

Access Factors Affecting Supply Chain Efficiency of Medical Supplies in public Health Centres in Kenya: A Case Study of Public Health Centres in Elgeyo Marakwet Count

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Abstract *The purpose of this study was to determine factors affecting efficiency of supply chain of pharmaceutical products (drugs) to Public Health facilities in 47 Counties of Kenya. The study precisely sought to establish whether: procurement processes, ICT infrastructure, distribution channels and competency of medical staff in supply chain, are factors affecting efficiency of supply chain of pharmaceutical products to Health Centres in Kenya. A population size of 120 employees was targeted in 15 health Centres from which a sample size of 60 was chosen out of the 66 questionnaires distributed, 60 filled and returned. This study used descriptive research design and the data was collected mainly from primary sources such as questionnaires, observation, and interviews. The analytical framework draws upon William's theory of the mechanism of governance and insights from new institutional economics of institutional changes. The information used in this study is based on the author's more than 50 questionnaires issued with a variety of stakeholders, including government agencies, health centres and electronic bidding platforms providers. The data was analyzed using both qualitative and quantitative techniques. In quantitative analysis pie charts, graphs and tables will be used to present the study findings. This research focuses mostly on proper medical supply chain efficiency to enhance good flow of medical products to foster primary health services in the Country. Technology is key aspect in this study the researcher ought to understand which level of technology is adopted in medical supply chain and how efficient it can be when they adopt this technology and training of the staff towards adaptation of this new technology for efficient service delivery.*

Key words Efficiency of supply chain, procurement process, distribution, staff competencies, supply chain theories

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1. Introduction

Poverty, which afflicts close to half of the Kenyan population, is the result of insufficient income generating opportunities. It undermines access to health services and health sustaining goods and services. The poor may be willing but often cannot afford to pay health care especially in private sector and prefer public health facilities because it is affordable. Health is critical for human well-being and development, WHO emphasizes a physical, social and psychological wholesomeness not just absence of infirmity for optimal exploitation of livelihood opportunities. (*Assessment of the pharmaceutical situation in Kenya: a baseline survey*, Ministry of Health/WHO/HAI, 2003 Ministry of Health)

The failure by government to allocate sufficient budget to public health is reflecting the persisting failure to attain the 15 percent public health spending level since the Abuja declaration of 2000, and WHO's US\$ 34 per person per year. Additionally, the current policy blue print, the comprehensive National Health Policy Framework 2011-2030, acknowledges that that due to parallel systems of procurement, warehousing and distribution of drugs, even though essential drugs list exists, adherence to it is below par.

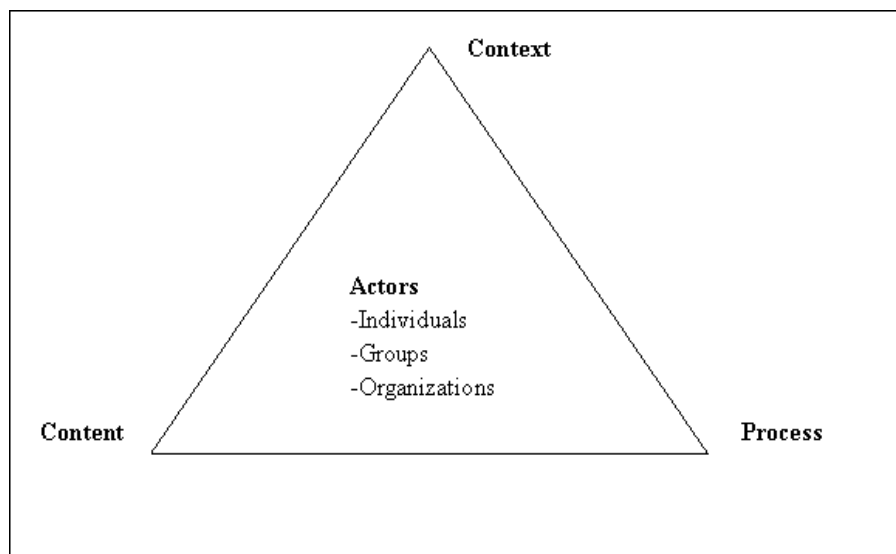
This asymmetric situation underscores the need for effective public treatment system based on an efficient Medical Supply Chain. Therefore efficiency of the public medical supply chain is critical while

consultation is affordable; the high costs of drugs and supplies for importers like Kenya are often prohibitive. (Access to essential medicine in Kenya, 2009)

