

Revisiting the unholy alliance of health-care operations: payor-provider integration of occupational health services

Alliance of
health-care
operations

357

Antti Peltokorpi
School of Engineering, Aalto University, Espoo, Finland
Juri Matinheikki
School of Business, Aalto University, Espoo, Finland, and
Jere Lehtinen and Risto Rajala
School of Science, Aalto University, Espoo, Finland

Received 30 April 2019
Revised 17 October 2019
20 December 2019
Accepted 9 February 2020

Abstract

Purpose – To investigate the effects of payor-provider integration on the operational performance of health service provision. The research explores whether integration governs agency problems and tilts the incentives of diverse actors toward more systematic outcomes.

Design/methodology/approach – A two stage multimethod case study of occupational health services. A qualitative stage aimed to understand the reasons, mechanisms, and outcomes of payor-provider integration. A quantitative stage evaluated the performance of the integrated hospital against fee-for-service partner hospitals with a sample of 2,726 patients.

Findings – Payor-provider integration mitigates agency problems on multiple levels of the service system by complementing formal governance mechanisms with informal mechanisms. Compared to partner hospitals, the integrated hospital yielded 9% lower the total costs of occupational injuries achieved primarily by emphasizing conservative care and faster recovery.

Research limitations/implications – Focuses on occupational health services in Finland. Provides initial evidence of the effects of payor-provider integration on the operational performance.

Practical implications – Vertical integration may provide systematic outcomes but requires mindful implementation of multiple mechanisms. Rigorous change management initiative is advised.

Social implications – For patients, the research shows payor-provider integration of health services can be implemented in a manner that it reduces care costs while not compromising care quality and customer satisfaction.

Originality/value – This study provides a rare longitudinal analysis of payor-provider integration in health-care operations management. The study adds to the knowledge of operational performance improvement of health services.

Keywords Payor-provider integration, Health-care operations management, Agency theory, Incentives, Multimethod study

Paper type Research paper

© Antti Peltokorpi, Juri Matinheikki, Jere Lehtinen and Risto Rajala. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

The authors thank the editor and the associate editor, as well as two anonymous reviewers for their insightful comments which helped improve the paper significantly. We would also thank Pohjola Insurance and especially Dr. Markus Torkki for providing access to data. This work has been funded by Business Finland as part of the Management of effectiveness (G3) research project (grant number: 4198/31/2015). The authors declare no conflict of interest.



1. Introduction

A health-care service system can be decomposed into a set of triadic process flows involving patients, health service providers, and third-party payers (Lee *et al.*, 2016), each with their specific interests and value drivers. Due to the self-interested goals and information asymmetries between the payors and providers of health care, relationships between the diverse actors can be analyzed as multiple principal-agent relationships in which the principals need to delegate work to autonomous agents (Fuloria and Zenios, 2001). Research in health-care payment models has suggested the operating model should provide value and incentives for each actor in the health-care service system (Porter and Kaplan, 2016; Rosenthal, 2008). This has been difficult due to the apparent discrepancy of incentives: a high quality of service for the patient, low costs for the employer and insurer, and a high profit margin for the private healthcare provider are examples of self-interested goals creating avenues for agency problems, such as a moral hazard (Holmström, 1979), when, for example, a care provider begins to value highly incentivized treatments.

Agency theory, widely applied in operations and supply chain management (OSCM) research (cf. Gibbons, 2005; Fayezi *et al.*, 2012), has been used to analyze situations of adverse selection (i.e. precontractual supplier selection) and moral hazard (i.e. postcontractual supplier monitoring). In health care, the presence of strong information asymmetry, the difficulty of evaluating treatment outcomes, and high costs of error complicate the formulation of effective outcome-based contracts and often lead to agent compensation on a fee-for-service (FFS) basis (Fuloria and Zenios, 2001; Tuohy, 2003). Furthermore, as care providers tend to be risk averse and unwilling to take full responsibility for a patient's treatment, FFS payment models seem to persist—despite their inherent tendency to cause agency problems (e.g. overtreatment and provider-induced demand). When left ungoverned, these factors may lead to a decreased performance of the entire health-care service system (Goddard *et al.*, 2000).

Operations management has been widely used to improve the health service provision in single hospitals. For instance, versatile performance measurement in clinical departments (Elg *et al.*, 2013), integrative information sharing and planning practices (Drupsteen *et al.*, 2013), and modular care and appropriate client involvement (de Blok *et al.*, 2010) can all improve the quality and flow of care. While there is little reason to doubt that a single health service provider can enhance its own performance, agency theory indicates that improvement in health-care operations should be approached from a service system perspective. That is, the agency theory directs attention to the parallel higher-level decisions concerning the relationships among actors in the service system, having the potential to enhance those decisions and supporting the performance improvement of the service system as a whole. Therefore, there is a need for a system-level approach to health-care operations management to improve health service delivery (Dai and Tayur, *forthcoming*).

This study builds on the argument that, at the system level, the alignment of goals and incentives can govern agency problems (Eisenhardt, 1989). In insurance-based health provision, one solution to achieve this could be the vertical, organizational integration of the insurer and the provider (Rosenthal, 2008). In general, vertical integration has been suggested as an effective instrument to govern agency problems in supply chains (Gibbons, 2005; Mahoney, 1992). Furthermore, a close payor-provider collaboration through joint strategic planning, shared data, and financial incentives can reduce costs and improve care quality (Claffey *et al.*, 2012). However, Kreindler *et al.* (2012) argued that mere ownership does not guarantee alignment of interests and values; different social integration mechanisms are required. Insurer-provider integrations may also lead to distrust among patients—as the integrated models may restrict patients' freedom to select their providers and integrated systems may emphasize cost cutting over the quality of care. These issues, leading to poor customer satisfaction, have been powerfully prevalent in the US-based market, where

patients are customers and a strong norm-base supports the customers' freedom of choice (Mechanic, 2004). Hence, the so-called managed care organizations in the US have especially faced a stiff headwind since the 1990s and are often perceived as unholy alliances that can be considered to be diminishing the quality of care for customers and leading to a *managed care backlash* (Miller, 2006). Despite the unpromising history of managed and integrated care organizations, there exists a theoretical rationale for the adoption of vertical integration to govern agency problems. Vertical integration has the potential to extirpate opportunistic actions and partial optimization in service systems (see, e.g. Gibbons, 2005). A crucial question in health-care management research remains to be resolved: under which conditions may the vertical integration of the payor and provider lead to system-level improvements?

To fill this gap in the knowledge, this empirical study reports findings from one specific case outside the US by addressing the following research question: How does the ownership-based integration of a payor and a provider affect agency problems and the operational performance of an insurance-based occupational health-care system? By using a two-stage multimethod approach, an in-depth case study of Pohjola Insurance Company Ltd. and its integrated hospital in the Finnish occupational health-care market was conducted. In the first stage, a longitudinal qualitative study analyzed Pohjola's efforts to establish and operate an integrated occupational care system. The study explored the causes of agency problems, identified potential remedies (e.g. different governance mechanisms), and documented their deployment in Pohjola Hospital. Multiple mechanisms and their temporal sequence were captured to describe the process of change toward the integrated system.

In the second stage, three working hypotheses were derived to further investigate the reasons why the integrated system could decrease the total cost of illness (comprising cost of care and cost of absence from work – that is, sick leave). A sequential multiple-mediator model was built to test a sample of 2,726 Pohjola occupational insurance customers and compare Pohjola Hospital's performance to partner hospitals', which are compensated on an FFS basis. The analysis provides statistical support to the observation that treatment in a payor-provider integrated hospital can attain improved performance by reducing the total cost of illness.

This paper makes two primary contributions. First, the paper advances the established, yet ongoing, theoretical debate in supply chain management that vertical integration may effectively govern agency problems (see, e.g. Mahoney, 1992; Gibbons, 2005) by illustrating an organizational change process toward an integrated system. Second, the study provides a more exact contribution to health-care (operations) management by illustrating an exceptional case in which integration can yield better cost efficiency while maintaining high customer satisfaction. The Pohjola case may appear as a *black swan* (i.e. an anomaly in the existing knowledge); however, by carefully illustrating the case and context-specific nuances (i.e. the factors behind the success), this study's analysis provides new insights into vertical integration in health care, opening avenues for future research.

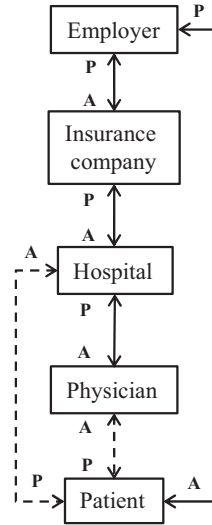
2. Theoretical background

2.1 Occupational health-care service system: multiple actors with diverse interests

In most industrialized countries, at least some parts of health-care delivery systems are built upon insurance-based services – in which the roles of service use, provision, and reimbursement are dedicated to different interlinked actors: patients, care providers, and payors (Lee et al., 2016). Diverse actors' varying interests and incentives may lead to conflicts when a health-care service system is managed through bilateral contracts between parties. Figure 1 presents a typical health-care service system of an employer-financed health program – which illustrates the different goals, as well as contractual (i.e. formal written contracts defining responsibilities and compensation scheme) and functional (i.e. need for

Self-interested goals

- Employer
 - Low insurance price
 - Rapid return to work
- Insurance company
 - Rapid return to work
 - Low care costs
- Hospital
 - Reputation
 - Operating margin
 - Reasonable care costs
- Physician
 - Maximizing service fees
 - Reputation
- Patient
 - Service experience
 - Rapid return to normal health status and work



↔ contractual relationship
 ↔ functional relationship

Figure 1.
Actors, goals, and agency relations in an occupational health service system

interaction between parties to deliver the care) interdependencies between parties. The figure also illustrates typical principal-agent relationships in this system.

Solving problems in one agency relation may become suboptimal – as one party (e.g. hospital) may simultaneously act as principal to one party (e.g. a physician) and as an agent to another (e.g. an insurance company). Indeed, the actors may simultaneously have fundamentally misaligned, as well as shared, incentives. For example, the patient, employer, and insurance company are all interested in the patient’s quick return to work, even if for different reasons. At the same time, physicians and hospitals are risk averse and typically have no stake in their patients’ rapid return to work or the reduction of patients’ expenses (Burns and Muller, 2008). Even if hospitals do have an incentive to contain physician costs, the physicians who make the actual care decisions often have an opposite incentive to increase their reimbursements. In addition, patients tend to suffer from information asymmetry concerning medical decisions and the best care and are risk averse. This leads to choosing a provider who signals the best customer experience (not necessarily the optimal treatment). Therefore, when not paying out of pocket for care, patients have little interest in saving hospital or physician costs (Miller, 2006). Together, varying interests, information asymmetries, and risk preferences form agency problems on multiple levels in health-care service systems, compromising the performance of the complete system.

2.2 Mitigating agency problems in health care

In health care, high levels of information asymmetry may lead to agency problems such as moral hazard through, for example, overtreatment (Dranova and White, 1987) or physician-induced demand (Rice and Labelle, 1989). Despite many attempts to introduce more outcome-

based contracts (Fuloria and Zenios, 2001), FFS and case rate payments (e.g. payments based on diagnosis related groups, DRGs) have remained a standard compensation model, mainly due to ease of use and uncertainty in evaluating care outcomes (Mooney and Ryan, 1993; Robinson, 2015). A capitated system (i.e. the care provider receiving a flat rate per patient per month while having the responsibility for all care needs of the selected patient population) has been proposed as an alternative; however, capitation may motivate care providers to optimize population-level targets and not improve the care of single patients, merely shifting the level of agency problems (Porter and Kaplan, 2016).

