Decision Making in an Academic Department of Medicine: The Role of a Management Control System

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Academic Departments of Medicine have several challenges in managing resources, meeting academic goals and clinical demands. In this paper, we describe a management control system installed in 2014: the Strategic Plan, a Balanced Scorecard reflecting clinical research and educational performance, Annual feedback and review by Departmental and Divisional Chairs, and Improvement Plans.

This system over 8 years resulted in a reduction in 30-day re-admissions of 14%, a decline in length of stay of 0.55 days, and reduced absolute in-hospital mortality of nearly 2%. Clinical revenue increased 42% from 2016 to 2022 largely due to increased ambulatory and procedural volumes. Teaching time and ratings were unaffected by the installation of this system. Return on investment for newly hired researchers and scientists was 67.5% with a 12.7% increase in peer-reviewed funding. We conclude that the Decision Management Control System was feasible to create and allowed capable monitoring of performance and informed decision-making. Major metrics improved after its implementation.

Keywords: balanced scorecard, management control system, dashboard

INTRODUCTION

Clinical academic departments are currently challenged by their dual role of financial and resource stewardship and a continuous need to innovate. Revenues to clinical departments are often based on fee-for-service models under either government control or insurance contracting. In many cases, salary support from the government is a predominant mode of revenue, with grant support from peer review agencies and endowments also playing a lesser role. The performance of services for hospitals also constitutes another means of salary support.

This salary support funds the education and research missions that academic medical centres and physicians have. How money is then allocated for operating expenses, research, education and innovation support requires a competent financial management system (Young, 2016, Kaplan and Norton DP, 2008). Financial shortfalls for salary support of providers and administrative support personnel occur and have to be borne by the Department. At the same time, the need to satisfy research goals and pursue innovation in clinical care is also a prerequisite for a successful clinical academic department.

Whether a department uses a tithe (or tax) system or has a fixed salary structure, there is a need to manage cost while supporting both research and education missions in addition to clinical service. At year's

end, assuming that revenues exceed expenses, the surplus can pay dividends or bonuses or be used to reinvest in the department. However, the situation is more complex in that salary support for researchers and educators may be encumbrances over multiple years, requiring a multi-year budget. A department with a well-designed strategic plan can make wise choices in support of the strategic plan amongst three alternatives:1) pay bonuses or raise salaries based on merit, 2) invest in the department in accordance with the strategic plan or 3) do nothing. In this way, research salaries can be projected over several years. The same would apply for educators within the department. New scientists would require start-up funds from the institution or department until they can actually receive external peer-review funding. Educational commitments should also be multi-year for successful completion of educational programs or curriculum changes.

To achieve our goals and objectives within our strategic plan we have created a management system that has four components:

1. The strategic plan itself with mission, vision and values with clear aims and goals using a strategic map as a means to focus departments and divisions on both mission and vision,
2. A balanced scorecard (Kaplan RS 2007) reflecting strategic goals and performance of individuals, divisions or department over time compared to external targets,
3. A set of operational tools to continually engineer process improvement including feedback to individuals and division heads on an annual basis, and
4. A strong commitment to a value-added proposition where value equals quality/cost.

In this way we have created a circular system (as shown in Figure 1) linking these features sequentially to achieve objectives.

METHODS

Description of Management System

Strategic Plan

In 2015 the Department of Medicine undertook the development of a Strategic Plan to guide itself over the next five years. As part of that plan a facilitator was contracted to help organize focus groups. It was agreed upon that the strategic plan would identify a clear mission and vision, articulate our collective values and strategic goals. This process took approximately six months to complete. A summary document was created. In addition, a strategic map was also developed as shown in Figure 2.

The strategic map is organized in rows and columns. The left-hand column organizes the diagram in terms of using resources wisely to build a strong prepared department, create cooperation among faculty and stakeholders, to operate with effectiveness and excellence to meet the needs of the patients and community we serve. Doing these things, we achieve our vision while performing this mission. We state clearly that our mission has several components: 1) to our patients, we use our expertise to provide the best possible care; 2) to our community, we are responsive to their needs, including safe and timely treatment and prevention to facilitate the development of a healthy community; and 3) to ourselves we create a faculty that is not satisfied with the status quo and is dedicated to continually improving patient care, creating innovative learning opportunities for all learners, and advancing knowledge through research excellence. The vision of aspiring to be a medical community that sets the standard for patient care, research and learning puts us in the vanguard of similar institutions. It makes it very clear that we are pursuing a level of mastery that would be second to none.

