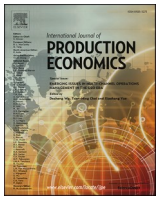
Int. J. Production Economics 232 (2021) 107961

Contents lists available at ScienceDirect

International Journal of Production Economics

journal homepage: http://www.elsevier.com/locate/ijpe



The antecedents of physicians' behavioral support for lean in healthcare: The mediating role of commitment to organizational change

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ARTICLE INFO

Keywords:
Lean
Healthcare
Physicians
Commitment to change

ABSTRACT

The purpose of this paper is to study physicians' reactions to Lean implementation in healthcare organizations. More precisely, we aim to answer the following question: what is the impact of pre-change and change antecedents on physicians' behavioral reactions to Lean implementation? To do so, we used a quantitative research methodology anchored in two significant frameworks from change management theory, while considering the unique characteristics of physicians as organizational actors. Using a survey of 176 physicians in healthcare organizations across the USA, the analysis revealed significant effects of pre-change and change antecedents on physicians' behavioral support for Lean change, mediated by their commitment to organizational change. We concluded that process antecedents linked to change management practices were instrumental in engaging physicians toward Lean, whereas efficiency driven Lean implementation and traditional managerial techniques of rewards and incentives were counterproductive. This paper contributes to the developing literature on Lean implementation and, more broadly, on service operations management in healthcare, notably by focusing on its most influential group of actors.

1. Introduction

Lean management has gained significant attention from the service operations management community following noteworthy success demonstrated via manufacturing organizations (Bortolotti & al., 2016; Dubey & al., 2015; Kroes & al., 2018; Marodin & al., 2018). Lean Management, a social-technical system developed by Toyota (Secchi and Camuffo, 2019; Soliman & al., 2018), is also gaining traction in various healthcare organizations, predicated on the benefits shown in other industries (Fullerton & al., 2014; Lindsay & al., 2020; Matthias and Brown, 2016; Narayanamurthy & al., 2018). Initially implemented in American and British hospitals, evidence of Lean implementation in healthcare can now be found globally (Costa and Godinho Filho, 2016; Moraros & al., 2016). While numerous Lean implementations have been attempted, few have been sustained, and the empirical evidence regarding its positive impact on hospital performance has long been incomplete and anecdotal (Moraros & al., 2016). However, recent large-scale studies by Shortell & al. (2018) and Tlapa & al. (2020) have finally uncovered evidence of Lean's positive impact on the performance of hospitals, bringing some support to the ongoing transformations in numerous healthcare organizations. Still, according to these authors, Lean implementation remains difficult for most hospitals.

According to Henrique and Godinho Filho (2020), the numerous barriers that exist for Lean implementation in healthcare are still under-documented. Amongst these, stakeholder engagement appears at the forefront of researchers' (Farris & al., 2009; Fournier and Jobin, 2018b; Henrique and Godinho Filho, 2020; Leite & al., 2020; Narayanamurthy & al., 2018; Smith & al., 2020) and practitioners' (Azevedo et al., 2020; Carmen & al., 2014; Jobin and Lagacé, 2015) preoccupations. More specifically, physicians' high levels of resistance or lack of engagement toward Lean change has come to the forefront of this issue. Large-scale practice reports and evidence from healthcare organizations and systems in Canada (Jobin and Lagacé, 2015; Moraros & al., 2016), the USA (Carmen & al., 2014) and Brazil (Leite et al., 2020), for example, have highlighted that physicians tend to show higher levels of resistance when involved in Lean changes, such as Kaizen-style improvement events or standardization efforts. Concurrently, these authors also emphasize physician engagement as key for successful Lean implementation.

Recent research by Leite & al. (2020) argues that physicians' lack of

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https://doi.org/10.1016/j.ijpe.2020.107961
Received 11 April 2020; Received in revised form 20 August 2020; Accepted 15 October 2020
Available online 17 October 2020

commitment and resistance to change are ostensible barriers to Lean implementation, and are derived from the underlying barrier of physicians' influence within the co-production process of healthcare. Because physicians are the central actors of healthcare, their resistance can truly inhibit Lean implementation. However, there remains a dearth of knowledge regarding the elements that influence physicians' commitment and resistance toward Lean. To that end, researchers (Henrique and Godinho Filho, 2020; Leite & al., 2020; Lindsay & al., 2020; Lorden & al., 2014; Shortell & al., 2018) have called upon the scientific community to further study this phenomenon. This research is a response to this call.

Considering the increasing presence of Lean in healthcare (Tlapa et al., 2020) and the necessity of physician engagement for its success (Lindsay & al., 2020), research on what influences physicians' reactions toward Lean becomes even more interesting. This paper aims to offer a quantitative, empirical, perspective of the underlying human mechanisms of physicians' reactions to Lean implementation and to provide a better understanding of the elements influencing physicians' reactions to Lean, as well as the levers that can trigger their support for this type of change. Individuals' reactions to organizational change can have affective, cognitive and behavioral dimensions (Oreg et al., 2011). In this study, we focus on the commitment to Lean and on the behavioral support for Lean change from physicians, both considered as behavioral reactions to change (Herscovitch and Meyer, 2002; Oreg & al., 2011). We draw on change management theory (Beer and Nohria, 2000; Burke, 2017; Farrell, 2000) to develop a conceptual model anchored in two frameworks of the organizational change literature: Herscovitch and Meyer (2002) commitment to change model, which stipulates that commitment to organizational change leads to the behavioral support for said change, and Oreg et al. (2011) framework of antecedents of reactions to organizational change, which proposes that reactions to change are influenced by pre-change and change antecedents. We attempt to answer the following question: what is the influence of pre-change and change antecedents on physicians' behavioral reactions to Lean implementation?

Our method uses a measurement tool (survey) aimed at physicians having experienced Lean change. Our rationale for choosing a quantitative approach is anchored in the current state of the literature, which mostly includes qualitative studies. The larger sample used by this quantitative inquiry heightens external validity and contributes an enhanced perspective on this phenomenon. It contributes to the developing literature on Lean implementation in healthcare and one of its most puzzling phenomena for both scholars and managers: physicians' resistance to Lean. Furthermore, this method also offers one of the few quantitative research on physicians as organizational actors during change initiatives in general. More broadly, our work also contributes to the healthcare service operations management literature by studying its central and most influential stakeholders.

To conduct our study, we collected data from 176 physicians across 63 healthcare organizations. We used structural equation modeling to test the hypotheses included in our conceptual model regarding the elements that influence physicians' behavioral support for Lean change. Our analysis allowed us first to validate the significant effect of physicians' commitment to Lean change on their behavioral support for it. We then identified the pre-change and change antecedents having significant effects on physicians' commitment to Lean change. Pre-change antecedents related to the organizational context were found to have little to no effect on commitment, while previous Lean experience proved to have a significant and positive influence. Antecedents related to the change process itself, such as the level of participation, the quality of communication and transformational leadership, also had significant and positive influences on commitment, while the perceived extent of change showed a negative effect. Our results also showed that perceived benefits linked to compensation and cost reduction negatively impacted physicians' behavioral reactions. Finally, we performed a mediation analysis using the bootstrapping method that identified the commitment to change construct as a significant mediator in the relationship between antecedents and physicians' behavioral support for Lean change.

The paper is structured as follows. First, the relevant literature on physicians and organizational change is presented, along with change management theory and the resulting conceptual model and hypotheses regarding pre-change and change antecedents' effects on physicians' commitment and behavioral support for Lean change. Second, the research method is described with details about the sampling and data collection procedure used. It also includes the measurement instrument, discusses measurement reliability and validity, along with common method variance and causality. In the third part, we present the results of our quantitative analysis. Fourth, the resulting structural model and observed relationships are discussed. Fifth, the theoretical and managerial implications are presented, along with the limitations of the study and avenues for future research. We conclude this paper with a summary this research's contributions.

