Chapter 8

SUMMARY AND CONCLUSIONS

The present chapter concludes the entire research work. It discusses major findings, contributions, inherent limitations and scope for further research.

8.1 Summary

The objective of this research is strategic planning and management of diabetes care. However, while conducting the literature review, we could find that the topic is discussed in few extant literature, but there is a complete absence of any comprehensive study done in the Indian context.

The literature suggests that Indian healthcare system is not prepared for facing the sudden surge of diabetes in India. The diabetes management in India is plagued with numerous challenges like a number of the qualified healthcare professional, awareness about the disease, and basic facilities (Kumar, 2010).The silo approach to management is not appropriate for managing the disease involving a long delay between causes and the health events. (Homer et al., 2004). There is a need for a system-wide approach for managing diabetes.

The decentralization in healthcare has its own advantages and disadvantages. The extant literature advises the cautious decentralization of the services in case of healthcare. While, some literature reports its positive effect in case of healthcare (Nyirenda et al., 2003; Rygh and Hjortdahl, 2007) other literature warn against unplanned decentralization in case of

healthcare (McIntyrea and Klugmanb, 2003; Collins and Greens, 1994; Kristki and Netto, 2000). But, there is a complete absence of literature on the method of decentralization in case of diabetes care.

The study also reviewed the extant literature on supply chain strategy selection and was able to find out the gap in present existing methods. The present existing methods either consider the type of product (functional or innovative products) or variability (demand and lead-time variability) as criteria for selection of the supply chain strategy for the product category (Fisher 2006, Christopher, 2006). There is a need for a comprehensive supply chain strategy section method for the diabetes care.

The extant literature shows that quality of care is one of the most important criteria for selection of hospital (Choi et al., 2004, Bochus et al., 2005). The literature also suggests that the cost of care in India is more than median per capita income and it is a major cause of non-adherence to medication regime (Peasah et al., 2015). We were not able to find out any study which discusses the patient's utility for various healthcare attributes in India. The measurement of service quality is very important in evaluating the effectiveness of a healthcare provider (Anderson, 1995). Presently existing tools like SERVQUAL only measure functional quality and are not appropriate to measure the quality of healthcare (Bowsers et al., 1994). SERVQUAL is inappropriate for measuring professional service quality as it excluded the dimension of 'core service', ' service customization' and 'knowledge of the professional' (Haywood-Farmer and Stuart, 1990). There is a need for a customized quality assessment framework for diabetes care and this research attempts to fill this gap.

This study is divided into five chapter with objectives: (1) Developing a System Dynamics model for prevention and control of diabetes in India, (2) Developing facility planning, logistics and decentralization strategy in case of diabetes care, (3) Implementing lean, agile and leagile supply chain strategy for diabetes care, (4) Assessing patient's utility for various service attributes in diabetes care, and (5) Developing a quality assessment and implementation framework for diabetes care in India.

Prevalence, Prevention, and Control of Diabetes

This research proposes and uses a system dynamics model for prevalence, prevention, and control of diabetes in Varanasi. The model was developed to explain the growth of diabetes since 2017 and portray possible future through 2050. The model simulations suggest characteristic dynamics of the diabetes population, including unintended increases in diabetes prevalence due to diabetes control, the inability of diabetes control efforts alone to reduce diabetes-related deaths in the long-term, and significant delays between prevention effort and improvement in diabetes outcomes.

The simulation model gives the prevalence of diabetes in Varanasi for the years 2030 as 0.52 million and 35.64 %. The study suggests involving 520 specialized doctors for management of diabetes in the city to achieve a ratio of one doctor per thousand population. The research examines the effect of the control efforts by using a ramped increase in the key performance variable over ten years.

The results conclude that after proposed policy measures the diagnosed diabetes population will decrease while undiagnosed diabetes population will increase and then decrease. Total population suffering from diabetes will increase irrespective of the policy measures, hence

the only option before policymakers is to tackle diabetes at prediabetes stage and make preventive and curative healthcare available at affordable cost.The method suggested by the study can be easily adapted for developing the similar models for other chronic diseases like Asthma, Chronic Obstructive Pulmonary Disease (COPD) and Tuberculosis.