The strategic map is also organized in columns according to patient care, research, and education missions. Importantly, we were able to identify four potential metrics to asses our progress in patient care, research integration, and learning. Each of these four areas had metrics that were electronically captured within our academic community either at the hospital level, at the medical school level or at the department level.

Our first goal of excellence in patient care was supported by tracking metrics such as length of stay, mortality, follow-up care, and patient visits. Our second area of excellence was in the area of patient research: again, tracking not only patient outcomes but also publications as senior or first author, grant

awards, as well as H-index. Our third area of strategic aim was to deliver a superior learning experience for all students. In this regard we were able to track teaching hours and evaluations. This data collection exists in various electronic databases within our system and can be readily accessed with little investment. Over time, we included teaching activities beyond undergraduate teaching to include coaching, national or internal leadership in education, and participation in national panels on education. The fourth area of interest was concerned with financial competence. The Department publishes financial statements annually which certified accountants audit. A financial management committee tracks profitability and return on our investments in both research and education for each year. This was done primarily at a departmental level, but allowed for the creation of a Development Fund that is used to recruit and support scientists and researchers.

Balanced Scorecard

The second component of the system is the creation of a balanced scorecard itself (Coskun Ali 2010) (Voelker KE 2001). A Balanced Scorecard is a web application hosted on the DOM Intranet, accessible by faculty physicians, division chairs, department chair, finance, education and research teams. The data is collected at the individual level, and the Balanced Scorecard web application groups the data and summarizes it at the individual, division, and department level. An administrative web application was developed to import and maintain the collected data, and configure the displayed physicians per academic year. The Technical environment: The data is in SQL Server, the programming language is C#, the compiler used is Visual Studio. Both web and database servers are virtual servers managed by LHSC.

As stated above, the balanced scorecard had metrics that were obtainable through various information systems across hospitals and medical schools. A team of financial officers collected this data and organized it by both individual and division and summarized department performance as a result. Each individual then receives a report annually on their progress in clinical care (patient visits, mortality, length of stay, pre=-admission rates), publications and grant attainment, and teaching hours and evaluation. This data was also aggregated for divisional and departmental review.

Process Management and Feedback

Every individual had an annual review with their Division Chair/Chief to assess progress and to determine whether their progress was satisfactory and consistent with future promotion. The Department Chair subsequently reviewed the division and individual reports with the Divisional Chair/Chiefs. This gave opportunity for the development of interventions for individuals who were struggling in terms of realizing the goals of their academic rank. Specific interventions were chosen for individuals who were not meeting agreed upon targets. In addition, future goals for individuals and divisions were created.

We extended our process management component to use the data to create a value-added proposition for both recruitment and programmatic decisions, ensuring value is being created by faculty through the quality and quantity of their activity at an acceptable cost. This allows essentially an updated annual scorecard looking at the progress of the entire department. Indeed, a proforma is created for the first 3 y for a new scientist or that tabulates start-up costs and operational costs for years 0 to 3, allowing the estimation of free cash flow for the project and the estimation of return on investment and payback period. This coupled with a business decision tree which itemizes expectations for each year of the pro forma with stopping rules if expectations are not met.

In such cases performance is reviewed and corrective strategies are enacted with either the individual or project leader. The annual meeting allows the departmental productivity to be reviewed with all faculty so the process is transparent.

RESULTS

From 2014 to 2021, inpatient cases decreased from 12,370 to 11,932 (3.5% decrease), 30-day re-admission rates fell approximately 14% over the same period and average length of stay declined from 7.53 days to 6.98 (7.3% reduction). However, clinical earnings increased from $ 52.1M in 2016 to $ 74 M in

2022(42% increase). Procedural billings counterbalanced the decrease in inpatient visits. As an example, Cardiology procedural billings increased during the study period by 27% before the pandemic and still levelled off to 19% over the entire study period. Similarly, Gastroenterological and respiratory procedures also increased over the time period (55% and 9 %, respectively). Mortality rates dropped slightly from 7.5% to 7.36% (-1.9%) between 2014 and 2021 (figure 3). To meet this increase in clinical demand 53 clinician teachers and educators were added to faculty over that time period (Table 1).