2. Literature review and hypotheses

According to Battilana and Casciaro (2012), physicians are the *de facto* central decision makers of healthcare, stemming from two synergistic characteristics: their power and status. Because they sit atop healthcare's professional hierarchy (Kellogg, 2009), they exert ascendance over other professionals (Giaimo, 2009). Their monopoly of expertise provides them with great autonomy (Chreim et al., 2012) and allows them to greatly influence organizational change (Mcnulty and Ferlie, 2004). In fact, many authors have highlighted physicians' notoriously high resistance to organizational change (Cabana & al., 1999; Light, 2000; Shortell & al., 1995). According to Denis & al. (2002), they are the most influential toward the success or failure of change initiatives in healthcare. Physicians can veto changes that are unanimous with other stakeholders when these are perceived to threaten their professional autonomy and status (Denis & al., 2002). Since Lean can have a profound impact on various aspects of organizational life, such as governance, decision-making processes, resource allocation, work organization or roles and responsibilities (Fournier and Jobin, 2018b), it can clash with physicians' power and status.

Change management theory is a set of various approaches arguing that individuals' reactions to organizational change is dependent on both the nature of the change and the process through which it is implemented (Burke, 2017). Furthermore, individuals' reactions to change can also be influenced by elements not directly related to the change itself, but that have more to do with the context of the change (Coyle-Shapiro and Conway, 2005) and the individual himself (Amiot et al., 2006). Hence, organizational change can unfold in many ways, depending on how antecedents influence the reactions of those experiencing change.

Oreg & al. (2011) conceptualize antecedents as the reasons for explicit change-related reactions as opposed to the reaction itself. They involve variables that predict reactions or that can indirectly influence them over time. These authors also distinguish between variables that are independent of the change taking place and those directly related to it. The former refer to *pre-change* antecedents, while the latter refer to *change* antecedents. *Pre-change* antecedents are pre-existing conditions in place prior to a change taking form. They are either individual characteristics or related to the internal organizational context. *Change*

antecedents relate to the content of the change, the way it is managed, and the perceived benefits foreseen by recipients. While various specific antecedents in both categories have been shown to create different reactions (positive or negative) from change recipients (Oreg & al., 2011), little is known regarding the specific context of physicians and Lean change.

Most studies on reactions to organizational change have used models based on change commitment scales rather than specific reactions. Herscovitch and Meyer (2002) define organizational change commitment as "*a force (mindset) that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative.*" They identified three types of commitment: *affective*, *normative* and *continuance*. *Affective commitment* (ACC) is generated when a change recipient fundamentally believes in the change's benefits. *Normative commitment* (NCC) takes place when a recipient feels an obligation to support the change. *Continuance commitment* (CCC) manifests itself when a recipient feels threatened by a change. Since ACC and NCC have proved to be highly and positively correlated, according to past findings (Bouckenooghe et al., 2015), we did not include NCC in our model. Ultimately, commitment to change influences the recipient's level of *behavioral* support (BSUP) for the change, which can be focal behaviors, such as compliance or resistance, or discretionary behaviors requiring extra energy or effort such as cooperation or championing.

Our conceptual model, presented in Fig. 1, proposes that pre-change and change antecedents have direct effects on physicians' ACC and CCC to Lean change, which in turn have direct effects on their BSUP for the change. In fine, both ACC and CCC should mediate the relationship between the dependent variables (pre-change and change antecedents) and BSUP. Each underlying hypothesis is detailed next.

2.1. The effects of pre-change antecedents on commitment

First, familiarity with Lean can create more positive dispositions toward it. Lean possesses its own unique vocabulary and practices, which, to the uninitiated, can be intimidating and create mistrust, often leading to resistance. When individuals undergoing Lean change are already familiar with its underlying philosophy, a greater chance of them supporting it is present (Martinez-Jurado and Moyano-Fuentes, 2014). Furthermore, as argued by Fournier and Jobin (2018a), healthcare workers already familiar with Lean through formal training or experience usually show higher support toward it. Thus, physicians with previous Lean experience (LE), defined as involvement in Lean projects or formal training and certification, are more likely to engage emotionally with Lean change.

H1. Physicians with previous *Lean experience* (LE) will show a) higher ACC and b) lower CCC.

Second, physicians' commitment to Lean might be influenced by the internal organizational context (Narayanamurthy & al, 2018). The history of organizational support is an individual's general perception regarding the level to which the organization values the individual's contributions and well-being (Eisenberger & al., 1986). If this perception is poor, physicians will tend to view change negatively and develop higher CCC (Dent, 2003). The history of organizational change is also a part of the organizational context. It refers to an individual's perception, or evaluation, of how past change efforts were managed (Bordia & al., 2011). If individuals believe their organization has not been good at managing past changes, they will tend not to commit affectively to change, and be more likely to show increased levels of CCC toward it (Bordia & al., 2011). Hence, if the histories of *organizational* support (OS) and of *organizational change* (OC) are perceived negatively by physicians, they will show lower levels of ACC and higher levels of CCC toward Lean.

H2. Physicians' perception of the Organization's support history (OS) will be a) positively related to ACC and b) negatively related to CCC.

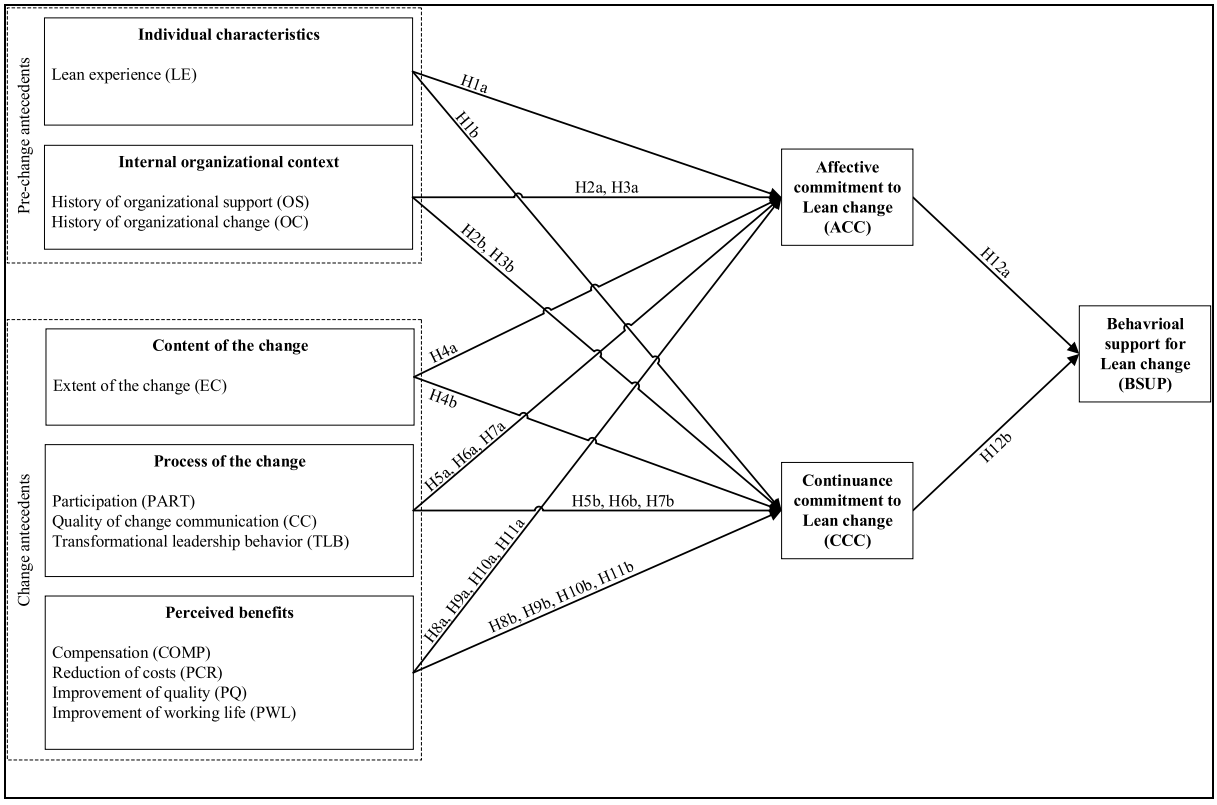

Fig. 1. Conceptual model of physicians' support for Lean change.

H3. Physicians' perception of the Organization's change history (OC) will be a) positively related to ACC and b) negatively related to CCC.

