

Adaptation of Hybrid Strategy in Healthcare Supply Chain

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Abstract

Supply chain strategies in the healthcare industry are vital in today's era. As there is an evident gap in the literature regarding this concept, the authors propose Lean and Agile as process strategies. Lean is a popular methodology that focuses on providing value to the intended customer by eliminating waste, ensuring continuous improvement, and reducing cycle time. Agile is a widely practiced project management method incorporated with software development characterized by the division of tasks into short phases of work and frequent reassessment and adaptation of plans. This exploratory paper aims to bridge the gap in the literature and construct a robust supply chain model that should be prepared for quicker response to uncertainties and reducing process cycle time by incorporating lean and agile as functional process parameters. It also focuses on overall performance improvement in each functional sub-divisions of the supply chain through this hybrid strategy, facilitates faster patient service, and provides a better service level to the patients by utilizing available resources efficiently. Recommendations have been suggested taking into account several criteria including patients' reason to visit, seasonal effect, demography, waiting time for OPD etc. Healthcare is undoubtedly a vast area, and the agendas and policies are different correspondingly to geographic entities. This study was primarily based on the healthcare industry of Bangladesh. Further study can introduce a new possibility of applying this strategy to other regions as well.

Keywords

Healthcare Supply Chain, Lean and Agile, Performance Enhancement, Supply Chain Strategy, Healthcare of Bangladesh

1. Introduction

The concept of Supply Chain Management was coined around the early '80s, and soon it became popular among operations managers throughout the world. Nowadays, this concept is going to be more and more vital not only in manufacturing industries but also in the service industries. Especially in healthcare sectors, the introduction of an efficient and effective supply chain has yet not been inaugurated. Health care industries worldwide have grown to a vast extent today, and due to scarce resources and increasing demand, the researchers are now driven to focus on new approaches and methodologies to withstand the newly discovered challenges associated with healthcare service providers. In third world countries like Bangladesh, the need for a well thought out approach and a robust, efficient strategy is imminent. Also, the cost cutting measurements are of vital importance in healthcare organizations. It is estimated that Supply chain constitutes 25-30 percent of operational costs for hospitals (Hana and Sethuraman, 2005; Roark, 2005; Nachtmann and Pohl, 2008). So, an equilibrium between cost and service quality in health care has been a highly disputed issue for a long time. This indicates that reducing lead time and associated costs without sacrificing the care quality is crucial.

Even though we have a few appreciable efforts in the healthcare industry of Bangladesh, a lack of academic research in the field of health care supply chain management still exists (Shah et al., 2008). The present situation in the healthcare sector of Bangladesh is quite a bit scattered, and there is an apparent absence of any well-planned strategy to facilitate the effectiveness of the supply chain. The implementation of Supply Chain Management to ensure proper responsiveness towards the patients and provide the best possible care and medication through efficient utilization of existing resources, is more complex than in any other industries causing these practices not to be adopted in

Bangladesh. To overcome the shortcomings of the current situation, this paper introduces a hybrid strategy by incorporating Lean & Agile as process strategies and combining these two methodologies to enhance the quality of service and optimize the efficiency of the healthcare sectors in Bangladesh.

2. Literature Review

For our study on the current healthcare service industries of Bangladesh, we have studied various journals, papers and government newsletters with provided valuable information. The following sections discuss the situation of SCM in healthcare in current situation, lean and agile as process strategies and our findings and recommendations with the limitations of the study.

2.1. SCM and Health Care Services in Bangladesh

Health Care organizations are looking for effective methods to improve operational efficiency and reduce expenditure without disrupting care and service quality (Msimangira, 2010). So, healthcare organizations worldwide are continually searching for innovative and efficient new ways to develop the traditional concept. SCM is about solving functional divisions that occur within and between organizations and create seamless processes (Mentzer et al., 2001). This indicates a need for functional specialization and process orientation in healthcare organizations (Aronsson et al., 2011). There are structural similarities in requirements and flow processes with the manufacturing industry, indicating that supply chain concepts could be beneficial to the health care sector. Health care is a service industry, which means that the customer is part of the whole process. Here the patient can be considered a customer who is receiving medical care until his recovery as a part of the process. Instead of inventories, healthcare industries use patient queues. This whole patient flow process can be optimized for greater efficiency at every functional group by adopting a hybrid strategy where Lean & Agile would be utilized and essential process parameters.