In addition, educational results demonstrated high-quality evaluations and satisfactory numbers of hours devoted to teaching, satisfying the clinical practice plan. More importantly, additional teaching contributions, including coaching, mentorship, and research supervision of residents and fellows, as well as graduate students, significantly increased with the addition of new researchers. Table 1 also indicates that 24 researchers and scientists were added over the study period.

These additions in faculty resulted in approximately $14M of grants being awarded and 313 publications as senior authors, and 410 publications as co-authors for the time period of the study. Additionally, for those investigators with >5 years on faculty (i.e. hired between 2014-2017) the start-up funding for scientists was $2,825,000 and $350,000 for researchers. The return of investment (Grant dollars awarded/(salary dollars + start-up dollars)) was 67.5 %. Another accomplishment was the establishment of a Center of Quality, Innovation, and Safety, which resulted in improved performance in patient days and mortality.

DISCUSSION

Our results are the first report of installing an academic medicine department management control system with a comprehensive long-term follow-up. The major insights of this paper are four-fold: (1) creation of a management control system including a balanced scorecard (BSC) that incorporates the 3 missions of clinical service, education, and research is feasible using existing databases; (2) the balanced scorecard is an important tool of this departmental management control system; (3) the management control system was associated with clinical and fiscal growth, and improvements in clinical performance and; (4) the management control system approach augments the ability of academic departments to manage the complex challenges they face including capital growth and investment monitoring. The most significant change was an increase in revenue while maintaining high educational standards, allowing for a significant investment in research hires and project start-ups.

This study is notable because of its academic focus and the richness of a 7-year balanced scorecard dataset that can assess outcomes of early investments and track multi-year growth. Because the initial goal was to assess feasibility, metrics were kept as simple as possible and depended on data that was already being captured electronically (billing, hospital EHR, academic tracking) through other functions with a minimum of extra manual data collection. Hence, the data sets are complete and reflect goals that the Department developed through strategic planning (Figure 1).

Shortly after the inception of the BSC, the Department Chair met with each Division to explain that the rationale of the BSC was to assess individual performance and progress in the clinical tracks pertinent to the respective individual. This allayed anxiety as it was not being used to determine pay scale, which is reviewed by a separate committee and looks at additional factors not captured by the BSC.