2.2. The effects of change antecedents on commitment

The *antecedents* of change can also influence physicians' reactions to Lean. Physicians are notably resistant when they think the change will impact their medical practices or the organization of their work (Dent, 2003). To that end, the *extent of the change* (EC) refers to the perceived level of disruptiveness a change has on work processes, procedures and routines (Caldwell & al., 2004). The greater the perceived *extent of the change* (EC) is, the less likely physicians are to affectively commit to it, and greater the chances are they will exhibit higher levels of CCC.

H4. Physicians' perception of the *Extent of change* (EC) will be a) negatively related to ACC and b) positively related to CCC.

The *process of change* can also impact individuals' reactions to Lean (Narayanamurthy et al., 2018; Secchi and Camuffo, 2019). As demonstrated by Goldstein and Ward (2004), involvement during change tends to create positive reactions from recipients. Participation refers to the process in which influence or decision-making related to the change, such as setting objectives and implementing solutions, is shared between superiors and change recipients (Sagie et al., 1995). To that end, if physicians are involved in decision-making regarding the change, the chances of them supporting it are greater. *Participation* (PART) from physicians will lead to higher ACC, while lower participation will result in greater CCC.

H5. Physicians' Participation (PART) will be a) positively related to ACC and b) negatively related to CCC.

Furthermore, the *quality of change communication* (CC) is an essential component of sound change management principles (Axtell & al, 2002). Change communication is the process by which information is provided to people to help them understand and deal with the change process (Lewis and Seibold, 1998). Hence, the ability of management to properly communicate information regarding the change to physicians should lead to higher ACC. The contrary would lead to CCC.

H6. Physicians' perception of *Quality of change communication* (CC) will be a) positively related to ACC and b) negatively related to CCC.

The leadership of change agents can also be influential. Lean notably emphasizes *transformational leadership behavior* (TLB) as the most conductive to successful change (Liker & al., 2012). According to Rubin & al. (2005), TLB is an active form of leadership where leaders are "*closely engaged with followers, motivating them to perform beyond their transactional agreements*." It includes dimensions such as articulating a vision, fostering the acceptance of group goals, setting high expectations, challenging change recipients' thinking and supporting their individual needs, as well as acting as a role model (Podsakoff & al., 1996). Mathie (1997) highlights how physicians are particularly influenced by the way leaders manage change. Hence, when change agents demonstrate high levels of TLB, physicians should exhibit higher ACC, while lower TLB should lead to higher CCC.

H7. Physicians' perception of *Transformational leadership behavior* (TLB) will be a) positively related to ACC and b) negatively related to CCC.

Thirdly, the *perceived benefits* of a change also impact recipients' reactions. These relate to the perceived consequences associated to the change from the recipient's point of view (Oreg & al., 2011). To that end, compensating physicians specifically for participating in a Lean change initiative might be conductive to higher levels of ACC, while the opposite would lead to higher CCC.

H8. Physicians' specific *Compensation* (COMP) for Lean will be a) positively related to ACC and b) negatively related to CCC.

Furthermore, Lean has historically been viewed by healthcare actors, notably physicians, as a way for organizations to reduce costs, making them unyielding toward it (Cammisa & al., 2011). Physicians tend to perceive the benefits of change from their own perspective, by listening to their professional judgment (Dent, 2003). They will frown at the idea of changing only to directly reduce staff or equipment costs. If they believe the change's objective is cost reduction (i.e. direct reduction of staff or equipment costs), CCC will be higher and ACC lower.

H9. Physicians' perception of the *cost reduction* objective of Lean change (PCR) will be a) negatively related to ACC and b) positively related to CCC.

However, physicians will be more interested in Lean when they believe it's objective is to *improve the quality of care* (PQ) or their *quality of working life* (PWL), as this aligns much more with their interests and values (Cabana & al., 1999; Dent, 2003). This should result in higher levels of ACC and lower levels of CCC.

H10. Physicians' perception of the *quality of care* objective of Lean change (PQ) will be a) positively related to ACC and b) negatively related to CCC.

H11. Physicians' perception of the *quality of work life* objective of Lean change (PWL) will be a) positively related to ACC and b) negatively related to CCC.

2.3. The effects of commitment on Behavioral Support for Lean change

In accordance with Herscovitch and Meyer (2002) findings and the extant literature validating them (Bouckenooghe & al., 2015), we hypothesize that higher ACC should lead physicians to show higher levels of BSUP for Lean change, while higher levels of CCC should be negatively correlated with BSUP.

H12a. Physicians' ACC will be positively related to BSUP for Lean change.

H12b. Physicians' CCC will be negatively related to BSUP for Lean change.

2.4. The mediating effects of commitment

Finally, our conceptual model hypothesizes that the direct effects of both commitment constructs on BSUP should lead to ACC and CCC mediating the effects of pre-change and change antecedents on BSUP for Lean change.

H13a. ACC will mediate the effects of pre-change and change antecedents on BSUP for Lean change.

H13b. CCC will mediate the effects of pre-change and change antecedents on BSUP for Lean change.

3. Method

3.1. Sample and survey procedure

We developed a survey to test our theoretical model. The targeted population was physicians having experienced Lean change from 63 American hospitals within the Catalysis Healthcare Value Network. Data collection was coordinated with the help of Catalysis's network leadership team which helped identify potential respondents. An email including a link to a web-based survey hosted by Qualtrics was sent to

each participant. The email also included a summary explaining the reasons why respondents were solicited. We would like to point out that this research project was approved by the academic institution's research ethics committee.

In total, the survey was sent to 632 physicians, of which 176 returned completed and useable responses, resulting in a response rate of 27.85%. Over 60% of the respondents were aged between 41 and 60 years old. Roughly 55% were men, which is somewhat in line with the general population of physicians in the USA according to the American Medical Association (https://www.ama-assn.org). Most of the respondents were general practitioners (54.5%) while the rest were specialists (45.5%). This is also consistent with the American Medical Association statistics. About two thirds of physicians were employed (64.8%), while the rest were independent workers (35.2%). In total, 14.2% of respondents had been compensated specifically for their participation in the Lean change initiative, while 85.8% had not been. We assessed non-response bias by comparing early and late responses (Armstrong and Overton, 1977), specifically the first and last 30, in terms of *history of organizational change* (OC) and *affective commitment to change* (ACC). No significant differences were found.

3.2. Measures

BSUP, ACC and CCC for Lean change were operationalized using Herscovitch and Meyer (2002) model of organizational change commitment. ACC and CCC used four items each, measured on a seven-point Likert scale (1 = strongly agree, 7 = strongly disagree). BSUP used one item measured on a five-level scale identifying five types of change supporting behaviors: active resistance, passive resistance, compliance, cooperation and championing. *Note that all items using Likert scales employed seven-point scales going from 1 = strongly agree to 7 = strongly disagree. Items for the measurement instrument are available in appendix B.*

First, we used a binary coded variable (0 = no, 1 = yes) for LE, and asked respondents if they had any previous experience with Lean thinking. Then, we operationalized OS using seven Likert-scale items from Eisenberger et al. (1997) measure of perceived organizational support. These items measured the respondent's perception of the level of individual support the organization had traditionally offered in the past. OC was measured using eight Likert-scale items adapted from Bordia et al. (2011) measure of perceived change management history. The items measured the respondent's perception of organizational change previously experienced, in general, within the organization.

The EC scale was built using four Likert-scale items from scales developed by Caldwell & al. (2004) and Fedor & al. (2006). The scale measured the respondent's initial perception of how the Lean initiative would change things such as the organization of their work and their medical practices.

The level of the physician's *participation* (PART) in the Lean change initiative was measured using a three-level item aimed at assessing the level of the respondent's involvement during the change. Respondents were asked to choose from the following options: 1) "My involvement was limited to being informed about the change taking place", 2) "I was consulted when it came time to make decisions", and 3) "I was involved in the decision-making process from start to finish."

CC was appraised with six Likert-scale items based on Bordia & al. (2004). Respondents were asked to rate change communication regarding the Lean change initiative by evaluating various dimensions such as accuracy and informativeness. We measured the perceived TLB of the change agent using the aggregated scale developed by MacKenzie & al. (2001) based on the initial scale of 22 items proposed by Podsakoff & al. (1996). The scale comprises 12 Likert-scale items that measure three core dimensions shown to be reliable and valid in measuring the TLB construct (Rubin & al., 2005): the ability to articulate a vision for the change, fostering the acceptance of group goals and providing a role model.