Thus, the present study investigates the factors effecting supply chain efficiency of medical supplies in Elgeyo Marakwet County being with distinct and common features that can represent other Health facilities in Kenya. Elgeyo Marakwet County is in Northrift region of Kenya with similar features of remote parts of Kenya that can give reflective study on how this sector can be improved.

Health Policy Framework

Health policies are formed through the complex inter-relationship of context, process and actors. Walt and Gibson (1994 in Buse *et al.*, 2005) have proposed the health policy triangle as a way of systematically thinking about all the different factors that may affect policy



Source: Walt and Gilson, 1994 (in Buse *et al.*, 2005)

Figure 1. The Health Policy Triangle

Actors refer to individuals, organizations or the state, and their actions that affect health policy. All actors have their own interests and agendas. Examples of actors include individuals, international NGOs, national NGOs, pressure/interest groups, international organizations, bilateral agencies, funding organizations, private sector companies, and the media.

Context means systematic factors such as political, economic, social or cultural, both national and international which may have an effect of health policy. These include:

- Situational factors for example transient, impermanent conditions which can have an impact on policy (e.g. wars, droughts)
- Structural factors like relatively unchanging elements of society (e.g. the political system, type of economy, demographic features) and cultural factors such as religion, ethnicity, gender
- International or exogenous factors- some policies require cooperation between national, regional or multilateral organizations

Content is the substance of a particular policy which details the subjects and topics covered.

Process is the way in which policies are initiated, developed or formulated, negotiated, communicated, implemented and evaluated.

Policy formation falls into the process corner of the framework above and is influenced by actors, content, and context. It is a process of negotiation and bargaining in order to satisfy various interests and build a coalition of support. Policy formation varies according to the nature of the policy and the organizational structure in which it is made (i.e. actors, content, and context) but often includes assembling information, developing arguments, developing alternatives, and persuading others. Sometimes the process is rational systematically weighing the pros and cons of various alternatives; and sometimes the

process is incremental an iterative decision making process without explicit goals (Anderson and Sotir Hussey, 2005).

Reforms in the MSC are imperative to address performance concerns; the supply chain must be sufficient and integrated. Markedly, efforts were made by government to mitigate the challenges through the government's Kenya Health Sector support project (HSSP) which seeks to address availability of essential health commodities and strengthening of supply chain management (SCM) through the Health Sector Service Fund (HSSF)., it also seeks to enhance effective and transparent implementation of the Kenya Essential Package for Health (KEPH) through direct cash transfer to primary health facility.

Theory of Constraints on Supply Chain

By far the most popular approach to supply chain management is Goldratt's Theory of Constraint (TOC) (Triestch 2005). The theory of constraints is a management paradigm that views any manageable system as being limited in achieving more of its goals by a very small number of constraints and as such TOC uses a focusing process to identifying the constraints and restructure it to realize more through put through the system (Triestch, 2005). This is in line with the views of an earlier propagator of the theory of constraint, Mewes (1963), who identified bottlenecks as underlying inefficiencies of most processes.

The theory of constraints is based on the premise that the goal achievement by a goal oriented system is limited by at least one constraint (Triestsch 2005; Cox, Jeff, Goldratt & Eliyahu 1986). Only by increasing flow through the constraint(s) can overall output be increased and the objectives of the system realized (Goldratts, 2004).

Assuming the goal of the system has been articulated and its measurement defined, the steps include identifying the systems constraint, deciding how to exploit the constraint, subordinate everything else to align the whole system and make changes (Goldratt 2004). Constraints according to Noreen, smith & Mackey (1995) can be external or internal to the system and include such phenomenon as constraints of equipment, policy and regulation, lack of skilled people The theory of constraint has been used in the supply chain management to provide solution towards greater availability and flow of inventory by identifying constraints such as, and offering management techniques to reduce, replenishment time, lead time, and late deliveries (Herman 2000). Any improvements in such areas will improve availability of products and services to customer.