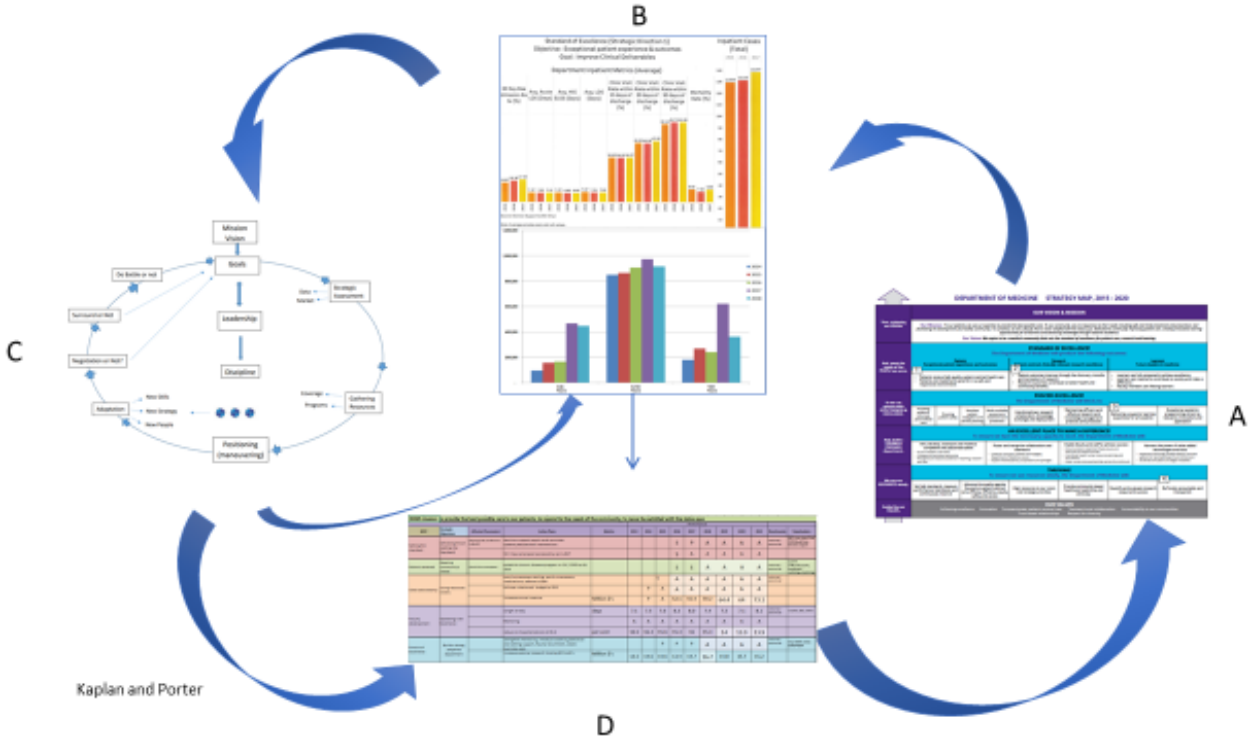
Since 1992, when Kaplan and Porter (1992) first described it, the use of the balanced scorecard has been adopted by many in industry and was described as part of a management control system by both Young (Young D 2016), and Kaplan and Norton (2007). In healthcare, it has also been described by several (Bohm 2021) (Amer F 2022) with systemic reviews that have looked at design and **primarily** implementation. Amer et al. looked at **20 studies that described** specific outcomes such as development and implementation, patient satisfaction, healthcare worker satisfaction, and financial performance. Several studies included in their review were found to have integrated the balanced scorecard into strategic maps or planning. Bohm et al found only 69% of publications on balanced scorecard were linked to strategic planning and were infrequently done in a local setting. None of these reviews have focused on large,

complex academic clinical departments, making our paper unique. In addition, correlation of the balanced scorecard to improved performance was not demonstrated.

Our most significant finding was the revenue increase over the study period despite service interruptions caused by the COVID 19 pandemic. We attribute this to both quality Improvements and new staff hires. Admittedly, we did not include all possible metrics. Our initial goal was to determine the feasibility of a management control system, and we tried to keep it as simple as possible using only existing electronic databases. We did not have patient satisfaction or condition-specific metrics. We anticipate including patient and health care worker satisfaction in future stages as there were departmental and institutional limitations during this period precluding their inclusion that will be addressed in future versions. Our balanced scorecard was focused primarily on clinical care, education, and research. The use of the BSC in this paper was derived by a strategic planning process that had input from most faculty and other stakeholders using a facilitator. A Committee of Departmental Leaders organized it with the input of medical school and hospital leaders. This structure provided good alignment of the department and major stakeholders. Annual feedback throughout the Department was conducted by Divisional Leaders with their division and later reviewed with the Departmental Chair.

In conclusion, implementing a management system within the Department of Medicine was associated with clinical growth, reductions in length of stay, and a significant increase in research productivity and awards justifying the investment in the research mission. This was accomplished without the loss of educational deliverables. Such systems as we have described, are recommended for clinical departments to monitor progress simultaneously in all three missions.

