

Balanced Score card as a Strategic Management Tool in Hospital Pharmacies: An Experimental Study

Abstract

Purpose: A balanced scorecard (BSC) is an applied tool for implementing strategic management in various organizations. Implementing strategic management using the BSC approach has not received much attention in pharmacy departments. This study aims to provide a model for the strategic management of pharmacy departments using the BSC framework.

Design/methodology/approach: This experimental study was conducted from 2015 to 2018 in a 300-bed hospital and regional healthcare centers affiliated with the Petroleum Industry Health Organization (PIHO) in Tehran Province, Iran. After carefully reviewing the organization's mission and vision, the strategic objectives were determined via the internal matrix and the external matrix (IE matrix), and the strengths-weaknesses-opportunities-threats matrix (SWOT matrix) were examined. Then, six BSC measures and interventions were identified, and each was examined from the perspectives of finance, patient satisfaction, internal processes, and learning/growth. Finally, the proposed strategy was evaluated.

Findings: Results showed significant increases in patient satisfaction and gross profit. The observed increase range, from 0.09 to 0.29, indicates more effective operational management for optimal resource utilization. In addition, the pharmacy department was able to save US \$539,137 by implementing prepared protocols for expensive medications. Similarly, the pharmacy department saved \$442,899 during the two years of our strategic management plan by implementing the standard mechanism for returning unused medications to the pharmacy department after patients were discharged from various treatment units.

Originality: This study is among the first studies to demonstrate the simultaneous development, implementation, and evaluation of the proposed strategy using the BSC in a pharmacy department in a public healthcare center. The BSC application improved the optimal use of resources and

reduced costs while increasing patient satisfaction. It appears that the application of such an intervention may be as valuable to public pharmacies as it is to other private centers.

Keywords: Strategic management, balanced scorecard, Hospital pharmacy

Introduction

Strategic management enables managers and employees to work together to achieve the company's vision and mission. Kaplan and Norton (2001) introduced the balanced scorecard (BSC) system as a tool to monitor and evaluate both financial and non-financial measures. The tool includes four aspects: finance, customer satisfaction, internal processes, and growth/learning. By applying the company's mission and vision, the BSC seeks to develop performance measures necessary to optimize an organization's performance and strategies (Papalexandris et al., 2005). More importantly, the BSC has been used in both public and private sectors (Rabbani et al., 2011). Many organizations around the world have successfully implemented this approach (Santiago, 1999, Haworth, 2008). Evidence shows that in a sample population of more than 700 companies, 62% of these organizations used the BSC. However, a survey by Pribadi (2014) found that only about 20% of Canadian companies used the BSC for their strategic management, suggesting that further testing and use of the BSC is needed.

Interestingly, the BSC has found its place in non-profit organizations where more emphasis is placed on customer satisfaction than profitability. In recent years, many healthcare providers have improved their performance metrics using the BSC (Enwere, Jr et al., 2005; Rabbani et al., 2011; Mehralian et al., 2016). In particular, the BSC is useful in healthcare because it allows the parties involved (i.e., insurance carriers, healthcare providers, and employees) to assess their service quality (Santiago, 1999). In addition, the BSC can be used to list and monitor key performance indicators (KPIs) in a given healthcare system, enabling effective decision-making by the leadership team (Haworth, 2008). Hospitals, in particular, are healthcare facilities that can greatly benefit from appropriate resource allocation through the BSC implementation.

Pharmacy departments are among the hospital departments that play an important role in financial flows and revenues. Hospital pharmacies require the most budget resources. Pribadi (2014) reported that 40-60% of hospital revenue comes from the pharmacy department. This suggests that the pharmacy department is at risk of financial deficits without proper management. Therefore, strategic management is crucial for the pharmacy department, and the use of the BSC can go a long way toward achieving the goals of both the hospital and the pharmacy department. The Iranian healthcare system includes public and private hospitals and community pharmacies (Mehralian et al., 2014). While most public hospital pharmacies are affiliated with the Ministry of Health and Medical Education (MOHME), other organizations also have their own hospitals and pharmacies. The Iranian Petroleum Industry Health Organization (PIHO) provides inpatient and outpatient services among the public organizations. The PIHO's pharmacy department includes 14 different regional centers throughout the country, with 119 community and hospital pharmacies staffed by 66 pharmacists and 258 pharmacy technicians. The PIHO provides healthcare services to 500,000 employees and retired members. The pharmacy of the PIHO center in Tehran was selected as the site for the present intervention because it is the largest hospital within the PIHO system, with 300 beds and admits patients from other PIHO healthcare centers. It is also classified as a tier-1 hospital by the Ministry of Health, as almost one-third of the PIHO's annual budget is allocated to the Tehran center.

