Forcing the system: A configuration analysis of a regionalized neonatal-perinatal health network

Christian M. Rochefort
Lise Lamothe

Background: Health care transformations often involve the development of networks to ensure smooth and safe patient flows throughout the care continuum. However, more empirical information is needed on the workings of health networks and on how their structures, processes, and systems influence access to high-quality patient care.

Purpose: Using Miller’s concept of configuration, we describe the workings of a health network specialized in the provision of neonatal-perinatal care, a specialty where accessibility issues are quite problematic. We aimed to generate evidence that will assist policy makers, network managers, and clinicians in facilitating access to high-quality neonatal-perinatal care.

Methodology/Approach: From late 2007 to early 2008, we conducted a case study of all (N = 7) neonatal intensive care units (NICUs) in the province of Quebec (Canada). We performed field work into two purposefully selected NICUs. This involved 450 hours of nonparticipant observation and 56 semistructured interviews with various actors. Data from these sources were triangulated with data collected during informal interviews with key actors from the other five NICUs in the province and from administrative databases.

Findings: We found that the elements of this health network are pulled together by a core orchestrating theme: “Forcing the system.” Indeed, in attempting to fulfill the network mission of providing access to high-quality neonatal-perinatal care, clinicians and managers must implement various strategies to compensate for the misfit of the configuration. Although these strategies are successful in providing access to neonatal-perinatal care, they, however, have adverse effects that are paradoxically in contradiction with the network’s core mission.

Practice Implications: This configuration analysis enabled us to identify a set of modifiable elements that contribute to the misfit of the configuration and its suboptimal functioning. The comprehensiveness of the configuration approach was proven useful for the analysis of such a complex organizational form.

There is general consensus that health care organizations will require a variety of transformations to meet the challenges of ensuring accessibility to high-quality patient care (Institute for Health Care Improvement [IHI], 2004; Institute of Medicine, 2001). These transformations often entail the development of

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Christian M. Rochefort, PhD, RN, is CIHR/CHSRF Postdoctoral Fellow, Clinical and Health Informatics Research Group, McGill University/McGill University Health Centre, Montreal, Quebec, Canada. E-mail: Christian.Rochefort@mcgill.ca.
Lise Lamothe, PhD, is Associate Professor, Department of Health Administration, Faculty of Medicine, University of Montreal, Montreal, Quebec, Canada. E-mail: Lise.Lamothe@umontreal.ca.

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health networks that are intended to ensure smooth and safe patient flows throughout the care continuum (Haraden & Ressar, 2004; IHI, 2003). Although previous research has provided evidence about the various structures and strategies used in health networks (e.g., Bazzoli, Shortell, Dubbs, Chan, & Kralevoc, 1999; Dubbs, Bazzoli, Shortell, & Kralevoc, 2004), we still know little about their workings and how their structures, processes, and systems have bearing on access to high-quality patient care (Huerta, Casebeer, & Vander Plaat, 2006; Luke, 2006).

In this article, we use the concept of “configuration” (Miller, 1992; Miller & Whitney, 1999) to describe the workings of a health network specialized in the production of neonatal–perinatal care. This is a specialty area where accessibility is a serious issue in many regions around the world (e.g., Gill, Bottomley, Chatfield, & Wood, 2004; Zeitlin, Papiernik, & Bréart, 2004). Through a description of the structures, processes, and systems surrounding patient flows, the aims of this study were to (1) get a better understanding of how the organizational elements of this health network are orchestrated and influence access to high-quality neonatal–perinatal care and (2) generate evidence that will assist policy makers, health network managers, and clinicians in facilitating access to these services.

### Conceptual Framework and Background

#### Configuration Theory

In the organizational sciences literature, there have been two main approaches to the study of configurations: the development of conceptual typologies (e.g., Mintzberg, 1979a) and the generation of empirically derived taxonomies (e.g., Miller & Friesen, 1980). Within the health care industry, configuration analyses of health networks and systems have led to the development of a taxonomy based on the structural and strategic characteristics of hospitals (Bazzoli et al., 1999; Dubbs et al., 2004). This taxonomy has provided policy makers, managers, and researchers with evidence about the heterogeneity of health networks and with a useful tool for exploring the variations in the performances and outcomes achieved by these organizations. In 2000, 72.1% of U.S. hospitals belonged to a health network and system (Dubbs et al., 2004); however, as noted by Luke (2006), despite their importance, we still know little about their management structures, spatial configurations, approaches to clinical and management integration, and, thus, about how these elements influence both the accessibility and the quality of patient care.