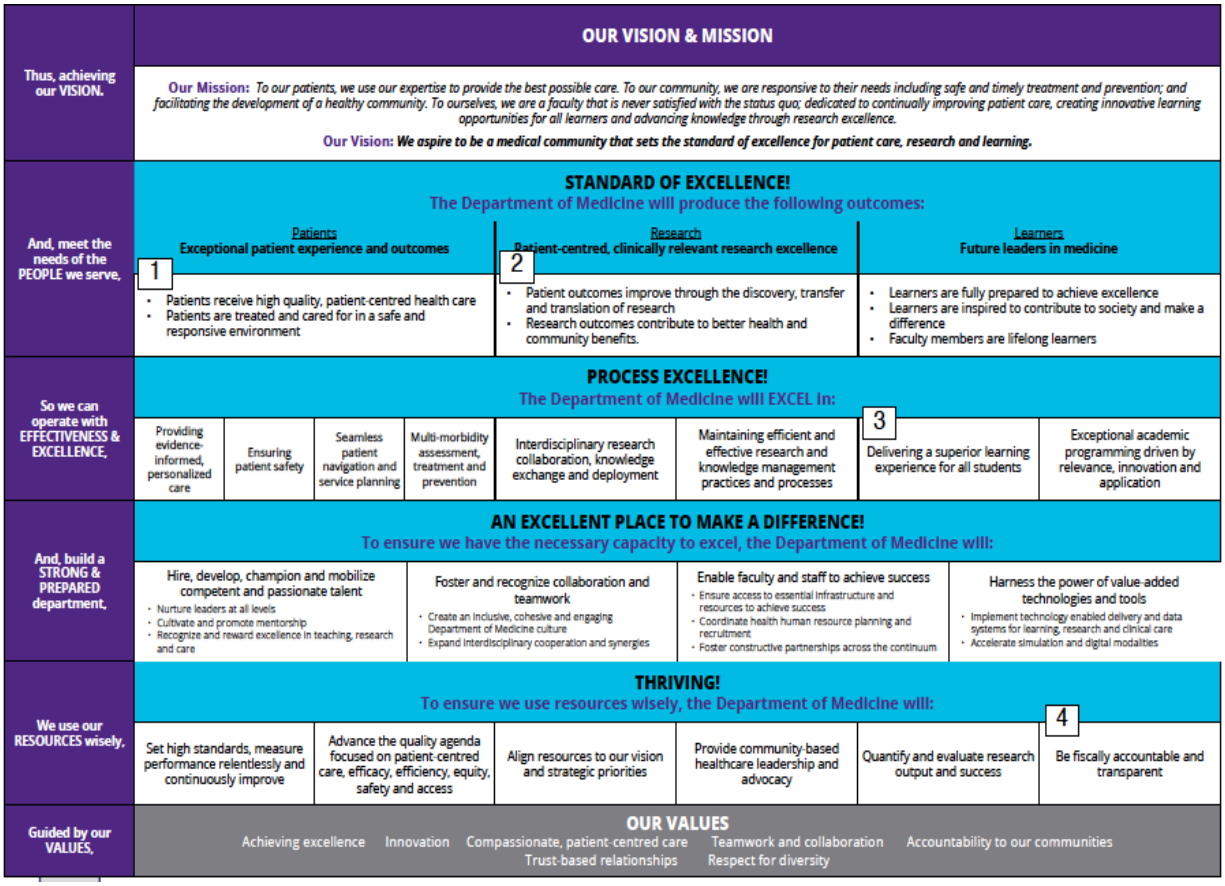
FIGURE 1
MANAGEMENT CONTROL SYSTEM



This diagram depicts all the components of the Management Control System developed by the Department of Medicine. It consists of a strategic map (A), a balanced scorecard for the Department, Divisions and individuals (B), a feedback loop leading to improvement plan (C) and a dashboard of results

