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Applying Service Supply Chain Management in Response to the COVID-19 Pandemic: the Case of a Thai Public Hospital

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Abstract

During the COVID-19 pandemic, Thai hospitals have faced substantial resource constraints within their operations. Hence, this study aims at contributing to the service supply chain management (SSCM) research by proposing an SSCM model that will help public hospitals respond to the pandemic. By applying the competence-based view, SSCM processes are intra- and inter-organizational in nature and include seven major dimensions, namely (1) demand management (DM); (2) capacity and resource management (CAP); (3) customer relationship management (CRM); (4) supplier relationship management (SRM); (5) order process management (ORM); (6) service performance management (SPM); and (7) information and technology management (ITM). This model not only identifies key practices related to these dimensions but also explains how each element is related to others and how they coproduce quality medical services that satisfy patients' needs in the right place and at the right time. This study also provides practical guidelines for public hospitals in response to the pandemic. Despite these contributions, this research was limited by time constraints and the degree of the hospital's participation with two vice-directors involved in completing the research project, both in regard to the breadth and depth of the analysis, as well as the interpretation of the results. As a single case study using research methodology was utilized in this study, a longitudinal or experimental study is recommended to strengthen the causal inferences. Replicating and extending this study in other hospitals may also provide a basis for the external validation of the findings.

Keywords: service supply chain management, patient satisfaction, COVID-19 pandemic, hospital

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การนำการจัดการห่วงโซ่อุปทานการบริการ เพื่อรับมือการระบาดของโรคติดเชื้อ ไวรัสโคโรนา 2019 : กรณีโรงพยาบาลรัฐในไทย

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บทคัดย่อ

ในช่วงการระบาดของโรคติดเชื้อไวรัสโคโรนา 2019 โรงพยาบาลในไทยต้องเผชิญกับข้อจำกัดจำนวนมากด้านทรัพยากรในการดำเนินงาน ดังนั้น การศึกษานี้จึงมุ่งหวังที่จะต่อยอดงานวิจัยด้านการจัดการห่วงโซ่อุปทานการบริการ (SSCM) โดยเสนอตัวแบบ SSCM ที่จะช่วยให้โรงพยาบาลของรัฐตอบสนองต่อการระบาดของโรค ด้วยการใช้แนวคิดความสามารถเป็นฐาน ซึ่งกระบวนการ SSCM เกี่ยวข้องกับงานภายในและระหว่างองค์กร และประกอบด้วยเจ็ดมิติหลัก ได้แก่ (1) การจัดการความต้องการ (DM) (2) การจัดการศักยภาพและทรัพยากร (CAP) (3) การจัดการลูกค้าสัมพันธ์ (CRM) (4) การจัดการความสัมพันธ์กับซัพพลายเออร์ (SRM) (5) การจัดการกระบวนการสั่งซื้อ (ORM) (6) การจัดการผลงานการบริการ (SPM) และ (7) การจัดการข้อมูลและเทคโนโลยี (ITM) ตัวแบบนี้ไม่เพียงแต่ระบุแนวทางปฏิบัติหลักที่เกี่ยวข้องกับมิติเหล่านี้ แต่ยังอธิบายว่าแต่ละมิติเกี่ยวข้องกันอย่างไร และร่วมสร้างสัณฐานบริการทางการแพทย์ที่มีคุณภาพที่ตอบสนองความต้องการของผู้ป่วยในสถานที่และเวลาที่เหมาะสมได้อย่างไร การศึกษานี้ยังให้แนวทางปฏิบัติสำหรับโรงพยาบาลของรัฐในการตอบสนองต่อการระบาดของโรคดังกล่าว แม้ว่าการวิจัยนี้มีประโยชน์ตามที่กล่าวข้างต้น แต่ก็ยังถูกจำกัดด้วยข้อจำกัดด้านเวลาและระดับการมีส่วนร่วมของโรงพยาบาล รวมทั้งรองผู้อำนวยการทั้งสองท่าน ทั้งในด้านความครอบคลุมและความลึกของการวิเคราะห์ ตลอดจนการตีความผลการวิจัย เนื่องจากระเบียบวิธีการวิจัยแบบกรณีศึกษาเดียวได้ถูกนำมาใช้ในการศึกษานี้ การวิจัยครั้งต่อไปจึงควรใช้การศึกษาแบบระยะยาวต่อเนื่องหรือแบบทดลองเพื่อเพิ่มการอนุมานเชิงสาเหตุจากการวิจัยนี้ รวมทั้งอาจจำลองและขยายผลการศึกษานี้ในโรงพยาบาลอื่น ๆ ซึ่งอาจเป็นพื้นฐานสำหรับการตรวจสอบผลการวิจัยจากภายนอก