General Systems Theory on Supply Chain

The general systems theory was developed initially by Von Bertalanffy (1969) in the field of biology and extended by Weinberg (1975), Miller (1978) and Yourdon (1989) into paradigms of management (Rudolf, 2011). Bertalanffy (1969), a biologist who through his work on general body systems found that given the interaction between a system's components, a system was often more than just the mere sum of its components; it involves the interaction between components, differently, within the larger system. Miller (1978) argued that in most cases, real world systems are open systems which interact with, and are often influenced by, the external environment.

Another important concept of a system is the definable boundary that separates a system from its environment and allows inputs to and outputs out of the system (Rudolf, 2011). The general systems theory according to Rudolf (2011) identifies four general systems principles. These principles are; The more specialized or complex a system is, the less adaptable it is to its environment, the larger the system, the more the resources are required to support the system, systems often contain other systems, and are in themselves components of larger systems and systems grow proportionally to resources allocated to the system.

Supply chains are considered systems of providing flow of good, product or services to consumers (Chopra & Meindl 2004). The contribution of the general systems to supply chain can be seen from this view point that the supply chain is a system with inputs and expected outputs, to inform management of supply chain. Handfiled & Nicholas (1999) explains that, within the context of the general systems theory, the supply chain includes the management of information systems, sourcing and procurement systems, logistics systems, order and customer service systems and integration of these activities through improved relations between these systems can be used to gain competitive advantage. The general systems theory

provides opportunity to distinguish subsystems and variables that operate within a supply chain leading to a better understanding of the dynamics within the supply for better study and improvements.

Conceptual framework

This is a diagrammatical representation of the study showing the relationship between the dependent and the independent variables (Mugenda & Megenda, 2003). An independent variable is presumed that cause changes in the dependent variable.

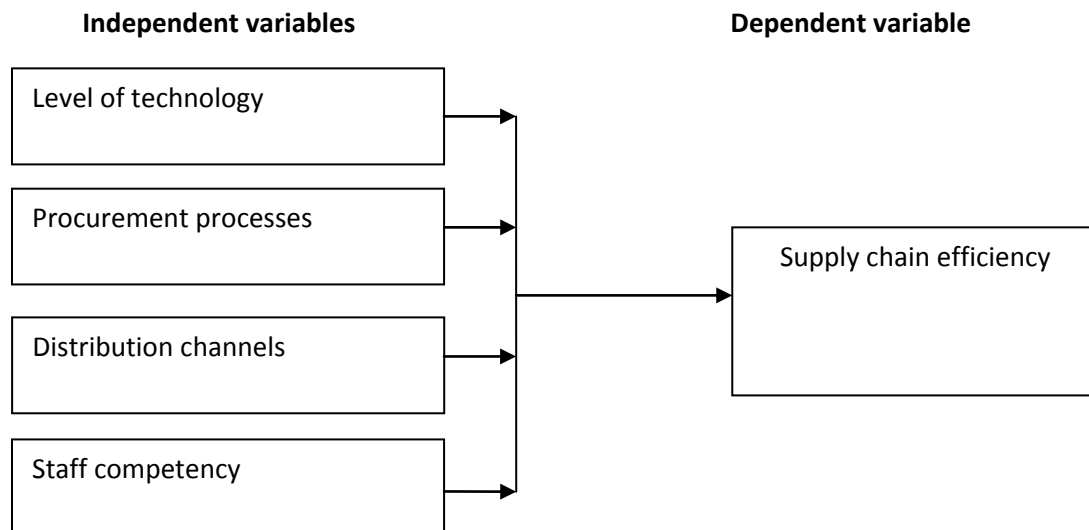


Figure 2. Conceptual framework

Supply Chain efficiency

Chopra, Sunil & Meindl (2004) defines a supply chain as including all functions involved in receiving and fulfilling a customer request. Similarly, Hertz (2001) defines a supply chain as a network that supplies a specific product from raw material to final product. Hertz (2001) goes further to state the common objective of any supply chain as efficiency and effectiveness. Efficiency is an internal standard of performance while effectiveness is an external standard of fit to various groups' demands (Pfeffer & Salancik, 1978). For the purpose of this study the researcher will focus on effectiveness

