professionals are trained to act with autonomy. They are, together with their colleagues, responsible for delivering quality of care
Training and development	Employees receive training and there are opportunities to develop new skills and knowledge	Both managers and employees receive training on quality management. There are opportunities to develop new skills and knowledge (e.g. Birdi <i>et al.</i> , 2008; Shah and Ward, 2003)	Professionals are highly trained individuals with a specific expertise. Performing tasks or development outside their area of expertise is unusual
Performance appraisal and rewards	Employees receive feedback on and are rewarded for their performance	Employees receive feedback on quality performance of their team and are rewarded for quality improvement (e.g. Anand and Kodali, 2009; McKone <i>et al.</i> , 2001)	Quality of care is highly appreciated and rewarded in healthcare organizations
Team working and autonomy	not applicable	Teams are formed to solve problems. Teams are encouraged to try to solve their problems as much as possible (e.g. Bonavia and Marin, 2006; Cua <i>et al.</i> , 2001)	Health care is usually provided by multidisciplinary teams of professionals and support services
Employment security	Employees have an employment contract that offers job security (Zacharatos <i>et al.</i> , 2007)	not applicable	Increasing expenditures create pressure on organizations
Work-life balance	Employees have the possibility to work flexible hours and arrange their work schedule	not applicable	Consumers are increasingly putting higher demands and expectations on healthcare professionals. Therefore, it is challenging to balance the needs of work and life for professionals

Table 2.
HRM systems approach

procedures (Patterson *et al.*, 2004). Second, these individual perceptions can be aggregated to the unit level or organizational climate if there is a certain degree of consensus among organizational members (Joyce and Slocum, 1984; Bergmann *et al.*, 2018). Disparities between the work environment of organizational units can lead to different climate manifestations within the same organization (Bergmann *et al.*, 2018). We therefore focus on the climate in work units rather than the whole organization as the appropriate level of analysis (Zohar and Luria, 2005).

Schneider and Reichers (1983) argue that, for the concept of climate to be meaningful, it must have a specific reference. In the past twenty years, a growing body of research has therefore focused on a climate “for something” (e.g. Patterson *et al.*, 2005; Schulte *et al.*, 2009).

Many scholars of operations management have attempted to define a climate for LM&SS, most of them by drawing on the experience of organizations that have implemented LM&SS successfully (Hines *et al.*, 2018). Bhat *et al.* (2022) argue that an integrated LSS strategy ensures a climate of continual improvement in the healthcare setting. Goodridge *et al.* (2015) state that LM&SS seeks to create an environment in which mistakes are opportunities for learning, with consistent application of no-blame approaches to mistakes and errors. Ambekar and Hudnurkar (2017) claim that people with a positive attitude and critical-thinking capability innovate and ideate solutions. While researchers agree that a successful LM&SS implementation will aim to achieve climate change and succeed, they fail to agree on the specific characteristics of such a climate for LM&SS. In this study, we focus on a climate for LM&SS that reflects employees' perceptions regarding the extent to which the organization emphasizes specific LM&SS values, goals, expected behaviors and contributions at work, related to quality, innovation and efficiency (Schneider, 1975; Veld and Alfes, 2017) (see Table 3).

2.4 LM&SS, climate and outcomes

LM&SS is now widespread in healthcare and used to improve quality and efficiency simultaneously (e.g. Goodridge *et al.*, 2015; D'Andreamatteo *et al.*, 2015; Moldovan, 2018; Young *et al.*, 2018; Vaishnavi and Suresh, 2020; Molla *et al.*, 2018; Hynes *et al.*, 2019; Ahmed *et al.*, 2018; Tagge *et al.*, 2017; Agarwal *et al.*, 2016; Bhat *et al.*, 2020). Some healthcare organizations use LM&SS to develop clinical pathways (Niemeijer *et al.*, 2011, 2012; Mandahawi *et al.*, 2010; Martinez *et al.*, 2011; Improta *et al.*, 2019); others, such as the Mayo Clinic Rochester in the USA, use it to improve process efficiency and financial performance (Cima *et al.*, 2011; Kuo *et al.*, 2011; AlKhamisi *et al.*, 2019). Drawing from the above-mentioned studies, we focus in our research on perceived organizational performance reflecting a wide range of improvements, including internal processes, customer satisfaction and finances (see Table 4). Perceived organizational performance can be defined as employees' individual perceptions of organizational efficiency (Giauque *et al.*, 2013) and refers specifically to employees' subjective evaluation of an organization's overall performance compared to its rivals in the same sector (Allen and Helms, 2002; Berberoglu, 2018).