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Introduction

Since December 2019, the COVID-19 pandemic in Thailand has driven healthcare systems beyond capacity. The influx of patients infected by COVID-19 has caused increased demand and has outstripped the capacity of healthcare organizations to manage infectious patients (Marome & Shaw, 2021; Sohal, Cox, de Vass, & Ivcovici, 2020). Thai hospitals have faced substantial resource constraints within their operations, such as insufficient access to personal protective equipment (PPE) (Vice Director for Administrative Affairs, personal communication, May 15, 2022; Vice Director for Medical Services, personal communication, May 18, 2022). Several resource-limited hospitals in Thailand have faced further challenges in response to the pandemic (Marome & Shaw, 2021). In order to smoothly operate a hospital in the context of the pandemic, a hospital, therefore, should be aware of the competency of service supply chain management.

Service supply chain management (SSCM) has not been widely discussed in response to the pandemic. Ellram, Tate, and Billington (2004) developed the services supply chain model, and Baltacioglu, Ada, Kaplan, Yurt, and Kaplan (2007) further developed the IUE-SSCM, which is widely recognized in the service industry. Acharyulu and Shekhar (2012) studied the impact of the supply chain management process implementation in Indian hospitals and measured the performance of supply chain processes across eight criteria: response, reliability, revenue, customer satisfaction, safety, sustainability, costs, and assets. Boon-Itt, Wong, and Wong (2017) studied service supply chain management process competency.

Previous studies of the Thai service industry focused on the SSCM process and its relationship with organizational performance rather than how SSCM is applied in response to the pandemic. Sukka (2014) presented case studies on the supply chain management process in the healthcare business, and Kangwanpaisan (2014) found a relationship between supply chain management and the efficiency of the operations of healthcare businesses. Budsayaplakorn (2015) investigated the performance measures of hospital supply chain processes. Therefore, the current study focuses on how SSCM is utilized in response to the pandemic with regard to the consideration of customer satisfaction.

Literature Review

Service supply chain management

Service supply chain management has been defined by many as the network through which suppliers, service providers, customers, and supporting agencies complete their duties and resources to provide services and where the resources are transformed into improving core services and delivering them to the end customer (Ray, Muhanna, & Barney, 2005). SSCM has four unique characteristics when compared to the general industry supply chain: (1) intangibility: the service is an abstract, intangible, and invisible process; (2) heterogeneity: the service is difficult to create a standard of; (3) inseparability: the service is consumed at the same as it is produced; (4) perishability: the service cannot maintain its shape and is impossible to be saved for later use.

Ellram et al. (2004) developed the services supply chain model, which consists of seven key processes: information flow, capacity and skills management, demand management, customer relationship management, supplier relationship management, service delivery management, and cash flow.

Baltacioglu et al. (2007) proposed the supply chain management model in the service industry so-called IUE-SSCM. According to their perspective, the supply chain system is viewed as a network in which suppliers, service providers, customers, and supporting agencies perform their duties to provide services. This model comprises of seven processes: demand management, capacity and resources management, customer relationship management, supplier relationship management, order process management, service performance management, and information and technology management.

Based on their extensive literature review, Boon-itt et al. (2017) defined SSCM process capabilities as the competency of an organization to perform the bundle of activities required to manage its service supply chains. Relying on the competence-based view, they argued that service operations require the effective management of skills and knowledge or deployment of different people (capacity), resources, activities, and organizational routines through complex interactions with suppliers and customers to create a competitive advantage. Hence, SSCM processes are intra- and inter-organizational in nature and include seven major dimensions, namely (1) demand management (DM); (2) capacity and resource management (CAP), (3) customer relationship management (CRM), (4) supplier relationship management (SRM), (5) order process management (ORM), (6) service performance management (SPM), and (7) information and technology management (ITM).

