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## Hospital Contracting Reforms: The Lebanese Ministry of Public Health Experience

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### Abstract

Since 2009 the Ministry of Public Health (MoPH) in Lebanon has been going through a major reform initiative to improve its contracting system with private and public hospitals. The private sector is the main provider of hospital care in the country, and the main contractor to the MoPH for the provision of curative care. As an “insurer of last resort,” the MoPH plays an important role in providing hospital coverage to 53% of the population who lack coverage by private or public insurance schemes, through contractual arrangements with the private sector. Historically, the MoPH used hospital accreditation as the basis for contracting and for determining the reimbursement rate. However, recent studies by the MoPH showed that reimbursing hospitals solely on accreditation results was not appropriate and led to an unfair and inefficient reimbursement system. The reform program included the development of several components, in particular: an automated billing system, a utilization review function, standardized admission criteria, and

a hospital case mix index that accounts for case complexity. In 2014, the MoPH started implementing a new mixed-model contracting system with private and public hospitals. Preliminary evaluation of the new model suggests that the system incentivized hospitals to admit fewer inappropriate cases and more cases that are more complex/serious. This article shares one experience of how to introduce a merit-based system to face the common practice of political clientelism and confessional/religious-based favoritism in Lebanon. It highlights the importance of stakeholder engagement in a framework of networking and participatory governance that proved to be a key element behind the resilience of a diversified health system.

## Introduction and health sector overview

Lebanon is a middle-income country with a population of about 4.5 million citizens and 1.5 million refugees, the majority of the latter group being due to the conflict in neighboring Syria.<sup>1</sup> Almost 88% of the Lebanese population resides in urban areas, two-thirds of which is between the ages of 15-64 years.<sup>1</sup> Since the mid-1970s, Lebanon has been grappling with a myriad of political and socio-economic hardships due to prolonged periods of conflict, including 15 years of civil unrest, war in 2006, and lately fallouts from the conflict in Syria. The fragile and conflict-prone environment has led to political instability, shrinking economy, limited governance capacity, and inadequate public services across sectors.

The long history of conflict contributed to the weakening of the public sector and to the development of private institutions and non-governmental organizations (NGOs). Accordingly, the private sector became the main provider of health care services in the country and the main contractor to the Ministry of Public Health (MoPH) for the provision of curative care. The unregulated growth led to the oversupply of services and created supply-induced demand with implications on the quality of care.<sup>2,3</sup> Consequently, more dedicated efforts were required on behalf of the ministry to strengthen its regulatory role and build strong partnerships with the private sector.

Despite the chronic instability and constraints, Lebanon's health outcomes compare favorably with other countries in the Middle East North Africa (MENA) region as well as middle-income countries in other regions. Life expectancy at birth is at 80 years (both sexes), compared to 68 years for the region and 74 years for middle-income countries.<sup>4</sup> Lebanon was one of the few countries to have achieved both Millennium Development Goals 4 and 5, namely reducing maternal and child mortality. Between 1990 and 2012, the Infant Mortality Ratio decreased from 32 to 9 per 1,000 live births, and the Maternal Mortality Ratio dropped from 64 to 16 per 100,000 live births.<sup>4</sup> These improvements were achieved while decreasing

total health expenditures from 12.4% in 1998 to 6.4% in 2012.<sup>5</sup> Lebanon was recognized by the World Health Organization as having been able to improve remarkably the health status of its population while decreasing significantly the GDP share of health expenditures, mainly by decreasing individual out of pocket spending on health care.<sup>5</sup> Lebanon is also well rated in terms of cost-effectiveness. According to a 2014 global comparative study by the *Economist*, Lebanon was ranked 32 among 166 countries in terms of outcome with a remarkably lower cost per outcome than the countries in the same category.<sup>6</sup>

As such, the health system in Lebanon proved to be resilient to the massive influx of refugees and to the rapid increase of its population by 30%. This was largely attributed to the governance arrangements led by the MoPH based on collaborative networking with the private sector and civil society organizations. Such governance was instrumental in overcoming the disadvantages of fragmentation of the health system while benefiting from the diversity of stakeholders involved.<sup>7</sup>

This paper discusses the experience of the MoPH in the reform initiatives to improve governance and regulation of Lebanon's hospital care in particular, including hospital contracting reforms between the MoPH and public and private hospitals. The focus of this experience is of major relevance for the health sector in Lebanon, given the prominent role of the MoPH as payer for hospital care, as well as that of private (and public) hospitals as providers. It also describes the approach of the MoPH to address the limitations due to asymmetric information in this payer-provider relationship and to improve the effectiveness and efficiency of health services while countering favoritism and clientelism with a merit-based system.