Besides contracts and incentive models, there are often informal mechanisms to mitigate agency problems—such as considerations of ethics, patient economic welfare (Ryan, 1994), and long-term patient-doctor relationships (Dranova and White, 1987). However, when the focus moves to the relationship between an insurer and the health service provider, the governing effect of such informal and interpersonal trust-based mechanisms may be weakened (Hunter, 1996) but may not necessarily disappear, as will be discussed later on. The rise of professionalized management in health care that emphasizes market transactions and arms-length professional relationships may present higher risks for agency problems primarily when physicians (agents) serve several hospitals (principals), which diminishes the effect of social constraints and norm-based informal governance mechanisms (Tuohy, 2003).

Indeed, the mitigation of agency problems becomes complex in treating a complicated disease that requires multiple treatments over complete and complex treatment chains because when each treatment is separately compensated with varying monitoring and compensation regimes, the service provider may come to favor specific highly incentivized tasks over others (Holmström and Milgrom, 1991). When combined with the increasing marketization, health service providers (including both hospitals and physicians) often serve many insurers simultaneously. Thus, the health service provider may devote its efforts to tasks providing the best return, such as expensive surgeries, rather than complicated tasks that are harder to measure and compensate, such as attending to a patient's mental health. When such indirect tasks are valuable for reaching a principal's goals, direct employment or ownership may outperform a contract (Grossman and Hart, 1986). Indeed, vertical integration can be seen as an efficient instrument because it allows a principal to better align interests and extirpate the deficit behavior of an agent through managerial actions (Gibbons, 2005), providing a rationale for payor–provider integration in health-care service delivery.

Another solution to induce norm-based governance in transactional agency relationships is relational contracting – which builds on self-enforcement and long-term partnerships between the parties (Board, 2011) and, therefore, is classically positioned between markets (e.g. transactional contracts) and hierarchy (e.g. vertical integration). In other words, the contracting parties mutually agree upon compensation of hard-to-measure tasks by building tight social ties and trust between the two (or more) organizations so the potential self-interested behavior (such as overtreatment) is extirpated (Vandaele *et al.*, 2007). Despite their promising characteristics, the utilization of relational contracts has remained marginal in health-care compensation schemes where payments are conventionally based on clearly measured units (e.g. a separate payment for each care component, see Robinson, 2015). Relational contracts are mainly, if at all, utilized in more holistic undertakings such as the privatization of the complete care infrastructure or the so-called public–private partnerships (see, e.g. Roehrich *et al.*, 2014). The reasons for such marginalization are unfortunately beyond the scope of this paper.

2.3 Integrated health-care service delivery

Integrated delivery systems came into existence in the US as early as the 1990s in response to managed care pressures and health-care reforms, and they emphasize vertical integration between a hospital, physician and an insurer as a means to increase the efficiency and

effectiveness of care by aligning the incentives (Shortell *et al.*, 1994). Previous research has criticized payor–provider integration because it may reduce competition, limit customers’ choices of providers, and has no apparent connection to improved quality (Boonen and Schut, 2011). Integrated delivery systems also have a rather poor reputation—which has led many patients to deliberately avoid managed care programs, resulting in the so-called *managed care backlash* (Miller, 2006). Managed care backlash is argued to result from customer’s beliefs and personal impression/experiences of declining customer service (claimed to result from cost savings) and limiting freedom to choose their provider, not necessarily from the verified decline in medical quality of care (Blendon *et al.*, 1998). However, due to the marketization of health care, such social stigma may cause customer distrust and declining enrollment and profit margins, eventually leading to the rupture of a potentially working system (Mechanic, 2004). In other words, there exists high information asymmetry between the customer and the integrated payor–provider (about what is considered as effective care), leading to fear among customers that their decision-making capacity is limited.

In conclusion, if vertical integration is used to mitigate agency problems between the payor and the provider, one must simultaneously resolve agency problems on other fronts, such as between the patient and the integrated service system. Hence, instead of partial optimization, one needs a systematic way of searching for governance mechanisms against agency problems. This empirical study of Pohjola Hospital aims to identify such mechanisms and analyze how they may affect the performance of the occupational health service system.

3. Research design and methods

3.1 Multimethod case study design

This empirical study investigates how integrated health care service delivery can mitigate agency problems and improve health service performance through a longitudinal multimethod case study of the Pohjola Insurance Company (a part of OP financial group), Finland’s largest occupational accident insurer, with about 31% share of the total market. The company engaged into an ownership-based integration of health insurance and service provision in occupational health services [1] by establishing a new insurer-owned hospital unit, Pohjola Hospital, in 2013.

An in-depth case study design allowed a longitudinal qualitative analysis to capture the details of the examined phenomenon (see, e.g. Barratt *et al.*, 2011) such as analyzing evolution of actions and mechanisms through which the integration between the payor and the provider becomes to mitigate agency problems and affect the performance of health-care operations. Furthermore, quantitative patient-level data was utilized to test the extent to which integration leads to improved performance. This study’s approach is termed an in-depth *multimethod case study*. In general, multimethod research designs using different forms (qualitative vs. quantitative) and sources (interviews, archives, and surveys) of data in examining a single phenomenon are arguably the potential next methodological step in improving the rigor and relevance of OSCM research (Choi *et al.*, 2016).

More precisely, the first longitudinal qualitative study examined the decisions, actions, and mechanisms through which Pohjola Insurance formed the integrated delivery system. The quantitative stage tested, through three working hypotheses (i.e. developed through the qualitative findings), if the integrated system could outperform the partner hospitals. A sample of 2,762 Pohjola occupational insurance patients was used, out of which 40% were treated in Pohjola Hospital. As patient data was fully anonymized, leading to physical and mental integrity among the patients, the ethical committee of Oulu University Hospital indicated specific ethical permission was not needed. In the following subsections, the method used for the qualitative inquiry will be explained, followed by the results of the qualitative stage. The method and the results of the quantitative stage are thoroughly explained in Section 5, and the combined insights of both phases are discussed in Section 6.

3.2 Qualitative data collection and analysis

During the longitudinal study between September 2012 and February 2018, qualitative data was collected primarily through interviews and focus group meetings. In total, 6 focus groups and 15 semi-structured interviews were conducted with different personnel groups from the hospital and the insurance company (details available in [Table 1](#)) to gain insights into the objectives, activities, and events related to establishing and operating the new hospital. The authors did not participate in the integration activities, but one of the authors was in close contact with the hospital representatives facilitating the access to conduct interviews and organize focus group meetings. One or two of the authors attended the interviews and focus groups. In the focus groups, participants were asked about their perceptions, opinions, expectations, and reactions to the integrated system and its outcomes. The aim was to gather information about the new service model and the activities that were connected to its implementation and performance. Extensive notes were written on all the focus groups and interviews and 10 of the interviews were recorded and transcribed. For triangulation purposes, a documented data archive was established containing more than 50 unique sources of newspaper articles, project reports, press releases, presentations, brochures, company reports, and detailed plans starting from the year 2013.

A four-stage empirically grounded analysis approach was used to move up the ladder of abstraction from the case-specific findings to more conceptual mechanisms ([Gioia et al., 2013](#)). First, the actions taken by Pohjola managers to reconcile the varying interests of the hospital and the insurer were identified, thus forming the first-order concepts (see the data structure in [Figure 2](#)). In parallel, to understand potential causality between the actions and the role of events occurring outside the case organization, a chronological storyline and a case narrative of prominent events were crafted during the planning and operations phases of the new integrated hospital (see a timeline of events in [Figure 3](#)). The documented data archive was utilized to triangulate this information. Second, the typical patterns among these first-order concepts were noted. Hereafter, a more abstract categorization of the data was conducted to form second-order themes describing mechanisms taken to establish the integrated hospital and govern agency problems. At this stage, the existing literature was carefully revised to provide a theoretically more meaningful categorization (i.e. engaged in abductive reasoning, see, e.g. [Ketokivi and Choi, 2014](#)).

Third, the themes were summed up into three aggregate dimensions, which formed the main categories of the remedies identified in the case. The illustrative categorization of the raw data into the first-order and second-order constructs is available in [Table A1](#). Finally, by accounting for temporal interrelationships of the second-order themes and the aggregate dimensions, the data structure was compared to the chronological timeline to craft [Figure 4](#) presenting an overview of the sequence of stages to develop a payor-provider integrated system in the given case.

4. Qualitative findings

The qualitative findings indicated that payor-provider integration produces system-level benefits by speeding up patients' recovery and return to work and thus decreasing the total costs of occupational accidents. However, the analysis revealed that the connection between the integration of the care provision and decreased costs is not straightforward. Contrarily, several mechanisms were identified to precede the realization of the positive outcomes. [Figure 4](#) encapsulates the different actions and mechanisms required to implement the change and achieve such results in this particular case. The figure shows how the development of the integrated system was triggered by the alignment of actors' diverse interests which preceded the activities which focused on improving daily operations and signaling superior experience to customers. Next we explain how these three main remedies

Informant's role	Organization	Time, place and duration
Chief Physician	Pohjola Hospital	Sep-14–12, Pohjola Hospital (PH), 120 min Apr-18–17, PH, 87 min
Business Controller	Pohjola Insurance Services	Oct-15–13, PH, 45 min
CEO	Pohjola Hospital	Oct-15–13, PH, 90 min
Orthopedist A	Pohjola Hospital	Jun-13–16, Helsinki University Hospital, 60 min
Work Master* A	Pohjola Hospital	Jun-21–16, PH, 58 min
Work Master B	Pohjola Hospital	Jun-21–16, PH, 50 min
Work Master C	Pohjola Hospital	Jun-21–16, PH, 52 min
Head Nurse	Pohjola Hospital	Jan-4–17, PH, 110 min
Team Leader of Surgical Unit	Pohjola Hospital	Apr-5–17, City of Tampere, 52 min
Orthopedist B	Pohjola Hospital	Oct-3–17, PH, 42 min
Orthopedist C	Pohjola Hospital	Oct-6–17, PH, 48 min
Director of Health and Wellbeing Business	Pohjola Insurance Services	Oct-10–17, OP Group headquarters (OP), 60 min
Vice President	Pohjola Insurance Services	Oct-17–17, OP, 55 min
Physiatrist	Pohjola Hospital	Nov-02–17, PH, 70 min
<i>Workshop 1</i>		Oct-29–14, PH, 80 min
Chief Physician	Pohjola Hospital	
Business Controller	Pohjola Hospital	
Head Nurse	Pohjola Hospital	
<i>Workshop 2</i>		Dec-16–14, PH, 60 min
CEO	Pohjola Hospital	
Chief Physician	Pohjola Hospital	
Head Nurse	Pohjola Hospital	
Vice President	Pohjola Insurance Services	
Senior Manager	Pohjola Insurance Services	
Business Controller	Pohjola Insurance Services	
<i>Workshop 3</i>		Apr-22–15, PH, 70 min
CEO	Pohjola Hospital	
Chief Physician	Pohjola Hospital	
Business Controller	Pohjola Insurance Services	
<i>Workshop 4</i>		Dec-18–15, PH, 120 min
Chief Physician	Pohjola Hospital	
Work Master A	Pohjola Hospital	
Work Master B	Pohjola Hospital	
Work Master C	Pohjola Hospital	
<i>Workshop 5</i>		Oct-2–17, PH, 60 min
Chief Physician	Pohjola Hospital	
Director of Health Business	Pohjola Insurance Services	
Director, Business Development	Pohjola Insurance Services	
Head Nurse	Pohjola Hospital	
Orthopedist D	Pohjola Hospital	

Table 1.
List of interviews and workshops

(continued)

Informant's role	Organization	Time, place and duration
<i>Workshop 6</i>		
Director, Business Development	Pohjola Insurance Services	Feb-16–18, OP, 120 min
Business Intelligence Manager	Pohjola Insurance Services	
Data Analyst A	Pohjola Insurance Services	
Data Analyst B	Pohjola Insurance Services	

Note(s): *Work Masters helped customers manage work-related issues during rehabilitation (discussed later in the paper)

Table 1.

consisting of multiple actions in this particular case became to govern agency problems on multiple fronts.