Nagariya, Kumar, and Kumar (2021) found fifteen enablers of the sustainable service supply chain (SSSC) in an Indian hospital. The seven enablers include “understanding and managing demand (E1)”, “resource and capacity management (E2)”, “customer relationship management (E3)”, “supplier relationship management (E4)”, “real-time information sharing through different channels (E6)”, “meeting legal requirements (E11)”, and “business ethics (E15)”. These enablers are categorized in the cause group and can be comparable with the key elements of SSCM mentioned by Ellram et al. (2004), Baltacioglu et al. (2007), and Boon-itt et al. (2017). The remaining eight enablers (i.e., “service delivery performance (E5)”, “financial performance (E7)”, “adoption of the environmental friendly activities (E8)”, “reduce the contamination (E9)”, “reduce the energy consumption (E10)”, “understanding and maintaining relationship with employees (E12)”, “responsibility towards community and stakeholders (E13)” and “designing new and unique services and packages (E14)”) are considered as the effect group and can be viewed as the effects of SSCM.

According to the literature review presented above, SSCM commonly used in a hospital and other service organizations may consist of seven process capabilities as follows. First, demand management process capability (DM) is defined as the competence in managing and balancing customer demand by using up-to-date demand information for accurate demand forecasting and service delivery (Baltacioglu et al., 2007; Boon-itt et al., 2017; Ellram et al., 2004; Nagariya et al., 2021). This capability includes the ability to apply accurate service demand information to forecast, allocate, and plan resources reliably, control demand by influencing the magnitude of its peaks and troughs against planned capacity, proactively stimulate demand, and adjust supply or match demand with capacity in an operation given the fact that it is not able to store capacity in the form of inventory to respond to demand variation.

Second, capacity and resource management process capability (CAP) is defined as the ability to identify and manage tangible resources, such as facilities, labor, inventory, and capital as well as intangible resources, such as skills, experience, and knowledge (Baltacioglu et al., 2007; Boon-itt et al., 2017; Ellram et al., 2004; Nagariya et al., 2021). CAP encompasses service capacity planning, customer job scheduling, workforce scheduling, and facility and equipment scheduling for some services. It is competence in managing resources and service capacity to meet demand with optimum service capacity.

Third, customer relationship management process capability (CRM) is competence in maintaining and developing long-term customer relationships through such means as adopting

customer information systems and understanding customer needs (Baltacioglu et al., 2007; Boon-itt et al., 2017; Ellram et al., 2004; Nagariya et al., 2021). CRM helps customers by providing input, service specifications, materials, and labor to the service delivery process. Fourth, supplier relationship management process capability (SRM) is the competence to develop, manage, and maintain a close and long-term relationship with suppliers (Boon-itt et al., 2017). It coordinates the service development, sourcing, supply planning, and procurement across the value chain.

Fifth, order process management process capability (OPM) consists of obtaining service orders from customers, checking the status of service orders, and communicating to customers about the order status and filling it (Baltacioglu et al., 2007; Boon-itt et al., 2017). In the service industry, customers clarify their expectations and may request a modification to “standard” services when they place an order. However, this is more complex in healthcare service because patients may not have sufficient knowledge related to their symptoms or the diagnostic techniques employed. Moreover, service-level agreements may not be able to cover all of the implicit aspects raised by patients. Therefore, the understanding of the patients’ needs is a more delicate process because healthcare service needs cannot be fully described by standard “menus” or “catalogs.” Patients’ needs must be carefully communicated, clarified, and processed. Then the medical staff will correctly understand the needs of each patient, and in turn, the patients can accurately understand what they are getting.

Sixth, service performance management process capability (SPM) is the ability to manage and improve the performance of the service processes (Baltacioglu et al., 2007; Boon-itt et al., 2017; Nagariya et al., 2021). It comprises having a good track record of service performance in order to remain competitive and profitable, maintaining consistency in service quality and reliability of the service process, providing services to the right customer, in the right place and at the right time, improving service quality, and meeting customers’ requirements (Boon-itt et al., 2017; Ellram et al., 2004).

Lastly, information and technology management process capability (ITM) is defined as the competence in adopting information technology and systems that support SSCM processes and information flow (Baltacioglu et al., 2007; Boon-itt et al., 2017; Ellram et al., 2004; Nagariya et al., 2021). It provides an effective flow of information for DM, capacity and resource management, CRM, SRM, and OPM (Baltacioglu et al., 2007; Boon-itt et al., 2017). For instance, it helps to identify demand, share information, establish expectations, define the scope of the service and the skills required of the service providers, and provide feedback on performance (Boon-itt et al.,

2017; Ellram et al., 2004). Information technology is utilized to generate and share information in assisting decision-making and extends the information flow, from a hospital to its suppliers and patients, in order to facilitate inter-organizational information sharing (Baltacioglu et al., 2007; Boon-itt et al., 2017).