The supply chain is not just any method; instead, it is an entire behavioral change in particular ways (Storey et al. 2006) and describes an overall flow-oriented strategy by incorporating Lean and Agile. So, to have the most out of SCM in healthcare, each individual has to adapt to the required behavioral change and specific infrastructural properties. In Bangladesh, the infrastructure is a massive letdown for the actual application of a properly working SCM to work as traditional approach is very common in this environment. Moreover, there are specific barriers we have to meet for this purpose. (Alt,1997) states that the increase in healthcare costs and inefficiencies are the direct results of inadequate and tedious purchasing procedures and purchasing information systems. So, the strategy must be robust and take into account all these barriers. A recent study concludes that one of the barriers to the implementation of Lean and Agile is limited education on supply chain practices (McKone-Sweet et al., 2005). As the healthcare industry has numerous functioning groups and all of them have to work together to ensure proper care to patients, changes must be made in each group in a well-defined manner, which will be discussed further in the paper.

2.2. Lean and Agile: Strategic Applications in Healthcare

The Toyota production system first introduced lean, and the Japanese found a significant improvement in their production flow process by reducing or eliminating wastage from every possible small group of the entire production process. Lean has emphasized creating good supplier partnerships, reducing the number of suppliers, and transferring responsibilities to the supplier of just-in-time deliveries and quality (Aronsson et al., 2011). Thus, whereas Lean deals with these criteria.

Agile is a comparatively new concept in the industry and has also been successfully implemented in various manufacturing industries. But in the healthcare sector of developing countries like Bangladesh, combining these two strategies has not been possible; if it were, it would be much beneficial for the citizens. Currently, the country's healthcare sector has been practicing Lean in a primary stage, but Agility in the supply chain is still nonexistent. There is a functional difference between these two. As described by (Christopher 2000), "Lean" focuses on doing more with less as we denote "efficiency", while being "agile" refers to the organization's ability to respond rapidly to changes in demand.

3. Research Methodology

The process of patients coming in and going out with their health restored from a healthcare center can be described as a service industry where we can use the knowledge of supply chain management and its various tools to make it

into a smoother and comforting process to go through. For our research we chose the hybrid use of the tools called lean and agile principles/process strategy of supply chain.

Lean is very much known to us as a principle which is used in various industries to reduce cost, increase productivity and assure JIT. And Agility as a process strategy is a very fast, responsive act on a process to be dealt with. And for the health-care supply chain both are equally important and needed. From a patient's view, one might come for a single appointment of the physician to a lifelong treatment of a disease for which the supply chain of health-care is versatile and complex. And in all of these various processes many times we need to apply lean and for the other times agile. So, when to use lean or agile. It is as simple as their theories/definitions mean. For dealing with emergencies/fast responses we are to put in effect an agile process strategy other than that we will use lean as a process strategy to ensure maximum productivity by least cost.

In the perspective of the Health-care system in Bangladesh, be it rural or urban region, most people go to the general hospitals and medical college hospitals run by the government for check-ups, emergencies and accidental cases. For our research we are considering only the government run hospitals and medical college hospitals to deal with the majority. At present in every district of Bangladesh, there are around 300 bed capacity hospitals. In Upazilla level there is one government health care complex which can perform basic surgery operations. From our study, we found that human resource for health care mix: doctors/nurses 2:1. Number of doctors and nurses per 10,000 populations 5.3 and 2.9 respectively. Which indicates a severe scarcity of human resource in healthcare of the country. This figure is even worse when we consider the Relative geographical distribution of doctors/nurses (rural/urban) per 10 000 populations which implies,

Doctors: rural 1.1, urban 18.2

Nurses: rural 0.8, urban 5.8 (World Health Organization, 2017)

We studied and found various causes responsible for patient mortality and morbidity, Top causes of mortality and morbidity across all ages:

Top causes of mortality

- Cardiovascular disease
- Diseases of the respiratory system
- Cerebrovascular disease (stroke)
- Infectious diseases
- Poisoning
- Injury due to assault or road traffic accident

Top causes of morbidity

- Cardiovascular disease
- Pregnancy and associated complications
- Infectious diseases
- Diseases of the digestive system
- Injury due to assault or road traffic accident
- Diseases of the respiratory system

Source: Ministry of Health and Family Welfare (2), based on combined reports from all types of public hospitals in Bangladesh and classified according to the International Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) (World Health Organization, 2017).

A closer insight to the existing healthcare system with the government hospitals and medical colleges reveal that all the cases can be categorized in two major groups as General cases and accidental/emergency cases.