4.1 Remedy 1: aligning diverse interests

While analyzing occupational accident reimbursements, Pohjola Insurance's management saw that sick leave compensations comprised a major portion of their compensation costs. This observation led them to ponder how to align providers' and insurers' diverse interests (i.e. govern the inherent agency problem). They realized that the critical remedy was to develop a system-level goal that, at least, most of the system participants could accept. The management concluded the goal could be the patient's rapid recovery and return to work because it aligns the interests of an employer, an employee, and, naturally, a payor. However, due to the risk aversion of providers, it seemed unrealistic that partner providers would accept this overall metric as the determinant of compensation (because of the high bargaining costs). Hence, Pohjola Insurance saw that the only way to introduce the goal into the provider's practices was to take ownership of a hospital, paving the way for the establishment of Pohjola Hospital. A patient's quick return to work then became the system-level goal, committing the CEO of the new hospital as well as the chief physician to continuously develop practices in pursuit of the goal. The events of setting the goal and establishing the hospital unfolded as follows.

4.1.1 Raising system improvements to the strategic agenda. In 2011, the new CEO of Pohjola Insurance highlighted the need to improve treatment chains when requesting a thorough analysis of the occupational accident reimbursements. The analysis revealed that the loss of earnings during sick leave caused almost two-thirds of the reimbursements and that the conventional way of managing the system by yearly service fee negotiations with private partner hospitals was not effective in decreasing the loss of earnings. The management concluded this to stem from the agency problem that arises when partner hospitals have no monetary incentive to shorten periods of sick leave when compensated on an FFS basis. Pohjola Insurance realized that one radical approach would be to take control and launch a payor-owned hospital that would focus on system-level improvements instead of suboptimization from a provider perspective. This step was not easy as many board members were worried about the potential adverse effect of the hospital on the company's brand. Despite the opposition, the board decided to proceed, and the new hospital was opened in Helsinki in early 2013.

4.1.2 Developing easy-to-measure system-level indicators. From the outset, the integrated service system's actions and communication emphasized patients' rapid return to work as the primary goal. The Pohjola Hospital system framed this goal as beneficial to the patient, his or

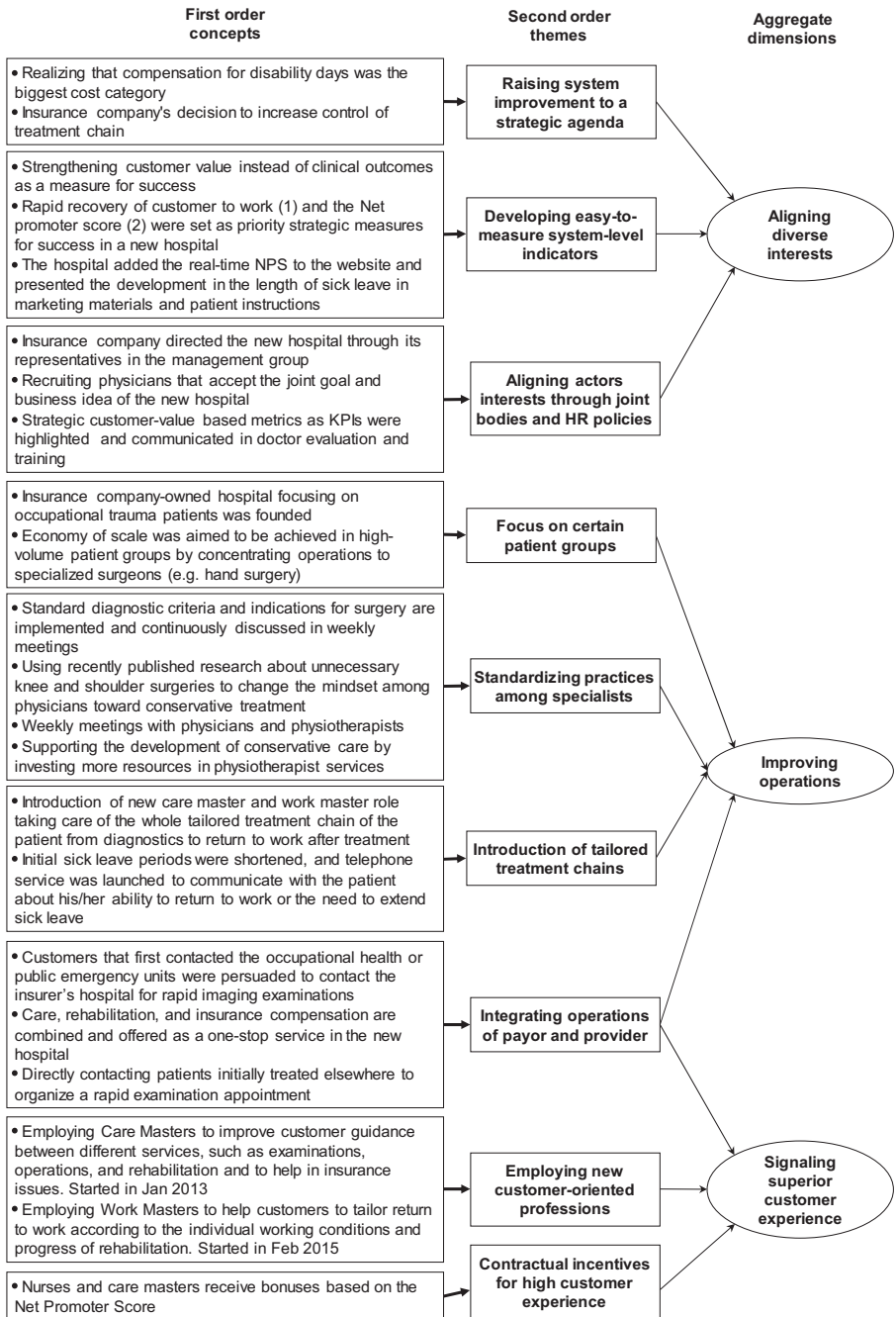


Figure 2.
Data structure

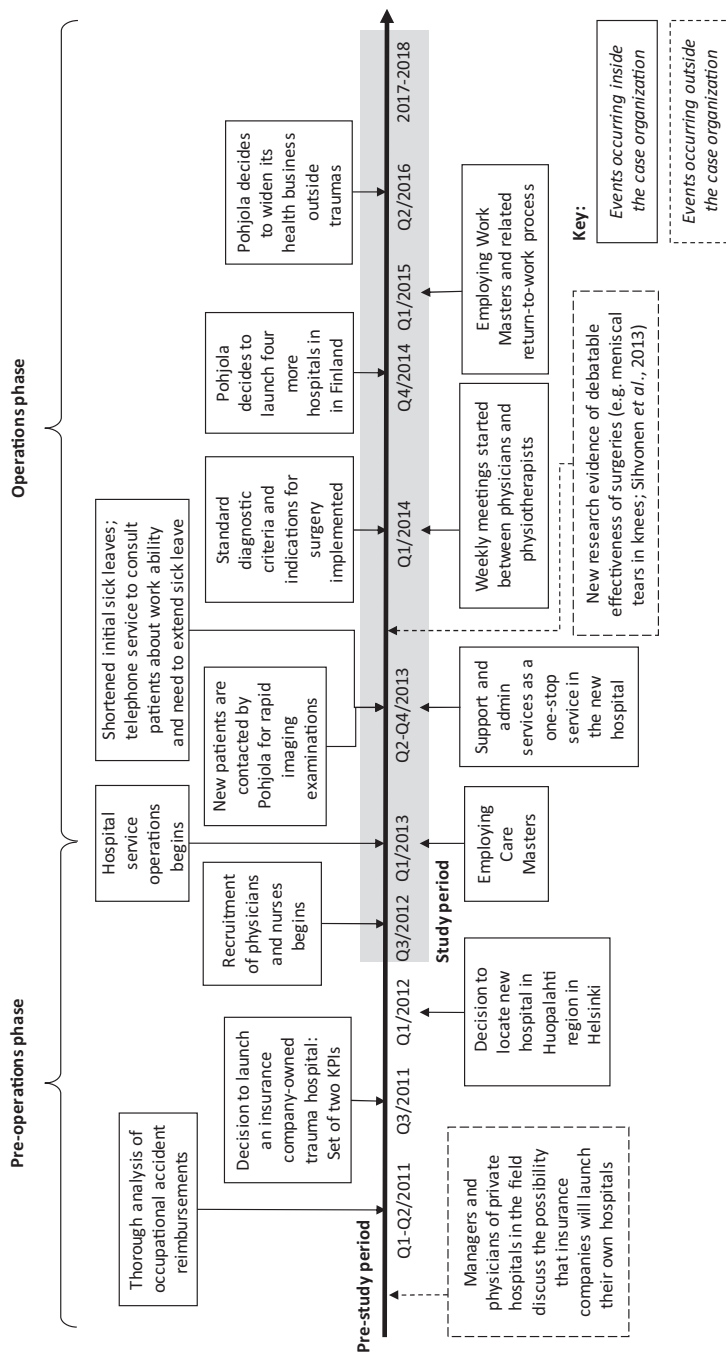


Figure 3. Timeline of the most prominent case events

her employer, and the integrated payor–provider. To ensure the clarity of the goal in the service system, the hospital measured real-time performance using two indicators: (1) the total length of patients’ sick leave periods and (2) the patients’ net promoter score (NPS) [2]. Those publicly released metrics were easy to measure and together represented and supported the new goal. The measurement system provided readily accessible information on whether treatment actions of individual physicians and supporting staff were producing the desired result (i.e. rapid recovery and high-quality care experience). Defining such measurement thus reduced information asymmetry and enabled a better outcome-based assessment of care governing agency problems.

4.1.3 Aligning actors’ interests through joint bodies and HR policies. After establishing the integrated hospital, reflecting on the strong norms in the field and the power of physicians, the FFS model was still used to compensate physicians who practiced within Pohjola Hospital. However, Pohjola Hospital could start with a clean slate and emphasize its strategic agenda while recruiting practitioners. Hence, in recruiting, training, and in personnel communication, the hospital highlighted customer satisfaction and the patient’s rapid recovery as the hospital’s key goals. Interestingly, all interviewed physicians underlined the overall customer orientation as their major motivational factor to work in the new hospital. They recognized that customer experience is a primary measure they can individually affect, and the patient’s rapid recovery is more related to the overall hospital culture in which all actors aim to serve the same customer in a coordinated manner to yield total health outcomes. Also, performance on both metrics was constantly debated in the hospital’s management group, which consisted of representatives from the hospital and the insurance services.

The CEO and the head physician of the new hospital also faced some challenges when aiming to align physicians’ interests with the KPIs. One radical idea was to connect specialists’ rental fees of the hospital facilities to the amount of sick leave they sign. The idea was shut down by the physicians and Pohjola Insurance. Thus, physician compensation was still conventional. Instead, at the beginning of the operations, some ideologically suitable but hesitant specialists were persuaded to work for the hospital by lowering their rental fees.