Although the BSC method is widely used in both public and private organizations in general and in healthcare organizations in particular, to our knowledge, the implementation of this strategic management technique in the pharmacy context has not been adequately researched. In light of this, some scholars have called for more empirical research on applying the BSC in pharmaceutical service and practice (Enwere, Jr et al., 2004). Thus, it seems that this study is the first to focus on implementing the BSC as a strategic management model for the pharmacy department. In addition, this study helps to improve our understanding of how the BSC can be implemented in hospital pharmacies and presents an experimental design that allows pharmacy measures to be implemented and evaluated simultaneously.

Against this background, this study aimed to provide a comprehensive model for pharmacy department strategic planning using the BSC approach to promote patient-centered pharmacy services. This article also highlights the key metrics that pharmacy managers should consider when

designing the BSC for their pharmacy departments. It also explains the importance of using the BSC to support the department's mission and vision, lists the specific metrics used to monitor medication safety, operational efficiency, quality improvement, education, and financial performance, and highlights how pharmacy managers can promote pharmacy services using the BSC.

Methods

This experimental study was conducted from 2015 to 2018 at Tehran Central Hospital, affiliated with the PIHO. The study was divided into three phases: strategy development, strategy implementation, and strategy evaluation, as shown in Figure 1.

“Please insert Figure 1 here.”

According to Figure 1, an optimal strategy was first developed step by step, considering the pharmacy department's vision, mission, and SWOT analysis. Then, the developed strategy was implemented using the BSC tool, the related measurements were determined, and the productivity improvement measures to be implemented were improved. Finally, the strategy was evaluated. The methodological details are provided below:

Context of the study

This study was conducted in the pharmacy department of the Iranian Petroleum Industry Health Organization (PIHO). The PIHO's pharmacy department consists of 14 different regional centers across the country, with 119 community and hospital pharmacies staffed by 66 pharmacists and 257 pharmacy technicians. The PIHO provides healthcare services to 500,000 employees and retired members. Retired members are a source of income for the PIHO, as their expenses are covered by the Civil Servants Pension Organization. The center in Tehran is the largest hospital within the PIHO system, with 300 beds, and admits patients referred from other PIHO healthcare centers. The Ministry of Health classifies the PIHO as a tier-1 hospital because nearly one-third of the PIHO's annual budget is allocated to the Tehran center.

Phase I - Strategy development

The first phase of strategy development was designed in two sub-phases to determine the vision and mission of the pharmacy as well as the situational analysis. In the first sub-phase, a comprehensive review of the vision and mission was conducted to establish value and strategy development. Then, in the second sub-phase, several in-depth interviews were conducted with 10 pharmacy management experts to assess both internal and external factors might affect the pharmacy business orientations in the future. Then, a survey was conducted using a quantitative method to find the most influential factors provided by interviewers. The results of both the internal matrix and the external matrix (IE matrix) and the strengths-weaknesses-opportunities-threats matrix (SWOT matrix) were compared to formulate an initial strategy (Facchinetti et al., 1999).

Phase II - Strategy implementation

In the second phase, i.e., the strategy implementation, a strategy map was first created with the strategic goals obtained in the previous phase. Then, for the BSC implementation, 40 measures were gathered from the literature and selected based on the protocols approved by the PIHO. To finalize the measures, a questionnaire based on a Likert scale (very high, high, moderate, low, and very low) was designed, and 30 pharmacists with at least five years of experience were asked to rate the importance of each measure. Based on the statistical analysis results, the final measures were selected. After the measures were defined and finalized, we examined the status quo of the selected measures. Data were collected from 11 healthcare centers, one warehouse, and one hospital in Tehran. These data were collected using the hospital information system (HIS) and the National Iranian Oil Company (NIOC) software program. To measure staff satisfaction, questionnaires were completed by 47 pharmacy technicians and 14 pharmacists. Besides, 394 questionnaires were completed by patients to determine patient satisfaction. Data collection was conducted at the beginning and end of the study. Finally, we proposed the necessary steps to achieve the desirable strategic objectives by determining the number of interventions recommended by 10 experts in pharmacy practice. These interventions were as follows:

