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Knowledge and Experience of Lean Thinking Amongst Senior Health Care Managers in Selected South African Public Hospitals

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Abstract

With the pressing need for quality improvement and with a view to adopting Lean as a systematic management approach in a crisis-ridden health care sector in South Africa, it was an opportune time to investigate the baseline level of knowledge and experience of Lean amongst senior health care managers in public hospitals in KwaZulu-Natal (KZN), South Africa. The research was centered on a positivist paradigm (involving quantitative methods) and took the form of an observational, descriptive study in KZN. This article presents the results of one of several key objectives of a seminal PhD study conducted in KZN. A total of 218 senior managers located in 73 hospitals participated in the research. A self-administered, semi-structured questionnaire was used. Most managers indicated that they have not heard of Lean before and had no prior practical experience thereof. All participants indicated that they were interested in learning more about Lean, that there was an opportunity for adopting Lean practices and that Lean could possibly improve the operational performance in their hospitals.

JEL Classification: I19, L23, M19
Keywords: Lean knowledge, Lean thinking, Lean in public hospitals, Experience with Lean, Operations management.

1. Introduction

The South African public health-care facilities face a variety of operational management issues, partly owing to two key groups of limitations. One of these, cited in the 2008 'Road Map' report of the Development Bank of South Africa (DBSA) and by Gilson and Daire (2011), is related to the challenges in policy implementation (Development Bank of Southern Africa, 2008). Certain new policies have caused more barriers to health care, defeated equity promotion, and undermined quality of care and health provider motivation. The other significant limitation concerns the organizational structures and culture entrenched in the public health care system (Gilson and Daire, 2011).

The research on which this paper is based was conducted in the province of KwaZulu-Natal (KZN), South Africa, which is the second most densely inhabited province out of nine in the

country. KZN is located in the eastern coastal region of the country and consisted of approximately 11 074 784 citizens in 2017 according to mid-year population estimates from Stats SA (KZN Department of Health, 2017). Within the province, there is one Metropole (eThekwini), ten health districts, 50 municipalities and 828 municipal wards scattered across an area of 92100 square kilometers (KZN Department of Health, 2017).

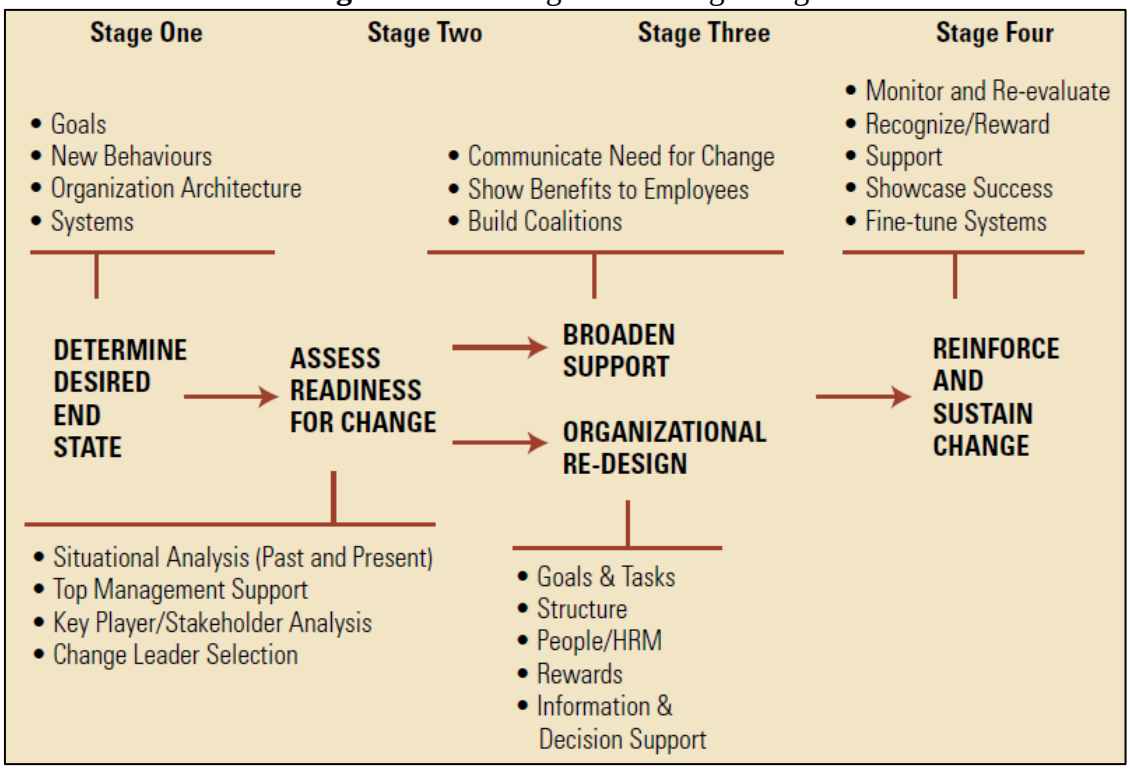
In order to achieve sustainable improvement in the delivery of health care with limited resources, efforts should be made towards improved health care management and "doing better with less" (Mayosi and Benatar, 2014). Lean thinking, or "Lean", is a well-recognized management approach employed to identify and successfully resolve operational problems, providing better health care to patients, while reducing inefficiency and cost (Bliss, 2009; Zidel, 2006a). With the need for quality improvement and with a view to adopting Lean as a systematic management approach in a crisis-ridden health care sector in South Africa (Gilson and Daire, 2011), it is opportune to investigate the baseline level of senior health care managers' knowledge and experience of Lean in public hospitals in KZN.