Research shows positive relationships between organizational climate and employee well-being (Parker *et al.*, 2003; Veld *et al.*, 2010). Employee well-being is a multidimensional construct (e.g. Van de Voorde *et al.*, 2012). Where the traditional view held that well-being was mainly about affect, several broader conceptualizations have more recently been proposed that include behavior and motivation (Ryff and Keyes, 1995; Warr, 2007). In the context of

Table 3.
Climate

	Description (Patterson <i>et al.</i> , 2005)
A climate for LM&SS	A reflection of employees' perceptions of the extent to which the organization emphasizes specific LM&SS values, goals, expected behaviors and contributions at work (Schneider, 1975; Veld and Alfes, 2017)

Table 4.
Performance

	Description (e.g. Holden, 2011; Shah and Ward, 2003; Wiklund and Wiklund, 2002; Habidin <i>et al.</i> , 2012)
Organizational performance	Measures related to organizational performance, that reflects a wide range of improvements such as internal process-, customer-, innovation, and financial performance

organizations, well-being can be broadly defined as the overall quality of an employee's experience and functioning at work (Peccei *et al.*, 2013). Following current HRM literature (e.g. Grant *et al.*, 2007; Van de Voorde and Boxall, 2014), we identify three core components of well-being: health, happiness and trusting relationships (see Table 5). Subdividing well-being into these components is important for several reasons. First, the dominant models within both HRM and LM&SS theory and research continue to focus largely on ways to improve performance, with employee concerns mainly as a secondary consideration (Fotopoulos and Psomas, 2009; Guest, 2017). Second, scholars do not agree about the effect – positive or negative – of LM&SS on employee well-being (e.g. Conti *et al.*, 2006). With the evidence being inconsistent, there is a need for more in-depth research that focuses on both the positive and negative effects of LM&SS on employee well-being.

2.5 Research hypotheses

Over the past ten years, a growing body of research has examined the concepts of psychological and organizational climate among healthcare employees (e.g. Veld *et al.*, 2010; Purohit and Ashok, 2012). Systematic research on the relationship between a LM&SS systems approach and a climate for LM&SS is lacking in healthcare, however. We expect that the more an organization adopts LM&SS practices, the more LM&SS is internalized. Internalization takes place when employees develop shared perceptions concerning the value of LM&SS practices, referred to as climate (Patterson *et al.*, 2005). We therefore expect that:

- H1.* The adoption of a LM&SS systems approach is positively related to a climate for LM&SS in hospitals.

Previous studies have confirmed that HRM plays a vital role in shaping organizational climate (Gelade and Ivery, 2003; Ali *et al.*, 2018). Thirkell and Ashman (2014) claim that it is essential to combine LM&SS and HRM to achieve the desired breadth and depth of LM&SS adoption at the macro, meso and micro levels. In this context, HRM can be seen as a signaling system that constantly sends messages to employees stressing the attitudes and behaviors desired within the organization (Bowen and Ostroff, 2004). In other words, HR practices can be used to strengthen goal alignment and foster specific work behaviors (Veld and Alfes, 2017), thereby creating a desired climate. For example, hospital management can use HRM practices to create a desired climate where LM&SS initiatives take root by communicating to employees that quality improvement is important and that improvement initiatives and innovative behavior are expected and rewarded (Bowen and Ostroff, 2004; Veld and Alfes, 2017). Studies

Well-being components	Description (Van de Voorde <i>et al.</i> , 2012)	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, such as workload, job strain and need for recovery	Healthcare professionals perceive increased demands and expectations from customers
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment	Professionals highly value performing rewarding work
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relationships between employees and their employer and colleagues	The hierarchical structure impacts the relations between employees and their employer and colleagues

Table 5.
Employee well-being

on both the role of HRM and organizational climate relating specifically to LM&SS are scarce. Recent research shows that a system of HRM practices can be used to create climate perceptions (e.g. [Veld and Alfes, 2017](#)), leading us to expect that:

H2. An HRM systems approach is positively related to a climate for LM&SS in hospitals.

Researchers suggest that a positive climate, for example a climate for LM&SS, influences quality and quantity of work done in organizations as well as employee productivity ([Mullins, 2010](#); [Permarupan et al., 2013](#)). If employees perceive a positive LM&SS climate in their organization, they tend to rate organizational performance higher than that of competitors ([Berberoglu, 2018](#)). Although there is evidence showing that organizational climate is an important determinant of organizational performance ([Burton et al., 2004](#)), there has been little systematic research on the relationship between a climate for LM&SS and performance. Recent studies identify a climate for LM&SS as the missing link in achieving performance improvements that are sustained over time (e.g. [Bortolotti et al., 2015](#); [D'Andreamatteo et al., 2015](#)). We therefore expect that more shared perceptions among employees concerning LM&SS will lead to higher levels of performance:

H3. A climate for LM&SS is positively related to organizational performance in hospitals.

Research by [Gouldner \(1960\)](#) suggests that employees are expected to reciprocate the organization for its encouragement, benefits and support for, in this case, LM&SS with positive employee outcomes. We could therefore argue that a climate for LM&SS is positively related to employee well-being. Others authors, however, point out that emphasizing efficiency and productivity puts employees under greater pressure and intensifies their workload ([Holden, 2011](#)). The nature of the relationship – positive or negative – between climate and employee well-being can vary between the three components of well-being ([Peccei et al., 2013](#)). Internalization is linked to employee commitment and employee perceptions of trust ([Kostova and Roth, 2002](#)). Following [Blau's \(1964\)](#) social exchange theory, we expect that employees interpret a climate for LM&SS as indicative of organizational support and care, and reciprocate accordingly with commitment, satisfaction and trust ([Whitener, 2001](#); [Van de Voorde et al., 2012](#)). Based on research suggesting that LM&SS has a negative effect on employee health ([Hasle et al., 2012](#)), for example that LM&SS leads to higher levels of stress, we furthermore expect that a climate for LM&SS negatively impacts employee health.