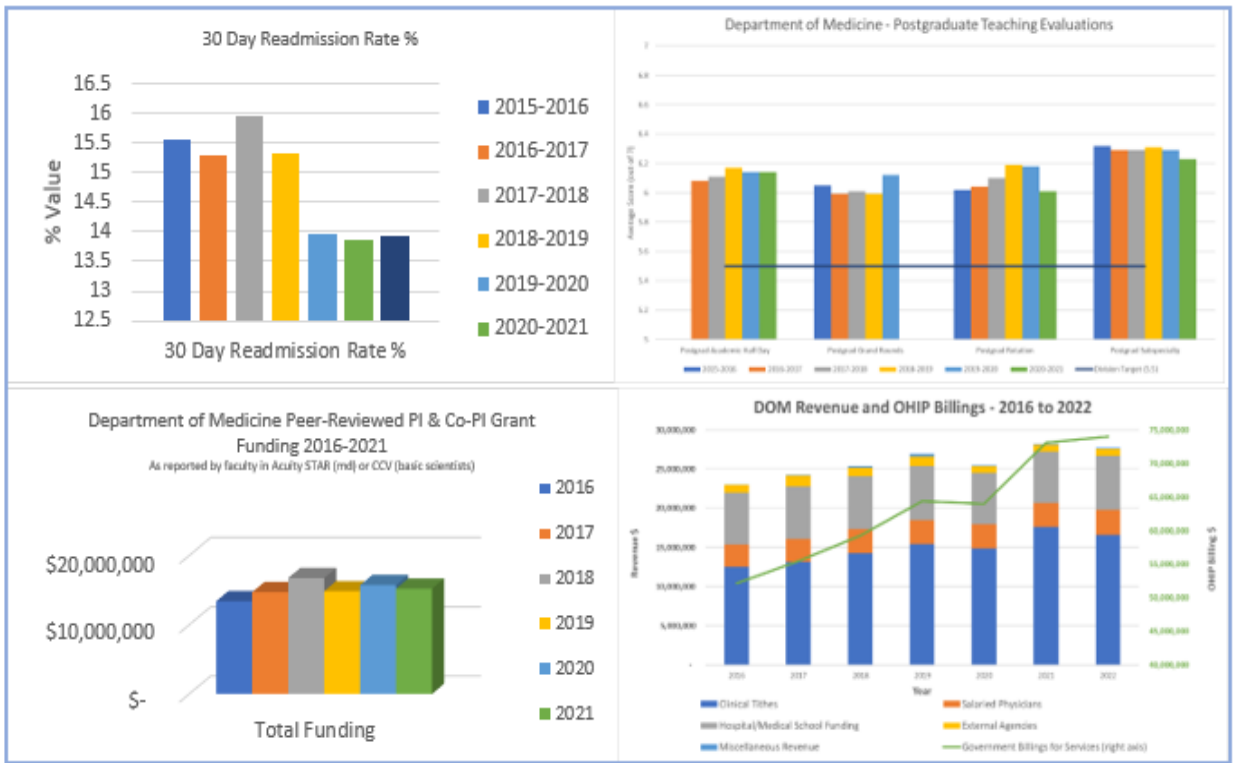
for multiple years (D). The feedback loop incorporates a strong leadership presence and iterative cycles of improvement to achieve desired results. The dashboard is described in more detail in Table 2.

FIGURE 2
DEPARTMENT OF MEDICINE – STRATEGY MAP, 2015-2020



This is described in the text, but there are 4 main goals that are high priority for all.

FIGURE 3
RESULTS OF BALANCED SCORECARD 2015-2022



A composite of selected variables including 30-day re-admission rates, departmental grant funding, postgraduate evaluations and Department of Medicine revenue streams between 2016 and 2022. The horizontal blue line (top right panel) represents the minimal expected evaluations by learners of faculty based on a grade of 5 out of a 7-point Likert scale. The green line (Lower left panel) indicates the progressive increase in billings.

TABLE 1
FACULTY HIRING 2014-2021

Year	New Teachers and Educators	Net sum of T&E (old+new retirements)	New Researchers and Scientists	Net sum of Researchers and Scientists (old+new retirements)	Net Sum of Teachers, Educators, Researchers, Scientists
2014-2015	7	77	4	50	127
2015-2016	1	78	4	54	132
2016-2017	9	87	2	56	143
2017-2018	9	95	1	57	152
2018-2019	7	101	1	58	159
2019-2020	6	105	7	64	169
2020-2021	4	108	1	65	173
2021-2022	10	115	4	69	184
Total	**53**		**24**		

Hiring of new faculty over the time period. Patients are asked to fulfill specific academic categories with recommended time requirements (ranges) for each category. The net sum of each category is to take in to account retirements and resignations over time.