Lean is one such fast-growing approach, which uses tools and techniques that are readily adaptable and suitable for application in public hospitals. However, in transforming health care service delivery, understanding the readiness for change and conducting a situational analysis is the second of the four stages of the model for leading change after determining the desired end state (Figure 1) (Fine, Golden, Hannam and Morra, 2009). In addition, in order to determine the level at which to pitch any future Lean adoption or implementation strategies or tools, the primary objective of this paper was to conduct a baseline survey of the current knowledge and experience of senior health care managers in public hospitals in KZN. This objective was one of several key objectives of a seminal PhD research conducted to identify critical success factors for Lean initiation in public hospitals in KZN. Three secondary objectives were formulated to achieve the primary objective. The first objective was to determine the actual knowledge of Lean and senior health care managers' use of Lean tools and techniques. The second objective was to identify if these managers have practical experience with Lean, and the third objective was to establish if the senior public health care managers are willing to learn more about Lean and to apply Lean in their daily managerial tasks.

The primary focus of Lean is on reducing waste, synchronizing flows and managing variability in (process) flows. In this context, the knowledge and experience thereof amongst public health care managers is not well understood in South Africa.

The paper starts with the literature review regarding the SA context of health care management, Lean as a philosophy and how it can be linked to health care management, and Lean critical success factors. The research methodology is then explained, followed by the findings, conclusion and recommendations of the research study.

Figure 1: Four stages of leading change



Source: Fine et al. (2009)

2. Literature Review

2.1 The South African context of health care management

Despite the developmental trajectory of health services and enthusiasm of government leaders to improving health care in South Africa, social science researchers offer intricate explanations for the "failure of the developmental state" in South Africa (Seekings, 2015). In simple terms, Von Holdt (2010) cites in Seekings (2015) five factors that underlay the mismanagement in public sectors such as health: (1) The high turnover of managers in public hospitals due to affirmative action policies provided fertile ground for rapid progression up the corporate ladder which created instability in the journey to improve services in institutions (Naidoo, 2008); (2) Incongruity and contradiction in skills required to perform managerial functions, in the face of employment equity rubrics, provided a game-changing view of productivity in the public sector; (3) Deference and race were more important than competence and skill in managerial roles; (4) A breakdown in work ethic and organizational discipline, with vociferous labour unions and their demands, naturally led to the demise of order and corporate governance in some institutions; and (5) Budget mismanagement and extreme resource constraints in the face of increasing demands on the health care system, and corruption imbroglio amongst certain managers, added more pressure to crumbling institutions. Given this backdrop, particularly the last factor, it is imperative that a fundamental shift in management philosophy is required to create a platform which breeds inspiration and yields productivity through efficiency.

Of recent, the South African Department of Health has embarked on a journey of implementing National Health Insurance (NHI) in a drive towards universal health coverage of the population. This is being carried out by creating a functional District Health System (DHS) as a platform for Primary Health Care (PHC) re-engineering, strengthening and

delivery, as well as reorientation of the health system toward “prevention is better than cure” (Gilson, Elloker, Olckers and Lehmann, 2014; KZN Department of Health, 2014, 2018; National Department of Health, 2011, 2013, 2014).

A significant component of these cross-cutting ambitions involves operations and quality management, like health systems reforms and strengthening, quality improvement, financial and information systems management. However, the answers to how management systems can be overhauled are left wanting as a considerable portion of the KZN Department of Health priorities and goals are overtly in need of adroit managers with a sound management approach to be successfully addressed. Again, the question of how operations or systems related priorities are tackled in a systematic approach is unanswered and marginally described. In fact, there is no mention at all in the above plans of any management approach or system that could be adopted to operationalize the priorities, once again leaving elaborate documents floating without a management tactic to form the backbone of implementation of such.

Several operations-management techniques exist that can be implemented in the health care sector. Lean, which implies “Lean Thinking”, is a philosophy involving proven operations practices and techniques to improve the quality and efficiency of production and service delivery, by creating flow, and eliminating waste in an organization (Zidel, 2006b). This paper explores if senior public health care managers have knowledge of and experience in using Lean to manage a public hospital in KZN.

2.2 The concept of Lean

The primary focus of Lean is on reducing waste, synchronizing flows and managing variability in (process) flows (Casey, 2007). Lean methodology is pinned on five tenets (Womack and Jones, 1996; Zidel, 2006a):

- *Specify value* by asking oneself what is valuable to the end-user (the patient);
- *Identify the value stream* using a Value Stream Map (VSM);
- *Make the value stream flow* by restructuring process steps and eliminating, non-value-adding steps (eliminating bottlenecks);
- *Pull*: The forerunning process (e.g. collect medication from pharmacy) down the value-stream signals when upstream activities (e.g. doctor consultation) can begin in order to stabilize demand on the system; and
- *Pursue perfection* through continuous improvement.

Lean classifies activities in a value stream into three categories: (1) value-added work, (2) type 1 non–value-added work is necessary but does not add value from the standpoint of the patient, and (3) type 2 non–value-added work (waste or “*muda*”) which does not add value to the patient and should be eliminated (Zidel, 2006b). Taiichi Ohno, an earlier vice president of Toyota, identified seven types of wastes, which Zidel (2006b) adapted to health care (Table 1) (Zidel, 2006b).

After a dramatic process change (*kaikaku*), one of the key techniques supporting the implementation of Lean is continuous improvement (*kaizen*), which may be practised using the iterative, 4-step Shewart or Deming cycle, also called the PDCA (*P*lan, *D*o, *C*heck, *A*ct) cycle (Womack and Jones, 1996). The A3 report augments the PDCA cycle; the process may be facilitated through regular *kaizen* team (or Quality Circle) meetings. The *kaizen* team usually consists of frontline workers from the *Gemba* (actual place where value is being created, such as an OPD) and key role-players who identify problems and plan, implement, and adjust improvements (Fine, Golden, Hannam and Morra, 2009).