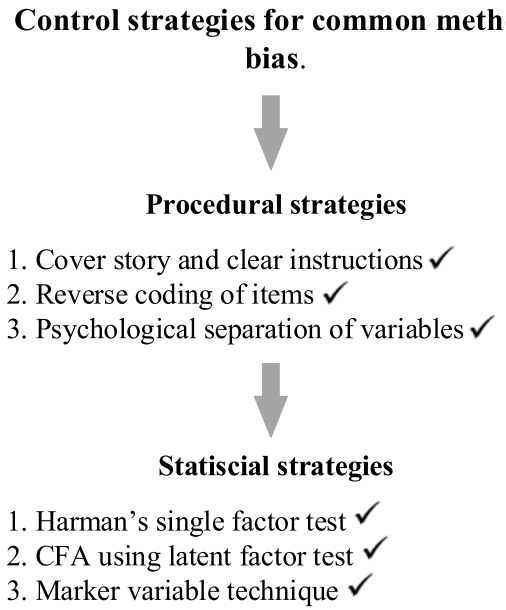

Fig. 2. Summary of control strategies for CMB.

The perceived benefits of the change were first evaluated by using a binary coded variable (0 = no, 1 = yes) to measure whether the respondent had been compensated, outside of regular compensation or salary, for participating in the Lean change initiative (COMP). We then used three Likert-scale items asking the respondents how they felt about the Lean change's final objective(s) regarding three different aspects: PCR, PQ, and PWL.

Finally, we controlled for *age, gender* (0 = male, 1 = female) and *medical specialty* (0 = specialist physician, 1 = general physician). Controlling for these variables is usually recommended in the change literature, as they can sometimes have an effect on dependent variables (Oreg & al., 2011). We also controlled for the employment status (EMP) of physicians using a binary coded variable (0 = employee, 1 = independent worker). As presented by Callister and Wall Jr (2001), physicians are not always employees of healthcare organizations. They are sometimes independent workers paid, *in fine*, as subcontractors. Controlling for this variable contributes to the rigor of our study.

3.3. Measurement reliability and construct validity

We tested the reliability of each construct using the two-step approach suggested by Graham (2006). The Tau equivalent model was selected based on model fit indices and chi-square, from a group also including the parallel, essentially Tau-equivalent and congeneric models. Doing so means that the reliability that was calculated is Cronbach's alpha (0.855–0.968). We also computed the composite reliability values, which are all above the commonly recognized threshold of 0.70, ranging from 0.843 to 0.968.

We performed a confirmatory factor analysis (CFA) using AMOS 25 to test the validity and composite reliability of the measurement model. Using the maximum likelihood (ML) approach, we verified the construct

validity by testing the fit of the measurement model, as well as convergent and discriminant validity. Considering the significant number of measurement variables and limited sample size, results for the measurement model indicate a good fit with a $\chi 2(1106) = 1750.262$ with $p < 0.001$, root mean square error of approximation (RMSEA) = 0.058, comparative fit index (CFI) = 0.912, incremental fit index (IFI) = 0.912, standardized root mean square residual (SRMR) = 0.0691 and expected cross-validation index (ECVI) = 11.3996 smaller than the saturated model (Hair & al., 2010).

The standardized factor loadings of each measurement item were examined in combination with the average variance extracted (AVE) of each latent construct to establish convergent validity. First, the factor loadings are all significant ($p < 0.001$), range from 0.605 to 0.922 and are above the suggested value of 0.5, indicating convergent validity (Hair & al., 2010). Second, the latent constructs have AVE values ranging from 0.520 to 0.835. Those values also point to convergent validity since the constructs can account for more than 50% of the items' variance (Ambulkar & al., 2015). We tested for discriminant validity by comparing each construct's square root of AVE with the correlations between each construct. This indicates discriminant validity since the square roots of AVEs are bigger than the correlations between all constructs pairs in the measurement model (Fornell and Larcker, 1981; Henseler & al., 2015). All measurements are provided in appendix A (Table 3).

3.4. Common method bias

Survey-based data collection creates potential for common method bias (Podsakoff & al., 2003; Podsakoff & al., 2012). We addressed common method bias (CMB) by using a combination of procedural and statistical strategies (Podsakoff & al., 2003; Podsakoff & al., 2012), as illustrated in Fig. 2. To increase the probability that respondents would give accurate answers, we provided a good cover story along with clear instructions (Aronson & al., 1998). In addition, we used reverse wording on some items to decrease the motivation of responding stylistically. We also made sure that measures of criterion and predictor variables were psychologically separated and that respondents were guaranteed anonymity (Feldman and Lynch, 1988; Podsakoff & al., 2003).

Our statistical strategy involved three phases. First, we performed Harman's single factor test (Harman, 1976). Following the guidelines established for this test, we found that CMB is not a major concern because 1) several factors were identified, 2) the largest explained variance by any single factor was 38.64%, and 3) no general factor was observed in the unrotated factor structure. However, Ketokivi & Schroeder (2004) have argued that Harman's single factor test is not sufficiently robust to assess common method variance (CMV). To further address CMV, we performed a CFA using the latent factor test (Podsakoff & al., 2003) by introducing a single latent factor to the initial measurement model. No loss of significance of the factor loadings was observed, and the model fit was not improved, indicating minimal CMV. Third, we also employed the marker variable technique, recommended

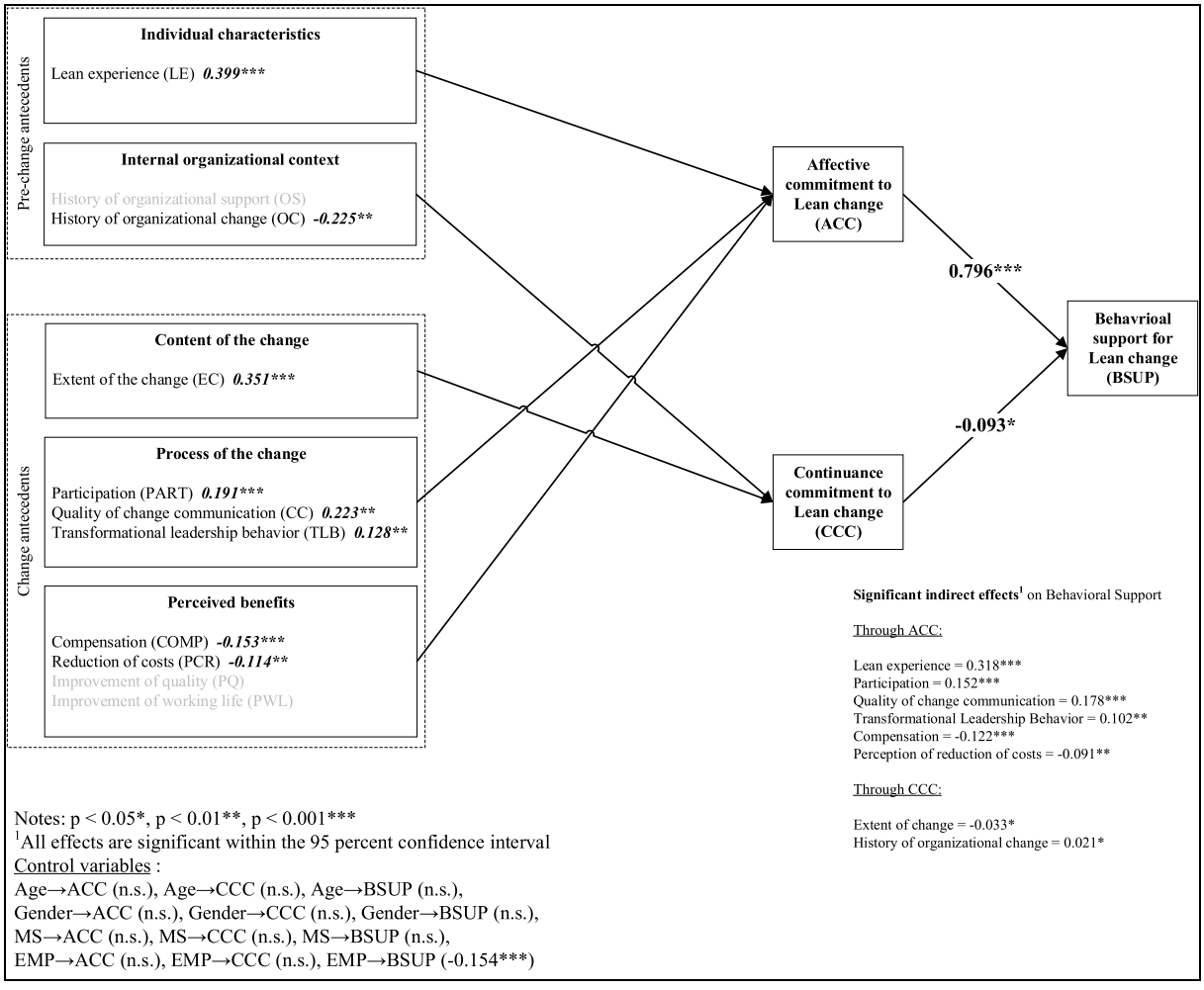

Fig. 3. Significant direct and indirect effects on physicians' behavioral support for Lean change.