TABLE 2
DEPARTMENTAL DASHBOARD 2014-2021

DOM mission: to provide the best possible care to our patients, to respond to the needs of the community, to never be satisfied with the status quo															
				Performance											
MVV	Strategic Objectives	Action Plans	Metrics	2013	2014	2015	2016	2017	2018	2019	2020	2021	Target	Benchmarks	Stakeholders
Setting the standard	Achieving Vision (setting the Standard)	decision support,report cards reminder systems,educational interventions					S	P	A	A	A	A	Accomplished	national / provincial	MD's, site chiefs, Chair-DOM, Quality Dept, Decision support
		Will have a balaced scorecard by Jan 1,2017					S	A	A	A	A	A	Accomplished		
		increase in hospital EBM in CHF, COPD, pneumonia											80%		
		top 5 residency program													
Patient centered	Meeting community's needs	establish chronic disease program in CHF, COPD by Q4, 2016					S	S	A	A	A	A	Acomplished	national / provincial	SWOTT, LHIN, LHSC, SJHC, researchers
Great stewardship	Using resources wisely	avoid unnecessary testing, avoid unnecessary medications, adhere to EBM				S	A						-50%	national / provincial	
		Achieve a balanced budget by 2015			P	A	A	A	A	A	A	A	Accomplished		
		increase annual revenue	Million $'s		P	A	52.1	55.4	59.2	64.4	64	73.1	5%/y		
Faculty development	Operating with Excellence	Length of stay	days											national / provincial	coaches, JEC, others
		reduce re-hospitalization(	days			15.6	15.3	16	15.3	14	13.9	13.9	reduce 1.2 d		
Pursuit of Excellence	Build a strong prepared department	strengthen mentoring, introduce coaching,statistical and editing support, faculty recruitment, create business plan				P	P	P	A	A	A	A	Accomplished	national / provincial	Chair-DOM, Admin - DOM, POEM
		increase external research funding Million$'s	Million $'s				13.4	14.7	16.7	14.8	15.7	15.2	10% increase		

The 7-year dashboard for the Department including select clinical, education, research and financial performance variables.
S = started, P = planned, A = accomplished

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REFERENCES

Amer, F., Hammoud, S., Khatatbeh, H., Lohner, S., Boncz, I., & Endrei, D. (2022). The deployment of balanced scorecard in health care organizations: Is it beneficial? A systematic review. *BMC Health Services Research*, *22*, 65–79b.

Bohm, V., Lacaille, D., Spencer, N., & Barber, C. (2021). Scoping review of balanced scorecards for use in healthcare settings. *BMJ Open Quality*, *10*, e001293.

Coskun, A., & Senyigit, V.B. (2010). *The Balanced Scorecard for Health Care Organizations in Contemporary Research in Cost and Management Accounting Practices*. North American Business Press.

Dubas-Jakóbczyk, K., Kocot, E., Tambor, M., Szetela, P., Kostrzewska, O., Siegrist, Jr., R.B., & Quentin, W. (2022). The Association Between Hospital Financial Performance and the Quality of Care – A Scoping Literature Review. *International Journal of Health Policy and Management*, *11*, 2816–2826. https://doi.org/10.34172/ijhpm.2022.6957

Kaplan, R.S., & Norton, D.P. (2007). Using the Balanced Scorecard as a Strategic Management System. *Harvard Business Review*, pp. 1–14.

Kaplan, R.S., & Norton, D.P. (2008). *Plan the Strategy.* Cambridge, MA: Harvard Business School Publishing Corporation.

Kaplan, R.S., & Norton, D.P. (2020). Using the Balanced Scorecard for Successful Health Care M&A Integration. *NEJM Catalyst*, pp. 1–8.

Norton, D.P., & Kaplan, R.S. (1992, January–February) Balanced Scorecard Measures That Drive Performance. *Harvard Business Review*, pp. 71–79.

Voelker, K.E., Rakich, J.S., & French, G.R. (2001). The Balanced Scorecard in Heslthcare Organizations: A Performance Measurement and Strategic Planning Methodology. *Hospital Topics*, pp. 13–24.

Young, D. (2016). *Management Control in Nonprofit Organizations* (10th Ed.). Cambridge, MA: The Crimson Press.