Protocols for expensive medications and input from clinical pharmacists

- The Drug and Treatment Committee of the hospital in Tehran approved a set of protocols for the use of expensive medications (such as albumin vials, pantoprazole injections, and some antibiotics) prepared by an experienced clinical pharmacist (Brooks, 1996).
- Definition of packs of disposable medical supplies for common surgeries
- A series of meetings with OR technicians who were considered experts in the hospital (with at least five years of experience) were held to define single-use medical supply packs for common surgeries.
- Staff training.
- Technicians and pharmacists were trained in two specific courses on the NIOC software, and their competency was assessed in a subsequent exam.
- Coding Medical Equipment Standard Code (MESC)

The dental, laboratory, OR, and pharmacy departments identified drugs and disposable medical supplies without an MESC that met the inclusion criteria (high inventory turnover, high price, and long expiration date). The coding process was used to increase the optimal utilization of resources. The new MESC's were then sent to the warehouse unit to be merged with the existing database in the NIOC software.

Reconciliation provided by clinical pharmacists

This was a case-controlled study in which 180 patients were selected from the in-house unit for eight months. Patients were randomly assigned to two groups. The test group received additional medication reconciliation by a clinical pharmacist at discharge, whereas patients in the control group received only usual care from a physician or nurse. A follow-up telephone interview was then conducted within 30 days of discharge to assess patients' adherence to medication regimens. The telephone interview focused on clarifying medication adherence, review of indications, frequency of medication use, potential side effects, satisfaction with counseling, and the number of readmissions (if any) was reviewed. Data were analyzed using SPSS software version 16.

Return of unused medications from discharged patients

Individual medication boxes were prepared daily. Each ward was required to return all unused medications to the pharmacy department after patient discharge.

Phase III - Strategy evaluation

In the third phase, the impact of the interventions mentioned above on the specified measures was evaluated against the strategic objectives.

Results

According to the flowchart of the study (Figure 1), the present results are presented in three separate sections of strategy development, implementation, and evaluation as follows:

Strategy development

After confirming the vision, mission, and values of the pharmacy department, the results of the IE matrix (The mean value of internal factors 2.8 ± 0.39 , the mean value of external factors 2.3 ± 0.22) were compared with the SWOT matrix. The applicable strategy was identified, focusing on the competitive strategy (maintenance- external support). The strategic objectives identified in this phase were patient satisfaction, operational management for optimal use of resources, and cost reduction.

Strategy implementation

Strategy map

A strategy map was created to visualize the performance dynamics for all employees and units within the organization (Norton, 2001). This map illustrates the four aspects of the BSC, including finance, customer satisfaction, internal processes, and learning and growth. Figure 2 shows the details of the strategy map.

“Please insert Figure 2 here.”

Balanced Scorecard

Performance measures were developed according to the strategy map. These measures were defined in four different perspectives: finance, patient satisfaction, internal processes, and growth/learning. The current status of the measures was assessed, and targets were set for each measure. Of the 26 final measures, nine were considered for intervention (Table 1).

“Table 1- should be inserted here”

Strategy evaluation

Financial perspective

There were seven pre-planned financial targets in implementing the BSC, and four out of seven were achieved during the intervention. Regarding the cost of NIS (Not In Stock) drugs, the goal was to reduce costs by 10%, but our results showed a 40% reduction in costs. The second goal was to reduce expired drug costs to 0.1% of annual drug costs, and this was achieved in the first year of BSC implementation and remained at 0.1% in the second year. The third goal was to increase the percentage of medications available to patients, and this goal was successfully achieved at 100%. Gross profit increased to 0.14 by the end of the first year and peaked at 0.29 at the end of the second year, well above the intended level. The fifth goal was to increase the inventory turnover from 3.3 to 4, which was not achieved as intended. Inventory turnover decreased from 3.3 to 2.6, and the inventory turnover and retirement income goals reached 62.5% and 81.7%, respectively. The final financial goal was to increase return on assets (ROA), which could not be calculated for the pharmacy department because tax laws treat the pharmacy department independently of other PIHO departments (Table 2).

Customer perspective

The main objective was to increase patient satisfaction. At the end of the study, as shown in Table 2, patient satisfaction improved significantly from 2017 to 2018 (64% to 96%, p-value < 0.001).