One approach to obtaining knowledge about these elements is to study configurations as a quality possessed by an organization (Miller & Whitney, 1999). From that perspective, a configuration can be defined as:

...constellations of organizational elements that are pulled together by a unifying theme.... The first constellation is called the core; it consists of the mission, the means (the fundamental abilities and resources to accomplish the mission), and the market. These constitute the raison d’être of the enterprise. The second constellation includes the systems, processes and structures that support the core (Miller & Whitney, 1999, p. 6).

For Miller and Whitney (1999), the competitive advantage of an organization resides in its power to orchestrate these two constellations into an evolving system of tightly interrelated and mutually supportive elements. Configuration (or the lack of it) can thus be seen as a quality within each organization that can create or destroy its competitive advantage and influence its performances. In a well-configured organization, there is harmony within and between the two constellations that creates the synergies required to make a company uniquely effective (Miller & Whitney, 1999).

In a recent study, Lamothe and Dufour (2007) used this approach to study the workings of hospital organizations. They observed that production units within these organizations are characterized by distinct suborchestrating themes, a finding that highlighted the heterogeneity of hospitals’ operating core. The authors then suggested that, to be successful, upcoming health care reforms will need to be based on a deeper understanding of these production units and be supportive of their distinct configurations. Building on this recommendation, we set the task of studying a specific production unit: the configuration of neonatal–perinatal services, which has the particularity of being structured as a health network. Specifically, we sought to answer the following questions: (a) What are the drivers of clinicians and managers actions in this network (mission)? (b) What are the strategies and the means used by these actors to achieve this mission (means)? (c) How and why are existing structures, processes, and systems supportive (or not) of that mission and those means?

#### Regionalized Neonatal–Perinatal Health Networks

Modern neonatology developed during the late 1960s and early 1970s from advances in both medical sciences and life-support technologies (Holmstrom & Phibbs, 2009; Philip, 2005). Early shortages of trained personnel and facilities led to the concentration of specialized neonatal services in select hospitals, usually large, academic medical centers or children’s hospitals (Holmstrom & Phibbs, 2009). With the growing success of these hospitals...
at reducing perinatal mortality and morbidity, efforts to regionalize neonatal–perinatal care began, and specialized transport systems emerged to ensure rapid patient transfers toward specialty centers (Philip, 2005). Since then, several examples of successful regionalization of neonatal–perinatal services have been reported throughout the world (e.g., Blondel et al, 2009; Holmstrom & Phibbs, 2009, Neto, 2006).

In many countries, hospitals in regionalized neonatal–perinatal networks are classified by the highest level of care provided, using three main categories: basic neonatal care (Level I), specialty neonatal care (Level II), and sub-specialty neonatal intensive care (Level III; American Academy of Pediatrics [AAP], 2004; British Association of Perinatal Medicine, 2001; Canadian Pediatric Society [CPS], 2006). In Canada, this classification was further refined with the addition of seven sublevels of care (Level Ia, Ib, Iia, Iib, Ila, IIb, and IIc) to capture more fully the variations in the type and amount of resources and technologies available at each neonatal unit among different jurisdictions in the country (CPS, 2006). Nonetheless, in Canada, as in other countries, access to safe neonatal–perinatal care should rest on the loose coupling of otherwise independent hospital organizations through several coordination mechanisms (e.g., referral systems, specialized antenatal and neonatal transport systems, standards of practice, and guidelines about which type of services may be provided in each type of hospitals).

In addition, comparative studies of antenatal (in utero) and neonatal (ex utero) transport provided evidence that perinatal mortality and morbidity were lower with antenatal transfers of at-risk mothers (Holmstrom & Phibbs, 2009; Philip, 2005). As a consequence, a regionalization model based on the antenatal transfer of at-risk mothers and the use of neonatal transport as a fallback system when the more optimal antenatal transport cannot be attained (e.g., cases that present too late to be safely moved before delivery and some cardiac anomalies that are not diagnosed until after delivery) is thus seen as the preferred organizational form for ensuring access to high-quality care (AAP, 2004; British Association of Perinatal Medicine, 2001; CPS, 2006).