Table 1: Examples of the seven wastes (Type 2 non-value-added work) in health care

Delay	Waiting for bed assignments, waiting to be discharged, waiting for treatment, waiting for diagnostic tests, waiting for supplies, waiting for approval, waiting for the doctor, waiting for the nurse
Over-processing	Excessive paperwork, redundant processes, conducting unnecessary tests, using intravenous lines when oral medication would suffice, multiple bed moves
Inventory	Laboratory specimens awaiting analysis, emergency department patients awaiting a bed assignment, patients awaiting diagnostic tests, excess supplies kept on hand, dictation awaiting transcription
Transportation	Transporting laboratory specimens, transporting patients, transporting medication, transporting supplies
Motion	Searching for charts and supplies, delivering medications, nurses caring for patients on different wings
Overproducing	Mixing drugs in anticipation of patient needs
Defects	Medication errors, wrong-side surgery, improper labelling of specimens, multiple sticks for blood draws, injury caused by defective drugs or restraints or lack of restraints

Source: Zidel (2006b)

The primary tool of Lean for identifying work activities and waste in the value stream is the *current- and future-state Value Stream Map (VSM)*. This is a process flowchart which presents information about speed of value-added work, types 1 and 2 non-value-added work and the continuity of flow (Casey, 2007). The *kaizen* team meetings can help eliminate wastes and improve flow to move the process toward the idealized future state. A tool that principally empowers employees in its application is the *A3 report*, which is the core of Toyota's success in problem-solving. This tool, which harmonizes the PDCA cycle, is an 11-by-17-inch sheet of paper that can be used to analyze the way in which a process may be improved in the value stream. On the left-hand side of the sheet, the problem background is described, and a *root-cause analysis* is determined by frontline workers. The right-hand side allows role-players to develop solutions to the problems. By empowering workers, A3 thinking is often the first step toward culture change; this inculcates a spirit of teamwork by fostering work across functional boundaries or "silos" (Grunden, 2009). The *5-Why analysis* technique for root-cause analysis and identifying wastes during *kaizen* team meetings is also part of the Lean toolbox (Zidel, 2006b). The *5S (sort, straighten, scrub, standardize, and sustain)* technique helps with housekeeping, standardization and systemization of work (Zidel, 2006b).

Several studies, mainly in the manufacturing industry, identified the critical success factors for Lean. It is therefore important for senior public health care managers to know which critical success factors can be used to address waste in the form of non-value-added work. Table 1 identified seven activities that waste time and money in health care and Table 2 identifies critical success factors for Lean implementation, which can be characterized as ways in which to address non-value-added work based on the views of various researchers.

The identified critical success factors for Lean, however, need to be tested in health care specifically due to the differences between the manufacturing sector and the health care sector. Before this could be done, the baseline knowledge and experience of Lean amongst managers, specifically the senior public health care managers in KZN, had to be determined as Lean would require training before it can be implemented effectively and efficiently.

Table 2: Research landscape showing identified critical success factors for Lean implementation

Context and researchers	Critical success factors (extracted from literature review)
CSFs relevant to measuring the degree of success of Lean implementation in Information Technology support services (Kundu and Manohar, 2012)	Management leadership; Management support; Top management commitment; Organizational culture; Communication; Training and skill building; Financial Capability; Measurement framework
Implementation of Lean Manufacturing within SMEs (Achanga, Shehab, Roy and Nelder, 2006)	Leadership and Management, Financial Capability, Skills and Expertise and Organizational Culture
Enablers and inhibitors during the implementation of Lean in a Mexican public service organization (Sua´rez-Barraza and Ramis-Pujol, 2010)	Commitment to and wish for improvement; Clear resolve to improve; Focus on the simple and practical; Active leadership; Outcome or stakeholder-oriented service; Holistic and transversal thinking; Establishing a system for measuring service process performance; Effective implementation of best Human Resource Management practices
Success factors identified during two Lean implementation projects within the same company: a global manufacturer of food processing machines and equipment (Scherrer-Rathje, Boyle and Deflorin, 2009)	Management commitment to, and involvement in, the Lean effort; Employee autonomy to make decisions regarding business process changes; Information transparency of Lean goals; Evidence of initial performance improvements and long-term sustainability of Lean efforts
A secondary review of research literature of key factors of success in the management of the Synchronized Production System (SPS) implementation process (Skrudupaite and Jucevicius, 2011)	Business plan and vision; top-management support (including funding); project management (including project champion and teamwork and composition); change management, organizational culture; effective communication, education and training, knowledge transfer, knowledge management (including skills and expertise); organizational structure; monitoring and evaluation of performance: performance measurements
Critical success factors within SMEs implementing Lean (Kumar, Antony and Douglas, 2009)	Management involvement and commitment; Communication; Link quality improvement to employee; Culture change; Education and training; Link quality improvement to customer; Project selection; Link quality improvement to business; Link quality improvement to supplier; Project management skill; Organization infrastructure; Vision and plan; Information Technology and innovation.
Ten critical success factors for software industries from a pilot study (Antony and Fergusson, 2004)	Leadership engagement and uncompromising commitment of top management, supporting organizational improvement, cultural change, Lean training, linking Lean to business strategy, accountability, customer involvement, understanding of Lean methodology, project management, project prioritization and selection
Four essentials for successful implementation of a Lean programme (Mefford, 2009)	Belief in the new program that it will work; Commitment for implementing it from managers; Involvement of the whole organization – employees and other resources; Patience and long-term view for the results

3. Research Methodology

The research was centred on a positivist paradigm, employing quantitative methods, and took the form of an observational, descriptive study (Naidoo and Fields, 2019). Non-probability, purposive type sampling was used in order to focus the inquiry based on particular characteristics of targeted senior public health care managers. The target population included 500 senior managers, consisting of the following ranks based across 73 public hospitals in the province (whether acting in the position or not): hospital executive managers, assistant managers, operational or unit managers and managers of clinical departments. The planned sample size of senior managers, considering a 5% margin of error and 95% confidence interval, was 218 out of a population of 500 senior managers. The response rate was 96.8% with 211 participants. Simple random sampling was applied to select the participants from the categories of senior public health care managers.

A self-administered, semi-structured questionnaire with mixed categorical, open-ended and variable Likert-scale questions was used for data collection. The data extracted from the Likert scale responses was utilized for the purposes of other research objectives which are not reported in this article (Naidoo and Fields, 2019). Statistical analyses were carried out using the SPSS® software package. Descriptive statistics, including means and standard deviations, where applicable, were used. The Wilcoxon Signed Ranks test was used to test whether the average value is significantly different from central scores for responses to Likert scale questions. It was also used in the comparison of the distributions of two variables. The Kruskal Wallis test, Fisher's Exact test and Mann Whitney U test were used where applicable.