4.2 Remedy 2: improving operations

In Pohjola, physicians were not part of the integrated system but offered their services to Pohjola Hospital on an FFS basis. Hence, after aligning diverse interests of the insurer and the hospital through integration, the CEO and the head physician of the Pohjola Hospital needed

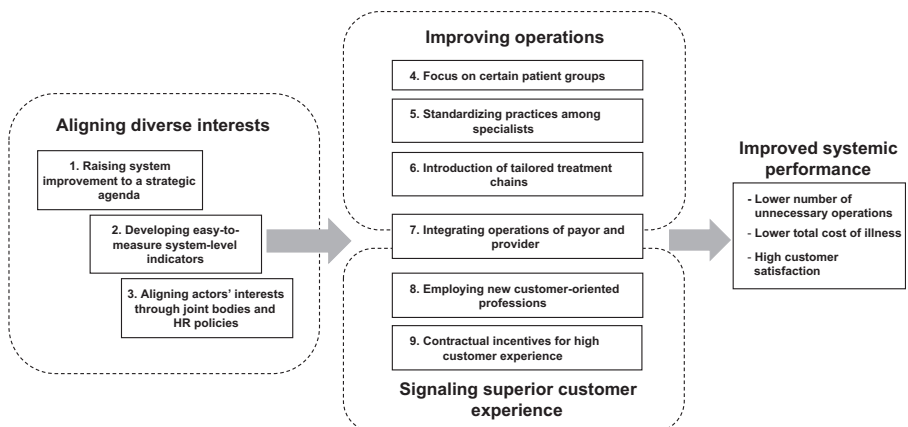


Figure 4. A sequence of stages to develop an integrated system for the mitigation of agency problems and improvement of operational performance

to find alternative means of governing agency relations between the physicians and the hospital at the operational level. In addition to aforementioned HR policies, remedies were found in operational improvements when managers and specialists of the new hospital started to shape the care practices to align them with the newly released and accepted system-level goal—a rapid return to work with high-quality customer experience.

4.2.1 Focus on specific patient groups. A large insurance company, as the owner, provided Pohjola Hospital with the ability to develop its operations without a need to get immediate positive cash flow but to focus on certain diagnosis groups (e.g. orthopedics and trauma care). While serving a wide range of patients, Pohjola Hospital focused its developmental efforts, according to the system-level goal, on medical conditions that were typical in occupational trauma—such as knee, shoulder, and wrist injuries, and in which the rapid recovery was achievable. Through focusing, patient volumes in those groups were increased, which helped to recruit highly recognized specialists. The efforts followed crucial features of value-focused systems (Porter and Kaplan, 2016): reorganizing care delivery around medical conditions and a sufficient volume of cases to develop deep expertise. In addition, increased focus supported subsequent activities to develop new standardized treatment practices and tailored treatment chains.

4.2.2 Standardizing care practices among specialists. At the patient group level, vertical integration and the inherent focus on certain patient groups created the conditions for management–profession collaboration to define effective and efficient standard treatment practices. The head physician (who later became the CEO of Pohjola Hospital) organized weekly meetings, where physicians discussed standardized diagnostic criteria and care procedures. This standardization did not happen in a vacuum, it was aimed at aligning decision making on care procedures with recently published clinical research and new national care guidelines that supported conservative care (see, e.g. Sihvonen *et al.*, 2013). The overarching goal was to deter surgeons from performing unnecessary surgeries but instead to choose conservative care whenever it was reasonable to ensure patients' rapid recovery and return to work. Individual physicians were still given the freedom to decide on the treatment method, and meetings were seen as a forum to get information on the most recent evidence-based care practices as well as support from colleagues to make a decision or to try new approaches in unclear situations.

Finally, these coordination efforts decreased the number of surgical patients, especially patients with injuries in which the effectiveness of surgery was debatable, such as meniscal tears in knees. The new practices and services emphasized the comprehensive paradigm shift from a maximum amount of treatment to care effectiveness resulting in rapid recovery and shorter sick leave periods. The disruptive innovation in favor of conservative care required the promotion of new evidence-based care practices at the operational level to align actors within the integrated service system.

4.2.3 Introduction of tailored treatment chains

Immersion in the problem of rapid recovery raised the need not only to develop effective standard practices but also to facilitate customized treatment chains, such as the creative bundling of standardized service components if a patient's condition and context required that. As a response, the hospital introduced new *care master* and *work master* roles, which assumed the responsibility of overseeing the patient's entire treatment chain from diagnosis, to treatment, and finally, to the patient's return to work. The physician was still responsible for decisions concerning which treatment chain (e.g. surgery vs conservative care) to choose based on the standardized diagnostic criteria. The care master was responsible for informing and guiding the patient through the procedures of the recommended treatment chain. Such a new mediator role between the patient and the provider ensured that the patient knew what would happen next and why and when it will happen; hence, reducing information

asymmetry. The work master role was designed to provide patients with additional help and services, especially when the injury and resulting treatment required adapting to work and everyday life. Periods of sick leave were also better customized to fit a patient's needs.

4.3 Remedy 3: signaling superior customer experience

The findings suggest that, along with the activities governing effective and efficient treatment, managers of the new hospital paid specific attention to superior customer service and experience to avoid negative associations with integrated health-care delivery. In other words, Pohjola Hospital needed to send a strong message (i.e. signal) to its patients that their care would not be compromised even though the payor and provider shared a common bottom-line. In being able to walk the talk, Pohjola Hospital needed actual improvements to offer a higher customer satisfaction of care than its competitors.

4.3.1 Integrating daily operations of payor and provider. Pohjola Insurance improved its instructions for patients who had initially contacted their occupational health provider or public hospitals. The new instructions directed patients to go for medical examinations immediately but allowed them to choose either Pohjola Hospital or a partner hospital. Pohjola Hospital procured the best available high-capacity magnetic imaging equipment that facilitated rapid diagnostic and consequent access to care. In parallel, Pohjola Insurance established a service point inside Pohjola Hospital to help customers manage administrative tasks (e.g. compensation decisions) during their first examination at the hospital. As an outcome, integrated operations contributed to both cost-efficient back-end processes (improving operations) and streamlined front-end processes for customers (signaling high customer service) hence, placed in the middle of [Figure 4](#).

4.3.2 Employing new customer-oriented professions. The incorporation of the two new professional roles, care masters and work masters, strengthened the customer-centric focus of the new hospital. Care masters helped patients navigate between services at the hospital, and work masters helped customers manage work-related issues, such as a modified working environment during rehabilitation and seeking options for part-time work. Although the work masters also facilitated the rapid return to work, their background as social workers, members of the clergy, and pedagogues allowed them to assist patients with their everyday problems, thus improving the customers' experiences by accounting for the totality of their needs.

4.3.3 Contractual incentives for excellent customer experience. The nurses' and care masters' salaries were connected to the customer experience through bonuses paid based on the NPS. This contractual incentive aligned each employee's daily activities more closely with high-quality service. The NPS survey was the only systematic way for a patient to give feedback to the provider, so connecting personnel bonuses to it rather than to patients' return to work decreased the agency problem related to contracts that maximize efficiency but not patients' well-being.

Achieving and signaling superior customer experience required significant investments in hospital resources and services. However, to mitigate the effect of managed care backlash, it was necessary to show customers that the new hospital would be attentive to patients' medical and nonmedical needs.

4.4 Positive outcomes

The informants provided anecdotal evidence that Pohjola Hospital was outperforming its competitors and that customer satisfaction was kept at a high level. Pohjola Hospital measured their customer satisfaction through NPS, which is an anonymous scoring system for measuring a customer's willingness to promote the consumed product or service [3]. Pohjola Hospital's monthly aggregate NPS can be seen in [Figure 5](#), which indicates a high level of customer satisfaction.

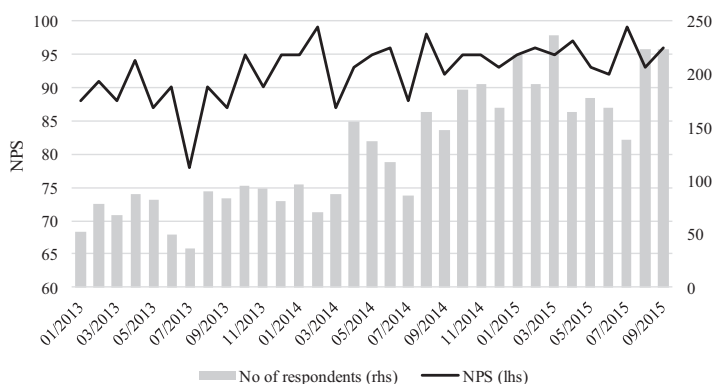


Figure 5.
Pohjola Hospital's
monthly average net
promoter score 1/2013–
9/2015

Regarding actual performance, the chief physician, among others, claimed that the integration led to lower total cost of illness by focusing on patient's rapid recovery and return to work, decreasing unnecessary operations, favoring conservative care practices, and introducing the new care and work masters who personally helped patients during the time of recovery. Hence, the hospital management believed that improving operational performance in certain areas (e.g. favoring conservative care) combined with the investments in other areas (customer services) led to overall performance improvements, decreasing the total costs of occupational accidents while maintaining high customer satisfaction.

In conclusion, the fundamental question in a successful payor-provider integration is whether the cost reduction caused by mitigating agency problems between payors and providers and the internal improvements in operations offsets the cost increase caused by additional investments in customer service. The quantitative study phase, reported in the following section, sought to answer this question.

5. Quantitative study phase

To evaluate the performance of the integrated system, three working hypotheses were formed motivated by this study's qualitative findings. It should be noted that despite the formulation and testing of hypotheses, the aim of the quantitative part is not to develop and test a generalizable theory, as the sample is restricted to Pohjola Insurance patients. Hence, this phase's aim is more modest and it provides numerical support that payor-provider integration in the Pohjola case actually led to improved performance.

5.1 Working hypotheses and model

As explained earlier, Pohjola Hospital aimed to decrease the total costs of an occupational accident by shortening periods of sick leave, as the lost time of work comprises a significant portion of costs for the insurance company. Hence, reductions in sick leave periods became a strategic priority and acted as a system-level goal for the whole integrated health-care system. Pohjola Hospital's predominant means to shorten sick leave periods, especially in cases of orthopedic trauma, was to avoid unnecessary surgeries in favor of conservative care and rehabilitation. These reductions in the total cost in the integrated system can therefore be traced through the reduced likelihood of undergoing a surgery, leading to shorter average sick leave periods. Conceptually, this can be understood as a serial multiple-mediator model. Thus, the first hypothesis was generated:

Working hypothesis 1. The effect of treatment at an integrated hospital on the total costs of an occupational accident is sequentially mediated by likelihood of undergoing surgery and the length of the sick leave period, thus producing a negative (cost-decreasing) indirect effect.

However, this study's qualitative findings, as well as past research on managed care backlash (e.g. Miller, 2006), indicate that an integrated hospital needs to invest in improving customer experience (e.g. offer better support services and improved care experience) to avoid managed care backlash. Therefore, these improvements may lead to an increase in care costs. Thus, the second hypothesis was generated:

Working hypothesis 2. Treatment at an integrated hospital has a positive (cost-increasing) direct effect on the total costs of an occupational accident.

To stay competitive, it can be assumed that the negative cost effect of shortened sick leave periods should offset the investments in customer experience, making an integrated system overall more cost-efficient than a nonintegrated system. This leads to the final hypothesis:

Working hypothesis 3. Treatment at an integrated hospital has a total negative (cost-decreasing) effect on the total costs of an occupational accident.

Figure 6 summarizes the hypotheses into the serial multiple-mediator model and reports the results and empirical test with 2,726 Pohjola Insurance patients. The data, analysis, and results are explained in the following sections.