However, in many regions, there are still high rates of “inappropriate” neonatal transfers to Level III units (i.e., that could have been done in antenatal) and high rates of inappropriate neonatal and antenatal (in utero) transfers across Level III units, both within and across health administrative regions (e.g., due to capacity limitations; Cusack, Field, & Manktelow, 2007; Gill et al., 2004). These findings suggest that common problems and unresolved issues remain in providing access to regionalized neonatal–perinatal care. In addition, there is evidence that these issues could be related to the characteristics of the hospitals and units involved; namely, the structures, processes, and systems in place (Cusack et al., 2007; Parmanum, Field, Rennie, & Steer, 2000). To understand better how organizational elements are orchestrated and influence access to high-quality patient care, we undertook a configuration analysis of a regionalized neonatal–perinatal network. Our aim was also to generate evidence that could assist policy makers, health network managers, and clinicians in facilitating access to these services.

### Methods

#### Design and Data Sources

Data for this study came from a multiple case study (Yin, 2003) of all (N = 7) neonatal intensive care units (NICUs) in the province of Quebec (Canada). In 2006–2007, these units received 5,298 admissions (all levels of care included), of which 3,841 (72%) required Level III neonatal care. Of all NICUs, two units, hereafter referred to as “Supra-Regional” and “Regional,” received 32.7% of all neonatal admissions and 43% of all Level III hospitalizations (Quebec Ministry of Health and Social Services, personal communication, October 17–23, 2007), establishing them as important providers of neonatal care. These two sites were thus selected for field work.

In addition, Supra-Regional and Regional also contrasted on several organizational characteristics that have been shown to influence neonatal outcomes (e.g., size, patient volume, and technology; see Holmstrom & Phibbs, 2009, for a review of this literature), thus reinforcing their selection as study sites. Supra-Regional belongs to a highly specialized hospital that receives patients from across the province. It has the required resources for offering all types of neonatal services (i.e., Level IIIs). Regional is somewhat less specialized (Level IIIs) and of smaller size but otherwise typical of other regional NICUs in the province in terms of size, volume, and technology. To ensure the validity and the representativeness of the dynamics observed at Supra-Regional and Regional, our study design allowed for a triangulation of these data with data collected during site visits and informal interviews with key actors from the other five NICUs in the province and with data extracted from provincial administrative databases (e.g., volume, worked hours, and case mix).

Although NICUs constitute only one component of neonatal–perinatal networks, it is where patient safety and accessibility issues are the most salient (Gill et al., 2004; Parmanum et al., 2000). Thus, we hypothesized that by systematically examining patient flows in and out NICUs, we could get an accurate picture of the dynamics characterizing the overall network. Indeed, understanding patient flows requires looking at the whole system of care, not just the isolated units, to identify network-wide processes that may create flow and accessibility problems (Haraden & Ressar, 2004; IHI, 2003).
Data Collection

From late 2007 to early 2008, we performed 450 hours of nonparticipant observation (250 hours at Supra-Regional and 200 hours at Regional) and conducted 56 one-hour semistructured interviews (40 at Supra-Regional and 16 at Regional) with managers, clinicians, and parents of NICU patients. Interview and observation guides were based on an adaptation of the data collection guides developed by Zimmerman et al. (1993) for gathering information on both clinical processes (e.g., patients’ admission and discharge or transfer processes) and organizational processes (e.g., continuity and coordination of care and communication) in adult intensive care settings. In addition, we conducted several site visits and informal interviews with managers and clinicians in the other five NICUs. We also used provincial administrative databases to generate indicators about all seven NICUs’ operations (e.g., unit size, case mix, patient volumes, and regular and overtime hours). Prior to data collection, clearance for the project was obtained from research ethics committees at a university and at each participating site. Informed consent was obtained prior to any interview or observation session, and no incentives were offered to participants.

Data Analyses

Data analyses were guided by a combination of deductive and inductive data interpretation and coding techniques (Mintzberg, 1979b; Patton, 1990; Yin, 2003). According to Miller and Whitney (1999), a configuration consists of two mutually supportive constellations of organizational elements that are pulled together by a unifying theme: the core and its support structure. To make these two constellations explicit, deductive analyses were used. Specifically, fieldwork and interview data collected at Supra-Regional and Regional were coded and categorized according to Miller and Whitney’s framework. This allowed for the identification of the mission, the means, and the market of the configuration and of its supporting systems, structures, and processes. To identify the unifying theme of the configuration, inductive analyses were employed. Inductive analyses also allowed for the emergence of any new themes from the data and their inclusion in the case description. To ensure the credibility and the validity of the patterns identified at Supra-Regional and Regional, data from these sites were triangulated with data collected during site visits and informal interviews conducted at the other five NICUs in the province and with data extracted from provincial administrative databases. In addition, key informants periodically reviewed and commented on the case study description (Patton, 1990).