Research ethics approval (HSS/0031/016D) was obtained from the Human Social Sciences Research Ethics Committee (HSSREC) at the University of KwaZulu-Natal (UKZN). Permission was also obtained from the KZN Department of Health's Provincial Health Research and Knowledge Management unit (KZ_2016RP31_475) and Deputy Director General for Specialized Services and Clinical Support. Informed consent was obtained from all participants. Permission for publication of the results was granted by the Provincial Health Research and Knowledge Management unit.

4. Results

4.1 Response rate and general characteristics of respondents

This article reports the findings in relation to only one of several research objectives of the PhD study which do not fall within the scope of this article (Naidoo and Fields, 2019). A total of 211 out of 218 self-administered questionnaire responses were received (96.8% response rate). The main respondents were assistant managers (other than nursing) and supervisors (46.4%), nursing unit or assistant managers (24.6%) and managers of clinical departments (10.4%) (Figure 2).

The majority of the respondents (43.1%) possessed more than 10 years of management experience, followed by a smaller proportion (25.6%) of them having 5 to 10 years management experience (Figure 3). A smaller proportion (19.0%) possessed 2 to 5 years of management experience.

4.2 Senior Managers' knowledge of and experience with Lean

A significant 72% (n=152) of managers indicated that they have not heard of Lean before ($p<0.0005$). The most common medium or platform through which the remaining 28% (n=59) of managers had heard of Lean previously was through an informal setting, a

colleague or a friend (62.1%) (Figure 4). Other common sources of reading about Lean were through Internet searches or non-academic websites (34.5%) and newspapers, television, pamphlets or brochures (19%). Relatively few managers learnt about Lean via a training course, workshop or conference held within (10.3%) or outside (6.9%) the KwaZulu-Natal Department of Health.

Figure 2: Distribution of respondents' rankings (job titles)