Effectiveness by definition is a qualitative measure set by an evaluator; the evaluators here refer to customers. The concept of effectiveness according to Moller and Torren (2003) is an actor's ability to produce solutions that provide value to markets (customers). A related, but a more specific concept of effectiveness is given by Hines *et al.* (2000) who define organizational effectiveness as an external standard of how well an organization meets the demand of various groups that are concerned with its activities. Supply chain effectiveness is equalized, by

Gunasekaren, Patel and Tirtiro (2001), to the level to which organizations involved in delivering value to customers create customer satisfaction by delivering the right product offering at the right time at the right place.

Ralph (2000) established that in order to achieve the supply chain validity of outcome (effectiveness; delivering the right product offering on time, to the right groups and at the right place (Gunasekaren, Patel & Tirtiro 2000), all barriers to free flow of products from the supplier to user must be removed. Ineffective supply chains are loosely integrated with poor management of existing interdependencies (Hertz 2001). These interdependencies refer to the management, and coordination, of activities and functions, individually and collectively, involved in acquisition of raw materials to the point final product is delivered to customer.

Intermediaries after much more immediate and local representation. Because they are closer to their customers, they are better able to ascertain their customers' needs and wants. Various authors have studied supply chain performance from different points of view. According to Lee & Corey (1995) supply chain performance is contingent on its ability in conversion of procured raw materials into finished goods and delivery to consumers through a distribution system. This manufacturing orientation is consistent with

studies of supply chain by (Hertz 2001, Ganeshan & Harrison 1998, Scott & Westbrook 1991). Christopher (1998) in his study asserted that supply chain performance is a factor of linkages, that is, the supply chain is a network of organizations involved in the different process and activities that produce value in form of products and services to customers, and how well this objective is met is determined by how these links in activities and processes is managed.

Paul *et al.* (2006) study conceptualized improving the effectiveness of supply chain through purchasing management. In his study (Paul *et al.*, 2006) identifies purchasing planning, supplier collaboration, supplier base rationalization and nature of supplier relationships as major valuables predicting supply chain performance. The study by Neves *et al.* (2001) & Davidrajuh(2005) on the other hand lay importance on distributing the processed goods, to customers. Their study proposed distribution channel planning model.

Srivastava & Srivastava(2006) explored use of an iterative approach for designing distribution chain in an agile environment and proved that distribution agility of the supply chain is necessary to enable achievement of supply chain core objectives of enabling firms achieve competitiveness.

Braganza (2002) and power (2005) noted that supply chain design; the level of effective integration of several functions at different organization levels is what achieves results. Moreover, Lalwani *et al.* (2006) suggested that the current development in systems thinking and continuous system simulation when applied to supply chain management and practice may offer good design of the supply chain and ultimately enhance supply chain performance. Mentzer *et al.* (2001) approaches supply chain management as the strategic and systematic coordination of the traditional business functions within a particular firm and across business within the chain for the purpose of achieving value for customers, effectively and efficiently. This approach is consistent with that of Chopra & Meindl (2001) that established that supply chain performance is resultant of all stages involved directly and indirectly, collectively, in fulfilling a customer's request.

Despite the fragmented approach and viewpoints to supply chain management and supply chain performance, researchers have noted a number of problems regarding supply chain activities (Sridharan *et al.*, 2005). It's observed that either the system or subcomponent of the supply chain is malfunctioned or poorly designed (Spenn & Bersk 2002). Mentzer *et al.* (2001) and Fawcett *et al.* (2005) findings are consistent with Sridharan *et al.* (2005) that supply chain performance is inhibited by barriers within or with the chain.

These barriers according to Fawcett *et al.* (2008) range from poor supply chain planning and design, misaligned supply chain processes and structures, supply chain partner culture differences, trust and ethics, information technology deficiency. These problems are at both the enterprise level and supply chain level and hence need to be tackled to improve performance of the supply chain as a whole.