5.2 Data and sample

The overall quantitative dataset consisted of a subset of all patient cases covered by Pohjola Insurance Services from 2002 to 2015. The total dataset (more than 20,000 patients) was narrowed by using the following criteria. First, patient cases treated between 2013 and 2015 after the introduction of Pohjola Hospital were chosen. Second, orthopedic trauma cases in which conservative care (as opposed to surgery) might have opportunities for significant cost savings were isolated and three ICD-10 diagnosis types and their subtypes were analyzed: S46 (injury of muscle, fascia, and tendon at shoulder and upper arm level), S43 (dislocation and sprain of joints and ligaments of shoulder girdle), and S83 (dislocation and sprain of joints and ligaments of the knee). These diagnoses were highly represented in the dataset, comprising more than 50% of all treated cases during the given period. Concentrating on these diagnoses helped control the variation while providing sufficient statistical power. All three diagnoses shared a similar treatment pattern, typically beginning with magnetic resonance imaging, followed by the decision to conduct surgery or apply conservative treatment through physiotherapy and medication.

Third, the maximum period of sick leave was limited to 270 days to eliminate potential chronic cases. Patient cases entered into the system less than 270 days before the end of the

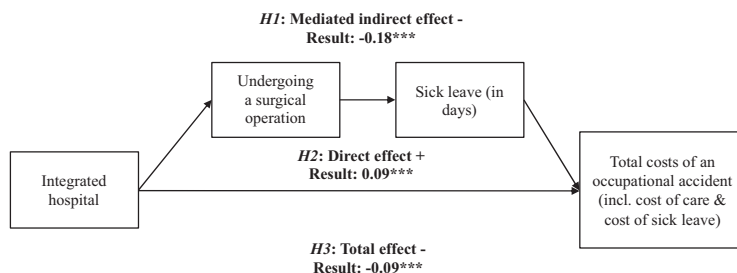


Figure 6.
Serial multiple-mediator model

observation period (the end of 2015) were deleted; this ensured the dataset did not contain “open patient cases” and almost all the observed patients had returned to work (i.e. rate of recovery of 96.5% in total; 96.8% for Pohjola Hospital’s and 96.2 % for the partner hospitals’ patients). Furthermore, the minimum length of the realized sick leave period was set as one day to delete the minor patient cases. Finally, patient cases that did not have any incurred costs and one individual case with relatively high costs were eliminated, all of which indicated possible mistakes in the system. The data manipulation led to a final sample of 2,726 patients, 40% of whom had been treated at Pohjola Hospital and the rest at FFS-compensated partner hospitals.

5.3 Variables

5.3.1 Dependent variable. The total cost of an occupational accident was used as the dependent variable. This included all costs incurred by the insurance company from a patient’s occupational accident—such as the direct cost of care and sick leave costs. All costs were inflation-corrected and measured in euros. However, as this study concerns measuring cost changes (better described as percentages), a natural logarithm transformation was applied to the dependent variable of total costs, leading also to significantly improved normality of residuals.

5.3.2 Explanatory and mediating variables. The independent variable of interest, *payor-provider (PP) hospital*, was a binary variable indicating if the patient was treated at Pohjola Hospital (= 1) or one of the 22 partner hospitals (= 0).

The first mediator variable, *surgery*, was a binary indicating if a patient’s treatment chain included a surgical operation (= 1) or not (= 0). This variable was constructed by identifying surgical procedures from the Nordic Medico-Statistical Committee procedural codes recorded in each patient’s treatment chain. Regarding the second mediator variable, *sick leave*, the logarithm transformation was similarly applied to the original measure of the total length of the realized sick leave period in days.

5.3.3 Control variables. Standard demographic control variables of age in years and a binary variable of sex (1 = male), were used, as they may influence the likelihood, severity of and recovery from an occupational accident (Chau *et al.*, 2002). Furthermore, the chosen diagnosis types (S83, S46 and S43) were used as dummy variables to control for variation. S46 was used as the baseline. In a similar vein, a dummy variable was formed for each year of the analysis (2013, 2014 and 2015); 2013 was used as the baseline.

The patient’s profession affects the total costs due to differences in average salaries, as well as the likelihood and severity of occupational accidents. Therefore, the analysis controlled for *profession*, constructed by using the first digit of the Nordic Occupational Classification. See Appendix 2A for the detailed list of the 10 control categories. Category 1 was treated as the baseline.

5.4 Analyses

The hypothesized multiple-mediator model was tested using the multiple regression approach (MacKinnon, 2008). Because the first mediator was a binary variable (*operation*), the first path of the indirect effect had to be estimated using logistic regression (Model 1). The remaining two paths were estimated with ordinary least squares (OLS) regression (Models 2 & 3). To evaluate the total indirect effect by using path estimates, the estimates of these separate models were standardized (MacKinnon, 2008). The standard errors and the significance levels for the mediated indirect, direct, and total effects were then estimated using bootstrapping with 1,000 replications (Preacher and Hayes, 2008). The statistical software package Stata/MP 15.0 was used to run the analyses (the Stata code used is available from the authors).

5.5 Results

Descriptive statistics and correlations are available in Table A2. Table 2 reports the results of the individual regression models—showing unstandardized coefficients, standard errors (in parentheses), and standardized coefficients (below). For improved readability, the table shows the coefficients of the hypothesized paths by including all controls, while the coefficients of the controls [4] are available in Table A3.

The results of Model 1 indicate that treatment in Pohjola Hospital decreased the likelihood of undergoing surgery ($b = -0.38, p < 0.001$). The coefficient can be transformed into an odds ratio of 0.68, of which the reciprocal ($1/0.68 = 1.48$) gives an interpretation that it is nearly one and half times more likely that a patient will undergo surgical operation when treated in a partner hospital. Model 2 shows treatment in Pohjola Hospital had a statistically significant negative effect on the number of sick leave days ($b = -0.1, p < 0.01$), meaning that sick leave periods were 10% shorter than in the partner hospitals. Finally, Model 3 estimated the final mediator path and the direct effect of an operation on total costs, showing that treatment in an integrated hospital increased the total costs ($b = 0.09, p < 0.001$), a result that will be explained in more detail.

The bottom rows of Table 2 report the results of the mediator analysis attained with bootstrapping. All hypothesized effects were statistically significant. For ease of interpretation, the standardized coefficients were unstandardized (listed in the rightmost column). The results show treatment in a payor-provider hospital reduced the total costs of an occupational accident by 9% (total effect, $b = -0.09, p < 0.01$). As hypothesized, this decrease seemed to be achieved through the decreased likelihood of undergoing a surgical operation further decreasing the length of sick leave. This mediated effect would result in an 18% decrease in the total costs of an occupational accident (indirect effect, $b = -0.18, p < 0.001$). However, as hypothesized, the direct effect of treatment in the payor-provider hospital increases the total costs by 9% (direct effect, $b = 0.09, p < 0.001$), which partially offset the mediated effect.

	Model 1 surgery Coeff. (SE) beta coeff.	Model 2 In (sick leave) Coeff. (SE) beta coeff.	Model 3 In (total cost) Coeff. (SE) beta coeff.
Method	Logistic	OLS	OLS
Controls	Included	Included	Included
<i>Hypothesized variables</i>			
PP hospital (0/1)	-0.38 (0.08)***	-0.10 (0.03)**	0.09 (0.02)***
	-0.1	-0.05	0.04
Surgery (0/1)		0.96 (0.03)***	0.37 (0.02)***
		0.47	0.2
Ln (sick leave)			0.73 (0.01)***
			0.79
Constant	0.13 (0.27)	3.37 (0.11)***	5.81 (0.06)***
R^2		0.36	0.83
F		91.5***	749.2***
Chi-Square	197.63***		
N	2,726	2,726	2,726
<i>Bootstrapped results of mediator analysis (1,000 permutations)</i>			
	Standardized Coefficients (B')	Bootstrapped Std. Err	Unstandardized Coefficients (B = B' * SD _y / SD _x)
Indirect effect (H1-)	-0.09***	0.02	-0.18***
Direct effect (H2+)	0.04***	0.01	0.09***
Total effect (H3-)	-0.05**	0.02	-0.09**
Note(s): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$			

Table 2.
Results of individual
regression and
bootstrapped mediator
analyses

6. Discussion

6.1 *On the process of change: overcoming the resistant to ensure positive outcomes*

This study sought to understand how integration between a payor and a provider of health care can mitigate agency problems and improve the performance of an occupational trauma care system. A longitudinal study was used to show how Pohjola Insurance Services established a vertically integrated hospital to ensure patients' rapid recovery and timely return to work after an occupational accident. This system-level goal proved beneficial to multiple actors (i.e. an insurer, an employer, and an injured employee) within the health-care system. However, the case highlights that an integrated system is not built overnight but requires a careful analysis of the sequence of stages affecting the process of change (illustrated in Figure 4) through which the new goal is formed and legitimized among diverse stakeholders, and the corresponding integrated hospital infrastructure and mundane operations are established.

The qualitative findings indicated that integration decreased goal conflicts between the integrated hospital and the physicians and helped realign treatment practices to favor conservative care practices. Literature has shown how medical professionals have been especially careful to protect their practice from structural changes that contradict their goals and meaning systems by using professional power to degrade the effects of new rules, regulations, and configurations (Currie *et al.*, 2012; Kellogg, 2009). The findings of this study on the integrated system suggest that managers can mitigate and even utilize this professional power by combining selective recruitment, use of evidence-based care guidelines, and support to use collegial feedback in medical decision-making. Although the transition toward aligned goals and practices was also confronted with challenges, such as the fact that minority of doctors continued to focus on performing as before, the results of this study suggest that, at least, in newly established hospitals, where individual managers and professionals have more power to shape overall practices, the informal remedies could pave the way for the dissemination of new care practices that are beneficial to all parties of the health-care system. In this regard, the findings of this study are in line with research on microprocesses to legitimize new practices, which suggests giving more authority to hybrid actors (i.e. professionals with more managerial responsibilities) such as in our case the head physician who later became the CEO of Pohjola Hospital (Reay *et al.*, 2006).

In addition, integration led to other operational improvements such as mass-customized treatment chains, which allowed consideration of patients' specific needs as well as signaled an excellent customer experience in the insurer-owned hospital. Previous research on managed care programs and integrated systems has reported distrust and a decrease in customer experience (Mechanic, 2004; Miller, 2006). The results of this study indicate that in an integrated system, high customer experience should be considered seriously at all levels—including strategic KPIs of the system, marketing and customer communication, and investments in superior and new operational resources and practices. Furthermore, the quantitative analysis of the Pohjola Insurance Services patient data from 2013 to 2015 showed that payor-provider integration was effective in decreasing the number of unnecessary operations and length of sickness leave, which then resulted in improved performance by significantly decreasing the total costs of occupational accidents. Naturally, there is always a high potential for false-positive errors in this study's analysis, a topic discussed next.

6.2 *Alternative explanations and generalizability: does integration explain the increased performance?*

The results of this quantitative study, as well as the evidence from the qualitative inquiry, suggest that, in this study, the integrated hospital can outperform its peer hospitals. Valid

questions such as “What could have been alternative causes of performance improvement and how far outside this study’s context can the findings be extrapolated?” arose. These concerns are addressed in the paragraphs below.

The quantitative analysis indicates that the performance of Pohjola Hospital can be explained by the decrease in unnecessary surgical operations. The qualitative findings suggest that this stems from the fact that the integrated system lacks the perverse incentive given to the FFS-compensated providers to conduct highly profitable surgeries even when there is no clear medical justification.