H4. A climate for LM&SS is positively related to the happiness (H4a) and trusting relationships (H4b) components of well-being, while it is negatively related to the health (H4c) component of well-being in hospitals.

[Bowen and Ostroff's \(2004\)](#) proposition that climate can be seen as a mediating factor between HRM and outcomes is confirmed by studies in healthcare (e.g. [Veld et al., 2010](#); [McCaughey et al., 2013](#)). For example, [Veld et al. \(2010\)](#) report that climate in hospitals mediates the effect of perceived HRM systems and unit commitment. Unlike HRM literature, research on LM&SS has produced scant evidence as to what role climate plays between LM&SS and outcomes. Our study builds on growing evidence in the field of HRM of climate's mediating role, and we therefore expect that climate mediates the relationship between LM&SS and HRM on the one hand and performance and employee well-being on the other. Although we expect the relationships between the described variables to differ, the nature of this relationship – positive or negative – depends on our findings for [hypothesis 4](#) (relationship between a climate for LM&SS and employee well-being). We have therefore formulated a neutral hypothesis regarding the relationships between a climate for LM&SS, HRM and outcomes:

H5. A climate for LM&SS mediates the relationships between LM&SS (H5a) and HRM (H5b) on the one hand and organizational performance and employee well-being in hospitals on the other.

Figure 1 summarizes the proposed relationships in this study.

3. Research methodology

3.1 Population and sampling

This paper describes a cross-sectional, multisite study that uses quantitative research methods and nested data from internal service units in Dutch university hospitals. In healthcare, LM&SS is often introduced, first of all, in high-volume processes such as cleaning, logistics and food service (Stamatis, 2011; Goodridge *et al.*, 2015). Hospital service processes differ fundamentally from processes at a fast-food restaurants or cleaning companies. The employees of internal service units are usually assigned permanently to a hospital ward and, therefore, perceive nurses and physicians as their direct colleagues, have direct contact with patients, and see their work as a link in the value chain for delivering top-notch care. While most of the above-mentioned studies focused on a single hospital unit or department, our study covers more than 40 internal service units at hospitals in the Netherlands (A to H). These hospitals deliver highly specialized patient care, combined with specialist diagnosis and treatment, and are closely linked to medical research and education. The internal service units differ in size and structure (see Table 6). The more homogeneous a population, the easier (i.e. more likely) it is to generate a representative sample (Jager *et al.*, 2017). To ensure a homogeneous sample and internal and external validity and reliability, we applied four criteria for participation in our research:

- (1) Services had to be similar in nature and present at four or more university hospitals.
- (2) At least ten employees and three supervisors per unit had to assess the theoretical concepts at unit level for reliability.
- (3) Employees and supervisors (including temporary workers) had to have been employed by the internal service unit for at least one year.
- (4) Outsourced services were excluded.

Applying these criteria gave us a sample of 1,668 employees and 218 supervisors in 42 units (response rate of 55%, varying from 20% to 96% per unit). The average group size per unit was 40 employees and five supervisors. Table 6 shows the response rates at unit level for each of the eight hospitals. Following Cohen (1992), we categorize effect sizes into small (0.10), medium (0.30), and large (0.50).

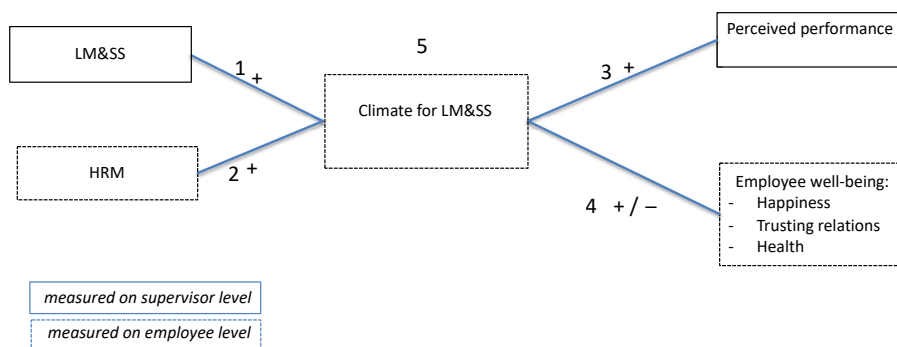


Figure 1. Conceptual framework for examining relationships between LM&SS, HRM, climate for LM&SS and outcomes

At the time of the research, according to the Dutch law approval from the 'Central Committee on Research Involving Human Subjects', ethical approval is only necessary when research concerns medical/scientific research and participants are subject to procedures or are required to follow rules of behavior. In this study, the study population involved employees of internal services only. Therefore, these criteria were not met and ethical approval of the Central Committee on Research Involving Human Subjects was not found applicable.