Reviewed supply chain scientific literature provides plausible solutions to supply chain barriers. Some of the plausible solution noted in literature according to Mentzer *et al.* (2001) Fawcett *et al.* (2008) & Sridharan (2005), include information transparency, collaborative planning, supply chain design and alignment, individual activities management and human factor control. In a commercial setting, these lead to increased revenues, inventory turnover, decreased order time, responsiveness, decreased time to market, reduced distribution costs- supply chain performance.

The chartered institute of purchasing and supply (CIPS 2012) identifies key subcomponents of the supply chain that are key predictors of supply chain performance. These include; procurement, operations, logistics and distribution, the integration of which determine to a great extent the effectiveness of a supply chain. Similarly, Croom *et al.* (2000) and Wisner & Tan (2000) agree that all-encompassing philosophy of SCM embraces each of the stated subcomponents to produce overall supply chain performance.

Procurement Process in the supply chain

Procurement as defined by Hoekman, Ptois & Mavroids (1997) is the whole process of acquiring property or services. Public procurement, a division of procurement, entails any procurement which is financed by public funds. "Public funds" means monetary resources appropriated to procuring entities through the budgetary process, as well as extra budgetary funds, including aid, grants and credits, put at the disposal of procuring entities by foreign donors, and revenues of procuring entities (PPDA 2005). The Organization for Economic Cooperation and Development (OECD) acknowledges that government worldwide act as providers of essential services for socio-economic development through public

procurement such as health, education, agricultural support and infrastructure, especially in developing country where major vulnerable populations exist. Arrowsmith (1998) in agreement, notes that procurement has been utilized as an important tool for achieving social economic goals. Thai (2001) defines the goals of a procurement system as being divided into two: 1; procurement goals, to include quality, timeliness, cost and integrity and: 2; non procurement goals to include economic, social and green procurement goals. Both these goals must be achieved to create value to citizenry of any nation. Aketch (2009) identifies two different ways in which procurement is actualized. 1: project specific procurement; is procurement of goods, works, and services sought for a particular initiative and 2: general procurement; which relate to general consumable required by a procuring entity to perform its goals. In this context, procurement of subsidized fertilizer is project specific procurement.

OECD (2009) defines the overriding goal of any state public procurement system is to deliver efficiency and value for money in use of public funds whilst adhering to regulation and policy. In this regard, Ogola (2008) & Otieno (2004) estimate the cost of inefficiency of public procurement in Kenya at ksh 30 billion out of poor planning and irregular procurement activities in public institutions leading to misappropriation of resources.

The ability of a government meeting its development objectives, according to World Bank (2004), is hinged on the efficiency in project specific procurement management. Most governments' development agenda is implemented in public projects such as infrastructure, health and education. The successful implementation, and hence achievement of project objectives is predicted by, among other things, the public procurement process: planning, supplier selection and contract management, that is transparent, open and accountable to ensure funds are absorbed into the project as outlined (Thai, 2001). The subsidy program is a project aimed at stimulating agricultural production in the country (Duflo, Esther, Michael & Jonathan, 2008).

Distribution system in the supply chain

Keskinocak & Tayur (2001) in an analysis of supply chains identifies distribution as a core subsystem within the entire supply chain that defines whether the supply chain objectives will be achieved. Distribution is an element of the marketing mix; others include product, pricing and promotion that are defined as making products or services available for use by consumers using direct or indirect means (Kotler, Keller & Burton 2009). Kotler *et al.* (2002) further asserts that distribution takes place by means of channels, which can be classified according to the number of intermediaries between source (producer) and consumer.

A level zero channel has no intermediary. Burton (2008) identifies three types of distribution in various channels: intensive distribution where products are stocked widely in many outlets, selective distribution where producers rely on few intermediaries and exclusive distribution where producer relies on very few or one intermediary

Chopra, Sunil & Meindl (2001) explains that while customer service consist of many components, response time, product availability and variety, and customer experience are most directly influenced by the structure and capability of the distribution design in a supply chain.