as a key test for CMV within the operations management field (Dubey & al., 2019; Wamba & al., 2019). Based on the guidelines of Lindell and Whitney (2001) to account for CMV in cross-sectional studies, we created a revised model by introducing a marker variable without any theoretical relations to the constructs of our research model. We then compared this revised model to our research model, where we assessed the significance of the correlations based on Lindell and Whitney (2001) conclusions. We observed no changes in the significance of the correlations. Based on these statistical approaches, we argue that common method bias is non-substantial in this study.

3.5. Causality

Before testing hypotheses, *causality* is an aspect that must be addressed (Dubey & al., 2017; Guide Jr and Ketokivi, 2015; Soytas & al., 2019). We conceptualize change antecedents as exogenous model variables to the commitment to change constructs and BSUP variable, and not the other way around. These stated relationships have been examined in the extant organizational behavior literature, and their directionality has been validated by other researchers (Bouckenooghe & al., 2015; Herscovitch and Meyer, 2002; Oreg & al., 2011). Nonetheless, as a precaution, we tested for endogeneity by correlating the antecedent variables with the error terms of the dependent variables. The correlation coefficients were all non-significant. These considerations therefore lead us to conclude that endogeneity is not a major concern.

4. Results and analysis

4.1. Model estimation

We used structural equation modeling to test the hypotheses shown in Fig. 1. We first tested the complete structural model using AMOS 25 and then used a model-trimming approach (Ullman and Bentler, 2012), progressively removing non-significant paths one at a time and verifying our model fit, all the while controlling for *age, gender, medical specialty,* and *employment status*. The resulting model is presented in Fig. 3. The results yielded good fit statistics: $\chi 2(1144) = 1711.959$, IFI = 0.917, CFI = 0.916, RMSEA = 0.053, Standard RMR = 0.0666 and ECVI = 11.885 for the default model versus the saturated model at 15.154. We then performed a mediation analysis with the bootstrapping method at 5000 samples to test our mediation hypotheses. Fig. 4 in Appendix C presents the structural model following path diagram representation.

4.2. Commitment to change

We tested if our data supported our nested model of commitment to Lean change. ACC was shown to significantly and positively predict BSUP ($\beta = 0.796$, $p < 0.001$), and CCC was shown to correlate negatively and significantly with BSUP ($\beta = -0.093$, $p < 0.05$), though its relationship with BSUP was not as strong as that of ACC. This validates H12a and H12b and is in line with findings from the extant literature (Bouckenooghe & al., 2015; Herscovitch and Meyer, 2002). It is also important to note that, while many antecedents showed significant Pearson correlations with BSUP (see Table 1), these relationships became no longer statistically significant once the mediator variables were inserted into the model.

4.3. Pre-change antecedents

As an *individual characteristic*, LE was found to significantly predict ACC ($\beta = 0.399$, $p < 0.001$), but not CCC, thus confirming H1a, but not H1b. None of the control variables had significant relationships with any of the mediator and dependent variables, except for EMP which related significantly to BSUP ($\beta = -0.154$, $p < 0.001$). Of the *internal organizational context* variables, only OC had a significant relationship ($\beta = -0.225$, $p < 0.01$) with CCC, while both OC and OS showed no

Table 1
Descriptive statistics and Pearson correlations.

Constructs & variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Age	48.10	11.49	–																
2	Gender	0.46	–	−0.117	–															
3	MS	0.55	–	0.145	0.109	–														
4	EMP	0.35	–	−0.197	−0.013	0.028	–													
5	LE	0.66	–	0.085	−0.009	−0.007	−0.053	–												
6	COMP	0.14	–	−0.075	−0.114	−0.053	0.381**	−0.203**	–											
7	OS	4.29	1.44	0.065	−0.062	−0.047	−0.335**	0.537**	−0.198**	0.940										
8	OC	3.48	1.14	0.123	−0.214**	0.032	−0.308**	0.211*	−0.168*	0.310**	0.903									
9	PART	1.93	0.71	0.050	−0.105	0.155*	−0.182*	0.411**	−0.053	0.418**	0.219**	–								
10	EC	4.61	1.28	−0.201**	0.017	−0.134	0.237**	−0.027	0.033	0.062	−0.337**	−0.062	0.855							
11	CC	4.19	1.42	0.014	−0.026	−0.094	−0.282**	** 0.367**	−0.198**	0.406**	0.124	0.556**	−0.113	0.924						
12	TLB	4.60	1.34	0.075	−0.007	−0.107	−0.512**	** 0.462**	−0.337**	0.409**	0.230**	0.469**	−0.053	0.412**	0.957					
13	PCR	4.36	1.87	0.038	−0.271**	−0.012	0.277**	−0.228**	: 0.217**	−0.178*	0.009	−0.050	−0.040	−0.067	−0.223**	–				
14	PQ	4.95	1.68	0.064	−0.054	−0.007	−0.305**	‘ 0.284**	−0.211**	0.375**	0.166*	0.441**	0.021	0.365**	0.323**	−0.118	–			
15	PWL	3.76	1.57	−0.040	−0.049	−0.096	0.067	0.218**	−0.084	0.061	0.002	0.135	−0.084	0.350**	0.123	0.308**	0.315**	–		
16	ACC	4.66	1.83	0.172*	−0.077*	0.045	−0.329**	0.459**	−0.404**	0.228**	0.286**	0.486**	−0.116	0.470**	0.436**	−0.279**	0.259**	0.176*	0.968	
17	CCC	3.44	1.19	0.004	0.073	0.058	0.028	−0.081	0.122	−0.020	−0.296**	−0.070	0.282**	−0.034	−0.100	−0.064	0.020	−0.053	−0.183*	0.911
18	BSUP	3.51	1.36	0.122	0.013	0.058	−0.476**	0.479**	−0.405**	0.235**	0.251**	0.441**	−0.114	0.401**	0.432**	−0.358**	0.195**	0.116	0.756**	−0.099*

Notes: *p < 0.05, **p < 0.01(two-tailed), Gender: 1 = female, MS: 1 = general practitioner, EMP: 1 = employed, LE: 1 = previous Lean experience Diagonal represents Cronbach's Alpha for latent variables.

Table 2
Mediation results based on bootstrapping method (5000 bootstrapping resamples).

Independent variable	Mediating variable	Dependent variable	Direct effect	Effect of IV on M	Effect of M on DV	Standardized indirect effect	Standardized total effects	95 percent bootstrap CI for indirect effect		
LE	ACC	BSUP	–	0.399***	0.796***	0.318***	0.318***	0.232	to	0.404
PART	ACC	BSUP	–	0.191***	0.796***	0.152***	0.152***	0.073	to	0.231
CC	ACC	BSUP	–	0.223**	0.796***	0.178**	0.178**	0.072	to	0.284
TLB	ACC	BSUP	–	0.128**	0.796***	0.102**	0.102**	0.014	to	0.190
COMP	ACC	BSUP	–	−0.153***	0.796***	−0.123***	−0.122***	−0.189	to	−0.051
PCR	ACC	BSUP	–	−0.114**	0.796***	−0.091**	−0.091**	−0.155	to	−0.027
EC	CCC	BSUP	–	0.351**	−0.093*	−0.033*	−0.033*	−0.068	to	−0.002
OC	CCC	BSUP	–	−0.225**	−0.093*	0.021*	0.021*	0.001	to	0.041

significant relationship with ACC. Thus, H3b was supported, but not H2a, H2b, nor H3a.