3.2 Measurement instruments

To operationalize the theoretical concepts of LM&SS, HRM, climate, performance and employee well-being, we searched the literature for existing validated measurement instruments. In consultation with experts, we selected empirical studies that applied validated measurement instruments to healthcare. A translator translated our original surveys into English, with an independent bilingual native speaker of Dutch and English performing the back translation. Under the supervision of a research assistant made available for a week at each research site, the cross-sectional survey was distributed to the supervisors and employees of eight university hospitals to collect survey data on LM&SS, HRM, climate, performance, and employee well-being.

Our LM&SS systems approach incorporates the following practices: top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics, and supplier relationships. We adapted the original manufacturing-oriented items (e.g. error rates, defect rates, scrap, defects, cost of quality) to reflect a healthcare perspective (e.g. mistakes, throughput time, productivity). We excluded elements of the survey that focus specifically on the industrial context of plants (for example: "We design for manufacturability"). With the exception of the LM&SS customer relationship practice measured at supervisor level (Cronbach's $\alpha = 0.66$), the reliability of all scales exceeded 0.70.

We studied a wide range of HR practices: training and development, performance appraisal and rewards, team working and autonomy, participation and job design, employment security, and work/life balance. We included 27 items on HR practices, measured using the scale proposed by [Boon et al. \(2011\)](#) (for example: "My unit offers me work that gives me the opportunity to express myself"). Response choices were on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). We constructed the HRM and LM&SS system approaches by calculating the sums of the mean scores for the separate practices and separating them into two bundle variables. With the exception of the work/life balance HR practice ($\alpha = 0.69$), the reliability of all scales exceeded 0.70.

We included seven items on organizational performance ([Zu et al., 2008](#)) (for example: "The quality of our units' products and services has been improved over the past 3 years."). After consultation with the author of the original scales, we changed the scale from a seven-point to a five-point Likert scale, ranging from "completely disagree" (1) to "totally agree" (5), because this is more in line with other parts of the survey.

As employee well-being is an individual characteristic, we measured it at the individual employee level. Regarding the health component of employee well-being, we used subscales of the Dutch standardized survey on the experience of work (VBBA) ([Van Veldhoven et al., 2002](#)) to measure workload and strain. The scale for strain captures small deficits in employee functioning at the end of, or just after, a workday ([Van Veldhoven, 2005](#)). Sample items include "Do you have too much work to do?" and "It is an effort for me to stay focused in my free time after work". Response choices were on the original four-point Likert-type scale ranging from "never" (1) to "always" (4). There are several measures of intra-organizational trust available that differ depending on who is being trusted ([Dietz and Den Hartog, 2006](#)). We focused on trust between an employee and his or her direct supervisor, using the seven-item scale devised by [Robinson \(1996\)](#). Sample items include "I can expect my supervisor to treat

me in a consistent and predictable fashion". Response choices were on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliability of all scales was 0.84 or higher (see Table 7). To measure the happiness component of employee well-being, we included items on satisfaction and commitment. In contrast to the health and trusting relationships components, we measured the happiness component of well-being at the group level. Mason and Griffin (2005) show that assessing the satisfaction of the group directly, rather than simply aggregating the individual job satisfaction ratings of group members, explains additional variance in outcomes. We therefore transposed the items on commitment and satisfaction from the individual to the unit level. To measure employee satisfaction, we used one other VVBA item: "All things considered, my colleagues are satisfied with their job". Organizational commitment was measured using four items from Allen and Meyer's (1990) Affective Commitment Scale (for example, "My colleagues feel like 'part of the family' at their unit"). Response choices were on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliability of all scales exceeded 0.70.

To measure climate for LM&SS, we used 14 items on important LM&SS aims, namely quality, innovation and efficiency climate, as proposed by Patterson *et al.* (2005). We reformulated the original items, which reflected an organizational-level perspective (e.g. "People in this organization are always searching for new ways of looking at problems"), to represent a unit-level perspective (e.g. "People in my unit are always searching for new ways of looking at problems"). This reformulation was necessary because each climate item should focus on the specific collective unit corresponding to the climate being studied (in this case, the unit). By specifying a clear frame of reference, we precluded the risk that respondents would describe the perceptions of different parts of the organization (Patterson *et al.*, 2005). Response choices were on the original four-point Likert-type scale ranging from "absolutely not true" (1) to "absolutely true" (4). The reliability of all scales was 0.71 or higher.

Table 7 shows the psychometric characteristics of the measurement instruments as well as the respondents (employees or supervisors) for each measurement instrument.

As potential control variables, we included the general characteristics of respondents (age, gender, educational level), general characteristics of the job (work unit, number of years working for the organization, number of years working in the specific work unit and job, type of employment contract) and general characteristics of the work unit (size). We dummy coded categorical variables and added familiarity with LM&SS and experience participating in LM&SS projects to our control variables.