Mbugua (2008) in a study on distribution of petroleum products in Nairobi established that outlet location and number of outlets is vital to ensuring product availability and customer response. Customized packaging is also another key element of the distribution system that has been found to enhance variety and customer experience in studies by Dibb & Smoking (2001) and Mulinge (2006).

Staff competency in Supply Chain

Ideally, a paradigm shift in work allocation should be considered to have more administrators, qualified in supply chain issues, running health facilities. The medical qualifications doctors and nurses possess do not necessary imply supply chain competence. However, as long as human resources allocation is the way it is now, all health workers involve in supply chain should be given corresponding medical supply chain related training (report on resource optimisation in delivering health care, 2010).

Continuous specific training of medical supply chain staff is imperative particularly those involved in quantification at the Ministries and those who act as the interface between the national distributor and the

health facilities at the counties. A model incorporating facility or office based training would be preferable and should incorporate a supportive follow-up programme (Force KT, Kems Task Force Report, 2008).

Technology in the Supply Chain

In the realms of supply chain management, use of IT refers to the use of inter organizational systems that are used for information sharing or processing across organizational boundaries (Subramani, 2004). According Subramani (2004), besides internal IT systems such as ERPS,

Includes all other information systems such as distribution resource planning, capacity planning systems as well as other tools such as RFID, barcodes, and EDI platforms that are used in supply chain transactions to enhance processing and communication. Supply chain management emphasizes on long term benefit of all parties on the chain through cooperation and information sharing. This affirms the importance IT in the supply chain (Jiang & Jiang, 2007).

Research demonstrates that Information technology use in managing purchasing in the supply chain is widely utilized in a variety of procurement applications including communication with vendors, checking vendor price quotes, international sourcing over internet and negotiations (Tippins, 2003). Information technology increases information processing capabilities of suppliers, thereby enabling or supporting greater relationship in addition to reducing uncertainty (Yu, Z. *et al.*, 2001). As such, it leads to reduced cycle time, cost of procurement and errors in the processing orders.

Information technology has been applied to logistics and distribution: for example tracking systems in transportation, and distribution planning systems. This creates better visibility of the distribution channel as well as allows better control of the logistics systems (Zhu, 2006). Additionally, it tools such as RFID, barcodes, and EDI platforms have enabled firms be more proactive in the management of inventory in the supply chain.

Ultimately, IT can lower coordination costs, and in supply chain context, can substantially improve transactional efficiencies through increased information sharing and communications capabilities, resulting in improved supply chain performance (Jiang & Jiang, 2007).

2. Research design

The study adopted a qualitative case study design. Case studies are preferred when ‘how’ or ‘why’ questions are being posed. Robert K. Yin (2009) defines a case study as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real life context especially when the boundary between phenomenon and context are not clearly evident. The major aim of this study was to find out the factors that are affecting effective supply chain of pharmaceutical products (drugs) to Health Facilities in Elgeyo Marekwet County Kenya. It therefore was an approach of establishing the various variables which determines effective supplies of medical products.

The case study design is to provide facts and suggestions on major connections between variable and their apparent causes and the population is expected to describe what, why and how factors like procurement process, distribution channels, ethical issues and information technology and other related requirements affects effectiveness of supply chain of drugs to primary health facilities in Kenya. The study sought to explore all, unknown variables that affect effective and efficient delivery of health commodities against need based on epidemiological and consumption data. The investigation involved collection of primary data from resource persons in health facilities in Egeyo Marakwet County as well as review of secondary data. This involved field survey whereby the researcher went to meet the population of interest and collected data from them. This research design enabled subject to be observed in their natural set up without manipulating the environment, it clearly deals with a defined problems and objectives as the data was collected from relatively a larger number of cases for it to be more representative to address the problems because it was a cross section.