Patient satisfaction

Previous studies have mentioned several measures of organizational performance that are influenced by SSCM. For example, Acharyulu and Shekhar (2012) measured supply chain performance using eight criteria: responsiveness, reliability, revenue, customer satisfaction, safety, sustainability, cost, and asset. Dotson and Allenby (2010) emphasized the importance of customer (patient) and employee satisfaction in relation to a firm's financial performance. However, the ultimate goal of a healthcare supply chain is to provide patient care services and to serve patient satisfaction (Al-Saa'da, Taleb, Abdallat, Al-Mahasneh, & Nimer, 2013; Gerami, Mavi, Saen, & Mavi, 2020; Nagariya et al., 2021). Therefore, this current research focuses on patient satisfaction which is defined as a patient's emotional or cognitive evaluation of a health care provider's performance (American Nurses Association [ANA], 1999; Batbaatar, Dorjdagva, Luvsannyam, & Amenta, 2015; Ng & Luk, 2019; Yellen, Davis, & Ricard, 2002).

Research Methodology

Research design

An in-depth case study was conducted in this research. The unit of analysis relates to defining what the case actually is (Yin, 2003). Hence, the unit of analysis for the present study is at the organizational level (a hospital). As Perry (1998) and Romano (1989) argued that there is no precise guide nor ideal number of cases for qualitative research, this study utilized the single-case study design (Kairy et al., 2019; Rahimnia & Moghadasian, 2010; Yin, 2003). Therefore, one hospital was selected for this study. The present study applied a criterion sampling technique to select the company cases. Criterion sampling refers to selecting all of the cases that meet some predetermined criterion (Patton, 1990). In this study, the criterion for the selection of cases was based on the following:

- The selected hospital represents a large hospital that contains at least 500 or more beds.
- The selected hospitals need to have been involved with COVID-19 responses.

- The interview subjects will be top executives who have an in-depth understanding of (i) the challenges that the hospital has faced during COVID-19; (ii) the policies/strategies and practices implemented by the hospital in response to the COVID-19 pandemic; (iii) the impacts of those new practices on the hospital, its staff, and patients; and (iv) the lessons learned by the hospital leaders in combating COVID-19.
- Potential interviewees had to complete the consent form and had to be willing to participate in an interview for at least 40 minutes, had to agree to allow the interview to be audio-taped and/or videotaped, agree to make themselves available for a further interview if required, and provide documents and other sources of information that were relevant to the scope of the study. The cover letter invited the recipients to respond to the interview.

Hence, one Thai public hospital was chosen for the research. This hospital is located in Chanthaburi province, a major city in the eastern region of Thailand, and has 755 beds in a total area of 389,532 square meters. This hospital played a major role in response to the pandemic in this region. Its vision is to be a modern, super tertiary care hospital where people's faith leads to the country's stability, prosperity, and sustainability. Its mission statement demonstrates the aim to "serve and promote better health and wellness."

Data were gathered from primary sources using interviews and from secondary sources such as documents, reports, and websites. The single case study was completed based on face-to-face interviews conducted in May 2022. There were semi-structured interviews with the two executives (Vice-Director for Administrative Affairs and Vice-Director for Medical Services) involved in responses to COVID-19. Each interview was tape-recorded and transcribed by the researcher. This process allowed for tests of convergence and provided data for triangulation (Miles & Huberman, 1994). All of the interviews were conducted online. The interview format is generally open-ended so as to allow the interviewer to explore areas that come to light during the course of the discussion (McCutcheon & Meredith, 1993). By applying previous studies related to the research framework (Aimnang, Tribuddharat, Sathitkarnmanee, & Sabangban, 2021; Boon-itt et al., 2017; Patel, Messersmith, & Lepak, 2013; U.S. Department of Health and Human Services [HHS, ASPR], 2021), the protocol included questions on the following areas:

- 1) What are the challenges that the hospitals has faced during the COVID-19 pandemic?
- 2) What specific supply chain management practices have enabled your hospital to better respond to the COVID-19 pandemic? How do these practices enable on-time delivery

- from your suppliers?
- 3) What are the practices that help you effectively and efficiently manage information flow inside the hospital and share information with stakeholders, e.g., suppliers, customers, etc.? How do these practices help you respond to the COVID-19 pandemic?
 - 4) What are the impacts of these practices on patient satisfaction?
 - 5) What are the lessons learned by the hospital leaders in combating the COVID-19 pandemic?