Decentralization Facility Planning, Logistic Strategies for Diabetes Care

The research discusses the decentralization, facility planning, logistics strategies for the Varanasi city. The objective of the research is to identify the location for the central facility and then plan a Milk-Run connecting the central facility with the remote locations. This study classifies the components of diabetes management in two categories namely "central facility only" and "remote facility" using Multi-Attribute Utility Theory (MAUT). The three criteria for decision making were taken as criticality, cost, and perishability. The method uses the global utility of decision maker as criteria for selection of a component of diabetes to be kept at the central facility. The global utility score for the components was found as Hospitalization (0.82), Neuropathy detection (0.59), Pathology (0.59), and Pharmacy (0.59). Taking a cut –off of 0.5 for keeping a component of diabetes care to be kept at central facility, the study concluded that Hospitalization, Neuropathy Detection, Pathology, Pharmacy should be kept at the central facility while other components of care like consultancy, Foot Care, Eye Care, Exercise and Diabetes Education, and Medical Nutrition Therapy should be kept at remote facility. The study uses nonlinear programming method for identification of central facility and found Chetganj, a location in the center of the city, as the location for the central facility. In the last, the research uses Traveling –Salesman-Problem method for

identifying the milk-run route connecting this facility with remote locations. The sequence of the nodes traveled during Milk-Run is:

- Chetganj-Kotwali-Jaitpura-Adampura-Chowk-Dashashwamedh-Nagwa-Khojwan-Bhelupur-Sigra-Nadesar-Shivpur-Sikraul.

Leagile Strategy Implementation in Diabetes Care

This research proposes a method for identification of best-fit supply chain strategy in case of diabetes care. The study finds out that simple classification on the basis of demand and lead-time variability proposed in the extant literature is not adequate to address the complexity of the healthcare supply chain. The study uses secondary research and expert interview to divide the inventory into eleven homogeneous groups as Antidiabetic, Insulin, Lipid Lowering, Antiarrhythmic, Antihypertensive, Heart Failure, Antithrombotic, Nursing Aids, Footwear, Assistive Technology, and Food Supplement. The study uses Multi-Dimensional Scaling (MDS) method for exploring the dissimilarities of these groups on criteria other than demand and lead time variability. The visual representation suggests us that there exist significant dissimilarity in the group for the factors other than lead-time and demand variability. The study then uses focus group discussion to identify three additional criteria for the classification of the supply chain strategy namely criticality, cost, and perishability. Based on these additional dimensions this study proposes a two-step rule-based approach for selection of the best supply chain strategy for the diabetes care.

Patient's Utility for Healthcare Service Attributes in Diabetes Care

This part of the research deals with the identification of patient's utility for various service attributes in the context of diabetes care. The study uses focus group discussion to identify the important attributes for the diabetes care and then uses conjoint analysis to calculate the patient's utility for various service attributes. The study randomly selects 301 patients from two diabetes specialty clinics in Varanasi and Jaunpur. The importance scores for the different attributes were found as Quality (56.52), Waiting (17.79), Hospitalization Expense (12.83), Spend p Per Visit (10.04), and Distance (2.764).The result of the study shows that quality is most important criteria for selection of a hospital followed by waiting time. The least important criteria for selection of a diabetes clinic was the distance of the hospital.

Quality Assessment and Implementation for Diabetes Care

The research also proposes and uses a framework for assessment and implementation of quality in a healthcare organization. First of all, the study identifies eighteen attributes using focus group discussion as: Quality of Clinical Care, Quality of Investigation, Cost of Medicine, Length of Stay, Professional Flexibility, Practitioner's Attitude, Administrative Staff's Attitude, Waiting Time, Facility Availability, Access, Grievance Handling Time, Medical Record Keeping, Hospital Infection Control, Privacy, Waste Disposal Policy, Process Flexibility, Cost of Consultancy, and Cost of Investigation. The high correlation among the variable suggested us to perform factor analysis to reduce the list of variables. The six factors identified after the factor analysis were: Employee Attitude Factor, Care Delivery Factor, Cost of Care Factor, Cleanliness and Privacy Policy Factor, Customer Relationship Factor and Process Flexibility Factor. Next, the study uses Interpretive Structural Modeling(ISM) for identifying and summarizing relationship among these factors related to

the quality of diabetes care. The ISM Model identifies employee attitude as the most important factor in the implementation of quality practices in a healthcare organization. In the last Analytic Hierarchy Process (AHP) was used to calculate the priority weights of these factors. The study found the weights for the factors as Employee Attitude (0.337), Care Delivery (0.337), Cost of Care (0.164), Cleanliness & Privacy Policy (0.039), Customer Relationship (0.084) and Process Flexibility (0.039).

8.1.2 Contributions of the study

This research contributes towards strategic planning and management for diabetes care. The research provides a method for investigating the prevalence and control of diabetes with an example of Varanasi city. The study estimates the prevalence of diabetes in Varanasi at 35.54% by the year 2030. The research further proposes a decentralization strategy for diabetes care using the preference of decision maker and then identifies the central facility and milk-run connecting central facility with remote locations. Based on Global Supply Chain Matrix proposed by Martin Christopher, this study proposes a two-stage rule-based method for identification of supply chain strategy for diabetes care. The study further uses conjoint analysis to find out the utility of the patients for various diabetes care attributes. The study finds the quality of care as most important attributes out of all diabetes care attributes. At last but not the least the study proposes a quality implementation and assessment framework for diabetes care.