4.4. Change antecedents

Various *change* antecedents were found to have significant relationships with the two commitment to Lean change variables. First, EC loaded significantly and positively with CCC ($\beta = 0.351$, $p < 0.001$), but did not, however, relate significantly to ACC, confirming H4b, but not H4a. Second, the *process of change* variables had significant relations with the ACC variable, but none with CCC. PART had a significant and positive relationship with ACC ($\beta = 0.191$, $p < 0.001$), CC presented a significant and positive correlation with ACC ($\beta = 0.223$, $p < 0.001$), and TLB also significantly predicted ACC ($\beta = 0.128$, $p < 0.05$). Thus, H5a, H6a and H7a were validated, while H5b, H6b and H7b were not.

As *perceived benefits*, both COMP ($\beta = -0.153$, $p < 0.001$) and PCR ($\beta = -0.114$, $p < 0.01$) had significant and negative relationships with ACC, while displaying no significant correlations with CCC. PQ and PWL, however, showed no significant correlations with the commitment variables. Hence, H8a and H9a were confirmed, while H8b, H9b, H10 and H11 were invalidated.

4.5. Mediation of commitment to change

We used the bootstrapping method in AMOS 25 to test the mediation relationships (H13a and H13b) of our refined model, following the recommendations of Zhao & al. (2010). The detailed results are presented in Table 2.

First, ACC significantly mediated the effects of the remaining pre-change and change antecedents on BSUP for Lean change, in line with H13a. LE ($\beta = 0.318$, $p < 0.001$), PART ($\beta = 0.152$, $p < 0.001$), CC ($\beta = 0.178$, $p < 0.01$) and TLB ($\beta = 0.102$, $p < 0.01$) all had significant and positive indirect-only effects on BSUP, within the 95 percent confidence interval (CI). Both COMP ($\beta = -0.122$, $p < 0.001$) and PCR ($\beta = -0.091$, $p < 0.01$) had significant and negative indirect-only effects on BSUP, also within the 95 percent CI.

Second, CCC also mediated the effects of the remaining pre-change and change antecedents on BSUP for Lean change, thus validating H13b. EC ($\beta = -0.033$, $p < 0.05$) had a significant and negative indirect-only effect on BSUP through CCC, while OC ($\beta = 0.021$, $p < 0.05$) had significant and positive indirect-only effect, both within the 95 percent CI.

5. Discussion

Our research proposes a model of physicians' behavioral support for Lean implementation, anchored in Herscovitch and Meyer (2002) model of organizational change commitment and Oreg et al. (2011) framework of change recipients' reactions to organizational change. Our findings contribute to the ongoing concerns regarding the involvement of physicians in Lean transformations. In this section, we discuss their theoretical and managerial implications, as well as their limitations and future research avenues.

5.1. Theoretical implications

Change management theory emphasizes that individuals' reactions to organizational change depend on multiple factors (Beer and Nohria, 2000; Burke, 2017). The nature of the change, the way it is implemented and the context within which that implementation takes place can all have meaningful impacts on stakeholders' reactions and, ultimately, the success or failure of the change. In the case of Lean change and physicians, our findings lend credence to the importance of affective commitment to change and good change management practices in favoring behavioral support for change.

Our results show that physicians with a strong emotional belief in Lean change (ACC) tend to exhibit positive discretionary behaviors toward it. This echoes other findings (Rafferty & al., 2013), according to which change recipients who develop strong fundamental beliefs in the value of a change tend to show support for it. In a recent article, Haffar & al. (2019) pointed out that individuals' affective commitment to change was a key component for the successful implementation of Total Quality Management (TQM). While Lean and TQM have fundamental differences, they do share many similarities (Andersson & al., 2006). Bortolotti & al. (2018) also identified ACC as a determining element of Lean capabilities and employee attitudes in healthcare. Hence, the congruence of our findings with those of other researchers (Bortolotti & al., 2018; Haffar & al., 2019) about the significance of affective commitment to change toward the success of quality improvement approaches is certainly meaningful. However, our understanding of the relationship between CCC and BSUP remains somewhat fuzzy. While we did find a significant and negative correlation between CCC and BSUP, the relationship was nowhere near as strong as its ACC counterpart, as shown in Fig. 3. This means that the belief in the value of the Lean change far outweighed the fear of loss in the eyes of physicians, hence favoring their BSUP for its implementation.

Our study also provides interesting evidence regarding *pre-change* antecedents. First, LE significantly influenced BSUP through the affective commitment dimension, meaning that previous Lean experience created a positive outlook on Lean from physicians. This is logical and consistent with the extant literature (Fournier and Jobin, 2018a). Second, our findings suggest that the internal organizational context (OS and OC) has minimal impact on physicians' support for Lean. This finding is somewhat in line with Narayanamurthy & al. (2018), who found that a healthcare institution's attributes were not the most significant elements influencing stakeholders' readiness to Lean change.

Change antecedents provided a more substantial contribution regarding physicians' support for Lean. The most salient effects were found through ACC. First, physicians who participated more in decision-making with regards to Lean change (PART) tended to be more supportive, which aligns with the organizational change literature (Amiot & al., 2006). When recipients are involved in planning and implementing a change, positive emotions and greater behavioral changes are observed (Bartunek & al., 2006). Further support for the positive influence of change management was provided by the significant indirect effects of CC and TLB on BSUP. This emphasizes the critical role of change agents and leaders, and how accurate information can create positive feelings and behaviors toward change (Axtell & al., 2002), while the opposite diminishes recipients' belief in the value of the change (Schweiger and Denisi, 1991). It also appears that physicians' perceived EC did not strongly influence their support for Lean, meaning that proposing changes to medical practices and procedures did not create overly strong resistance behaviors from physicians.

Contrary to our hypothesis, compensating physicians for their involvement proved detrimental to BSUP. While this might appear to contradict the conventional wisdom of "rewards and incentives", we must remember that physicians' main motivations often lie outside of financial benefits and more toward their medical professionalism (Dent, 2003) and self-efficacy (Parker & al., 2006; Perrewé & al., 2004), the latter being identified as a key component of successful quality improvement (Haffar & al., 2019). They often do not respond well to financial incentives (Mcdonald and Roland, 2009) because these might damage their intrinsic motivation (Amabile & al., 1976) to undertake a task for its own sake. Incentivizing commitment through financial-type rewards implies that such reward is necessary to induce the desired change. As proposed by Frey (1997) economic theory of personal motivation, physicians are not only driven by money.

Additionally, the perceived benefits of Lean to the quality of care and to the quality of working life did not influence physicians' support, contrary to our hypotheses and to what other researchers have suggested (Lorden & al., 2014). Nevertheless, as shown by PCR's significant indirect effect on BSUP, if physicians believed the Lean change initiative's objective was to directly reduce costs, they showed lower levels of support for it. This resonates with researchers' conclusions according to which Lean implementation in healthcare usually fails when it is efficiency-driven (Radnor & al., 2012).

Interestingly, independent workers showed lower levels of BSUP for Lean than did employed physicians, as shown by EMP's direct effect on BSUP. We tested for the moderation of EMP on the relationships between both commitment dimensions and the behavioral support construct but could not find any significant influence of the interaction terms. Nonetheless, the significant relationship between EMP and BSUP is interesting. In the past, full-time employees have been shown to support organizational change more than contract workers (Martin & al., 2005). This is interesting because, in many healthcare organizations, physicians are independent workers, which, in addition to the power and influence they wield, amplifies the complexity of managerial decisions.

Overall, it is interesting to observe how *change* antecedents contributed significantly to physicians' BSUP for Lean change, most of which through a fundamental belief in the value of the change (ACC). *Compensation, participation, quality of change communication, transformational leadership behavior* and the *perception of cost reduction* are all *change* antecedents upon which an organization can act, providing ample opportunities to trigger physicians' engagement toward Lean. Other than familiarity with Lean, *pre-change* antecedents exhibited minimal contributions to physicians' support. *In fine*, our model shows that various levers can be activated to influence physicians' support for Lean.