3.1. General Cases

Generally, people coming for a normal check-up firstly must take an appointment through taking a token/coupon as a serial number. After that a waiting period (idle time) comes where people must wait for their serial to see the doctor which may take a long time, since we don't have enough doctors and nurses against the population. Many times, the doctors cannot make more time to see the patient/people in the queue for that specific day, which causes them to be scheduled later another day which results in wasting the whole day of the person waiting. And then, once the person gets his/her turn to visit the doctor for the diagnosis of the illness, the doctor might give the result instantly after hearing the symptoms from the person or, if the symptom of illness cannot be diagnosed by the prior process, then the

doctor gives some tests to diagnose the problem which is the natural process to go. And here lies a problem, which is that the test results most often take too long to come out which can be made possible to get sooner, due to such delays the condition of the patient might deteriorate over this period. Again, many times faulty diagnosis of the doctors due to lack of definite test results processed by less experienced operators make the illness of the patient even worse.

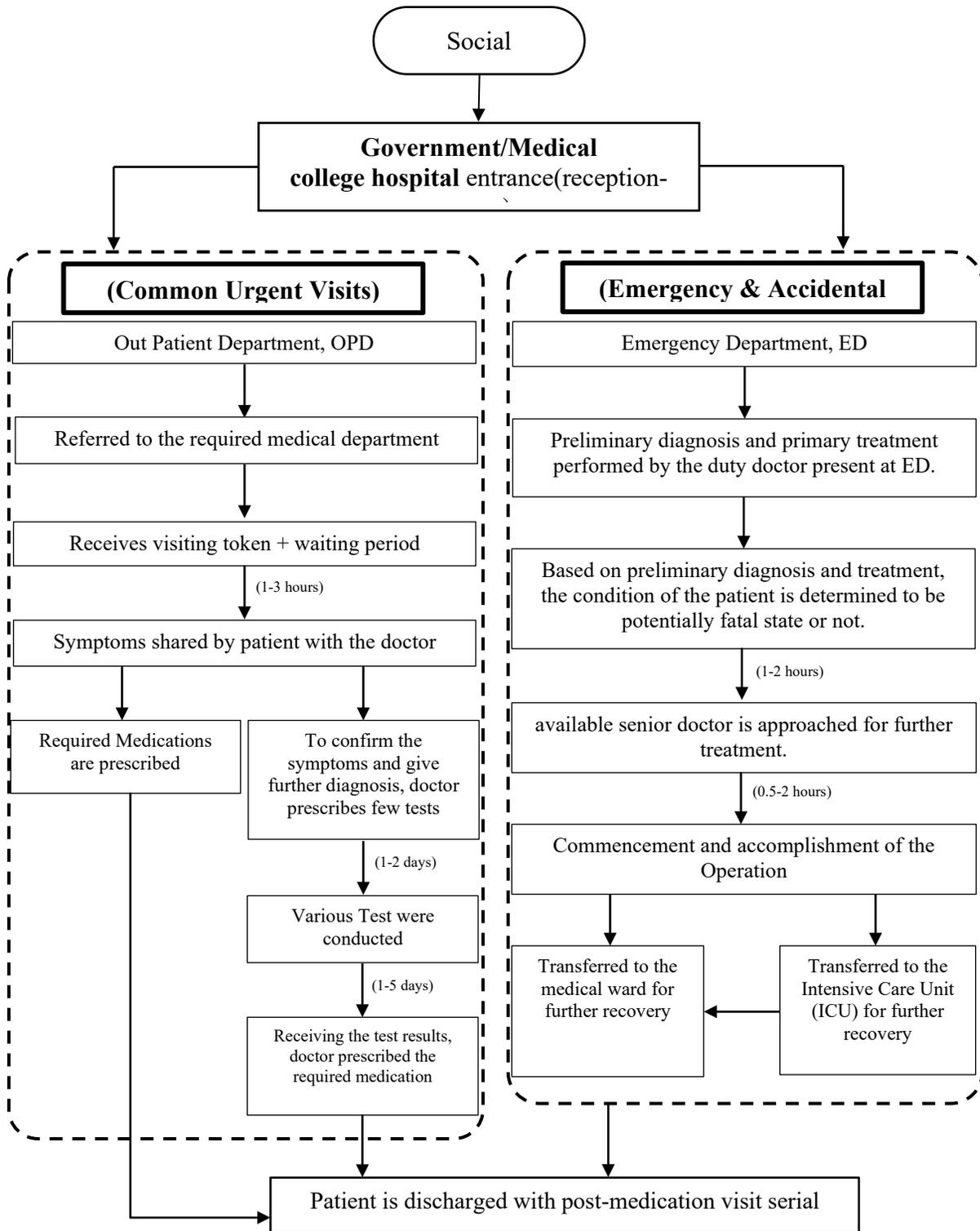


Figure 1: Existing steps to a patient's treatment in a hospital of Bangladesh.