### **Hospital Sector Overview**

The Lebanese health system is highly diverse, including a mix of public and private payers and providers. Health financing is mobilized from a range of resources, including general government revenues, social security contributions, and the private sector. Total expenditures on health constitute 6.4% of national

Gross Domestic Product, 40% of which is accounted for by hospitals alone.<sup>5,8</sup> The private sector also accounts for 71% of health care financing, of which 37% is out-of-pocket payments made by households.<sup>8</sup> While the public sector is the main payer of hospital care, the private sector dominates in terms of service provision. There are 165 hospitals in Lebanon, 82% of which are privately owned and managed by physicians or by charitable organizations, often religious.<sup>8</sup> Both public and private hospitals have similar average bed capacities. Public hospitals operate under a semi-autonomous model with hospital boards composed of various stakeholders involved, thus having a certain degree of autonomy.

Around 47% of Lebanese citizens have health insurance coverage. About 23% of those are covered by the National Social Security Fund (NSSF), 9% by military schemes, 7% by private insurance, 4% by the Civil Servants Cooperative (CSC); and 4% by other schemes.<sup>2</sup> The remaining 53% lack any formal coverage, and are covered by the MoPH, which serves as an 'insurer of last resort'.<sup>9</sup> This has meant a strong role for the ministry not only in preventive care, public health leadership and regulation, but also in curative care.

To provide hospital coverage to about 250,000 cases per year, the MoPH contracts 26 public and 105 private hospitals. Individual patient co-payment to the hospital constitutes 5% (public hospital) or 15% (private hospital) of the hospitalization costs, with the MoPH directly reimbursing the hospital for the 85-95% difference. A ministerial waiver is also applied in specific cases where the patient is unable to afford co-payment. As such, the MoPH is the main financier of private hospitals, allocating about 64% of its total annual budget (of about 367 million USD) for hospitalization coverage in 2012.<sup>10</sup>

### **MoPH Hospital Contracting Reforms**

Over the years, the MoPH has undertaken several reforms of its hospital contracting system, in line with its broad approach emphasizing participatory governance and involving stakeholders in policy making. The first reforms began with the development of a hospital rating system in 1983, leading to linking the ratings to

hospital reimbursement in the 1990s, and finally the adoption of hospital accreditation in 2001. Since then, the accreditation program has completed three cycles, and has expanded to include numerous medical specialties, patient care, performance appraisals, staff competency testing and appropriateness and implementation of policies and procedures. It remains a key part of the hospital contracting system.

Between 2001 and 2014, the reimbursement rate was determined solely by the hospital's results in the most recent accreditation cycle. A three-tiered reimbursement rate was used, with about 10-30% difference depending on whether the case is a medical or surgical (procedure) admission. This created a strong incentive for hospitals to have a higher reimbursement tier. The MoPH reimburses hospitals for surgical procedures using a pre-defined flat-rate, while for medical cases a fee-for-service structure is used; the latter being more likely to lead to over-utilization and inappropriate admissions.

The limitations of hospital accreditation being the sole determinant of reimbursement rate became more apparent to both the MoPH and hospitals. This was prompted by the heterogeneity among hospitals, and the difficulty in developing a composite score for the increasing number of accreditation standards. The interest of all involved parties to go beyond accreditation, while still maintaining it as an integral component for contracting, formed a favorable environment within which to undertake new contracting reforms.

With grant funding from the World Bank the MoPH embarked in 2009 on a new project to improve its hospital contracting system. The desire for a new reform was accompanied with a broad vision to improve the hospital reimbursement system, increase MoPH hospitalization coverage despite limited resources, and improve the quality of hospital care. More specifically, the project focused on three main goals: improve the appropriateness and fairness of contracting between MoPH and hospitals, improve the efficiency of MoPH spending, and promote good provider practices and discourage miss-use or abuse of services.