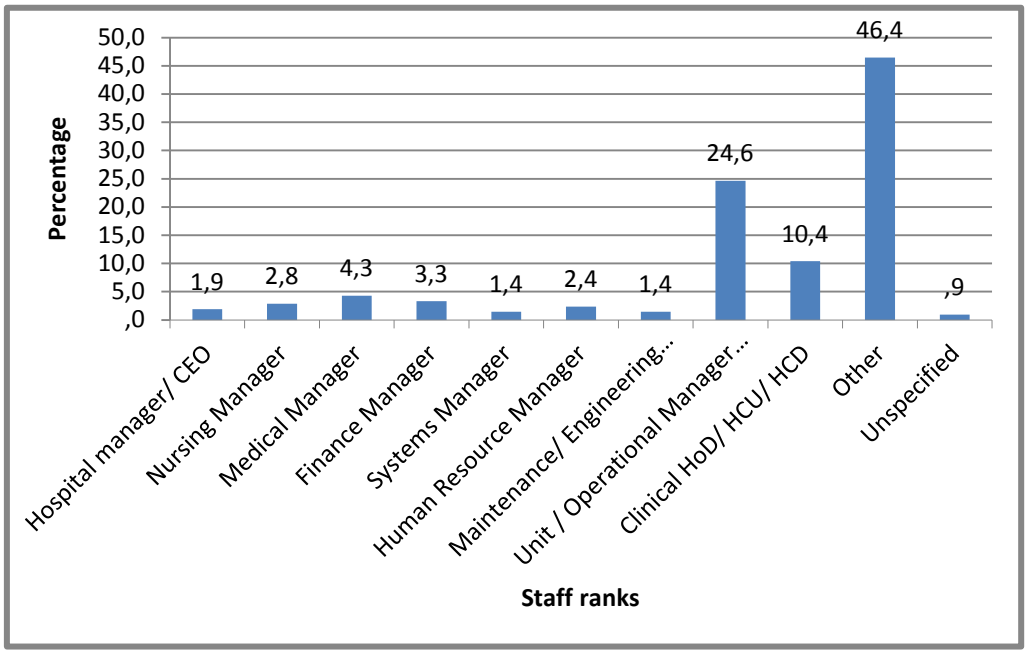


Figure 3: Respondents' management experience in years

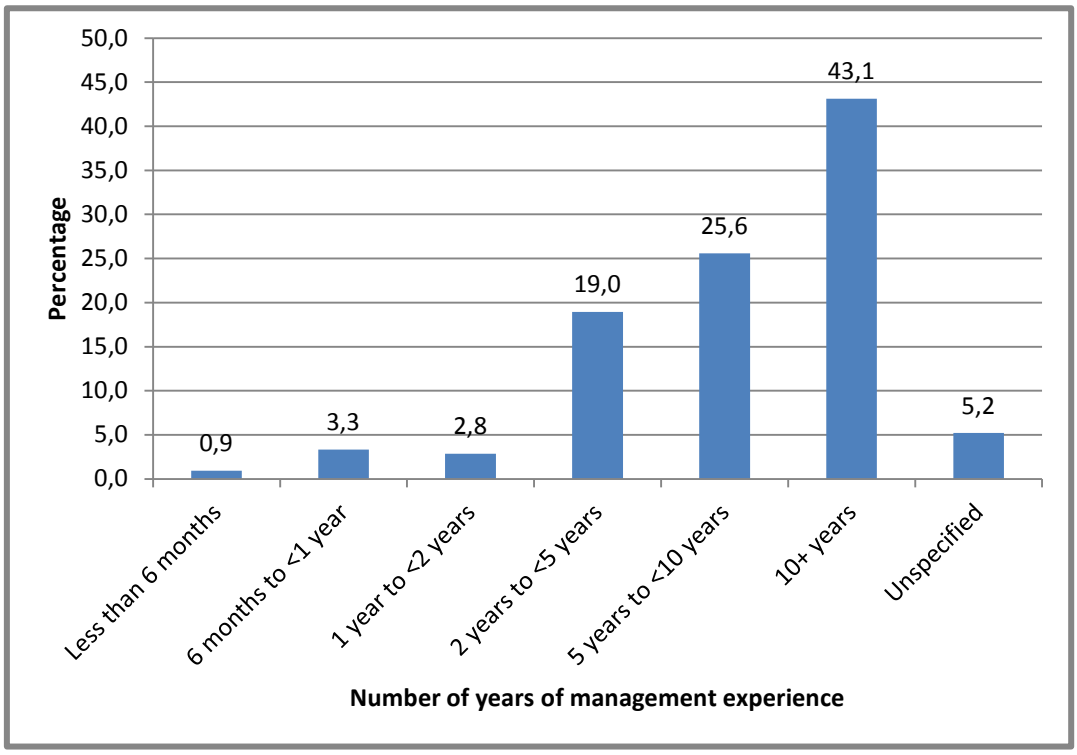
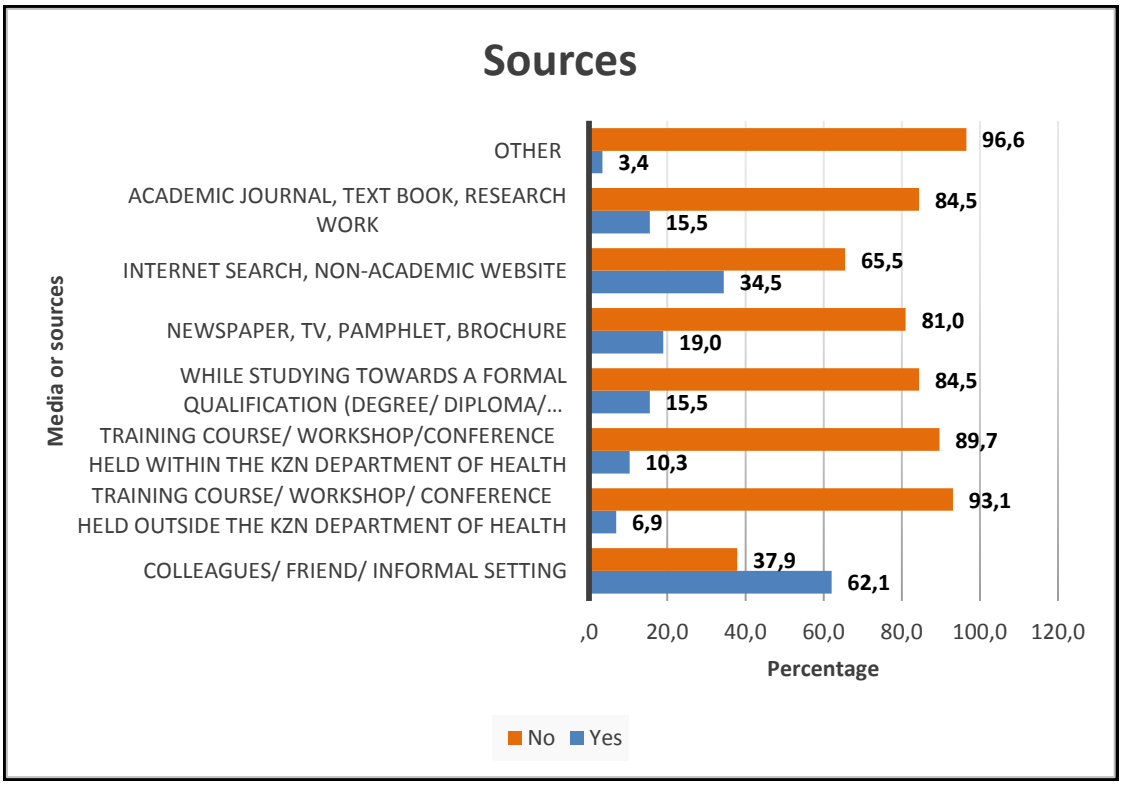


Figure 4: Distribution of sources through which managers have learnt about Lean



The results also indicate that a significant proportion of managers did not read or learn about Lean from these sources: Training course/ workshop/ conference held outside ($p<0.0005$) or within the KZN Department of Health ($p<0.0005$); while studying towards a formal qualification (degree/ diploma/ certificate) ($p<0.0005$); newspaper, television, pamphlet or brochure ($p<0005$); Internet search or non-academic website ($p=0.025$); and academic journals, text books or research work ($p<0.0005$).
In terms of managers rating their level of knowledge of Lean on a Likert scale, the average score was significantly lower than a neutral score of '3', thus indicating scant knowledge of Lean ($t(56) = -7.353$; $p<0.0005$).

The results also showed that a significant relationship exists between the number of years of senior management experience in the health sector and participants' having knowledge of Lean prior to the study (Fisher's exact = 12.235; $p=0.019$). A significant number of those with 10 or more years of management experience in the health sector had heard of Lean prior to the study, while a significant number of those with 5 to 10 years of health sector management experience had not.

4.3 Knowledge and use of Lean tools and techniques

Of the 59 senior managers who had a certain level of knowledge of Lean, approximately 62.7% (n=37) indicated that they did not know of any Lean tools and techniques ($p=0.067$). Of the 37.3% (n=22) who knew about Lean tools and techniques, the most commonly cited Lean tools and techniques were PDCA (15.38%), 5-why (12.82%) and 5-S (12.82%). Managers have indicated no knowledge of andons, *kanbans*, poka-yokes and *Jidoka*. A recognised concept of Lean (*kaizen*) has been correctly cited by managers who had knowledge thereof, but a number of other concepts or techniques listed, such as Key Performance Indicators (KPIs) and SMART (Specific, Measurable, Achievable, Realistic,

Time-bound) goals were incorrectly perceived as specific Lean tools and techniques.

In terms of the use of Lean tools and techniques in their jobs, 62.5% (n=35) of the managers who knew of Lean indicated that they have never used the tools previously (p=0.081). Of the 37.3% (n=22) of managers who were familiar with certain Lean tools and techniques, only a few had indicated that they had used them in their jobs. The results (Table 3) reflect the following Lean tools and techniques as being the top three to be used by these managers (proportion of managers who have used them are indicated in parentheses): Plan, Do, Check, Act (PDCA) (66.7%), 5-why (42.9%) and Just-in-Time (JIT) (33.3%).