Findings

A Configuration in Action

In the next sections, a neonatal-perinatal configuration in action is described. As we further illustrate here, the core mission of this configuration is to provide “immediate access to high-quality” neonatal-perinatal care (Table 1). For the actors interviewed, “immediate” thus refers to the urgency with which most patient flows occur in this network and the rapidity with which patients must have access to the appropriate resources. However, this notion of immediacy is not random; it is closely linked to the concept of quality, which has two dimensions. By

| Table 1 |
| Parameters of a regionalized neonatal–perinatal network |

| Core orchestrating theme: Forcing the system |
| The core constellation |
| Mission: Provide immediate accessibility to high-quality neonatal–perinatal care |
| Means: Networked health care organizations (regionalization) |
| Target: Pregnant women, neonates, family members |
| The support constellations |
| Formal: Refers to the structures (e.g., bed and resources), processes (e.g., expected patient flows within and across hospitals), and systems (e.g., antenatal and neonatal transport systems) required for the regionalization of neonatal-perinatal services. These elements are specified by professional norms (e.g., AAP, 2004; CPS, 2006). |
| Adaptive (adaptation strategies): Refers to the structures (e.g., use of overtime hours and staffing decisions), processes (e.g., adaptive patient flows), and systems (e.g., forcing admissions and discharges and readmission system) implemented or used by the actors of the configuration to adapt to the deficiencies (constraints) of the formal support constellation. These adaptation strategies often have adverse consequences that are paradoxically in contradiction with the core of the configuration. |
| Constraints: Result from a misfit between the elements of the formal support constellation and the core of the configuration (e.g., the gap between the size of “baby-friendly” hospitals and the needs of Level III units). To keep the fit, the actors of the configuration need to implement an adaptive support structure. |
means of the technical dimension, clinicians and managers ensure that the patients can have access to the appropriate expertise and technologies, to be safely cared for. Through the interpersonal relationship dimension, they try to preserve the trust relationship that developed over time, among a pregnant woman, her physician, and all other health care providers involved in her ante partum care. Using this dimension, clinicians and managers also try to protect the bonding relationship that must occur in the immediate postpartum period between the parents and their newly born infant(s). The following two quotations summarize the core mission of this configuration.

Internal medicine can always leave the patient in the ED whenever they don’t have beds or nurses available. In surgery, they can place the patients on a waiting list. But in neonatology, we can’t do that. We deal with premature deliveries and very sick neonates that need assistance right away. We have to find them a spot that provides the required level of care. (Manager—Supra-Regional)

They’ll do everything to avoid separating the mother and her infant. If there’s no space, they’ll make some space for the baby. (Nurse—Supra-Regional)

As shown in Figure 1, this configuration is part of a structural environment where organizational boundaries are permeable and where functional interdependencies are high. As will be further explained in the next sections, patient flows in this health network are converging toward the Supra-Regional hospital and are subjected to several constraints (Table 1) originating from (a) the institutional context and (b) the provincial network context itself, where three types of hospitals interact: (1) Level I or II hospitals, (2) Level IIIa or IIIb hospitals, and (3) the Supra-Regional hospital providing Level IIIc neonatal care (Figure 1). In the following sections, we describe how “immediate access to quality” is being provided and how the various constraints interact with the health network’s ability to fulfill its core mission. Table 1 provides a definition for the main parameters of the configuration. These will be further described in the remaining sections.
The Institutional Context

There are currently several institutional forces that shape the workings of the neonatal–perinatal health network studied and that limit its ability to provide immediate access to high-quality neonatal–perinatal care. Indeed:

The rates of premature births and of infants born with severe diseases have increased constantly over the past years. In addition, we now have the science and technology to keep alive highly premature infants that could not survive 25 years ago. As these infants require long hospital stays to reach maturity or be treated, they further increase the demand for NICU beds. However, our bed quotas have not increased proportionately. We indeed lost NICU beds through the various health care reforms. We also have an important shortage of personnel that further limit our ability to accept patients. So, there’s a marked increase in the demand for care, but we don’t have enough resources to respond. (Neonatologist—Supra-Regional)

Interestingly, despite these constraints, accessibility to this health network has not been compromised. For instance, in 2005–2006 (most recent year available), Quebec’s population required a total of 3,809 Level III hospitalizations, whereas over the same period, NICUs across the province were able to respond to 3,841 demands for care, implying that 32 additional patients from other Canadian provinces or territories could be cared for in these units that year (Quebec Ministry of Health and Social Services, personal communication, October 17–23, 2007). To understand how, despite these institutional constraints, managers and clinicians maintained the accessibility to neonatal–perinatal care, we need to look at the workings of the network context.