Approval for the study protocol and the research procedure was obtained from the hospital's Human Research Ethics Committee prior to the data collection.

Data analysis and presentation of findings

The primary method for analyzing qualitative data from case studies is pattern-matching logic (Yin, 2003). Yin suggests that the pattern-matching method allows researchers to examine a theoretical replication across respondents, and to use replication logic, which is the logic of treating a series of respondents of experiments where each respondent confirms or refutes the conclusions drawn from previous ones.

Reliability and validity

The goal of reliability is to minimize the errors and biases in a study. As suggested by Sommer and Sommer (2001), Yin (2003), and Tharenou, Donohue, and Cooper (2007), the interview protocol that allows cross-verification was used in this study to increase reliability, and in order to increase validity, multiple sources of evidence (interviews and secondary data sources, such as hospital annual reports, websites, and other documents) were collected and analyzed (Yin, 2003). As further suggested by Yin, in order to increase internal validity, pattern-matching was conducted in the present research, and to increase external validity, replication logic was used (Sommer & Sommer, 2001; Tharenou et al., 2007; Yin, 2003). This means that the results can be tested by replication in which other respondents are conducted in contexts where the results should be comparable (McCutcheon & Meredith, 1993; Tharenou et al., 2007).

Research Findings and Discussion

Based on the interview data and related documents, the SSCM practices used in the hospital to deal with the challenges brought about by the COVID-19 pandemic can be presented

according to the following themes. First, a relationship between DM (demand management) and CAP (capacity and resource management) was found. During the pandemic, the demand for healthcare services was heterogeneous and volatile, and at the same time, the services could not be inventoried. Service capacity is the highest quantity of output possible in a given time period with a predefined level of staffing and resources. Because service demand is heterogeneous and services are produced and consumed simultaneously, the hospital needs to constantly update its capacity and resource information. The hospital's CAP encompasses service capacity planning, patient scheduling, workforce scheduling, and facility and equipment scheduling for some services (Vice-Director for Administrative Affairs, personal communication, May 15, 2022; Vice-Director for Medical Services, personal communication, May 18, 2022). For instance, there were schedulings of medical staff for varying work shifts, and the use of volunteers recruited from the community to do tasks, e.g., receiving phone calls and screening patients. This helped the hospital manage resources and service capacity to meet demand with optimum service capacity. At the same time, DM helps the hospital forecast future demand more accurately and enables organizations to manage and balance customer needs and outcomes in the service supply chain. These findings are supported by previous studies (e.g., Boon-itt et al., 2017; Nagariya et al., 2021).

Second, DM and CAP affect SRM. DM helps the hospital accurately forecast demands. Whilst CAP balances demand from patients and the hospital's capacity to satisfy patients. The Vice-Director for Administrative Affairs (personal communication, May 15, 2022) explained that before contacting its suppliers, the hospital needs to know about the patients' needs. Managing a long-term relationship with its suppliers is also important so that it can get a fast response from the suppliers. Furthermore, information should be shared with suppliers; hence this helps to strengthen collaboration and gently allows for order adjustment when the hospital senses changes in the patients' needs in terms of quantity and quality of medical supplies and equipment. Therefore, SRM (supplier relationship management) supports the planning and coordination of purchases, buffer stock, capacity, and the resource and order management process. These findings were aligned with previous studies (Nagariya et al., 2021; Al-Saa'da et al., 2013)

The Vice-Director for Administrative Affairs (personal communication, May 15, 2022) further explained that during a pandemic, medical equipment is in great demand and is necessary. It is difficult to estimate exactly how much equipment the hospital needs in such a situation, the hospital needs to utilize the existing equipment to serve the current demands and to estimate future demands as well as to monitor stocks on a monthly basis. There is a supplier

selection committee that is responsible for searching for reliable suppliers that can provide medical supplies with the acceptable quality available in the market. The committee follows the *Public Procurement and Supplies Administration Act, B.E. 2560(2017)* (2017), but if a small lot of medical supplies is required, the committee may use an emergency purchase order that takes shorter time. During the pandemic, the Thai government relaxed the procurement regulations according to the Act.