Table 3:
Frequency distribution of Lean tools or techniques which managers have knowledge of

Lean tool or technique	**Frequency of responses**	**%**	**Cumulative %**
Plan, Do, Check, Act (PDCA)	6	15.38%	15.38%
5-why	5	12.82%	28.21%
5-S	5	12.82%	41.03%
JIT	4	10.26%	51.28%
Value stream maps	3	7.69%	58.97%
A3 chart	3	7.69%	66.67%
Andons/ kanbans	0	0.00%	66.67%
Poka yokes	0	0.00%	66.67%
Jidoka	0	0.00%	66.67%
"Other" (verbatim responses as indicated by managers, thus may reflect perceptions of managers and may not necessarily be Lean tools or techniques)			
Kaizen	4	10.26%	76.92%
Fishbone diagram	2	5.13%	82.05%
Process mapping	1	2.56%	84.62%
Team building	1	2.56%	87.18%
Bottleneck analysis	1	2.56%	89.74%
Root cause analysis	1	2.56%	92.31%
SMART goals	1	2.56%	94.87%
Walkabout	1	2.56%	97.44%
KPIs	1	2.56%	100.00%
TOTAL	**39**	**100.00%**	**100.00%**

The level of experience of managers with the use of Lean tools and techniques is illustrated in Figure 5. Only 4.8% of respondents indicated an “expert” level of skill for the application of PDCA. A fair proportion of managers reported having a mediocre level of skill in the application of PDCA (28.6), 5-why (23.8%) and JIT (23.8%). A basic level of expertise was reported by a number of managers with regard to the use of PDCA (28.6%), A3-chart (23.8%), 5-why (19.0%), Value Stream Maps (14.3%), 5-S (9.5%), JIT (9.5%) and poka-yokes (4.8%).

The overall level of expertise involving the use of Lean tools and techniques is illustrated in Figure 6.

Figure 5: Managers' indication of knowledge of and experience with Lean tools and techniques

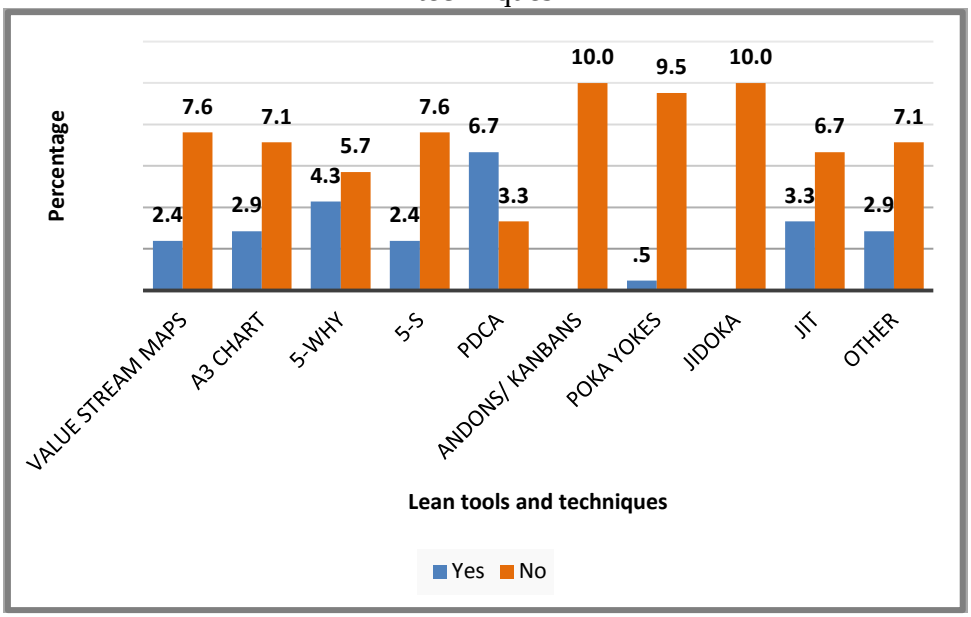
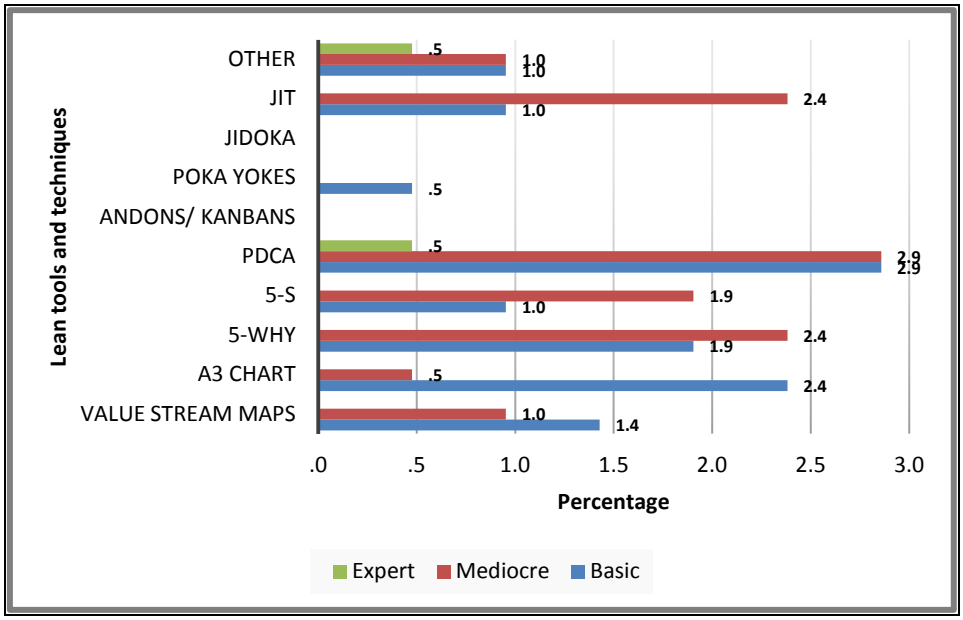