3.2. Emergency/Accidental Cases

For any accidents or life-threatening illness, the patient arrives at the ED, emergency technicians determine the reason for their visit. A registered nurse (duty doctor/intern doctor) will take their medical history and perform a brief examination of the symptoms. The triage registered nurse might assign the individual a priority level based on his/her medical history and current condition according to the following scale: Level 1 – Resuscitation (immediate life-saving intervention); Level 2 – Emergency; Level 3 – Urgent; Level 4 – Semi-urgent; Level 5 – Non-urgent and take action to stall the condition from degrading till the senior doctor contacted comes. In some cases, an emergency registered nurse may start diagnostic testing to decrease the time spent waiting for medical treatment. Should his/her symptoms worsen as he/she wait, notify the emergency technician or triage nurse immediately.

Five steps of Emergency care:

3.2.1. Step 1 (Triage)

Triage is the process of determining the severity of a patient’s condition. Patients with the most severe emergencies receive immediate treatment.

3.2.2. Step 2 (Registration)

The registration process is essential for two reasons: it lets the ED staff gather information about patient record and obtain consent for treatment.

3.2.3. Step 3 (Treatment)

Every patient who comes to the Emergency Department receives treatment from an attending physician or mid-level practitioner. Depending on the patient’s condition, a registered nurse may start preliminary steps to treatment. A nurse or technician may also take blood or urine samples or send him/her for an X-ray or other imaging test before a physician sees him/her. Physicians may also order blood tests on an urgent basis. Test results help emergency medicine physicians assess the patient’s condition. The results could be available within one to two hours, while the patients are in the ED. However, some test results may require a longer wait.

3.2.4. Step 4 (Re-evaluation)

An ED physician or mid-level practitioner will reevaluate the patient’s condition after they receive your test results because the results may give them additional insight into the type of treatment patient need. After his/her re-evaluation, the attending physician determines whether s/he should be admitted to the hospital or treated and sent home.

3.2.5. Step 5 (Discharge)

Part of our job is to keep patients healthy long after s/he has left the ED. All patients receive written home-care instructions to follow when discharged. The instructions describe how one can safely care for his/her wound or illness, directions for his/her prescribed medications, and recommendations for follow-up medical care (*Five Steps of Emergency Care | St. Mary’s Regional Medical Center, n.d.*).

4. Findings and Recommendations

Sampling Method: Data were collected through the simple random sampling (SRS) technique. Hospitals were selected through simple random sampling (SRS) from the existing District hospitals (64), medical colleges (29). Study samples were selected from seven divisions which represent the whole Bangladesh.

Sample size: As standard approach, the selected sample size was 500 for our survey

4.1. Findings

Table 1: Proportions of patients’ visit relative to Cause (General checkups, accidentals, Emergencies)

Cause of visit	Number of Patients (Sample population = 500)	Percentage (%)
Common urgent care visits/ general check-ups	334	66.80

Emergency Care visits	66	13.20
Accidental Case	100	20

Table 1 shows the cause-based analysis where it reveals that the majority (67%) of the patients visit the hospitals for general health checkups followed by accident cases (20%).

Table 2: Proportions of patients' visit based on Medical Departments

Name of the Medical Department	Number of Patients (Sample population = 500)	Percentage (%)
Medicine Specialist	150	30
Child Specialist	50	10
Eye Specialist	67	13.4
ENT Specialist	67	13.4
Orthopedics and Surgery	68	13.6
Cardiology	83	16.6
Burn and Plastic Surgery	15	3

Table 2 represents the department-based analysis, which shows that the majority (30%) cases are related to the medicine department, followed by the cardiology department (16.6 %). The least visited department is the child department, with only 10% of patients.

Table 3: Proportions of patients' visit based on Seasons in Bangladesh

Name of the Season	Number of Patients (Sample population = 500)	Percentage (%)
Summer	116	23.2
Rainy Season (Monsoon)	83	16.6
Winter	184	36.8
Other	117	23.4

Table 3 presents the season-based analysis. The season has a significant role in human health. Our analysis shows that, Winter has affected the most (37%) people followed by the rainy season (23%).