Internal processes

The first measure was the use of disposable packaging for medical supplies in common operations. During the implementation of strategic management, packages were defined for 76 out of 100 operations (76% achievement). The second measure was implementing a mechanism for returning unused medications from the treatment wards to the pharmacy department when patients are discharged. During the two years of strategic management, \$442,899 was saved. The third measure was to increase the number of the pieces of equipment with an MESC from 1604 to 3208. This number was increased to 2438 (75.9% achievement). Another measure was to increase the number of clinical pharmacists in the department from 0 to 2. One clinical pharmacist was hired (50% achievement). This resulted in the creation of 10 protocols for expensive drugs and a cost reduction of \$539,137 (Table 2).

Learning and growth perspective

Our main measure in this perspective was to double the number of qualified staff trained to use the NIOC software proficiently. The implementation of the BSC helped partially achieve this goal by increasing the number of qualified employees from 18 to 28 (78% of the goal) (Table 2).

“Table 2- Should be inserted here”

The result of the reconciliation by the clinical pharmacist showed that the percentage of readmissions was three times lower in the intervention group than in the control group (p-value < 0.05, χ^2 -test). Also, the number of missed medications (that is, when the patient eliminates the medication without the permission of the physician) decreased significantly in the test group vis-

a-vis the control group (p -value < 0.01 , independent t-test). However, no improvements were observed in frequency and dose errors in the test group. The average percentage of patient adherence (patients have more than 80% adherence) showed significant improvement after the intervention of the clinical pharmacist: 73.8% in the control group and 88% in the test group ($p < 0.05$, independent t-test) (Table 3).

“Table 3- Should be inserted here”

It is worth noting that there is a significant relationship between the mean score of treatment adherence and readmission. (P -value < 0.05 , independent t-test). In the group that was readmitted, treatment adherence was 68.8%, and in the group that was not readmitted, it was 82.5% (Table 4).

“Table 4- Should be inserted here”

Discussion

In this study, we introduced the BSC framework as a strategic planning approach in the pharmacy department of the PIHO branch in Tehran. Our objective was to test whether the BSC could enable the pharmacy department to increase patient satisfaction, optimize resource utilization, and significantly reduce the cost of services. Other previous studies have also shown a direct relationship between pharmacy performance and the use of strategic management tools (Harrison, 2005). One possible explanation for the success of the BSC approach in this study could be the managers' evaluation of accurate monitoring activities.

Financial perspective

The financial perspective is assumed to reflect the outcome of all measures in the other perspectives (patient satisfaction, internal processes, and growth and learning). The BSC can add value to financial information by enabling decision-makers to process information more

effectively (Cleverley, 2001). Return on assets (ROA) indicates how much revenue an organization's assets generate. However, the pharmacy department's net profit calculation remained unknown due to current tax calculations that do not treat the pharmacy department independently of other PIHO departments. Moreover, there is a direct and positive relationship between inventory turnover and ROA (Pribadi, 2014). Unfortunately, due to external threats (the US-led economic sanctions imposed on the country and inflation) and the changes in the organization's policies, we did not fully achieve the inventory turnover target (62.5%). The price fluctuations of pharmaceuticals and medical devices proved another challenge that caused us to keep the inventory turnover at a lower level and reduce costs (Federico Lega, 2013). We demonstrated that gross profit increased significantly, which could be attributed to the optimal use of resources and patient satisfaction. Although the relationship between customer satisfaction and financial outcomes has received much attention in recent years, a solid link between customer satisfaction and customer profitability is yet to be established. Some scholars have found a positive relationship between customer satisfaction and customer turnover at the individual level, but the relationship between customer profitability and satisfaction was insignificant (Yu, 2007).

Customer perspective

Patient satisfaction is an essential component of healthcare services (Hasan et al., 2013). Dissatisfied patients are more likely to file complaints with regulatory agencies and stop using services (Nau, 2009). We found a significant increase in customer satisfaction, which may be due to a decrease in annual NIS medications, thus increasing the availability of medications to patients. However, Ellangovan (2014) has shown that patient satisfaction depends on the healthcare provider's job satisfaction (K. Ellangovan 2014). Customer retention is a measure that contributes to patient satisfaction (Zafar Ahmed, 2011). We assessed this measure by calculating the percentage of hospital revenue generated by retirees as a percentage of total revenue. Since this measure did not show any significant change during the implementation of our intervention, we suggest an overall improvement in patient satisfaction.