Of course, the performance improvements (measured as decreased total costs of illness) may stem from improved operational efficiency of the Pohjola Hospital, which became specialized in orthopedic trauma indicating a potential creation of a *specialty hospital* (Barro *et al.*, 2006), while the partner hospitals perhaps aimed to serve a much broader patient population. There are at least three reasons to assume that operational efficiency purely due to specialization was not the primary and only cause of the performance improvement. First, despite standardizing the treatment procedures, Pohjola Hospital did not explicitly focus on specific patient groups but welcomed all Pohjola Insurance customers. Hence, no evidence suggests that any patient selection occurred (e.g. concentrating only on profitable and easy-to-treat groups), which would be a typical approach in specialty hospitals (Barro *et al.*, 2006). Second, this study’s quantitative model suggests that the direct effect, accounting for all other unmeasured factors (and their interactions), such as operational improvements, is positive (cost-increasing). This finding indicates (but does not prove) that Pohjola Hospital could actually be operationally more inefficient than the partner hospitals, but the performance improvements resulted from the decrease in the high cost of operations resulting in rapid recovery of patients.

Third, considering the quantitative model might not fully grasp the complex empirical reality (as no model fully does), an important mediator of operational improvements between performance and integration might indeed be lacking. This means that operational improvements may actually be the real result of integration as the qualitative findings of this case indicate. However, the quantitative data did not permit measuring this directly. The rationale for a relationship between integration and operational performance through specializing is that the integration *per se* may allow asset specificity (i.e. standardizing the care of specific patient groups), which would not be possible in a nonintegrated generalist system (for a theoretical proof, see Gibbons, 2005). This blurs the line between agency theory and transaction cost economics, but as Gibbons (2005, p. 16) stated, “Models of incentives between firms are incomplete unless they include something like asset ownership.” The model used in this study, like any other model, is incomplete but it can still give some insights into the potential performance gains of integration (i.e. “All models are wrong, but some are useful”).

How far outside the Pohjola case or the Finnish context can the findings of this study be extrapolated? First, the case is exceptional, even in the given context. No other such arrangement exists in Finland. Therefore, at best, the findings of this study can only be analytically generalized (Halkier, 2011). This implies that it cannot be bluntly stated that vertical integration leads always to better performance, but integration requires much more nuanced and situated mechanisms to ensure that the original idea (of governing agency problems) is put into practice. In this case, the managerial effort resulted in a positive outcome because the hospital recruited like-minded physicians and there was a medical justification for the system-level goal (i.e. avoiding unnecessary operations). But, naturally, not all organizations, especially physicians, are that responsive to change.

Another critical aspect is customers’ reaction to integration, which in the US has resulted in the managed care backlash. It is common knowledge that freedom of choice is highly valued among US customers (Mechanic, 2004). This is a natural tendency when one pays a significant amount of money out of one’s pocket for insurance. However, this is not the case in

Finland, where employers pay the major share of employees' occupational insurances and the majority of citizens use public health care for their private health matters instead of private insurances. The Finnish system makes patients potentially more indifferent in selecting their care provider. Thus, the context of this case might initially be a less fertile breeding ground for managed care backlash when compared to the US (or another fully insurance-based context). Nevertheless, the analytical generalization argument holds, meaning that the signaling mechanisms identified in this study may vary from one context to another but the vital point is that an integrated hospital, no matter the context, should clearly indicate that customer well-being is not compromised.

7. Conclusions

A longitudinal multimethod case study of Pohjola Hospital, utilizing both qualitative and quantitative methods was conducted to address the question: How does payor-provider integration affect agency problems and the operational performance of an insurance-based occupational health service system? The observed integrated Pohjola Hospital achieved a 9% decrease in the total cost of illness in three major diagnosis groups when compared to contractually compensated partner hospitals. Furthermore, this paper explains, in detail, the sequence of actions through which the integrated hospital was established and how it led to the mitigation of agency problems and the observed performance improvements. It can be observed that despite being constrained by one case and one setting, this study's findings provide valuable implications to both theory and practice while opening exciting avenues for future research.

7.1 Research implications

This empirical study delineates three specific contributions to different streams of literature focusing on agency problems in multiactor health-care service systems.

First, this study contributes to the supply chain management literature utilizing agency theory (Mahoney, 1992; Gibbons, 2005; Fayezi *et al.*, 2012) by showing that in the context of occupational health care, vertical integration can lead to the better governance of agency problems, resulting in increased operational performance. More specifically, this study shows that vertical integration allows the introduction of multiple formal and informal governance mechanisms, helping to incentivize the multiple actors to work for the welfare of the total system, not just their self-interested benefits. In addition, this paper delineates factors (i.e. the identified activities and mechanisms depicted in Figure 4) that affect the way a change toward an integrated system may unfold. These findings also add to the classical make-or-buy dilemma in operations management, hence diluting the line between transaction cost economics and agency theory (Gibbons, 2005).

Second, the study contributes to the more specialized literature on health-care management and vertical integration in health care (Kreindler *et al.*, 2012; Mechanic, 2004; Miller, 2006) by reporting an exceptional case in which integration of the payor and the provider led to improved performance (measured through total cost of illness) while maintaining high customer satisfaction (measured through patient-reported NPS). Despite being a potential exception proving the rule, the case illustrates the crucial mechanisms behind the integration, which may lead to improved outcomes. The main improvement effect was claimed to stem from the possibility to focus on a system-level goal of rapid recovery to work, which would have been challenging to incentivize in a nonintegrated system. This overarching goal aligning diverse interests was complemented with various governance mechanisms to mitigate agency problems and yield operational improvements. The longitudinal design of the qualitative stage also facilitated the analysis of the actual change process and hence the interrelations between the identified mechanisms. Finally, the

quantitative analysis verified the claimed performance improvements by showing that in the typical orthopedic injury treatment cases Pohjola Hospital could achieve a 9% decrease in the total costs of occupational accidents without compromising customer satisfaction. This study is likely the first to empirically validate such an increase in the performance of a health-care system achieved through payor–provider integration. Hence, being a black swan (or not), this study’s case will hopefully inspire further research to validate its findings in other contexts.

Finally, the results contribute to an emerging research paradigm in health-care operations management (i.e. HOM 2.0, cf. [Dai and Tayur, forthcoming](#)), which calls for examining the interactions between multiple actors within a health-care service system. Indeed, this study’s findings show agency problems arise and thus need to be governed on different levels of the system (e.g. payor–provider vs. hospital–physician relations). This study finds vertical integration allowed the direct governance of the moral hazard on the payor–provider level. The system-level goal and openly published KPIs triggered continuous development activities within the hospital’s operations (e.g. by standardizing processes and practices), which began to govern agency problems on the hospital–physician level. Furthermore, the introduction of new organizational roles (care and work masters) responsible for tailoring the treatment chains reduced information asymmetry between the hospital and the patient and, therefore, mitigated patients’ distrust of an integrated system (i.e. managed care backlash).

7.2 Managerial implications

This study shows that optimizing efforts within the boundaries of a single organization is not always effective on the system level. For example, by purchasing separate care components from the market (based on the lowest price), one gains only incremental improvements at best while possibly becoming more susceptible to agency problems that might diminish the performance of the whole system. However, payor–provider integrated systems can be built to meet a system-level goal that benefits multiple actors in the health-care system, also increasing their legitimacy among actors. Implementing a well-functioning integrated system requires managers to induce specific mechanisms to align the incentives of different parties—such as the use of outcome metrics and incentive systems. In addition to clinical outcome metrics, managers should also use patient-reported experience measures (PREMs) and patient-reported outcome measures (PROMs), such as customer-perceived quality of the service, and the delay in patients’ return to work.

In an integrated system, transaction-based operation models are replaced with joint ownership by two organizations operating under entirely different perspectives, which requires an alignment of the organizations’ strategies and values, hence rigorous change management. The integrated model may require a paradigm shift among health-care professionals by inviting them to critically evaluate traditional practices, treatment methods, and roles. This study showed that managers in insurance companies and health-care organizations must pay special attention to formulating a robust medically justified agenda for the change, which is then turned into a clear goal developed and accepted by the critical stakeholders of the system. Furthermore, such a shift may require the development of new organizational roles, capabilities and practices, such as deploying work masters or implementing multiprofessional teams, to form a more comprehensive understanding of the patients’ context.

7.3 Limitations and future research

The study was conducted in the context of an occupational accident insurer in Finland limiting generalizability of study findings to other service systems, patient groups, or social settings. However, this study provides important analytical illustrations about the possible

mechanisms behind the integration, of which further elaboration in another context may pave the way to improved management practice.

Also, the serial multiple-mediator model assumes causality among the constructs that should always be approached with care. The longitudinal data partially meet the causality assumption because the analyzed decision on a care provider and treatment precede sick leave and accumulation of total costs. Naturally, the claimed causality might be hampered by an omitted selection, as the study could not control who was sent to Pohjola Hospital for treatment. However, the informants claimed they did not exercise any control; instead, the patients' decisions were based on the patients' wishes. Furthermore, the study tried to mitigate omitted cause bias by including necessary and theoretically justified control variables. Nevertheless, further research in a more controlled environment is advised.

Furthermore, the explicit analysis of patients' influence in the decision-making regarding their health-care services was out of the scope of this study, although patients can be considered active decision-making agents. For example, the decision of whether to operate on a patient's knee might depend on the patient's qualities and personal goals. Although the patient's involvement was not measured, qualitative evidence was gained that new care master roles helped to decrease information asymmetry when treatment chain transparency increased. To develop a further understanding of agency issues on the patient-hospital interface, explicitly acknowledging the patient's agency in the comprehensive care process is advised in the future studies.

Finally, despite the specific focus on vertical integration, the important question is could some, if not all, mechanisms be effectively implemented without ownership-based organizational form? Vertical integration allows a stronger managerial control, but managerial and norm-based governance can be extended beyond organizational boundaries—for example, through relational contracting (Vandaele *et al.*, 2007), which has remained a surprisingly marginal approach in health care. For instance, in this study, despite calling other hospitals “partners,” Pohjola Insurance compensated them on an FFS basis representing more an arm's length relationship than true partnering. Questions related to effective governance through relational or more network-based governance mechanisms (e.g. long-term contracts, shared practices, trust, and interpersonal relations) and structures (alliances, joint ventures, etc.) are left for future research. Researchers should explore the mechanisms through which complete health-care systems can be operated to produce higher value to all stakeholders.

Notes

1. In the Finnish health care system, employers must provide employees with a statutory occupational accident insurance, which covers accidents both at work and on the commute to work. The insurance covers the cost of examinations, care, and rehabilitation, as well as the loss of income during the whole period of sickness. The victim of an occupational accident can choose the care provider (typically a private hospital), who the insurer compensates on an FFS basis.
2. Technically, the Pohjola hospital was still reimbursed in a fee-for-service way by Pohjola Insurance. However, transfer pricing rules within enterprises were followed, and, according to the Pohjola Hospital's public financial statements during the study period, the hospital's profit was around 1.5%–3% of the revenue, indicating the services fees reflected the actual production costs.
3. The net promoter score is based on one question: “How likely is that you would recommend our company or service to a friend or colleague?” The respondents give their answer on a scale of 0–10. Ratings from 9 to 10 describe that the respondent is extremely likely to recommend the service; a 7–8 rating means the respondent will not actively recommend the service; a 0–6 rating means the respondent is extremely unlikely to recommend the service. The respondents who give a rating of 9–10 are called promoters, and those who respond with a 0–6 rating are called detractors. The net promoter score value is the percentage of promoters minus the percentage of detractors.