Sampling Technique and Sample Size

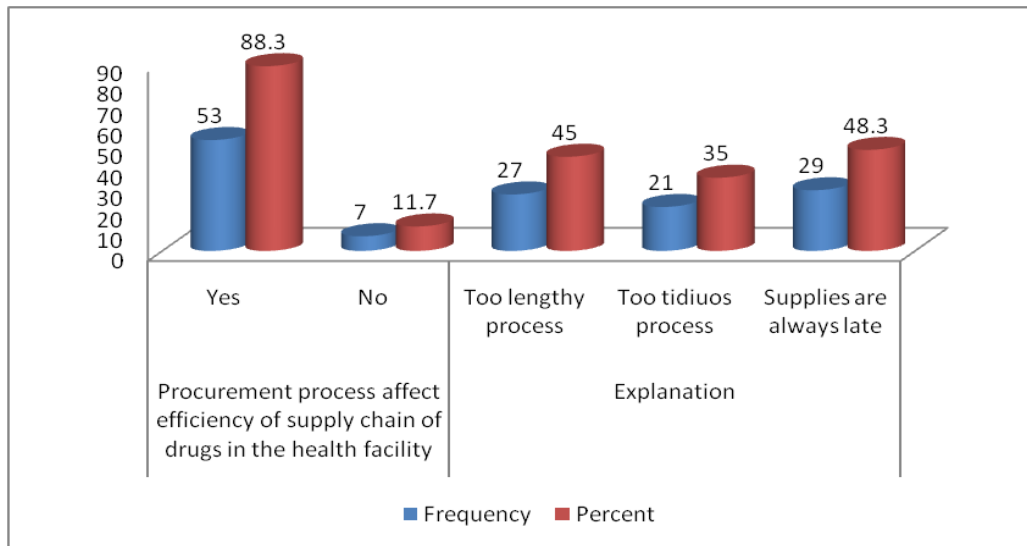
Selection of respondents for the study was guided by non-probability purposive sampling procedure wherein respondents were selected on the basis of being able to provide an in-depth understanding on the topics being assessed. Being a qualitative study, the aim was not to impose preordained concepts as

hypothesis and theory generated from data thus where sampling is concerned, statistical inference is not the objective but rather how rich the information generated.

The researcher used purposive sampling techniques due to nature of the study. This method enables generalization of the larger population with the margin of error that is determinable and also gives the health sector staff equal opportunity of participating (Mugenda and Mugenda 1999) therefore the researcher will consider a sample of 60 employees.

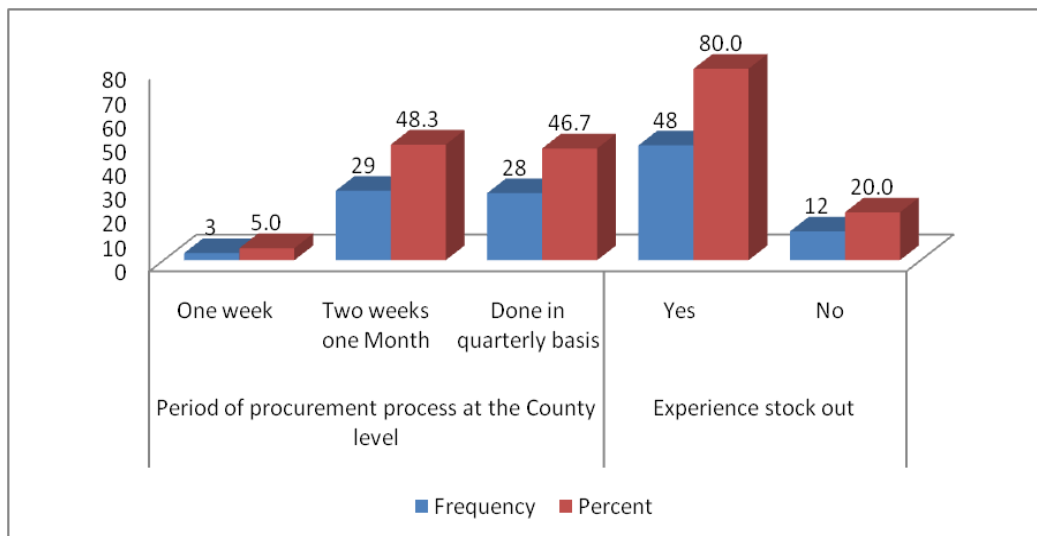
3. Results and Discussions

Effect of procurement process on supply chain of drugs



When asked how long the procurement process takes at the County level, most of the respondents (48.3%) said it's done in two weeks to month while 46.7% reported quarterly basis. However, more than three quarters of the respondents (80%) said that they experienced stock out.