The Network Context

A glimpse at the workings of Level I and II hospitals.

In a regionalized neonatal–perinatal network, it is expected that both pregnant women and neonates requiring, or predicted to require, a higher level of care will be transferred from Level I or II hospitals to Level III hospitals. Besides these “expected flows,” we found that other patient flows toward Level III hospitals were generated by various types of constraints experienced in Level I or II hospitals.

Our occupancy rates, here at Supra-Regional, are always high. Part of the problem comes from the fact that Level I or II hospitals do not always have the capacity, the resources or the expertise for taking care of their clientele. So very often, they’ll send us requests to transfer their patients over here. (Manager—Supra-Regional)

Although Level I or II hospitals could compensate for these constraints by transferring their patients to other hospitals providing the same level of neonatal–perinatal care (i.e., adaptive horizontal patient flows), another constraint prevents them from doing so. Most Level I and II nurseries are of relatively small size, and their size has been further reduced over the past few years as many of them have adhered to the Baby-Friendly Hospital Initiative of the World Health Organization and the United Nations Children’s Fund. To become “baby-friendly,” one of the norms that hospitals needed to comply with is the provision of continuous mother–baby cohabitation. As a consequence:

Many Level I hospitals either closed or considerably decreased the size of their Level I nursery. As part of the process, they also had to reassign some of their nursing staff to other nursing units. So now, whenever they have a patient that is not doing well, they don’t have the space or resources to cope anymore, and they’ll send us a request for a transfer. So we have a lot of pressures and our occupancy rates are always very high, sometimes going as high as 120 to 140%. (Manager—Supra-Regional)

Thus, although the use of adaptive vertical patient flows allows Level I or II hospitals to ensure immediate access to neonatal–perinatal care, this adaptation mechanism has a downside. It overloads Level III NICUs, which then need to develop adaptive strategies (see Table 1 for a definition) to maintain the accessibility to neonatal care. We will examine those while looking at the admission process on Level III NICUs.

A glimpse at the admission process in Level III NICUs. Admissions on a Level III NICU can originate from three paths: (a) the Level I or II hospital–NICU path, as described in the previous section; (b) the delivery room–NICU path; and (c) the Level III hospital–delivery room–NICU path. Here, we further describe these paths along with their associated constraints and adaptive structures, processes, and systems (see also Table 1). When a pregnant woman presents herself at the delivery room of the hospital where she is usually followed for a preterm labor or for a condition that is predicted to require a NICU admission, the decision about whether to admit her rests on the mutual adjustment between the obstetrician–gynecologist and the neonatologist on call.

Normally, the obstetrician and the neonatologist should talk and determine, based on the mother’s condition and that of her infant, whether or not the delivery room and the NICU have the required resources and capacity to admit her and her baby. (Nurse—Supra-Regional)
When resources and capacity are adequate, a direct path between the two units is created, and access to Level III neonatal care is provided in that hospital (i.e., the delivery room–NICU path). However, when resources and capacity are insufficient, several scenarios are possible, based on the physician’s decisions.

For instance, the obstetrician-gynecologist and the neonatologist might decide to transfer the pregnant woman to another institution (i.e., Level III hospital–delivery room–NICU path). In this context, the type of patient flow will be determined by the level of care required by the mother and her infant(s) (i.e., an adaptive vertical flow toward a hospital offering a higher level of care or an adaptive horizontal flow toward a hospital offering the same level of care). In practice, however, the obstetrician-gynecologists are often reluctant to use this path.

What’s difficult with the obstetricians is that they want to run their business alone. In theory, the decision to admit or not a pregnant woman should be jointly taken by the obstetrician and the neonatologist but they don’t always agree. When the NICU is closed to admissions, some obstetricians will say: “She’s my patient. I’ll admit her.” and we then find out that she’s at 26 weeks and expected to give birth to twins within the next hour, but we have no beds and no nurses to care for these extra patients. (NICU manager—Supra-Regional)