4. Some of the professions' controls appeared significant—which is as hypothesized, as some professions may systematically impact on the likelihood of an occupational accident and the required treatment, as well as the size of sick leave allowances and hence the total cost of care.

References

- Barratt, M., Choi, T.Y. and Li, M. (2011), "Qualitative case studies in operations management: trends, research outcomes, and future research implications", *Journal of Operations Management*, Vol. 29 No. 4, pp. 329-342.
- Barro, J.R., Huckman, R.S. and Kessler, D.P. (2006), "The effects of cardiac specialty hospitals on the cost and quality of medical care", *Journal of Health Economics*, Vol. 25 No. 4, pp. 702-721.
- Blendon, R.J., Brodie, M., Benson, J.M., Altman, D.E., Levitt, L., Hoff, T. and Hugick, L. (1998), "Understanding the managed care backlash: regardless of how well their plans perform today, people in managed care have greater fears than their traditionally insured peers do that their plan will fall short when they really need it", *Health Affairs*, Vol. 17 No. 4, pp. 80-94.
- Board, S. (2011), "Relational contracts and the value of loyalty", *American Economic Review*, Vol. 101 No. 7, pp. 3349-3367.
- Boonen, L.H. and Schut, F.T. (2011), "Preferred providers and the credible commitment problem in health insurance: first experiences with the implementation of managed competition in the Dutch health care system", *Health Economics, Policy and Law*, Vol. 6, pp. 219-235.
- Burns, L. and Muller, R. (2008), "Hospital–physician collaboration: landscape of economic integration and impact on clinical integration", *Milbank Quarterly*, Vol. 86 No. 3, pp. 375-434.
- Chau, N., Mur, J.M., Benamghar, L., Siegfried, C., Dangelzer, J.L., Francois, M. and Sourdot, A. (2002), "Relationships between some individual characteristics and occupational accidents in the construction industry: a case-control study on 880 victims of accidents occurred during a two-year period", *Journal of Occupational Health*, Vol. 44 No. 3, pp. 131-139.
- Choi, T.M., Cheng, T.C.E. and Zhao, X. (2016), "Multi-methodological research in operations management", *Production and Operations Management*, Vol. 25 No. 3, pp. 379-389.
- Claffey, T.F., Agostini, J.V., Collet, E.N., Reisman, L. and Krakauer, R. (2012), "Payer-provider collaboration in accountable care reduced use and improved quality in Maine Medicare advantage plan", *Health Affairs*, Vol. 31, pp. 2074-2083.
- Currie, G., Lockett, A., Finn, R., Martin, G. and Waring, J. (2012), "Institutional work to maintain professional power: recreating the model of medical professionalism", *Organization Studies*, Vol. 33 No. 7, pp. 937-962.
- Dai, T. and Tayur, S.R. (forthcoming), *Healthcare Operations Management: A Snapshot of Emerging Research*, Manufacturing and Service Operations Management, Published online in Articles in Advance 01 Aug 2019, doi: [10.1287/msom.2019.0778](https://doi.org/10.1287/msom.2019.0778).
- de Blok, C., Luijkx, K., Meijboom, B. and Schols, J. (2010), "Modular care and service packages for independently living elderly", *International Journal of Operations and Production Management*, Vol. 30 No. 1, pp. 75-97.
- Dranove, D. and White, W.D. (1987), "Agency and the organization of health care delivery", *Inquiry*, Vol. 24 No. 4, pp. 405-415.
- Drupsteen, J., van der Vaart, T. and van Donk, D.P. (2013), "Integrative practices in hospitals and their impact on patient flow", *International Journal of Operations and Production Management*, Vol. 33 No. 7, pp. 912-933.
- Eisenhardt, K.M. (1989), "Agency theory: an assessment and review", *Academy of Management Review*, Vol. 14 No. 1, pp. 57-74.
- Elg, M., Palmberg Broryd, K. and Kollberg, B. (2013), "Performance measurement to drive improvements in healthcare practice", *International Journal of Operations and Production Management*, Vol. 33 Nos 11-12, pp. 1623-1651.

-
- Fayezi, S., O'Loughlin, A. and Zutshi, A. (2012), "Agency theory and supply chain management: a structured literature review", *Supply Chain Management: An International Journal*, Vol. 17 No. 5, pp. 556-570.
- Fuloria, P.C. and Zenios, S.A. (2001), "Outcomes-adjusted reimbursement in a health-care delivery system", *Management Science*, Vol. 47 No. 6, pp. 735-751.
- Gibbons, R. (2005), "Incentives between firms (and within)", *Management Science*, Vol. 51 No. 1, pp. 2-17.
- Gioia, D.A., Corley, K.G. and Hamilton, A.L. (2013), "Seeking qualitative rigor in inductive research: notes on the Gioia methodology", *Organizational Research Methods*, Vol. 16 No. 1, pp. 15-31.
- Goddard, M., Mannion, R. and Smith, P. (2000), "Enhancing performance in health care: a theoretical perspective on agency and the role of information", *Health Economics*, Vol. 9 No. 2, pp. 95-107.
- Grossman, S.J. and Hart, O.D. (1986), "The costs and benefits of ownership: a theory of vertical and lateral integration", *Journal of Political Economy*, Vol. 94 No. 4, pp. 691-719.
- Halkier, B. (2011), "Methodological practicalities in analytical generalization", *Qualitative Inquiry*, Vol. 17 No. 9, pp. 787-797.
- Holmström, B. (1979), "Moral hazard and observability", *The Bell Journal of Economics*, Vol. 10 No. 1, pp. 74-91.
- Holmström, B. and Milgrom, P. (1991), "Multitask principal-agent analyses: incentive contracts, asset ownership, and job design", *Journal of Law, Economics, and Organization*, Vol. 7, pp. 24-52.
- Hunter, D.J. (1996), "The changing roles of health care personnel in health and health care management", *Social Science and Medicine*, Vol. 43 No. 5, pp. 799-808.
- Kellogg, K.C. (2009), "Operating room: relational spaces and microinstitutional change in surgery", *American Journal of Sociology*, Vol. 115 No. 3, pp. 657-711.
- Ketokivi, M. and Choi, T. (2014), "Renaissance of case research as a scientific method", *Journal of Operations Management*, Vol. 32 No. 5, pp. 232-240.
- Kreindler, S.A., Larson, B.K., Wu, F.M., Carluzzo, K.L., Gbemudu, J.N., Struthers, A. and Fisher, E.S. (2012), "Interpretations of integration in early accountable care organizations", *The Milbank Quarterly*, Vol. 90 No. 3, pp. 457-483.
- Lee, S.J., Abbey, J.D., Heim, G.R. and Abbey, D.C. (2016), "Seeing the forest for the trees: institutional environment impacts on reimbursement processes and healthcare operations", *Journal of Operations Management*, Vols 47-48, pp. 71-79.
- MacKinnon, D.P. (2008), *Introduction to Statistical Mediation Analysis*, Taylor and Francis, New York, NY.
- Mahoney, J.T. (1992), "The choice of organizational form: vertical financial ownership versus other methods of vertical integration", *Strategic Management Journal*, Vol. 13 No. 8, pp. 559-584.
- Mechanic, D. (2004), "The rise and fall of managed care", *Journal of Health and Social Behavior*, Vol. 45, pp. 76-86.
- Miller, N.H. (2006), "Insurer-provider integration, credible commitment, and managed-care backlash", *Journal of Health Economics*, Vol. 25, pp. 861-876.
- Mooney, G. and Ryan, M. (1993), "Agency in health care: getting beyond first principles", *Journal of Health Economics*, Vol. 12 No. 2, pp. 125-135.
- Porter, M.E. and Kaplan, R.S. (2016), "How to pay for health care", *Harvard Business Review*, Vol. 94 Nos 7-8, pp. 88-98.
- Preacher, K.J. and Hayes, A.F. (2008), "Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models", *Behavior Research Methods*, Vol. 40 No. 3, pp. 879-891.
- Reay, T., Golden-Biddle, K. and Germann, K. (2006), "Legitimizing a new role: small wins and microprocesses of change", *Academy of Management Journal*, Vol. 49 No. 5, pp. 977-998.
- Rice, T.H. and Labelle, R.J. (1989), "Do physicians induce demand for medical services?", *Journal of Health Politics, Policy and Law*, Vol. 14 No. 3, pp. 587-600.

- Robinson, J.C. (2015), *Purchasing Medical Innovation: The Right Technology, for the Right Patient, at the Right Price*, University of California Press, Oakland, CA.
- Roehrich, J.K., Lewis, M.A. and George, G. (2014), "Are public-private partnerships a healthy option? A systematic literature review", *Social Science and Medicine*, Vol. 113, pp. 110-119.
- Rosenthal, M.B. (2008), "Beyond pay for performance-emerging models of provider-payment reform", *New England Journal of Medicine*, Vol. 359, pp. 1197-1200.
- Ryan, M. (1994), "Agency in health care: lessons for economists from sociologists", *American Journal of Economics and Sociology*, Vol. 53 No. 2, pp. 207-217.
- Shortell, S.M., Gillies, R.R. and Anderson, D.A. (1994), "The new world of managed care: creating organized delivery systems", *Health Affairs*, Vol. 13 No. 5, pp. 46-64.
- Sihvonen, R., Paavola, M., Malmivaara, A., Itälä, A., Joukainen, A., Nurmi, H. and Järvinen, T.L. (2013), "Arthroscopic partial meniscectomy versus sham surgery for a degenerative meniscal tear", *New England Journal of Medicine*, Vol. 369 No. 26, pp. 2515-2524.
- Tuohy, C.H. (2003), "Agency, contract and governance: shifting shapes of accountability in the health care arena", *Journal of Health Politics, Policy and Law*, Vol. 28 Nos 2-3, pp. 195-216.
- Vandaele, D., Rangarajan, D., Gemmel, P. and Lievens, A. (2007), "How to govern business services exchanges: contractual and relational issues", *International Journal of Management Reviews*, Vol. 9 No. 3, pp. 237-258.