Table 4: Age Based Analysis

Range of Age (Year)	Number of Patients (Sample population = 500)	Percentage (%)
01-12	100	20
13-24	67	13.4
25-45	150	30
45++	183	36.6

The Table 4 (Age based Analysis) clearly states that majority (37%) patients age above 45 years and the least (13%) affected are under 13-24 years range.

Table 5: Gender Based Analysis

Based on Gender	Number of Patients (Sample population = 500)	Percentage (%)
Male	283	56.66
Female	217	43.34

This analysis of Table 5 indicates that male patients are accounted for majority of the cases.

Table 6: Patients Waiting Time in the OPD of Hospital

Waiting time interval	Number of Patients (Sample population = 500)	Percentage (%)
< 1 hours	217	43.4
1 – 2 hours	183	36.6
2 – 3 hours	84	16.8
>3 hours	16	3.2

In Table 6, we can see majority (43.4 %) of the patients have to wait below an hour to get diagnosis in the OPD of the hospitals.

Table 7: Reasons for Doing Investigations Outside the Hospital

Reasons for not using Government hospital	Number of Patients (Sample population = 500)	Percentage (%)
Long waiting time	233	46.6
Inexperienced Technician	150	30
Malfunctioning Machine/Equipment	117	23.4

Table 7 states that 47% of the patients are unwilling to get care from government hospitals due to the long waiting time.

4.2. Recommendations

After studying and identifying the existing flow chart and evaluating the analysis thoroughly, these recommendations are proposed:

- Waiting time in the hospital OPD may be reduced by timely attendance of the service Providers; for this automated time attendance system can be installed & utilized. Thus, lean can be used to reduce lead time.
- Segregation of the patients' category (simple, complicated, emergency), avoiding Medical Representative's visits at peak hour, vitalizing help desks should be activated.
- The vacant posts of the medical technologists should be filled-up with appropriate workforce as a priority
- Building capacity of the health workforce will maximize opportunities in early detection, management, and intervention; To facilitate quick response to patient, buffer amount can be utilized to be prepared for overload of patients, which will be Agile's application.
- The referral system must be functional and strengthened. The impact of non-referral system has adverse effects on secondary and tertiary level hospitals, which create load on the service providers, and thus, maintenance of the quality of services becomes difficult.
- Doctors, nurses, and other health personnel should be posted rationally so that the health workforce's utilization becomes effective and productive; this will ensure no resources are being idle.
- Decentralization of the procurement process to eliminate/reduce lead time.
- In the long-term, posts of Biomedical engineers may be created and recruited at the divisional level, and if required at the district levels, based on the necessity of the human resources.
- Need-based and time-based issues of equipment and other services must be ensured in procurement processes.

5. Limitations & Future Research

The system-wide implementation of the supply chain is possible yet not easy in the present circumstance and infrastructure. The whole supply chain process with all of its sub-processes must be adequately designed that it can be relied upon for delivering desired outcomes. Application of This Hybrid strategy in healthcare organizations in

Bangladesh exhibits high complexity and balancing the need for functional specialization, and efficient, high-quality patient flow system is an important factor (Aronsson et al., 2011). Hence, there are some limitations in regard to applying this strategy in the healthcare sector of this country.

Firstly, the lack of required infrastructural integrity and the mind setup of the responsible government individuals is crucial. As Government hospitals are the primary destination of the general patients, we have to propose and manage the officials about the necessity and positive outcomes from this system. As for the private hospitals, respective hospital owners have to have a proper understanding of the process and this will encourage them to invest in this regard. As the whole challenge here is to make a behavioral change throughout the organization, this is a must that each and every individual has a clear understanding of their responsibilities to keep this flow uninterrupted.

The present situation of the COVID-19 pandemic has caused a restriction to the authors to conduct a detailed survey, and consequently, the sample size was inadequate. Many of the hospitals have put a restriction for the researchers and visitors as a preventive measure. Moreover, in this paper, Lean and Agile were studied as process parameters, whereas other parameters can be found and studied for further research. This can upraise the efficiency and effectiveness of the proposed model, as well.

Numerous papers and researches have inspired the authors to implement a hybrid strategy by incorporating the two popular and widely practiced concepts in Bangladesh's perspective. This study was conducted specifically for Bangladesh, but this study's findings and recommendations can be further extended for a similar environment as Bangladesh. The authors welcome such attempts and believe collaboration and cooperation can excel in the supply chain's strength and uncover new possibilities for implementing the hybrid strategy.

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