To achieve the three inter-related goals, the MoPH first formed three committees: Utilization Review Committee, Admission Criteria Committee, and Performance Contracting Committee, each focusing on one of the goals yet working synergistically together. Each committee was composed of a mix of medical, public health and IT professionals whose affiliations included the MoPH, universities, and hospitals. The multi-disciplinary composition of the committees provided strong credibility with which to address the goals of the program. The primary task of each committee was to discuss and identify objectives and activities to be undertaken in the new reform. It is relevant to note, that the broad setting of the goals was an opportunity for the committees to assess the situation, identify gaps, and explore a wide variety of improvement interventions. Throughout the first year, committee meetings were held on a monthly basis and somewhat less frequently afterwards. The committees were kept abreast of discussions among them by few common members and by inter-committee events held semi-annually.

The initial phase also included a considerable amount of data extraction and analysis of MoPH hospitalization database. This provided more in depth understanding of the frequency of admissions and cost across medical and surgical conditions, as well as variations among hospitals and regions. This work was done in close collaboration with the MoPH Information Technologies (IT) department that played a central role in the reform process.

An important component of the project included the development of an Automated Billing System (ABS) aimed at simplifying the hospital billing procedures and expediting the reimbursement process. The development of the ABS included the purchase of data servers (jointly by the MoPH and private hospitals), software installation, user-interface program development, and trainings for hospitals and MoPH staff on bill entry and submission to the MoPH. The impact of the ABS implementation was beneficial to both hospitals and the MoPH as it reduced the number of days for processing a hospital bill from 35 days in 2008 to only 5 days in 2014.



## Strengthening the Utilization Review Function

The Utilization Review Committee was primarily tasked with developing the utilization review function to help improve MoPH spending efficiency as well reduce miss-use or abuse of hospitalization. The committee started by analyzing the hospital database which included a wealth of information on medical diagnoses, surgical procedures, cost and length of stay for every case treated at public or private hospitals. Using this database, the MoPH became more aware of the wide variation among cases and hospitals costs, specifically for medical admissions. This was to some extent expected, given the fee-for-service structure of such cases. The work of the committee focused on the following:

1. Extraction, exploration and analysis of hospitalization data, including comparison of admission to discharge diagnoses and cost indicators;
2. Development of a hospital coding nomenclature to support analysis;
3. Review of several medical diagnoses and surgical procedures, primarily those that were among the most frequent, most expensive and/or most prone for abuse/miss-use (e.g. appendectomy, headache, tonsillitis);
4. Identification of cost/frequency-outlier hospitals/cases;
5. Development of a rules engine to define which surgical procedures are allowed to be coupled together;
6. Development of an algorithm for identification of outlier bills for referral to MoPH auditing;
7. Interviews and collection of feedback and recommendations from MoPH medical controllers regarding improvement of hospitalization system.

Prior to this activity, the MoPH auditing body made limited use of the database, and had a practice of randomly selecting around 10% of all cases for detailed auditing. The work under this function provided auditors with a non-random method for selecting hospital bills using the algorithm developed to identify outlier bills. The identified bills were those that markedly differed in cost and length of stay, totaling up to about 3% of total annual cases. This complemented the existing practice of random bill selection by the MoPH auditing body, but helped focus the efforts on a small proportion of bills (3%) which accounted for over 20% of total hospitalization costs. This approach also led to the identification of select hospitals that had a relatively greater proportion of such bills. Subsequent notifications and deductions were made by the MoPH for some of these hospitals. In 2014, this was formally adopted as a regular process conducted in coordination between the IT department and the auditing body at the MoPH.

The analysis of hospitalization data also included a study whose key findings suggested that “[...] a significant proportion of the hospital admissions under [the MoPH] are for conditions that could generally be described as relatively minor and hence that may not have needed hospitalization, at least not to that level.”<sup>11</sup> The results also highlighted the differences in both, cost and average length of stay, of medical cases of private versus public hospitals, by region and by reimbursement category. The study was crucial to inform the work of the Admission Criteria Committee in the selection of conditions for criteria development, and of the Performance Contracting Committee in the selection of indicators.