4. Data analysis and results

We used descriptive statistics to describe our research population at the unit level. As our HRM, climate and employee well-being data was collected from a single source, the employees, we used a split sample for our analysis: we randomly split the units in half and obtained the values for the HRM and climate perceptions from one-half and the employee well-being variables from the other. We followed the same procedure regarding the values for the LM&SS perceptions and the performance variables. As these split-sample results were robust compared to the whole-sample results, we concluded that the common method bias was unlikely to be a serious problem in our data. To identify which control variables to include in regression analyses, we examined the degree of correlation between these variables and the dependent variables. Criterion for inclusion in the regression was an effect size of 0.30 or higher (reflecting medium to strong relationships) (Cohen, 1992). As no control variable exceeded this minimum level, none of the control variables were entered in the multilevel regression analysis. To test our hypotheses, we performed multivariate regression analyses. We employed multi-level analysis techniques to allow for the hierarchical structure of the

	Respondents	<i>n</i>	No. of items	μ	Σ	Chronbach's α	KMO statistics	ICC1 value	ICC2 value
<i>A LM&SS</i>									
LM&SS systems approach	Supervisors	208	41	3.52	0.21	0.83	0.85		
<i>B HRM</i>									
HRM systems approach (excl work/life balance)	Employees	1,482	20	3.26	0.54	0.92	0.90	0.05	0.66
<i>C Employee well-being</i>									
1 Happiness component (commitment and satisfaction)	Employees	1,636	5	3.39	0.71	0.86	0.85	0.06	0.71
2 Health component (workload and need for recovery)	Employees	1,592	12	1.90	0.55	0.89	0.90	0.10	0.81
3 Trusting relationships component	Employees	1,619	7	3.69	0.74	0.87	0.84	0.13	0.86
<i>D Perceived performance</i>									
Perceived organizational performance	Supervisors	215	7	3.66	0.55	0.83	0.82		
<i>E Strategic climate</i>									
Climate for LM&SS	Employees	1,704	14	2.86	0.40	0.85	0.90	0.03	0.57

Table 7.
Psychometric characteristics measures

data, in which employees and supervisors are nested within units. We conducted the analyses with performance as a dependent variable at the unit level. The HRM and climate variables then had to be aggregated. To support the aggregation of individual scores to unit-level scores, we calculated ICC1 and ICC2 values (intra-class correlations; to measure inter-rater reliability) and tested whether the average scores differed significantly across units. The ICC1 value was 0.05 and 0.03 for HRM and climate respectively, and the ICC2 value 0.66 and 0.57 respectively, exceeding the minimum value of 0.50 (Klein and Kozlowski, 2000) and supporting the aggregation to unit level. The ICC1 values of the three components of employee well-being implied that 6–13% of the variance in these components can be attributed to the unit level (see Table 7). Since we expected mediating effects, we used the mediation framework developed by Zhao *et al.* (2010) to test hypothesis 5.

4.1 Description of the study sample

Within the units, female employees account for 13% of the workforce and the average age of the respondents is 45 (see Table 6). The relatively small percentage of female employees can be explained by the technical nature of the internal service units, for example maintenance, logistics and security. More than 80% of the respondents have a permanent employment contract and only 17% attended higher education. Respondents have worked an average of ten years for their internal service unit, and eight years in their job (see Table 6).

4.2 Testing the hypotheses

The results of the regression analyses (see Table 8) show that the LM&SS systems approach has a significant, but very small, effect on a climate for LM&SS (β is 0.07). Hypothesis 1 is therefore not supported. In addition, HRM systems approach has an almost strong positive effect on a climate for LM&SS (β is 0.46). In total, 39% of the variance in climate for LM&SS is explained. Hypothesis 2 is supported.

The results of the regression analysis (see Table 9) indicate that a climate for LM&SS is not related to perceived performance (β is -0.05). Hypothesis 3 is therefore not supported.

With respect to the three components of employee well-being, the results of the regression analysis (see Table 10) indicate that a climate for LM&SS is positively related to the happiness and trusting relationships components (medium effects, both β s are 0.33) and negatively related to the health component (small effect, β is -0.13). The total explained variance in happiness is 22% and in trusting relationships 25%. Hypothesis 4 is supported.

Hypothesis 5a concerns the mediating effects on employee well-being. The analysis shows that a climate for LM&SS has small mediating effects on the three components of well-being (β s varied from -0.07 to 0.17) (see Table 11). There was evidence of complementary mediation

	Climate Climate for LM&SS β
Constant	-0.03
LM&SS systems approach	0.07*
HRM systems approach	0.46**
-2 log likelihood	4270.71
Variance individual level	0.76
Variance unit level	0.04
Explained variance individual level	20%
Explained variance unit level	19%

Note(s): * p -value < 0.05
** p -value = 0.00

Table 8.
Hierarchical multilevel
analysis LM&SS, HRM
and climate for LM&SS

for the three components, with both the mediated effects and the direct effect apparent and pointing in one and the same direction (Zhao *et al.*, 2010). The direct effect of LM&SS and HRM on employee well-being decreases, however, and the mediating effects are small (Cohen, 1992). Hypothesis 5b concerns the mediating effects on performance. The analysis shows that a climate for LM&SS has no effect on perceived performance (see Table 11). We conclude that a strategic climate does not mediate the relationship between LM&SS and HRM on the one hand and performance and employee well-being on the other.