The Vice-Director for Administrative Affairs (personal communication, May 15, 2022) further explained that to serve the massive demands during the pandemic, the Thai government allows a hospital to use an emergency purchase order that can be explained as follows. The first step is to evaluate needs. The second step is to estimate the number of medical supplies and equipment required, as well as their specifications. The third step is to select an appropriate purchasing process (i.e., an emergency purchase order or a normal e-bidding process). The fourth step is related to supplier selection. In the matter of assessment, both the price and quality of a procurement item must be considered. The hospital normally orders the quantity of an item to serve the predicted needs for two months. The hospital also monitors its inventory every week to check how many supplies were used and how many are left, as well as what will be used the following week.

The Vice-Director for Administrative Affairs (personal communication, May 15, 2022) explained that when urgent needs for medical equipment and supplies come up, the hospital accepts donations from both the public and private sectors. The hospital explains the specifications of the item to a donor and the quantity needed. As long as it is known, there are no complaints about the quality of an item reported, and the medical staff is satisfied with the quality of the items donated.

Third, there are effects of CAP and SRM on OPM. (order process management process capability) CAP enables the hospital to manage the capacity and resources required for providing services. By doing so, the hospital needs to efficiently manage tangible resources (such as medical supplies and equipment, spaces, and funds) and intangible resources (such as employees' skills, experience, and knowledge) (Vice-Director for Administrative Affairs, personal communication, May 15, 2022; Vice-Director for Medical Services, personal communication, May 18, 2022). The nature of services makes the service unable to be saved for later use. Additionally, a service only takes place after receiving the order. Therefore, if the hospital properly manages its capacity and resources, the order management will be smooth and uninterrupted (Boon-itt et al., 2017;

Ellram et al., 2004). The hospital shares information related to its stock levels and procurement plans with suppliers. This allows the hospital to properly deliver services on-time and significantly reduce operational errors in order process management. The hospital hence processes service orders correctly step-by-step (e.g., order preparation, order transmittal, order entry, order filling, and order status reporting). The information technology system, such as an intranet, is utilized to simplify the service order process and to make it flow smoothly.

Fourth, OPM affects SPM (service performance management) and the patients' satisfaction. To provide quality services to patients, the hospital needs to obtain service orders from patients or their families, check the status of the service orders, and communicate to customers about the status of the orders and fill them. The Vice-Director for Medical Services (personal communication, May 18, 2022) mentioned that in many cases, patients may not have sufficient knowledge related to their symptoms or the diagnostic techniques employed with them. For example, they may not know whether they have been infected with the COVID-19 virus, and therefore the patients' information related to their symptoms and background (such as whether they are close to other COVID-19 patients) must be carefully communicated, clarified, and processed. The medical staff then effectively allocates patients to appointment or reservation systems. Consequently, the patients' needs can be met. OPM helps to manage and improve the performance of service processes (Boon-itt et al., 2017), and allows the medical staff to have a good track record of service performance in order to maintain consistency in terms of service quality and the reliability of the service process (Ng & Luk, 2019). After receiving a correct order, the medical staff at a later contact point can provide services to the right customer, in the right place, and at the right time. As a result, patients' requirements can be met.

Fifth, there is a relationship between CRM (customer relationship management) and patients' satisfaction. A strong patient-provider relationship facilitates cooperation and provides greater opportunities to learn about an individual patient's unique health needs. Because every customer is different, a good understanding of the customer's needs is required for the effective management of demand and capacity and the maintenance of the patients' satisfaction. The Vice-Director for Medical Services (personal communication, May 18, 2022) mentioned that by focusing on meeting the patients' needs, CRM helps the hospital to improve their satisfaction; and in order to deal with patients' expectations, CRM helps the hospital to communicate optimistic and factual information to patients and their families, as well as improve their emotional relationships and satisfaction with service quality. Communicating with customers both before and after

the staff serves them makes them appreciate services and tend to maintain a long-term relationship with them, and consequently, positively affects their satisfaction. For example, COVID-19 patients need a medical doctor or nurse to follow up on their symptoms after returning home or when being isolated at home. This is practically considered a way to receive patients' feedback, and in turn, helps the hospital to improve its service quality (Ng & Luk, 2019). When patients are in the hospital, the CRM staff may ask a patient to evaluate the service quality after receiving service. Based on the hospital's annual report 2021, more than 80% of patients were satisfied with the hospital's services.