Internal processes

Strategic management with the BSC requires a critical evaluation of internal processes that contribute to better financial outcomes and customer satisfaction (Shutt, 2003). The strategic objectives in this phase were operational management of optimal use of resources and cost reduction. Specifically, we defined a standard package of medical supplies for common operations and assigned a standard code for medical equipment (MESC), which was specifically effective in reducing costs at the PIHO. These actions facilitated monitoring and effective control of medical equipment and resulted in better management of resources.

The present study showed that the pharmacy department could save \$220,000 per year on average by returning unused medications after patient discharge. This finding is consistent with the reverse logistics study by Ritchie (2000), which showed that returning unused medications can save £3,000 in 14 days (amounting to £132,000 in one year) (Liz Ritchie, 2000). The significant increase in the mean percentage of adherence in our test group that received a pharmacist intervention suggests that this intervention improves adherence, potentially leading to a reduction in readmission rates (Devine et al., 2009). These findings are consistent with previous studies showing that medication reconciliation by a clinical pharmacist can increase the safety and quality of pharmaceutical care (Haines et al., 2010, Harrison, 2010, R Batty, 1992). Clinical practice guidelines (CPGs) are known to reduce mortality and morbidity when patients adhere to them (Horning et al., 2007).

Our study showed that establishing a protocol for expensive drugs and antibiotics under the supervision of a clinical pharmacist saved the organization significant costs. Similarly, other studies have shown that investment in clinical pharmacy services can save four times more than the amount invested (Schumock et al., 2003). Bond et al. (2000) also reported that protocol management was among the top six contributions of clinical pharmacists and was associated with reductions in the total cost of care (Bond et al., 2000).

Learning and growth perspective

The learning and growth perspective refers to the importance of investing in human resources by ensuring that training programs are available to enhance existing skills if organizations are to achieve their long-term financial goals (Zafar Ahmed, 2011). Our main

objective in the learning and growth perspective was to train our employees and increase their satisfaction. Therefore, this intervention focused on offering educational courses. Our results showed that the number of employees with above-average skills for working with the NIOC software nearly doubled due to these educational courses, and job diversity increased. It has been suggested that an increase in job diversity and responsibility is associated with higher job satisfaction (Ngo, 2003). Some studies have found that pharmacists with higher job satisfaction perform better, leading to higher patient satisfaction (Murawski et al., 2008; Mohamed Ismail Mohideen Bawa, 2013).

Limitations

Our study has some limitations that should be considered when interpreting the results. Our work was conducted in a large city, so generalizing our results to other environments should be done with caution. Organizational and regulatory factors, such as administrative control, organizational structure, and professional climate, may differ in these settings. Another limitation was that only one clinical pharmacist performed all clinical interventions (medication reconciliation, cost reduction, etc.).

Conclusions

This study demonstrated the effectiveness of the BSC in the strategic management of the pharmacy department at the PIHO. The BSC approach positively impacted financial performance, increased patient satisfaction, and reduced unnecessary and wasteful spending. This is because the BSC is critical in developing strategies in line with an organization's mission and vision, taking current and future goals into account. This study provides the following contributions to the literature:

- Implement strategic management using a balanced scorecard for the pharmacy department.
- Determine the best strategies for the pharmacy department.
- Identify key measures of a balanced scorecard for the pharmacy department.
- Identify effective interventions to achieve strategic goals.

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Table 1.The status and definition of final measurement

Perspective	No.	Measures	Kind of measures	KPI, PI¹, KRI²
Financial	1	The cost of the drug (Not In Stock) NIS per year (Mutale et al., 2013)	Lag	KRI
	2	The proportion of the cost of expiry date drug to the cost of the annual drug (Alan Fowler, 2001)	Lag	KRI
	3	The cost of treatment medications available ³ (Mutale et al., 2013)	Lag	
	4	gross profit (E. Grigoroudis, 2012)	Lag	KRI
	5	Inventory turnover (Christine Di Martinelly, 2009)	Lag	
	6	Return on asset (ROA) (Chen et al., 2006)	Lag	KRI
	7	Percentage of income earned from retirees to total income ⁴	Lag	
Customer	8	Number of received complaints due to delays in delivering goods/services (Rabbani et al., 2010)	Lag	
	9	The satisfaction of veterans of special services (Biro et al., 2003)	Lag	
	10	Patient satisfaction (Biro et al., 2003, Haworth, 2008, Rabbani et al., 2010)*	Lag	KRI
Internal processes	11	Number of disposable medical supply packages for common surgeries*	Lead	KPI
	12	Returning unused medicines of patients discharged from the treatment wards to the pharmacy (Liz Ritchie, 2000)*	Lead	KPI