5. Discussion of findings

In this study, we focused on Lean Management and Six Sigma (LM&SS) as a widely adopted operations management approach in healthcare (Antony *et al.*, 2019; Niñerola *et al.*, 2020;

	Performance β
Constant	-0.03
Climate for LM&SS	-0.05
-2 log likelihood	612.95
Variance individual level	0.92
Variance team level	0.09

Table 9.
Hierarchical multilevel
analysis climate and
performance

	Happiness component β	Employee well-being Trust component β	Health component β
Constant	-0.18	-0.01	-0.07
<i>LM&SS</i>			
Climate for LM&SS	0.33**	0.33**	-0.13**
-2 log likelihood	4479.78	4368.06	4563.02
Variance individual level	0.85	0.77	0.89
Variance team level	0.04	0.17	0.13
Explained variance individual level	12%	15%	
Explained variance unit level	10%	10%	

Table 10.
Hierarchical multilevel
analysis climate and
employee well-being

	Performance β	Happiness component β	Employee well-being Trust component β	Health component β
<i>Constant</i>				
LM&SS systems approach	0.30**	0.02	0.10	0.08
HRM systems approach	-0.4	0.36**	0.34**	-0.14**
Climate for LM&SS	0	0.16**	0.17**	-0.07**
-2 log likelihood	319.13			
Variance individual level				
Variance team level				

Table 11.
Hierarchical multilevel
analysis mediating role
of climate,
performance, and
well-being

Note(s): **p*-value < 0.05
***p*-value = 0.00

Bhat *et al.*, 2022) within the larger framework of TQM (Klefsjö *et al.*, 2001). Specifically, we concentrated on several gaps in existing research, namely a failure to address the interplay between “hard” and “soft” factors of LM&SS (Ershadi *et al.*, 2019; Khalili *et al.*, 2019; De Koeijer *et al.*, 2022; Durairatnam *et al.*, 2021), inconsistent evidence for the effect of these “hard” and “soft” LM&SS factors on outcomes (Abdullah and Tari, 2017; Wilson *et al.*, 2018; Anthony *et al.*, 2018; Bhat *et al.*, 2022) and the potential of climate and Human Resource Management (HRM) for internalizing LM&SS (Thirkell and Ashman, 2014; Antony *et al.*, 2019; Cavallone and Palumbo, 2021). We conceptualized “hard” and “soft” practices for LM&SS and defined a separate bundle of “soft” LM&SS practices that are specifically HR-related. Our research shows that a balanced approach to internalizing LM&SS at the macro, meso and micro levels encompassing both “hard” and “soft” factors is indeed crucial and sheds light on the interplay between these practices, the internalization of LM&SS, and outcomes in several ways.

First, there appears to be a logical relationship between a climate for LM&SS and LM&SS adoption (Ambekar and Hudnurkar, 2017; Bhat *et al.*, 2022). We found, however, that the HRM systems approach, consisting of “soft” LM&SS practices that are specifically HR-related – and not the “soft” and “hard” practices that are part of the LM&SS systems approach – is crucial for creating shared perceptions among employees and, consequently, a climate for LM&SS. Our results indicate that to create a desired climate where LM&SS initiatives take root, management can use HRM practices by communicating to employees what is valued and considered important in the organization (Bowen and Ostroff, 2004; Veld and Alfes, 2017) and by encouraging them to attain organizational excellence (Beraldin *et al.*, 2020; Cavallone and Palumbo, 2021). Our findings are in line with research by Bowen and Ostroff (2004), Knies and Leisink (2014), and Ali *et al.* (2018) showing that HRM can influence climate by signaling what strategic goals are most relevant and what kind of employee behaviors are expected, supported and rewarded in connection with these goals. Combining LM&SS and HRM is therefore essential to achieving the desired breadth and depth of LM&SS adoption at macro, meso and micro levels.

An explanation for the absence of a relationship between LM&SS and a climate for LM&SS could be that employees of internal service units find it hard to grasp the concept of LM&SS and struggle to adapt the approach to their daily practice. For example, process management and a focus on metrics are LM&SS practices that require analytical skills from those who apply them. Employees of internal service units are usually lower educated: only 17% of our respondents attended higher education. When employees perceive LM&SS practices as distal and abstract, this may weaken the development of shared employee perceptions about the real value of such practices. In contrast, employees of internal service units are likely to have a much better understanding of HRM than LM&SS because HR practices are developed specifically for employees. For example, quality management training can be tailored to specific employee groups and their educational background. Following this line of thinking, it can be said that HRM boosts employee engagement and involvement in continuous quality improvement (Keng Boon *et al.*, 2007; Assarlind and Gremyr, 2014; Cavallone and Palumbo, 2021), which may explain the relationship between HRM and a climate for LM&SS. Also, an explanation for the relationship between HRM and a climate for LM&SS may be that the growing (internal and external) focus on efficiency in healthcare induces employees to perceive HR practices in light of these efficiency goals, perhaps fostering a climate for LM&SS (Nishii *et al.*, 2008).