Appendix 1. Qualitative study data and analysis

Identified theme	Representative quotes
<p><i>Aligning diverse interests</i> Raising system improvement to the strategic agenda</p>	<p>Realizing that compensation for disability days was the biggest cost category Actually, the biggest cost item was loss of earnings, it was not care costs . . . [] . . . then we found that rapid care episode is a key for everything. – CEO of Pohjola Insurance Services Insurance company’s decision to increase control of treatment chain Launching an own hospital was a natural solution. Existing providers focused too much on their own part of the chain. – CEO of the new hospital</p>
<p>Developing easy-to-measure system level indicators</p>	<p>Strengthening customer value instead of clinical outcomes as a measure for success Rapid recovery of customer to work (1) and the Net promoter score (2) were set as priority strategic measures for success in a new hospital It was the third time I went to the board meeting. They said that because I’m still so eager, I can found a new hospital but keep it as far as possible from the Pohjola brand. Do not destroy this brand . . . Two measures, customer experience and length of care episode, were set. And, of course, you cannot be unprofitable. The hospital should make small operating profit but not maximize it. – CEO of Pohjola Insurance Services Pohjola Hospital was our opening in health care services. Hospital’s operating model, in which the customer is in the center of everything and treatment episode is as short as possible, has already shaped the whole sector. Our geographic expansion to serve the whole country and extension to new services strengthen our position as a forerunner in the health care market. – CEO of OP Financial Group (excerpt from a press release)</p>
<p>Aligning actors’ interests through joint bodies and HR policies</p>	<p>Recruiting physicians that accept the joint goal and business idea of the new hospital It was important to find physicians who engage with these targets. In recruiting discussions, we went through the hospital’s business idea. The idea is that your patients recover to work as well as possible. And the other issue was customer experience. – Chief physician of the new hospital We even suggested that would it be fine, [physician N.N], that when you work for us, your rental percentage is based on how much you sign sick leave. Less sick leave means smaller rental percentage. This was so radical suggestion, that it was shot down by all, in physicians’ opinion it was not good, and neither by the Pohjola insurance. – Chief physician of the new hospital Strategic customer-value based metrics as KPIs were highlighted and communicated in doctor evaluation and training So if I think my own mission to work in this kind of place, so it is that I can lengthen the work career [of patients] in the middle. – An orthopedist of the new hospital There are different personalities among us orthopedists. Some of us are very surgery-oriented who just see that every patient should be operated. We do not have that kind of persons, but more like critical and pondering whether it is useful to operate. We do not have those omnipotent physicians who think that there are next to the God. – An orthopedist of the new hospital</p>

(continued)

Table A1.
Illustrative data
supporting qualitative
interpretation

Identified theme	Representative quotes
<p><i>Improving operations</i> Focus on certain patient groups and conditions</p>	<p>Economy of scale was aimed to be achieved in high-volume patient groups by concentrating operations to specialized surgeons The hospital produces over 3,000 ambulatory surgeries in orthopedics and hand surgery. I suppose that even the university hospitals have not that big volumes, even not Helsinki University Hospital – An orthopedist of the new hospital</p>
<p>Standardizing practices among specialists</p>	<p>Standard diagnostic criteria and indications for surgery are implemented and continuously discussed in weekly meetings We have weekly problem-solving meetings . . . [.] . . . and there we try to define common care guidelines, so that nobody can deviate from them, and treatment follows nationally set guidelines. – Chief physician of the new hospital Weekly meetings with physicians and physiotherapists It is more communal here, we have a lower limb team which has a meeting every Friday. I started it in 2014 for this my lower limb team and in the beginning there was just me, N.N [chief physician], and couple of physiotherapists. But soon there was more and more people. I now we have a room full of people. And we ponder also just basic issues, but also very challenging, like how you would treat this patient. – An orthopedist of the new hospital Using recently published research about unnecessary knee and shoulder surgeries to change the mindset among physicians toward conservative treatment We wanted to have specialists who are committed to these Current Care Guidelines, because the idea of these guidelines is to help people best to recover. – Chief physician of the new hospital</p>
<p>Introduction of tailored treatment chains</p>	<p>Initial sick leave periods were shortened, and telephone service was launched to communicate with the patient about his/her ability to return to work or the need to extend sick leave After two sick leave periods, it is then my duty as a chief physician to call the patient and negotiate about the situation. – Chief physician of the new hospital In rehabilitation, we all aim at individual system. How often and how physiotherapy, for example, is taken to support the treatment. – Orthopedist of the new hospital</p>
<p><i>Signaling superior customer experience</i> Integrating operations of payor and provider</p>	<p>Customers that first contacted the occupational health or public emergency units were persuaded to contact the insurer's hospital for rapid imaging examinations We informed public emergency hospitals that they should direct their patients to contact us if the case is related to occupational trauma. – Chief physician of the new hospital Care, rehabilitation, and insurance compensation are combined and offered as a one-stop service in the new hospital Insurance compensation can be handled at the same hospital visit. Their door is just next to our doctors' doors. – Business controller of the new hospital</p>
<p>Contractual incentives for high customer experience</p>	<p>Nurses and care masters receive bonuses based on the Net Promoter Score We have no salaried physicians; they are practitioners. But those who are salaried, care masters and nurses, they have customer experience in their bonus system. – Chief physician of the new hospital</p>

Table A1.

(continued)

Table A1.

Identified theme	Representative quotes
Employing new customer-oriented professions	<p>Employing Care Masters In the very beginning, we launched the care master service which has unquestionably improved service experience during hospital visits.” – Head nurse of the new hospital</p> <p>Employing Work Masters We realized that it would be better if the orthopedist could focus on the trauma treatment. And let’s launch this work master beside, whose task is specifically to accumulate knowledge about what patient is doing at work. – Chief physician of the new hospital</p> <p>The idea is that after two weeks of sick leave, patient is directed to one of our work masters. We can consult doctors or employers, and the contact with patient lasts until return to work. – Work master of the new hospital</p>

Appendix 2. Quantitative study variables and analyses

Appendix 2a. Profession control categories constructed from the first digit of the Nordic Occupational Classification, based on the International Standard Classification of Occupations (ISCO) established in 1958

- (1) 1 = technical, legal, and artistic work
- (2) 2 = healthcare and social work
- (3) 3 = administrative work
- (4) 4 = commerce
- (5) 5 = agricultural, forestry work, and fishing
- (6) 6 = transportation and traffic work
- (7) 7 = construction and mining work
- (8) 8 = industrial factory work
- (9) 9 = chemical industry work
- (10) 10 = service work

Categories 1, 3, and 4 include mostly white-collar workers, while the other categories represent blue-collar workers.

Table A2.
Descriptive Statistics
and Correlation Matrix

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1. Total cost	8720	7982	1																									
2. Sick leave	66	59	0.81***	1																								
3. Infected (cont)	867	095	0.88***	0.81***	1																							
4. Infected (env)	374	102	0.76***	0.88***	0.80***	1																						
5. Sick leave (env)	049	050	0.52***	0.46***	0.60***	0.50***	1																					
6. PPV hospital	040	049	-0.03	-0.10***	-0.06**	-0.11***	-0.09***	1																				
7. Male	067	047	0.11***	0.09***	0.14***	0.17***	0.02	0.02	1																			
8. Age	024	043	0.32***	0.16***	0.31***	0.15***	0.08***	-0.06***	-0.05**	0.06**	0.23***	1																
9. S46	016	037	0.06**	0.36***	0.06**	0.32***	0.06**	0.01	0.00	-0.08***	-0.25***	0.02	1															
10. S43	058	049	-0.32***	0.07***	0.06**	-0.33***	-0.09***	0.03	0.00	-0.22***	-0.63***	-0.53***	0.02	1														
11. S82	035	048	0.03	0.01	0.02	0.01	0.03	-0.07***	-0.02	0.02	0.01	-0.04	0.02	0.02	1													
12. Year 2013	035	048	0.03	0.01	0.02	0.01	0.03	-0.07***	-0.02	0.02	0.01	-0.04	0.02	0.02	0.00	-0.53***	1											
13. Year 2014	034	047	-0.03	-0.01	0.03	-0.01	0.04*	0.03	-0.02	0.01	0.00	0.00	-0.02	-0.49***	-0.48***	0.00	0.00	1										
14. Year 2015	031	046	0.00	-0.00	0.01	0.00	0.01	0.04*	0.04*	0.04*	0.04	0.04	-0.02	-0.49***	-0.48***	0.00	0.00	-0.02	1									
15. Prof 1	008	028	0.01	-0.05**	0.05*	0.05*	0.02	-0.08***	0.06***	-0.01	-0.01	0.01	0.01	-0.02	0.02	0.00	0.00	0.02	0.00	1								
16. Prof 2	015	036	-0.07***	-0.07***	-0.09***	-0.10***	0.02	-0.46***	0.03	-0.03	0.00	0.00	0.02	-0.01	-0.02	-0.01	-0.10***	-0.11***	-0.09***	0.00	1							
17. Prof 3	010	031	0.01	-0.09***	0.01	-0.08***	0.01	0.05**	-0.11***	0.08***	0.01	0.00	0.01	0.03	-0.02	-0.01	-0.10***	-0.11***	-0.09***	0.00	0.00	1						
18. Prof 4	006	024	-0.01	-0.02	0.00	-0.01	0.02	0.00	0.00	-0.03	-0.00	-0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1						
19. Prof 5	003	018	0.02	0.07***	0.03	0.06**	0.04*	-0.08***	-0.02	-0.02	0.00	-0.01	-0.01	-0.00	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	1					
20. Prof 6	012	032	0.05*	0.06***	0.05**	0.07***	0.00	0.02	0.18***	0.03	0.03	0.03	0.01	-0.04*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1				
21. Prof 7	014	034	-0.00	0.06**	0.02	0.07***	0.00	0.01	0.25***	-0.03	-0.03	0.03	0.01	0.02	-0.00	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	1			
22. Prof 8	014	035	0.05*	0.04*	0.04	0.04	0.03	-0.01	0.27***	-0.04*	0.03	0.01	-0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	
23. Prof 9	005	022	0.01	0.02	-0.04*	0.02	-0.04*	-0.03	0.06**	-0.03	0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	1	
24. Prof 10	012	032	-0.04*	-0.01	-0.05**	-0.00	-0.01	0.03	-0.09***	-0.08***	-0.04*	-0.00	0.04	0.01	-0.02	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	1

Note(s): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Method	Model 1 operation	Model 2 ln(sick leave)	Model 3 ln(total cost)
	Coeff. (SE) beta coeff.	Coeff. (SE) beta coeff.	Coeff. (SE) beta coeff.
	Logistic	OLS	OLS
<i>Controls</i>			
Male	0.87 (0.11)*** 0.22	-0.09 (0.04)* -0.04	0.06 (0.02)** 0.03
Age	0.01 (0.00)* 0.05	0.00 (0.00)** 0.04	0.00 (0.00) 0.01
S43	-0.70 (0.13)*** -0.14	-0.21 (0.05)*** -0.08	0.02 (0.02) 0.01
S83	-0.57 (0.10)*** -0.15	-0.65 (0.04)*** -0.31	-0.06 (0.02)** -0.03
Year 2014	-0.18 (0.10) 0.04	0.01 (0.04) 0.01	-0.02 (0.02) -0.01
Year 2015	-0.05 (0.10) -0.01	0.00 (0.04) 0	-0.01 (0.02) -0.01
Profession 2	-0.46 (0.18)* -0.09	0.13 (0.07) 0.05	-0.13 (0.03)*** -0.05
Profession 3	-0.19 (0.19) -0.03	-0.04 (0.07) -0.01	0.07 (0.03) 0.02
Profession 4	-0.22 (0.21) -0.03	0.18 (0.08)* 0.04	-0.12 (0.04)** -0.03
Profession 5	0.06 (0.26) 0.01	0.43 (0.10)*** 0.08	-0.26 (0.05)*** -0.05
Profession 6	-0.58 (0.18)** 0.1	0.39 (0.07)*** 0.12	-0.18 (0.03)*** -0.06
Profession 7	-0.62 (0.18)*** -0.11	0.46 (0.07)*** 0.15	-0.26 (0.03)*** -0.09
Profession 8	-0.54 (0.18)** -0.1	0.29 (0.07)*** 0.1	-0.15 (0.03)*** -0.05
Profession 9	-0.88 (0.23)*** -0.1	0.42 (0.09)*** 0.09	-0.15 (0.04)*** -0.03
Profession 10	-0.31 (0.18) 0.05	0.29 (0.07)*** 0.09	-0.26 (0.03)*** -0.09
<i>Hypothesized variables</i>			
PP hospital	-0.38 (0.08)*** -0.1	-0.10 (0.03)** -0.05	0.09 (0.02)*** 0.04
Surgery		0.96 (0.03)*** 0.47	0.37 (0.02)*** 0.2
Ln(sick leave)			0.73 (0.01)*** 0.79
Constant	0.13 (0.27)	3.37 (0.11)***	5.81 (0.06)***
R^2		0.36	0.83
F		91.5***	749.2***
Chi-Square	197.63***		
N	2,726	2,726	2,726
Note(s): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$			

Table A3.
Regression models
with control
variables shown

Corresponding author

Antti Peltokorpi can be contacted at: antti.peltokorpi@aalto.fi

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com