¹ Performance indicator

² Key result indicator

³Patients who get their medications from non-affiliated pharmacies are eligible for an 80% reimbursement from PIHO's insurance policy.

⁴ Evaluation of this measure is important because PIHO can earn a profit margin from providing it's free services to retirees by charging their Retirement Organization.

	13	Minimum time for distributing medicines and supplies from the warehouse to the pharmacy (Federico Lega, 2013)	Lead	KP
	14	Percentage of prescriptions controlled by the pharmacist to the total prescriptions (Facchinetti et al., 1999)	Lead	KP
	15	Re- admission rate (Heenan and Higgins, 2009, Alan Fowler, 2001)*	Lead	KPI
	16	Percentage of error (dosage, frequency, missed drug) (Heenan and Higgins, 2009)*	Lead	KPI
	17	Percentage of pharmacist's consultation (Nigam et al., 2008, Enwere et al., 2014)	Lead	KP
	18	Waiting time for the prescription (E. Grigoroudis, 2012)	Lead	KP
	19	Number of Medical Equipment Standard Code (MESC)*	Lead	KPI
	20	Number of clinical pharmacists*		KPI
	21	Number of protocols for expensive drugs (Weekes and Brooks, 1996)* (saving cost)	Lead	KPI
	22	Conformity of the warehouse with the checklist of evaluating warehouse performance	Lead	KP
Growth and learning	23	Training of pharmacists (E. Grigoroudis, 2012)*	Lead	KPI
	24	Employees' satisfaction (Syed Jaleeluddin Hydar, 2010)	Lead	KPI
	25	Percentage of payments in due time (salaries and benefits of employees)	Lead	KP
	26	Training technicians(Santiago, 1999)*	Lead	KPI
*They were considered for intervention.				

Table 1. Results of the strategy evaluation after during the intervention

Perspective	NO	Measures	Formula	Target	End of 2016	End of 2017	End of 2018	Percentage of achievement at the end of the year 2018
Financial	1	The cost of the drug (Not In Stock) NIS per year	\$	-10%	669520	724798	404050	100%
	2	Proportion of cost of expiry date drug to the cost of annual drug	cost of expiry date drug /cost of annual drug	0.001	0.002	0.000	0.001	100%
	3	The cost of treatment medications available	\$	+10%	57110	21208	163509	100%
	4	gross profit	(direct personal + direct Material + Overhead)- Income/ Income	0.18	0.09	0.14	0.29	100%
	5	Inventory turnover	Cost of goods sold/Average Inventories	4	3.3	2.6	2.5	62.5%
	6	Return on asset (ROA)	Net profit/ sum of asset	5%	NA	NA	NA	NA
	7	Percentage of income earned from retirees to total income	%	50%	42	46	41	81.7%
Customer	8	Patient Satisfaction	%	100%	NA	64	96	96%
Internal processes	9	Number of disposable medical supply packages for common surgeries	NO	100	0	41	76	76%
	10	Returning unused medicines of patients discharged from the treatment departments to the pharmacy	\$	↑	0	144834	442899	↑
	11	Number of Medical Equipment Standard Code (MESC)	No	Double the initial number (3208)	1604	1963	2438	75.9%
	12	Number of clinical pharmacist	No	2	0	1	1	50%
	13	Number of expensive drug 's protocol	No	10	0	6	10	100
		Cost of saving expensive drugs)	\$	↑	0	407696	539137	↑
Learning and growth	14	Staff training	No	Double the initial number (36)	18	23	28	77.7%

Table 2. Results of clinical pharmacist reconciliation

	Control Group	Intervention Group	P-Value
Re-admittance (%)	17.8	5.6	0.011*
Percentage Dose error (Min)	0.034	0.029	0.114
Percentage Missed drugs (Min)	0.117	0.05	0.003*
Percentage Frequency error (Min)	0.038	0.020	0.056*
Percentage of adherence to treatment (Min)	73.8	88	0.001*
*P-value <0.05			