### **Developing Admission Criteria**

During the 1990s, the health sector in Lebanon witnessed a large increase in the number of physicians in the country, reaching around 8.3% increase per year.<sup>12</sup> This was in large part due to physicians returning to Lebanon after the end of the 1975-1990 civil unrest, and those returning from fellowships and grants to study medicine outside Lebanon. This led to a high physician-to-population ratio of 3.2 per 1,000

inhabitants (2007-2013); well above the regional and global averages of 1.3 and 1.4 per 1,000, respectively.<sup>13</sup> This also meant a multiplicity of graduating countries and wide variation in educational backgrounds, making it particularly difficult to standardize clinical practices and protocols among providers.<sup>12</sup>

To address this situation, the Admission Criteria Committee was tasked with addressing the promotion of good provider practices by developing standardized admission criteria. The main approach of this committee was to explore interventions to support physicians in evidence-based decision-making for hospital admission. It also provided support for MoPH medical controllers who are often required to decide on admission of cases outside their specialty.

Building on the information gained through the utilization review function, the committee evaluated medical and surgical conditions and developed admission criteria for 40 high cost, high volume, and/or miss-use and abuse prone conditions (Table 1). The criteria developed benefited from the different medical backgrounds and specialties of committee members and the in-depth knowledge of the challenges and barriers faced by medical controllers. An extensive review of existing national and sub-national medical guidelines was also conducted through sources such as PubMed, US National Guideline Clearinghouse, UK National Institute for Clinical Excellence (NICE), and the French Haute Autorité de Santé (HAS). Guidelines were reviewed and adapted to the Lebanese context in order to increase the likelihood of physician compliance.

Several tools were also developed to support the medical controllers in their case review process. Brief checklists to support decision making for 34 conditions were prepared. Similarly, an indication level notification was also added to hospital admission forms of all cases under MoPH coverage, whereby medical controllers could inform the MoPH of their opinion on whether an admission had a low, medium

or high indication for admission. Low-indication cases were particularly monitored by the MoPH. While such cases are may not be inappropriate to admit, a high proportion prompted closer review by the MoPH.

### **Developing mixed-model hospital contracting**

The Performance Contracting committee had a considerably lengthy period of discussion and planning, both to build on information gained through utilization review, and to review the various approaches of evaluating hospital case complexity and indicators of performance.

Analysis of hospital case complexity was conducted using a locally adapted classification of ICD-10 code grouping and surgical procedures, with greater weight given to diagnoses expected to be more complex/serious or more costly. However, this approach was subsequently replaced with the development of hospital case mix index (CMI) calculation using ICD-10 code and surgical procedure code, with the standard formula below:

$$CMI_h = \frac{|\sum [W_g * N_{gh}] / \sum N_{gh}}{|\sum [W_g * N_{gn}] / \sum N_{gn}}$$

Where:

$h$  is the hospital;

$W_g$  is the weight calculated for each ICD/CPT code;

$N_{gh}$  is the number of cases within each code in hospital  $h$ ; and

$N_{gn}$  is the number of cases within each code in the total population.

Despite the absence of Diagnosis Related Groups (DRGs) in Lebanon, which is commonly used for case mix index calculation, and following review of the literature and local adaptation it was possible to calculate hospital case mix indices based directly on ICD-10 code and surgical procedure code. To our knowledge this was the first instance where such an approach was used at the national level where DRGs were not available. Despite the more limited precision expected in case mix index calculation in using this approach, it allowed the committee to overcome the limitations posed by the lack of DRGs, and measure the complexity of cases admitted at hospitals throughout the country.

Importantly, a study was also undertaken examining hospitals across reimbursement rate tiers and found that CMI varied considerably both among and within reimbursement tiers.<sup>14</sup> This argued against the previously prevailing assumption that hospitals with higher accreditation (and reimbursement) necessarily admitted more complex cases. The conclusion drawn from this was that the linkage of reimbursement rate solely to accreditation was not appropriate and led to unfair and inefficient reimbursement system.<sup>14</sup> This provided further support for including additional factors besides accreditation to the contracting system.