5.2. Managerial implications

Our findings have implications for healthcare managers involved in or thinking about Lean change. Because physicians are central to change efforts, a better understanding of their reactions toward Lean could prove significant to its successful implementation. Our results highlight specific areas of concern for managers. First, we cannot underestimate the impact previous Lean experience has on physicians' reactions toward Lean. Organizations should work to inform physicians about the origins, methods, tools, principles and the implementation challenges of Lean. For example, holding formal and informal training sessions where physicians can learn about Lean and question seasoned practitioners could be beneficial (Fournier and Jobin, 2018a). As shown by Roemeling & al. (2017), small investments in knowledge can broaden Lean's impact on healthcare. We also believe managers should stray from the "copy and paste" of Lean Manufacturing and focus instead on adapting it to healthcare.

Managers should also take notice of their own discourse and motivations regarding Lean. As our study illustrated, using Lean for direct cost reduction can negatively impact physicians' support. Physicians will not necessarily oppose to all types of financial benefits resulting from Lean initiatives, but they will tend to show much higher resistance when those gains are perceived as a direct result of staff or equipment cost reductions without regards for quality and safety. Lean programs can have significant financial benefits for organizations, but these usually result indirectly from improvements to quality, safety, patient and employee satisfaction (Cammisa & al., 2011). In fact, as argued by scholars (Womack and Jones, 2015), the essence of Lean has nothing to do with cost reduction. It is about value appropriation.

Furthermore, as our findings highlighted, using traditional rewards and incentives can be counterproductive with physicians regarding Lean change. As we discussed, organizations should not look at financial incentives as conductors of medical engagement toward Lean. Not only are financial rewards potentially detrimental, our data show that there are much more impactful ways of influencing commitment and overcoming resistance from physicians.

Our findings also highlight how the change process itself greatly influences physicians' support for Lean. We believe this is important for managers. First, physicians need to be involved in the planning and implementation of Lean change. They cannot merely be informed about the change. While this can lead to tensions and debates, the benefits of integrating them in the decision-making process far outweigh the consequences.

Second, change management should be a constant preoccupation. As our findings emphasize, communication and leadership significantly influence physicians' engagement in Lean transformations. Managers' competencies should be properly assessed, and appropriate efforts deployed to improve them. Lean initiatives would benefit from a structured communication plan to accurately convey information to physicians. The choice of the change agent(s) is also key, since strong transformational leadership is needed to engage physicians and other professionals toward common goals. Clinical governance mechanisms (Scally and Donaldson, 1998) should also be activated to favor physicians' engagement, which has been shown to favor cooperation and dynamism between clinical and managerial actors (Buetow and Roland, 1999). Ultimately, successfully implementing Lean is about properly

managing change.

Our findings could also be important for policy-makers. In certain jurisdictions, physicians are mostly independent workers, essentially paid as subcontractors. We found that physicians employed by their organization tended to show more support for Lean than independent workers. While it is not guaranteed that our results can translate outside the USA, they are nonetheless interesting and contribute to ongoing discussions and debates about physicians' roles in healthcare systems.

5.3. Limitations and avenues for future research

There are some limitations to our study. Our use of cross-sectional data should be enhanced by longitudinal data or case studies, allowing to study the evolution of medical support for Lean and the events that influence it during the implementation process. For instance, considering *pre-change* and *change* antecedents as parallel constructs rather than sequential does not take into account the temporality of these variables. Longitudinal assessment of these variables' impacts on physicians' commitment to Lean change could provide more insight into the unfolding of the Lean implementation process and how organizations can leverage each antecedent at a given point in time. Also, this longitudinal assessment could take into consideration the evolution of an organization's Lean maturity level and investigate if mature organizations are more successful in galvanizing commitment from physicians. Furthermore, our findings regarding the impact of Lean experience on commitment and support could be further studied in relation to the effects training and Lean certifications might have on physicians' relationship with Lean change. Also, it is not possible to assert if our findings would translate to jurisdictions outside the USA, such as those with public healthcare systems. Data from other countries could be used to perform comparative analyses, which could allow us to conclude on the generalizability of our findings or lack thereof. Furthermore, our model could be enhanced with data to study the relationship between physicians' behavioral support for Lean and organizational performance.

6. Conclusion

While the successful implementation of Lean in healthcare remains challenging, many signs point to a continuing trend regarding its use, especially considering the growing literature highlighting its positive effects on the quality and accessibility of care (Shortell & al., 2018; Tlapa & al., 2020). Physicians are at the center of any change initiative in healthcare organizations. To that extent, their role during Lean transformations is a critical determinant of success. Our empirical analysis highlights how positive, implementation-supportive behaviors can be adopted by physicians when antecedents of affective commitment to Lean change are enacted. This contributes to our understanding of Lean implementation in healthcare, and to a wider extent, services in general. As service operations management continues to develop, our research contributes to a better understanding of how influential professionals react to approaches from this field.

Funding

This work was supported by the Fonds de Recherche du Québec – Société et Culture (# 2021-NP-282775).

CRediT authorship contribution statement

Pierre-Luc Fournier: Conceptualization, Methodology, Formal analysis, Validation, Investigation, Writing - original draft, Writing - review & editing, Visualization, Project administration, Funding acquisition. **Denis Chênevert:** Conceptualization, Validation, Formal analysis, Writing - review & editing. **Marie-Hélène Jobin:** Writing - review & editing, Supervision.

Acknowledgements

We would like to acknowledge Mr. Paul Pejsa from the Catalysis Healthcare Value Network, who was instrumental in facilitating the data collection process. We would also like to acknowledge Pr. Rameshwar Dubey for his advice and guidance. Pr. Dubey kindly reviewed our paper prior to submission and provided meaningful recommendations for its improvement.

Appendix A

Table 3
Properties of the measurement model.

	Standardized Regression Weights	Reliability (Graham, 2006)	Composite reliability	AVE	Cronbach's Alpha
Organizational Support History (OS)		0,940	0940	0,692	0940
OS1	0,872				
OS2	0,803				
OS3	0,877				
OS4	0,848				
OS5	0,852				
OS6	0,832				
OS7	0,728				
Organizational Change History (OC)		0,903	0904	0,541	0903
OC1	0,736				
OC2	0,690				
OC3	0,605				
OC4	0,79				
OC5	0,783				
OC6	0,805				
OC7	0,691				
OC8	0,764				
Extent of Change (EC)		0,855	0843	0,576	0855
EC1	0,713				
EC2	0,823				

(*continued on next page*)

Table 3 (*continued*)

	Standardized Regression Weights	Reliability (Graham, 2006)	Composite reliability	AVE	Cronbach's Alpha
EC3	0,619				
EC4	0,858				
Quality of Change Communication (CC)		0,924	0925	0,672	0924
CC1	0,830				
CC2	0,798				
CC3	0,865				
CC4	0,811				
CC5	0,844				
CC6	0,767				
Transformational Leadership Behavior (TLB)		0,957	0958	0,653	0957
TLB1	0,839				
TLB2	0,797				
TLB3	0,741				
TLB4	0,825				
TLB5	0,804				
TLB6	0,808				
TLB7	0,770				
TLB8	0,826				
TLB9	0,832				
TLB10	0,773				
TLB11	0,818				
TLB12	0,858				
Affective Commitment to Change (ACC)		0,968	0968	0,835	0968
ACC1	0,915				
ACC2	0,922				
ACC3	0,915				
ACC4	0,907				
ACC5	0,902				
ACC6	0,920				
Continuance Commitment to Change (CCC)		0,911	0904	0,520	0911
CCC1	0,804				
CCC2	0,732				
CCC3	0,708				
CCC4	0,744				
CCC5	0,657				
CCC6	0,671				

All values are significant at the 0.001 level.