Table 3. Relation between re-admittance and adherence to treatment

	Re-admit	NO	Min	P-Value
Percentage adherence to treatment	No	159	82.5	0.009*
	Yes	22	68.8	
*P-value <0.05				

Figure 1- The study design flowchart

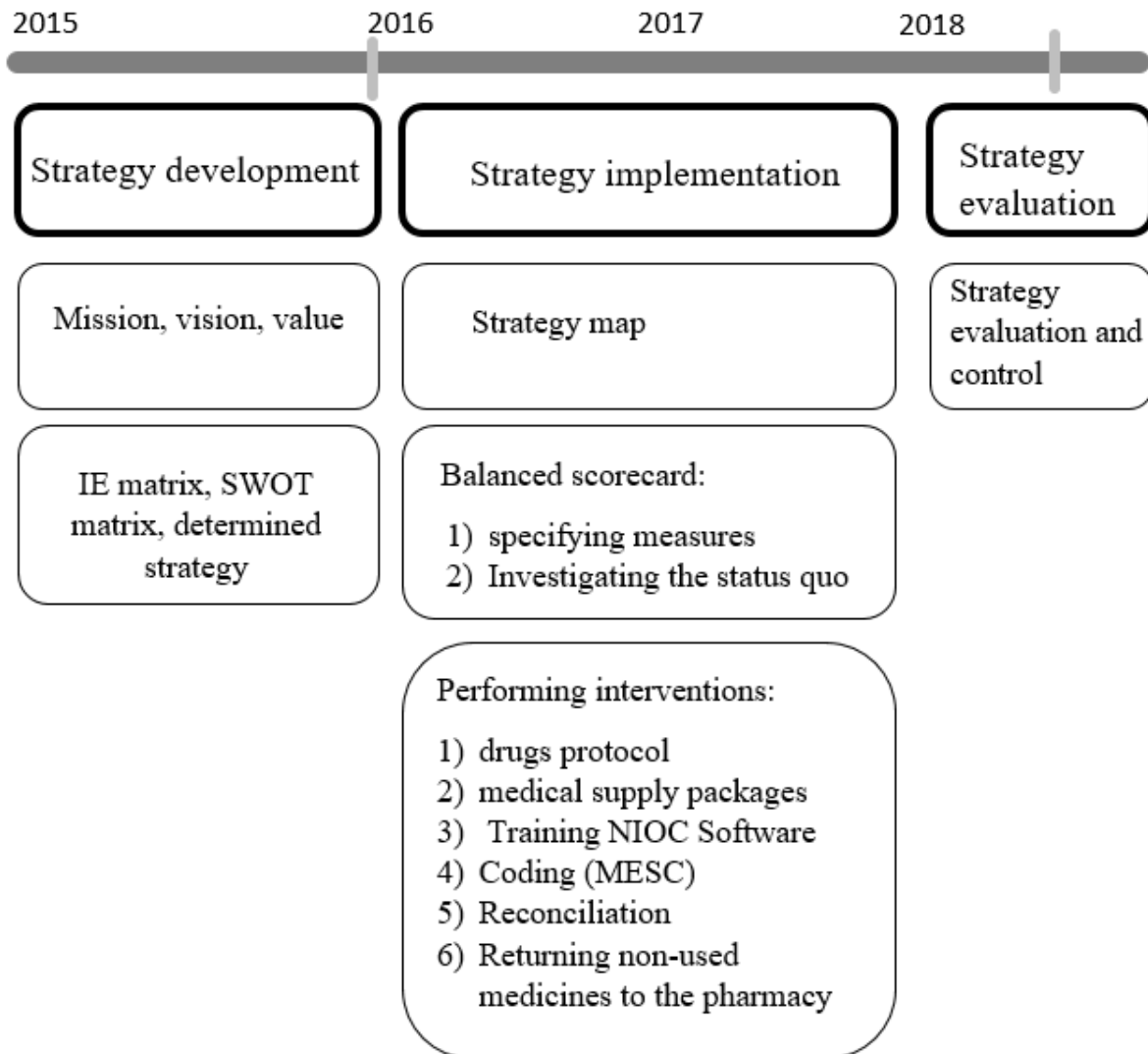


Figure 2. Strategy map