Lastly, the important role of the information and technology management (ITM) in the hospital's SSCM process was found. Basically, if the flow of information is good, other elements in the service supply chain will function effectively. The Vice-Director for Administrative Affairs (personal communication, May 15, 2022), for example, noted that information reduces the uncertainty faced by the decision-makers in the hospital. Then they are able to estimate the demands from patients and place orders with suppliers. Consequently, medical supplies and equipment are available at the right time. After contact with patients, the medical staff gathers, stores, retrieves, and classifies the recorded information. The Vice-Director for Medical Services (personal communication, May 18, 2022) mentioned that the staff's information processing and memory capacity is somewhat limited. Therefore, IT, such as an intranet, is utilized in the following areas: (1) facilitating effective workplace communication between departments that may also be geographically isolated from each other; (2) providing better workflow of day-to-day processes; (3) providing medical and administrative staff access to clinical documents and files so that they can provide better care more accurately, expeditiously, and cost-effectively if they have centralized access to information; (4) delivering a unified platform for access to operational content, directly affecting patient management and improving team communication, collaboration, and knowledge sharing; (5) reducing time and costs through movement towards a unified platform; and (6) increasing the interaction between the staff, and ultimately, the delivery of service quality to patients. These findings are consistent with previous studies (Boon-itt et al., 2017; Ellram et al., 2004; Srivastava & Singh, 2021) Figure 1 below presents the key research findings presented above.