Second, our results show that a climate for LM&SS leads to higher levels of happiness and trust among employees and that it has no effect on the health of employees. In addition, we found a weak relationship between a climate for LM&SS and performance. This suggests that internalizing LM&SS is important for employee well-being but not for performance. One explanation for this outcome may be that LM&SS is implemented in healthcare mainly with the aim of improving short-term efficiency and quality (Drotz and Poksinska, 2014), but not to

sustain it in the longer run. Given the ambition of hospitals to maintain higher standards of both organizational performance and employee well-being, however (Kowalski *et al.*, 2015), we argue that hospitals that adopt LM&SS should also foster a climate for LM&SS by combining LM&SS and HRM, thereby internalizing LM&SS. Blau's (1964) social exchange theory states that employees interpret management activities as indicative of organizational support and care and reciprocate accordingly with commitment, satisfaction and trust (Whitener, 2001; Van de Voorde *et al.*, 2012). In that sense, employees of internal service units may experience HRM as a form of recognition and concern, creating a climate for LM&SS and affecting their well-being. We did not find that a climate for LM&SS has a strong mediating effect, but it seems likely that there would be a positive effect that spirals upwards: the more an organization adopts LM&SS in combination with HRM, the more LM&SS is internalized and the more both overall performance and employee well-being improve, and vice versa. In other words, it could be argued that a coherent set of "soft" and "hard" LM&SS and HR practices is essential for achieving both internalization and outcomes at the micro, meso and macro levels.

Another line of thinking takes into account that the average interval between adopting LM&SS at the participating hospitals and our data collection was 18 months, and that most hospitals started out with a top-down LM&SS program. We did include a time lag for LM&SS adoption to gain a better understanding of the relationship between adoption, internalization and outcomes, but without any conclusive results. It is possible that at the time of data collection, there was a gap between supervisors and employees in terms of the degree of LM&SS internalization. The first groups of hospital employees to be impacted by strategic goals are usually the managers and supervisors. It is they who decide – when simple cost-cutting measures prove to be inadequate – to adopt LM&SS as a programmed approach to efficiency. In that sense, supervisors have a head start when it comes to creating shared perceptions about LM&SS and we can imagine that the climate for LM&SS among supervisors would have a stronger impact on outcomes than the climate for LM&SS among employees. There is therefore some likelihood that, over time, as employees increasingly internalize a systems approach encompassing both "soft" and "hard" LM&SS practices, the mediating effects of a climate for LM&SS on the relationship between LM&SS, HRM and outcomes will become stronger.

6. Conclusion

Our research shows that an integrated approach to implementing "soft" and "hard" LM&SS and HRM shapes a climate for LM&SS conducive to the pursuit of organizational goals. We found that the HRM systems approach, consisting of "soft" LM&SS practices that are specifically HR-related (e.g. teamwork and autonomy, appraisal and rewards, participation and job design, training and development) – and not the "soft" and "hard" practices that are part of the LM&SS systems approach – are crucial for creating a climate for LM&SS. In addition, we found that a climate for LM&SS is not related to perceived performance or employee health, and that it is positively related to the employee happiness and trusting relationships. This means that the combination of "soft" and "hard" LM&SS and "soft" HR practices allows healthcare organizations to internalize LM&SS through a climate for LM&SS, supporting happy and trusting employees. In their attempt to create mutual gains for organization and employees, hospitals that adopt LM&SS should foster a climate for LM&SS by embracing a balanced approach that consists of "hard" and "soft" LM&SS and HR practices, thereby internalizing LM&SS at the macro, meso and micro levels.

6.1 Managerial and practical implications

From a management perspective, our results emphasize that fragmentation into "hard" and "soft" LM&SS and HR practices may lead to suboptimal results, which will not be conducive

to establishing a fully-fledged quality philosophy (Cavallone and Palumbo, 2021). Both “soft” and “hard” LM&SS and HR practices should be incorporated into a systems approach, allowing organizations to capitalize on their synergies for internalizing LM&SS and employee well-being. Our research shows that management can use HRM to shape a climate for LM&SS conducive to the pursuit of organizational goals and the happiness and trust of employees. Hospitals should therefore involve their HR departments right from the start when introducing LM&SS programs to ensure that a HRM systems approach is in place. In the Netherlands, many HR practices are predetermined in national Collective Bargaining Agreements (CBA) for hospitals, making HRM – unlike LM&SS – a consistent component of healthcare organizations and covering all employees. These HR practices are practical and can be tailored to specific employee groups and their educational background. For example, HR practices such as teamwork, participation and training involve employees at different levels in continuous quality improvement. Management can use these HRM practices to create a desired climate in which LM&SS initiatives can take root. It is important that managers are consistent in communicating to employees what is valued and considered important in the organization and the kind of behaviors and attitudes that are expected and rewarded (Bowen and Ostroff, 2004; Veld and Alfes, 2017). For example, they should emphasize the importance of continuous improvement and of achieving quality outcomes, and discuss with employees how they can contribute in practical terms.