As the previous quotation suggests, some obstetrician-gynecologists may decide to “force the system” by accepting the pregnant woman at the delivery room, either because they refuse to have their case load determined by the constraints experienced by another unit or because they do not accept the idea of, at the critical moment of birth, transferring a woman they have followed for months to another institution. In such cases, the neonatologist on call may decide to transfer the neonate(s) to another institution that provides the appropriate level of care (i.e., through adaptive vertical or horizontal flows). However, this option has the downside of separating the mother from her infant(s) during the first few hours of life. To avoid this scenario, many neonatologists will also decide to force the system by admitting the neonate(s) on the NICU no matter what the resources on the unit are—a situation that will precipitate a cascade of adaptation strategies. Indeed, as we pointed out earlier:

In these situations, they’ll do everything to avoid separating the mother and her infant. If there’s no space, they’ll make some space for the baby. (Nurse—Supra-Regional)

**Forcing the system.** As we will describe here, we found three main strategies that can be used by NICU managers and clinicians, either alone or in combination, for adapting to instances of forcing the system: (1) using overtime hours, (2) revising staffing plans, and (3) transferring “stable” patients to other nursing units or hospitals.

But you know, when your occupancy rates regularly exceed 120%–140%, it’s clear that we do not have enough staff. So our way out, these days, is to use overtime hours. But that’s not a solution…you should not be asking your staff, on a daily basis, to work overtime. (Manager—Supra-Regional)

To further illustrate the extent to which this strategy is currently being used, in fiscal year 1999–2000, overtime hours accounted for 1.3% to 2.1% of all worked hours across all NICUs in the province, whereas these proportions varied from 3.9% to 6.3% in fiscal year 2006–2007 (Quebec Ministry of Health and Social Services, personal communication, October 17–23, 2007). Although the use of overtime hours allows NICUs to fulfill their core mission, this strategy also has a drawback:

For the past 3 years, we’ve been increasingly placed in the situation of using mandatory overtime to provide access to neonatal care services. But forcing people to work overtime is not a solution. In the long run, we lose our nurses as they seek jobs elsewhere. (NICU manager—Regional)

In addition to using overtime hours, NICU managers and clinicians can adapt to instances of forcing the system by revising their staffing plans:

Very often, when we’re short of staff, the managers will ask the assistant head nurses and the team leaders to take patient assignments. But by doing so, they suppress all the resources that we have to support our novice nurses. So, many of our young staff left the unit as they felt unsupported…(Manager—Supra-Regional)

We may also increase the nurse-to-patient ratios by giving a second, more stable patient to a nurse that should in principle be taking care of only one patient…. But when you start doing this regularly, people get exhausted and leave. (Assistant Nurse Manager – Regional)

Interestingly, both the revision of nursing staffing plans and the use of overtime hours appear to have the same result: In the long run, they contribute to the increase in the nurse shortage and thus reduce the ability of NICUs to fulfill their core mission. Third, NICUs can adapt to instances of forcing the system by “creating space” by transferring patients to other nursing units within the hospital (e.g., Level I nursery and a...
By the various constraints experienced by these hospitals, patient transfers to Level I or II hospitals may be delayed or reduced by the various constraints experienced by these hospitals, therefore reducing the efficacy of this mechanism.

That's another problem. And it's closely related to the shortage of staff and the shortage of expertise and equipment in Level I or II hospitals. These are variables that we must take into account when we want to transfer patients to these hospitals. For example, today if we phone to Hospital X (Level II) to transfer a patient, well maybe they would refuse the transfer today because they do not have the required expertise, space or equipment. So we would have to hold the transfer for a day, until they can accept it. (Manager—Regional)

Sometimes you may want to transfer a baby that's on caffeine and has an apnea monitor...but the unit where you want to transfer the patient has access to a pediatrician only two weeks per months. If you want to make your transfer during the two weeks where the pediatrician is away, it won't work. You have to wait. (Nurse—Supra-Regional)

Even when it is successful, the strategy of transferring patients from Level III NICUs to Level I or II facilities can have a drawback. The patient flows occurred at a point in time where the patients being transferred might not be clinically stable enough; as such, any change in the medical condition of these patients can result in a readmission on the NICU because the Level I or II hospitals may not have the required resources to adapt.

We do it often. For example, we transfer an unstable infant to the Level II unit just to make a spot for a new patient...and a few hours later, we transfer back this patient to the NICU because his condition deteriorated. He was not stable enough to be transferred. Same thing with Level I or II hospitals, they can transfer back a patient within 24 hours saying the patient is too unstable for the resources that they have. (Neonatologist—Supra-Regional)

Interestingly though, this drawback does not appear to influence patient safety because any patient whose health condition deteriorates will force his or her place back on a Level III NICU with a readmission.