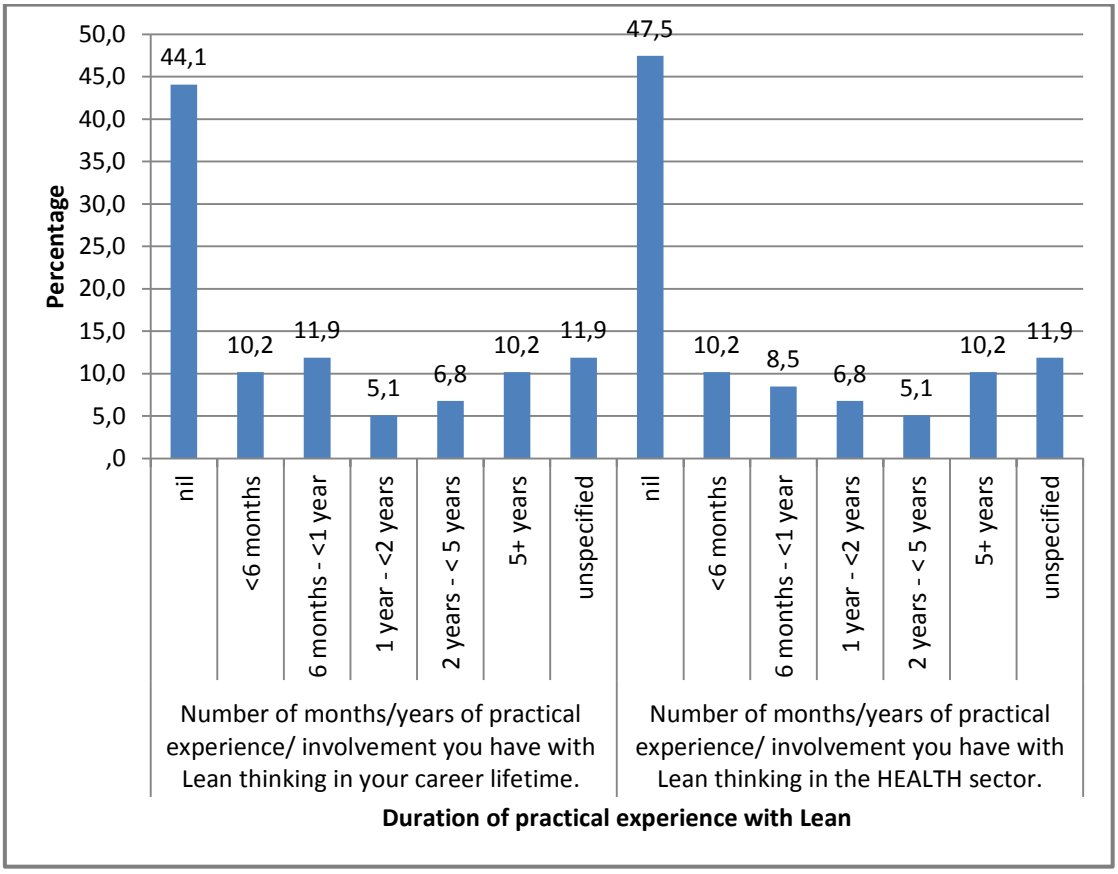
Figure 6: Managers' levels of expertise involving the use of Lean tools and techniques



4.4 Managers' practical experience with Lean

Of the 59 managers who have heard of Lean, a noteworthy 44.1% (n=26) reported having no practical experience with Lean in their career lifetime (Figure 7). Only 10.2% (n=6) reported having at least 5 years of experience with Lean. Specifically, in terms of their careers within the health care sector, 47.5% (n=28) of managers reported having no experience with Lean. Only 10.2% (n=6) claimed having more than 5 years of Lean experience within the health care sector.

Figure 7: Managers' duration of experience with Lean in their career lifetime



4.5 Prospects for learning and understanding more about Lean

Despite a significant paucity of knowledge and experience of Lean amongst senior health care managers, 91.9% (n=182) of them indicated that they would be interested in learning more about Lean ($p<0.0005$). From those who had existing or prior knowledge of Lean, 100% indicated that they would be interested in learning more about Lean.

Managers also strongly felt that there was an opportunity for adopting Lean practices and applying tools and techniques in their hospitals ($t=-12.800$; $df=188$; $p<0.0005$). In addition, the opinion of managers was that Lean could possibly improve the operational or systems performance in their hospitals ($t=-12.758$; $df=188$; $p<0.0005$). There was no significant difference in the average rating across all categories of managers with Lean experience in response to the question "*Do you think that Lean practices could possibly improve the operational/systems performance in your hospital?*" Most of them indicated a "1 = Most definitely" (Table 4).

Table 4: Managers' responses to a question regarding the potential of Lean to improve operational performance

Do you think that Lean practices could possibly improve the operational/systems performance in your hospital? (rate on a scale from 1 to 5 where '1' is "Most definitely" and '5' is "Definitely not")								
Categories of Lean experience in years	**N**	**Mean**	**Std. Deviation**	**Std. Error**	**95% Confidence Interval for Mean**		**Min rating**	**Max rating**
					Lower Bound	**Upper Bound**		
Nil	30	1.57	1.104	0.202	1.15	1.98	1	5
<6 months	6	2.00	1.673	0.683	0.24	3.76	1	5
6 months to <1 year	7	1.14	0.378	0.143	0.79	1.49	1	2
1 year to <2 years	3	1.33	0.577	0.333	-0.10	2.77	1	2
2 years to < 5 years	4	1.75	1.500	0.750	-0.64	4.14	1	4
5+ years	6	1.50	0.837	0.342	0.62	2.38	1	3
Total	56	1.55	1.077	0.144	1.27	1.84	1	5

5. Discussion of results

5.1 Senior Managers' knowledge of and experience with Lean

The study findings showed that more than two-thirds of senior health care managers lacked knowledge of Lean. Even the small number of managers who had heard of Lean admitted that their level of knowledge was significantly low ($p<0.0005$). Certain causes may be attributed to concerns relating to the organisational structures and culture entrenched in the public health care system (Gilson and Daire, 2011). Other possible causes include the popular use of informal and non-academic media or sources to read about Lean, corroborated with a large proportion of managers not having had exposure to Lean through formal or academic means such as training, workshops, academic journals or formal study. Additionally, Lean in South Africa is regarded as a relatively new management approach, and the adoption of Lean in the country's health care sector has been slow since the early 2000s, with only just over 20 health care institutions having carried out Lean projects from the early 2000s to 2013 (Moleko, Msibi and Marshall, 2014).