Where many studies so far have argued for the inclusion of HR practices in an LM&SS systems approach, our results show that LM&SS and HRM should be viewed as two different things that require constant alignment and that should be managed integrally. In practice, this could mean that when hospital leaders share the “why” of LM&SS within the organization, they should emphasize both performance improvements as well as higher levels of employee well-being. Another recommendation is to monitor progress in LM&SS integrally by focusing not only on the number of LM&SS initiatives and their progress but also on the happiness, health and trusting relationships of employees, and by explicitly including performance indicators in the “LM&SS dashboard”. In addition, since direct supervisors play a prominent role in transmitting values and climate (Kuenzi and Schminke, 2009), they should actively support their employees with a balanced approach that incorporates both “hard” and “soft” factors into the improvement process (Poksinska, 2010). For example, appraisal interviews should not only focus on “hard” key performance indicators, but also on improvement efforts and more narrative input. This may also mean that employee productivity would temporarily decline to allow time for improvement projects or quality training.

6.2 Limitations and future research

This study has a number of limitations. First, it focuses on cross-sectional relationships and is therefore not suitable for establishing cause-and-effect relationships. We included a time lag for LM&SS implementation to gain a better understanding of the relationship between intervention and outcome, but without any conclusive results. The findings – although based on a thorough literature study – should therefore be interpreted with some caution. We recommend that future research apply a longitudinal and intervention design (including control settings) to acquire a deeper understanding of the causal relationships between LM&SS, HRM, climate for LM&SS, performance and well-being. Such research could, for example, examine a potential spiraling positive or negative effect, i.e. that the more LM&SS in combination with HRM is adopted, the more LM&SS is internalized and the more performance and employee well-being improve, and vice versa. Longitudinal research could also verify whether the relationships that we found, for example, between LM&SS and performance, HRM, climate and well-being, are cause-and-effect relationships. That is

plausible for the relationship between HRM and climate based on earlier extensive research that confirms our findings (e.g. [Gelade and Ivery, 2003](#); [Ali et al., 2018](#)).

Second, efforts to improve quality and efficiency are nothing new for healthcare professionals; they have been part of their jobs for many years. Following this line of thinking, it could be argued that a climate for LM&SS is not necessarily the result of adopting LM&SS, but more a prerequisite for the successful adoption and internalization of LM&SS. This could explain why we did not find that a climate for LM&SS had mediating effects on outcomes (neither performance nor well-being). It would be interesting to examine this idea in subsequent research.

Third, we dealt only with internal service units at university hospitals. For most employees, including physicians, LM&SS is something new, in large part because medical school and residency training do not emphasize them ([Blumenthal et al., 2012](#)). We consequently argue that our findings are valid for every hospital ward, but it would be interesting to investigate the interaction between hospital wards and internal service units in future research. Including direct care processes and healthcare professionals could lead to a more in-depth understanding of the mechanisms underpinning the internalization of LM&SS in hospitals, for example, how professionals from internal service units and hospital wards develop and adapt their existing organizational routines to LM&SS practices. Differences between the characteristics of hospitals and other types of healthcare organizations (e.g. elderly and disabled care) may imply that our findings will not be easy to generalize to other types of healthcare organizations ([De Koeijer et al., 2019](#)) and should be tested in future research.

Fourth, the measures we included regarding the health component of employee well-being focus on the quantitative burden of work, i.e. workload and recovery time after a workday. It would be interesting to include other health-related measures in future research, for example (early) physical, mental and behavioral symptoms of burnout ([Maslach and Schaufeli, 1993](#)), especially with the health of healthcare employees being a pressing issue at present ([Taris et al., 2013](#); [Drenth, 2016](#)).

Fifth, we need a broader definition of performance in relation to LM&SS, as well as a more comprehensive set of performance measures. Recent debates have focused on how performance in healthcare should be defined and measured ([Willems and Ingerfurth, 2018](#)). For example, is performance about costs, efficiency (e.g. shorter waiting times and improved utilization) or about customer satisfaction, quality and health-related outcomes? Or is performance about all of the foregoing (e.g. [Porter, 2010](#); [Arora et al., 2016](#))? In light of these recent debates, we argue that the definition of performance in relation to LM&SS should be updated and clarified specifically in the context of healthcare. In addition to our research setting out a wide range of perceived improvements (e.g. internal processes, customer satisfaction and financial results), we propose incorporating objective outcome measures into any future research.

It is also worth mentioning the strengths of this research. Our study is one of the first to examine in-depth the impact of “hard” and “soft” LM&SS practices on both employee well-being (subdivided into different components) and performance in healthcare, as well as the role of “soft” HRM in this relationship. Linking LM&SS, HRM and outcomes to a climate for LM&SS is a relatively new approach in operations management research and has led to a deeper understanding of the mechanisms underpinning the internalization of LM&SS in healthcare. By studying employee-level as well as unit-level data, we gained a better understanding of the relationships between concepts at both levels. In addition, our sample is unique in several ways. To begin with, all Dutch university hospitals participated, which is remarkable given the increased competition between hospitals in the Netherlands. Our sample also consists of 42 units with an acceptable response rate of 55% ([Baruch and Holtom, 2008](#)), while earlier studies focused on a single hospital ward or department.

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