Length of time for procurement process



Most of the respondents (75%) agreed that level of technology affects efficiency of medical supply of drugs in their health facility. When asked to state the extent technology affects efficiency of medical supply of drugs most (70%) reported to a great extent.

4. Findings

Most of the respondents reported that their health facilities make orders to re-stock their facility with drug stock through sub-county while a third of the respondents said direct order from KEMSA. Most of the respondents reported that procurement process affects efficiency of supply chain of drugs in their health facility. When asked to explain how procurement process affects efficiency of supply chain of drugs in their health facility most of the respondents reported lateness of supplies and some complained of the length of the whole procurement process while a few were concerned with the tedious process. When asked how long the procurement process takes at the County level, most of the respondents said it's done in two weeks to a month. However, more than three quarters of the respondents said that they experienced stock out. These findings are in line with those of Triestsch (2005) who observed that order processing phase is a time consuming factor that affects the efficiency of total supply chain process. The findings also support those of Buse *et al.* (2005) who observed that excessive bureaucracy takes place in government, semi government and private organization which waste huge time that affect lead time for customer order. This procedure takes a long time to generate a shipment and as an obstacle, bureaucracy affects the flow of supply chain process.

Most of the respondents agreed that level of technology affects efficiency of medical supply of drugs in their health facility. When asked to state the extent technology affects efficiency of medical supply of drugs most reported to a great extent. Most of the respondents rated level of technology use in their health facility as low or very low while close to a third rated it as high. These findings support those of most of Allotey (2009) who reported that most suppliers do not use and even are not familiar with latest technologies. This is why; better performance is not reflected from the supply chain process for the lacking of facilities in technological infrastructure.

Most of the respondents consider supply chain as an element in drug supply. When asked to state the extent to which supply chain as an element in drug supply majority reported great extent. Most of the respondents were of the opinion that distribution channel affects distribution of pharmaceutical products in their organization to a great extent. Close to a third of the respondents believe that their organization is affected by transportation when distributing its products. On the other hand when asked to state the extent transportation affects distribution of their products, more a third cited high extent and another more than half moderate extent. These findings support those of Allotey (2009) transportation infrastructure affects the total supply chain performance due to poor infrastructure and heavy traffic congestion in big cities.

Most of the respondents said that pharmacists handle medical supply chain in their health centre. When asked whether the medical staff have adequate knowledge in medical supply chain most of the respondents said yes. More than half of the respondents reported that their organization has not managed to train employees on the facility on supply chain management in respect to Medical Supply Chain. Respondents who were of the opinion that their organization has managed to train employees on the facility on supply chain management in respect to Medical Supply Chain were asked to state how often training is carried out. Most of respondents reported that they receive training fairly often. Most of the respondents reported to have a computer in their medical products stores while majority reported to be doing their re-ordering of stock electronically. These findings concur with those of Buse *et al.* (2005) who reported that most employees do not have any technical knowledge about the machineries; and even there is no permanent technical person to fix the machines or equipment. If any machine is broken down or any problem is found in any equipment then the employee needs to wait for the technical person and to hire from outside. Re-ordering is stopped for a long time and ultimately delivery deadline is delayed.

5. Conclusions

The study was aimed at accessing factors affecting supply chain efficiency of medical supplies to Public Health Centres in Kenya. It was guided by four specific objectives including; to examine the effects of procurement process in supply chain efficiency of medical supplies to public health centres in Kenya; to access the effects of distribution in supply chain efficiency of medical supplies to public health in Kenya; to examine the effect of staff competencies supply chain efficiency of medical supplies to public health

centres in Kenya and to access the impact of technology on supply chain efficiency of medical supplies to Public Health Centres in Kenya.

Based on the results of the study, various factors are challenges to supply chain efficiency of medical supplies to Public Health Centres in Kenya. The resources, technology and knowledge among medical staff are inadequate and verbally interpreted as not so conversant on what is required for an efficient medical supply.

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