Appendix B

Measurement instrument	
Construct/variable	Scale
History of organizational support (OS)	Likert
In your experience:	1 = strongly agree 7 = strongly disagree
1. This organization cares about my opinions.	
2. This organization cares about my well-being.	
3. This organization strongly considers my goals and values.	
4. Help is available from this organization when I have a problem.	
5. This organization would forgive an honest mistake on my part.	
6. This organization shows very little concern for me.	
7. This organizational is willing to help me if I need a special favor.	
History of organizational change (OC)	Likert
Thinking about organizational change in general (i.e., restructuring, job reassignment, job rotation, etc.), that you have previously experienced in this organization (not the current changes occurring in this organization). In your experience:	1 = strongly agree 7 = strongly disagree
1. Organizational change has been positive.	
2. Organizational change has not been properly implemented.	
3. Past change initiatives have failed to achieve their intended purpose.	
4. Organizational change has been managed well.	
5. Organizational change has had a positive impact on the quality of service delivery.	
6. Organizational change has improved organizational performance and effectiveness.	
7. Employee opinions were undervalued during organizational change.	
8. The impact of change on employee well-being was an important consideration.	
Extent of change (EC)	Likert
This Lean change initiative involved …:	1 = strongly agree 7 = strongly disagree
1 … . changes in processes and procedures.	
2 … . changes in the way I do my job on a daily basis.	
3 … . changes in my interaction with other workers.	
4 … . changes in the way performance gets tracked and measured.	
	3-level item

(*continued on next page*)

(*continued*)

Measurement instrument	
Construct/variable	Scale
Participation (PART)	
Throughout this Lean change initiative, how would you qualify your level of involvement?	
1. My involvement was limited to being informed about the change taking place.	
2. I was consulted when it came time to make decisions.	
3. I was involved in the decision-making process from start to finish.	
Quality of change communication (CC)	Likert
Throughout this Lean change initiative, the official information provided about the change:	1 = strongly agree
	7 = strongly
1. Kept you informed throughout the change process, even after the official announcement.	disagree
2. Addressed your personal concerns regarding the change.	
3. Was accurate.	
4. Gave as much information as possible.	
5. Involved employees in the change process and decisions made.	
6. Communicated the reasons for the change.	
Transformational leadership behavior (TLB)	Likert
Over the course of that Lean change initiative, the Leader of the change …*	1 = strongly agree
**By Leader, we mean the actor responsible for managing the improvement initiative from start to finish.*	7 = strongly
1. Painted an interesting picture of the future for our group that would follow the change.	disagree
2. Had a clear understanding of where we were going.	
3. Did not get sidetracked by issues not relevant to the change.	
4. Inspired others with his/her plans.	
5. Was able to get others committed to his/her vision of the future.	
6. Fostered collaboration among work groups.	
7. Encouraged employees and participants to be "team players".	
8. Got the group to work together for the same goal.	
9. Developed a team attitude and spirit among participants and stakeholders.	
10. Lead by "doing" rather than simply "telling".	
11. Provided a good model to follow.	
12. Led by example.	
Perceived benefits	Likert
The objective(s) or reason(s) for this Lean change initiative was/were …	1 = strongly agree
	7 = strongly
1. … to improve the quality of care. (PQ)	disagree
2. … to reduce costs. (PCR)	
3. … to improve the quality of working life of our unit. (PWL)	
Affective commitment to Lean change (ACC)	Likert
Thinking back on that same Lean change initiative:	1 = strongly agree
	7 = strongly
1. I believed in the value of this change.	disagree
2. This change was a good strategy for this organization.	
3. I think that management was making a mistake by introducing this change.	
4. This change served an important purpose.	
5. Things would have been better without this change.	
6. This change was not necessary.	
Continuance commitment to Lean change (CCC)	Likert
Thinking back on that same Lean change initiative:	1 = strongly agree
	7 = strongly
1. I had no choice but to go along with this change.	disagree
2. I felt pressure to go along with this change.	
3. I had too much at stake to resist this change.	
4. It would have been too costly for me to resist this change.	
5. It would have been too risky to speak out against this change.	
6. Resisting this change was not a viable option for me.	
Behavioral support for Lean change	5-level item
Regarding this Lean change initiative …	
1. … I demonstrated opposition in response to the change by engaging in overt behaviors that were intended to ensure that the change failed.	
2. … I demonstrated opposition in response to the change by engaging in covert or subtle behaviors aimed at preventing the success of the change.	
3. … I demonstrated minimum support for the change by going along with the change, but did so reluctantly.	
4. … I demonstrated support for the change by exerting effort when it came to the change, going along with the spirit of the change, and being prepared to make modest sacrifices.	
5. … I demonstrated extreme enthusiasm for the change by going above and beyond what is formally required to ensure the success of the change and promoting the change to others.	

Appendix C

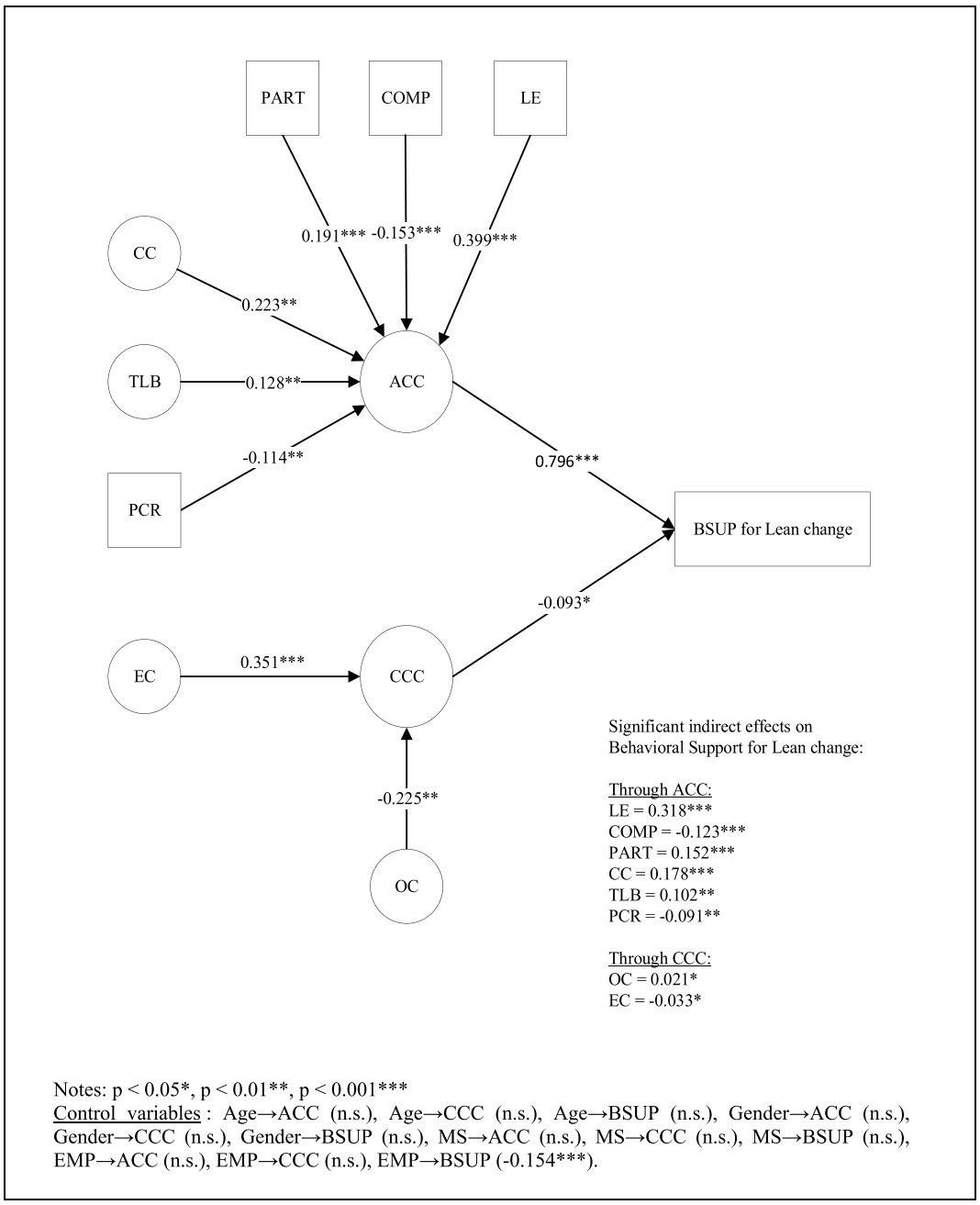

Fig. 4. Structural model of pre-change and change antecedents' effects of physicians' behavioral support of Lean change.

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