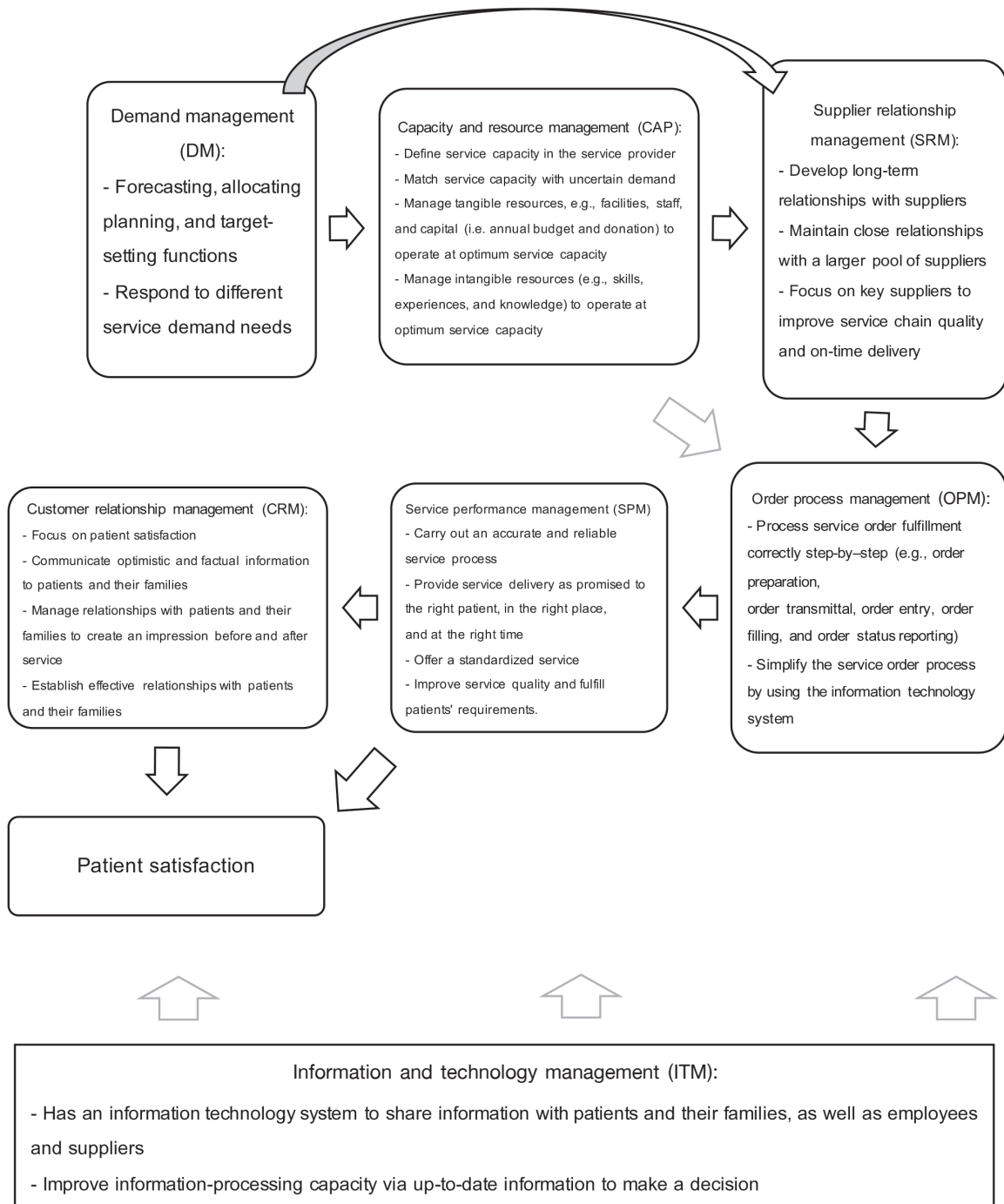


Figure 1 Research Findings

Conclusion, Implications, Limitations, and Future Research Directions

Based on the research findings presented above, this study contributes to the SSCM research as follows. First, the study proposes an SSCM model that helps a public hospital respond to the pandemic, as presented in Figure 1. This model explains how the seven elements in SSCM work in a real situation. This model not only identifies key practices related to these elements but also explains how each element is related to others and how they coproduce quality medical services that satisfy patients' needs.

Second, during the pandemic, uncertainty about service demands is a critical issue facing the hospital. According to information-processing theory, information reduces the uncertainty faced by decision-makers (Boon-itt et al., 2017; Galbraith, 1977). Hence, information flow along the hospital's service supply chain helps to meet the patients' needs in the right place and at the right time, and to reduce uncertainty, the medical staff needs to gather, manipulate, store, retrieve, and classify the recorded information. In service settings, information technology, such as email and LINE groups, helps to process the service performance information and share quality information with the staff at all levels in the process. ITM supports coordination and collaboration within the supply chain, including suppliers and patients to improve service operations. ITM also enhances operational efficiency and effectiveness on a real-time basis.

This study provides practical guidelines for a public hospital in response to the pandemic as follows. First, with regards to DM, a hospital should forecast demands by using up-to-date information and by responding to different service demand needs, e.g., the needs of COVID-19 patients and non-COVID-19 patients.

Second, for CAP, a hospital may begin with defining service capacity, then match its service capacity with uncertain demands. Utilizing tangible resources (e.g., facilities, labor, and capital) and intangible resources (e.g., the staff's skills, experience, and knowledge) in order to operate at optimum service capacity is also critical.

Third, SRM includes practices that help a hospital to develop long-term relationships with suppliers, maintain close relationships with a larger pool of suppliers, and focus on key suppliers to improve service chain quality and on-time delivery.

Fourth, OPM should help process service order fulfillment correctly and step-by-step (e.g., order preparation, order transmittal, order entry, order filling, and order status reporting). Furthermore, a hospital should simplify the service order process by using an information technology

system, e.g., an intranet.

Fifth, SPM should help conduct an accurate and reliable service process, provide service delivery as promised to the right customer, in the right place, and at the right time, as well as offer standardized services, improve service quality, and meet patients' requirements.

Sixth, CRM should focus on patients' satisfaction, communicate optimistic and factual information to patients and their families, and manage relationships with patients and their families in order to create an impression before and after the service. A hospital also needs to establish effective relationships with patients and their families by using IT, such as a hospital's Facebook page, an official website, and LINE. Telemedicine is also an effective communication tool for providing medical services.

Limitations and future research directions

Despite the above findings and contributions, this research was limited by time constraints and the degree of the hospital's participation involved in completing the research project, both in regard to the breadth and depth of the analysis, as well as the interpretation of the results. The following specific limitations were identified while conducting of this research.

First, the research objective of this study was to explain how SSCM is used in a Thai public hospital in response to the COVID-19 pandemic. However, because the single case study as a research methodology was utilized, several limitations were inherent in terms of the inferences of these relationships, primarily due to the lack of accounting for the lags between the practices implemented and possible outcomes. Further, a longitudinal or experimental study is recommended to strengthen the causal inferences.

The second limitation relates to data collection using a small number of respondents, and the presence of social desirability biases should also be noted. As such, every attempt to minimize concerns regarding social desirability biases, including multiple sources of evidence (interviews and secondary data sources, such as reports, websites, and other documents) was made.

Lastly, the findings of this study are applicable to other public hospitals, as well as private hospitals in Thailand. Therefore, replicating and extending this study to other hospitals may provide a basis for the external validation of the findings. This study can serve as a foundation that enhances understanding of how SSCM can be effectively utilized in terms of patients' satisfaction during a pandemic.

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