Lastly, when none of the previously mentioned mechanisms are sufficient for ensuring access to Level III neonatal care, then an ultimate adaptation strategy can be used:

The Regional Health Authority can force us to accept an admission. When all units are short of staff, the patient goes to the unit with the lowest occupancy rates according to our provincial intranet. (NICU manager—Regional)

In fact, the Regional Health Authority, a government-owned organization with a mandate of network surveillance and resources allocation, has the role of ensuring that access to neonatal care services is being provided. Although such a Regional Health Authority intervention brings the benefit of ensuring a bed to the patient for whom the system is being forced, it also means that the NICU where this intervention is being applied must adapt, using one or more of the adaptation strategies described in this article.

**Discussion**

**Understanding the Configuration of a Health Network**

To understand the workings of the neonatal–perinatal health network better, this study addressed the following research questions. What are the drivers of health professionals’ and managers’ actions in this network (mission)? What are the strategies and the means used by these actors to achieve this mission (means)? How and why are existing structures, processes, and systems supportive (or not) of this mission and those means?

Having examined a neonatal–perinatal “configuration in action,” we found that the elements of this health network are pulled together by a core orchestrating theme: “Forcing the system.” Clinicians and managers can be described as the network’s core protectors. In fulfilling the network’s mission of providing access to high-quality neonatal–perinatal care, they must implement various adaptive strategies that are indeed structures, systems, and processes that aim to compensate for the deficiencies of the formal support constellation. This particular finding highlights the misfit of the configuration. Although examples of “dysfunctional” configurations have been previously reported in the literature (e.g., Miller, 1992; Miller & Whitney, 1999), to our knowledge, this study is the first to describe the existence of an adaptive support constellation. Another original contribution of this study to the configuration theory literature is our observation that although the structures, systems, and processes of the adaptive support constellation are successful in providing “immediate” access to neonatal–perinatal care, they also have long-term adverse effects that are paradoxically in contradiction with the network’s core mission, therefore creating a vicious cycle.

For instance, clinicians in Level I or II neonatal units will respond to a capacity problem by transferring some of their patients to Level III neonatal units, an adaptive...
The system that overloads these units and consequently challenges their ability to provide access to high-quality neonatal–perinatal care. In Level III units, managers and clinicians will respond to this constraint by using adaptive structural measures (e.g., overtime hours and revising their staffing plans) or adaptive systems (e.g., transferring patients to Level I or II hospitals). However, our findings suggest that overburdened workloads resulting from the use of these adaptive strategies, or from the inability of a NICU to transfer some of its patients to a Level I or II hospital (due to resource or capacity constraints), are a cause of staff shortages and lead to additional capacity problems. These further challenge the NICU’s ability to fulfill the network’s core mission. These findings are consistent with existing scientific evidence, in which heavy workloads have been associated with higher work-related stress. This, in turn, is manifested in work absenteeism, job dissatisfaction, and burnout (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; O’Brien-Pallas et al., 2004), which are important correlates of nurse turnover (Hayes et al., 2006). Our findings support this literature by providing a detailed explanation of how and why the misfit of a health network’s configuration contributes to such adverse outcomes and challenges its ability to fulfill its core mission, a finding that further illustrates the usefulness of configuration analysis.

Our results also provide a context for explaining other recent empirical findings. For instance, Profit et al. (2007) have documented that high NICU censuses and high patient-to-nurse ratios increase the likelihood of discharge in moderately preterm infants. This indicates that discharge decisions depend not only on patients’ clinical status but also on unit workload and strains on the nursing workforce. Moreover, Donohue, Hussey-Gardner, Sulpar, Fox, and Aucott (2009) have reported that 19% of the patients transferred from a NICU to a Level I or II hospital were readmitted to a NICU before discharge from the hospital; the vast majority of these readmissions were reported as being unplanned and for services that could have been provided in Level I or II hospitals. In our study, we have seen that these back-and-forth transfers across neonatal units are part of a system implemented by clinicians and managers to compensate for the misfit of the configuration and thus adapt to the various constraints experienced throughout the network.

From our perspective, the misfit of the neonatal–perinatal configuration results from the fact that the regionalized neonatal–perinatal network we studied is indeed a virtual organization and its ability to accomplish its core mission is determined by the decisions made and the constraints experienced within each formal organization that supports its existence. Following a logic similar to that of Provan and Milward (2006), we suggest that although this regionalized neonatal–perinatal network can be seen as an interorganizational program containing interrelated pieces of different organizations, each of these individual organizations also consists of pieces of several different interorganizational programs, each competing for limited resources to achieve their own core mission.