A significant number of managers with at least 10 years management experience in the health sector had heard of Lean prior to the study. This finding confirms that Lean is relatively new in the public health care sector in KZN, and those who have been in the sector for shorter periods are less likely to know about Lean. Management support is repeatedly cited in systematic reviews as one of the key facilitators for Lean success and that prior experience with Lean enables improvement. The ability of the organisation to capitalise on the Lean experience of these managers and to train the cadres of junior and aspiring managers on Lean will portend the ease of Lean implementation going forward.

5.2 Knowledge of and practical experience with Lean tools and techniques

Almost half of the managers who knew of Lean had no practical experience with Lean in

their career lifetimes, and a larger percentage of managers reflect no Lean experience in the health care sector. Plan, Do, Check, Act (PDCA), 5-why, 5-S, Just-in-Time (JIT), Value Stream Map and A3 chart were cited as Lean tools and techniques known to and used by a relatively small proportion of managers who knew of Lean. These tools are commonly referred to in literature and teachings of Lean (Zidel, 2006a). They are also easy to apply in any project or activity, whether used as standalone tools or in combination with others, particularly if one is not practising Lean in the workplace. The tools and techniques considered to be appropriate for the more advanced Lean experience and skills levels, such as *Jidoka*, *kanbans* and andons, were the ones found to be unfamiliar to managers. These tools and techniques would generally be taught in formal Lean training or through academic resources, and the relative scarcity of managers learning about Lean through these formal platforms substantiates this observation.

Approximately two thirds of the managers who had heard of Lean had no practical experience with Lean tools and techniques in their workplace. The Lean tools and techniques used in the workplace by the remaining managers emulate those of which they were aware (PDCA, 5-why and JIT). This supports the need for training senior managers on the common Lean tools and techniques, as the application incidence is uncommon, notably by those who knew of Lean tools and techniques.

5.3 Characterising the baseline knowledge and experience of Lean within the organisation

Although Petterson (2009) offers little empirical evidence for the classification of Lean approaches, he posits four distinct ways in which Lean can be implemented in an organisation, based on the degrees of the level of existence (operational or strategic) and organisational orientation (philosophical or practical) (Figure 8).

The bottom left quadrant 1 reflects a Lean approach which uses isolated events ('Toolbox Lean' approach) (Burgess and Radnor, 2013). This fragmented approach can be perceived as being potentially destructive to the organisation. Quadrant 2 indicates an approach where the organisation defines its "Leanness" by a superficial application of a few basic Lean tools and techniques. Managers talk about Lean and arbitrarily use certain visible Lean tools and techniques but are actually not applying Lean comprehensively. This fallacy has often led to failed Lean implementation in certain organisations in Western countries (Burgess and Radnor, 2013). The approach reflected in Quadrant 3 is where improvements are aimed at reaching certain goals or targets, but the organisation does so in a continuous and strategic manner ("Becoming Lean"). Quadrant 4 describes an approach where the organisation appears to entrench Lean as a daily practice and make it 'part of their daily work' (Lean Thinking).

Figure 8: Characterisation of approaches to Lean

	Discrete (Operational)	Continuous (Strategic)
Ostensive (Philosophical)	2) Leanness	4) Lean Thinking
Performative (Practical)	1) Toolbox Lean	3) Becoming Lean

Source: Petterson (2009)

Analysing the relative numbers of KZN public hospitals' senior managers who knew of and applied Lean and its tools and techniques allows us to characterise the organisation's overall current and discernible approach to Lean in terms of Petterson's model (Petterson, 2009; Burgess and Radnor, 2013). For purposes of clarification, the KZN public hospitals are distant from a Quadrant 4 (Lean Thinking) approach. The findings resound a 'Toolbox Lean' approach, which places the organisation at a basic, entry level of Lean implementation on a small scale.

5.4 Prospects for learning and understanding more about Lean

A significant number of senior managers indicated their interest in wanting to learn more about Lean. The optimism of the managers wanting to use Lean to improve operational performance in their hospitals was strongly reflected in the findings. However, a careful approach is required to avoid a failed Lean implementation attempt, and this implies the need for better understanding of the critical success factors and an approach to initiate Lean in hospitals.

6. Conclusions and Recommendations

The level of knowledge of and practical experience with Lean and its tools and techniques is very low amongst senior health care managers in public hospitals in KZN. The approximate one third of managers who had heard of Lean admitted that their level of knowledge was significantly low. Managers with more than 10 years of experience in the health sector have some pre-existing knowledge of and interest with Lean, suggesting that the organisation should capitalise on such a cadre of enthusiastic managers for Lean implementation.

A number of the Lean tools and techniques which may also be used in any project or activity independent from other Lean methods, such as PDCA, 5-why, 5-S and A3 chart, are the most common ones known to senior managers in the province. Focus should be placed on enhancing the use of these tools and techniques as part of Lean implementation in the organisation, and other tools and techniques, such as andons and *kanbans*, should be taught through formal Lean training programmes within the organisation.

The organisation's overall current approach to Lean in terms of Petterson's model lies within the 'Toolbox Lean' quadrant (Petterson, 2009). This places the organisation as having a basic level of Lean implementation with sporadic and infrequent application of Lean tools and techniques on a small scale across the management gamut. This classification suggests that the organisation would benefit from critical success factors for Lean initiation to raise the degree of Lean industriousness to 'Lean thinking' in Petterson's model.

A large majority (91.9%) of managers, more especially those who had heard about Lean previously, indicated that they would be interested in learning more about Lean. Managers also strongly felt that there was an opportunity for adopting Lean practices and applying tools and techniques, which could possibly improve the operational performance in their hospitals. In light of this interest in Lean application, the senior managers working in all public hospitals in KZN would be ideally placed for training on Lean and to involve in the implementation of Lean.

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