8.1.3 Theoretical Contributions

The study proposes a system dynamics model for diabetes in the Indian context. The model is easy to use and can be adopted for another chronic disease like COPD, Asthma, and

Tuberculosis. Next, this research proposes a new method using Multi-Attribute Utility Theory (MAUT) for taking decentralization decision in case of healthcare. This study extends the Global Supply Chain Matrix proposed by Martin Christopher using three additional criteria criticality, cost, and perishability and proposes and uses a Two-Step Rule-Based Method (TRBM). The study uses conjoint analysis based study to identify the most important attributes for patients in selecting the diabetes clinic. The finding of the study concludes that quality is most important criteria for selection of a hospital. Finally, the study using Interpretive Structural Modelling (ISM) proposes a method for quality assessment in case of diabetes care.

8.1.4 Contribution to Practitioners

The practitioners can use System Dynamics Model proposed in this study for simulating the results of policy decisions. They can use this tool for strategic planning in case of diabetes management. The fourth chapter of the study proposes facility planning and logistics strategies for the Varanasi city. This approach can be easily adapted for other cities and other chronic diseases. The fifth chapter of the study provides a new approach for selection of supply chain strategies in case of diabetes care and a decision maker can use it for managing the hospital supply more efficiently. The sixth chapter of the study concludes that quality of care is a most important factor in the selection of a hospital while the distance of the hospital is the least important criteria. The decision maker can use these finding in designing the healthcare services in case of diabetes care. Finally, this research proposes a framework for quality assessment and concludes that employee attitude for highest driving power among all six factors selected for the study and cost of care has the highest dependence. These findings suggest that policymakers should invest in training and development of the employees to

implement the quality in a healthcare organization. The decision makers should also be aware of the effect of new policy on the cost of care, as the increased cost of care will move health care out of reach of the patients.

The proposed methods in the research are elaborated using the case of Varanasi city or diabetes specialty clinic from Varanasi. The finding of this research can be generalized for diabetes management in other similar cities and for other chronic diseases like Asthma, Tuberculosis, and HIV.

8.2 Limitations and Future Research

First, the data for this study is collected from the patients, doctors, and managers from a single diabetes specialty clinic, having two centers in Varanasi and Jaunpur, to find out utility, preference, and contextual score for various objectives of this research. Therefore, there exists a chance of method bias. Moreover, the data is collected from the private diabetes clinic and the inclusion of the data collected from public healthcare provider can make the study more inclusive. In addition to this only allopathic diabetes care units have been taken into consideration for the study.

Secondly, the study relies on indirect measures for unobservable variables that are assumed to influence the quality of a healthcare unit. The quality measurement framework developed in this research has not been tested practically due to time constraints. The study only uses five attributes for healthcare because using more attributes had made it difficult to get the response in case of conjoint analysis.

Future Research Directions

The finding of this research suggests that the prevalence of diabetes in near future will keep increasing irrespective of taking the policy measures. The only way to reduce the economic burden of diabetes is early detection and of diabetes and improving the factors affecting the onset of diabetes like lifestyle, environmental condition, and obesity. There is lack of availability of preventive and curative care facilities for diabetes care. The future direction of the study may include developing a more inclusive diabetes risk prediction model using the anthropometric variables. The reviewed literature suggests that hospitalization is a major component of the cost of diabetes management. The future direction of the study may include prediction of hospitalization in case of Indian. The future study may also include the study of factors affecting the non-adherence to the medical regime.

This study discusses the decentralization of the diabetes care but doesn't talk about the agility of this remote facility in managing the emergencies or referring the patients to a central facility. There is also need of prioritized resources allocation for the critical components of diabetes care. The future direction of study may include the study of resource allocation in diabetes care.

This study proposes and used two-step rule-based method (TRBM) for selection of a supply chain strategy using a case of private diabetes clinic. The future direction of the study may include the exploration of the suitability of the lean and agile strategy for the different type of organizations (private, public, large and medium scale etc.).

The reviewed literature suggests that there is a need for supply chain partnership for implementing the supply chain strategy efficiently. The future direction of the study may

include the development of a supply chain partnership assessment framework for the diabetes care. The future direction may also include the study of supply chain risk and measures to mitigate the same.

Finally, this study proposes a framework for implementation of the quality of diabetes care and find out employee attitude as a most important factor in implementing the quality in a diabetes care organization. The cost of care has high dependence and increases when we improve other factors of quality. The future direction may include further study of the enabler of the cost of care and employee attitude. The future direction may also include the factor affecting the adaptation of medical insurance in India.