Resources available to a given neonatal unit are thus influenced by the priority level assigned to the neonatal–perinatal program within a given hospital. Ultimately, these resources will determine the ability of a neonatal unit to contribute to the core mission of the “virtual” regionalized neonatal–perinatal network. Access to neonatal care services thus depends on a close alignment of intraorganizational (hospital) with interorganizational (network) dynamics, which involves, as suggested by Miller and Whitney (1999), tailoring a configuration’s support system to the core of the configuration.

To adapt structures, systems, and processes to the configuration’s core, health network managers need to develop a comprehensive or “holistic” perspective. Such a view of a regionalized neonatal–perinatal network would help us to recognize the influence that local decisions taken by individual hospitals may have on the workings of the network. Indeed, we have seen examples of decisions that were perfectly logical when considered locally but that were nonetheless taken with a limited rationality with regard to the regionalized neonatal–perinatal network. Some baby-friendly hospitals, for instance, decided to reduce the size of their neonatal units after having implemented mother–infant cohabitation—a decision that reduced their capacity in participating in the network’s core mission. In fact, although the size and resources of most Level I and II neonatal units may be appropriate for their specific needs, they are nonetheless insufficient for absorbing flows of stable neonates out of Level III NICUs. Together, such factors play a role in the configuration’s suboptimal functioning.

As emerging organizational forms, the locus of production for networks is no longer located within the boundaries of a single organization but rather at the nexus of relationships between various parties that contribute to the production function (Schilling & Steensma, 2001). The provoked explosion of professional and organizational boundaries forces parties to focus on their interdependencies and be more tightly coupled. But paradoxically, the network as a whole becomes more loosely coupled and is structured on various interlinked production processes (Lamothe & Denis, 2006; Orton & Weick, 1990). Flexibility is needed, but it implies redefining the core of health care services along a variety of self-organizing units, adapted to the nature of clinical work. This requires an emphasis on learning within and between constitutive units. Efficiency then relies on the flow of information between the parties involved. Greater flexibility also implies joint ad hoc decision making between all levels in the network. To deal with contradictions and paradoxes, governance must focus on integrative mechanisms across multiple organizations that

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share resources, a requirement that involves having an extensive understanding of the network’s production system as a whole.

### Practice Implications

Several recommendations for practice can be formulated based on the findings of this study. First, the results of this research are consistent with a growing body of evidence and suggest that the regionalization model is the most effective way of organizing neonatal–perinatal services. However, this configuration analysis revealed that the optimal functioning of a regionalized neonatal–perinatal network entails the close alignment of the structures, systems, and processes of the support structure with the core of the configuration. To assist managers in tailoring a configuration’s support system to its core, Thomas, Graffy, Wallace, and Kirby (2006) refer to the importance of developing shared clinical and managerial leadership and the necessity of building interorganizational interactions and learning spaces to foster the development of relationships of trust. This can be achieved most straightforwardly through the joint development and implementation of network-wide protocols, care pathways, and evidence-based clinical guidelines (e.g., Cornette & Miall, 2006) or the establishment of effective network-wide information systems and feedback mechanisms that would help understand suboptimal patient flows (e.g., reasons for delays and other system failures) and ensure seamless care processes (e.g., Marlow & Gill, 2006). Overall, these various strategies entail a participative, bottom-up approach while managing a health network, an approach that establishes a connection between local dynamics and patient flows.

In addition, this study provides evidence that the comprehensiveness of the configuration approach is valuable for the systematic analysis and understanding of the workings of a complex network. Managers of such networks could use a configuration analysis to identify modifiable elements of their organization that contribute to the misfit of the configuration and its suboptimal functioning. Each of these elements is, in turn, a potential lever on which decision makers and managers could act to adapt the support structures, processes, and systems to the operational core. Configuration analysis could also be used to assess the impact that managerial decisions and organizational changes, involving the structures, processes, or systems in place, can have on a configuration’s core.

In summary, the results of this study highlight the importance of developing a comprehensive perspective for better understanding and management of complex networks as new organizational forms. Their effectiveness relies on tightly coupled interorganizational clinical production processes, whereas their support structures and systems need to maintain flexibility. An extensive understanding of the network’s production system as a whole is then required, to be able to implement adequate integrative mechanisms. This makes the case for a participatory, bottom-up approach while managing a health network.

### References