Based on the results, the MoPH decided to move forward with the new model, linking private hospitals' performance to reimbursement. This represented a great challenge considering the climate of political instability and the strong affiliation of most hospitals to different political and confessional/religious factions. MoPH policy makers supported the decision with scientific evidence, particularly in using the results of the assessment study to highlight the gaps in the system.<sup>14</sup> This enhanced the credibility and objectivity of the work and highlighted the technical approach of the new contracting system. MoPH conducted a broad meeting with all hospitals to disseminate the evidence and project approach and gather feedback from hospitals. This was a decisive step to bring the discussions to a scientific ground and cut short political and confessional/religious interference.

By November 2014, the MoPH changed its hospital contracting design to a mixed-model that included hospital CMI, patient satisfaction, and three select policy indicators intended to incentivize increased intensive care unit capacity, decrease un-necessary admissions and inappropriate billing. This resulted in changes of reimbursement rate tiers in about half of contracted hospitals. More specifically, 65 hospitals had a change in their reimbursement tier and 66 stayed within the same tier. The distribution of hospitals before and after the implementation of the mixed-model is detailed in Table 2 below.

An evaluation of the hospital case mix model a year following implementation of the new system revealed that the average case mix index among private hospitals significantly increased from 1.14 to 1.18. This suggested that the new system incentivized hospitals to admit fewer inappropriate cases and more cases that are more complex/serious. The small number of public hospitals limited the statistical power needed to detect changes in such short term.

Preliminary analysis also suggested that there are some improvements, especially among medical cases, which are more informative due to their fee-for-service structure. In the seven months following implementation (Dec 2014-June 2015), both the average number of cases per month and the average cost per case decreased by 22.7% and 5.1% respectively, compared to the period prior to implementation (Table 3). However, the average cost per inpatient day increased slightly (0.6%). This figure is of limited accuracy, due to the short analysis period time that would not capture the entire length of stay of some long-term cases. Further analysis covering longer periods is needed in the future to provide more reliable results.

These findings complement the results of the case mix index, which suggests that fewer un-necessary and more complex cases are admitted following the implementation of the new system. This is not surprising given that a strong incentive was created by the new system for hospitals to avoid un-necessary

admissions. It is also likely that changes in hospital practices may have been influenced by the various activities introduced by this reform. Numerous hospitals sought to improve the quality of coding of hospital cases, which in the new system was linked to their reimbursement rate. Several trainings on ICD-10 coding for medical diagnoses and Common Procedural Terminology (CPT) for surgical procedures have been conducted for hospital coders. Nevertheless, these preliminary findings will need to be further examined as more hospitalization data from the post-implementation period accumulates, allowing for trend analysis for longer-term impact assessment.

### **Moving Forward**

The new mixed-model hospital contracting model implemented in 2014 was an important development in the relationship between the MoPH and hospitals. The new system is also more easily adaptable to subsequent improvements in the indicators used, which is an ongoing process. While the formal activities of the three committees have been completed, the work on each of performance contracting, utilization review and admission criteria has been incorporated into the MoPH's programs. This experience to date has laid the ground for improved hospital contracting, better collaboration among stakeholders, and informed new MoPH policy. In July 2016, the Minister of Public Health announced a new policy that provides full hospital coverage to all uninsured citizens above the age of 64 years and publicly stated that "[this] will be funded through savings [expected to be] achieved from utilization review and auditing reforms" implemented in 2014.

Meanwhile, the MoPH is continuing the work to strengthen further the contracting system. This includes the development of more precise weights to increase the accuracy of the hospital case mix index, increase the use of hospitalization data for utilization review in medical auditing, and the development of performance indicators that reflect actual patient outcomes. As part of an ongoing process, this work will

benefit from additional and more in-depth evaluation in the near future. As more post-implementation data is gathered, an evaluation study is planned to provide greater insight into the actual impact of the reform.

Several lessons may be drawn from the hospital contracting reform initiative of 2009-2014. The involvement from the conception of the initiative of multi-disciplinary professionals with affiliations to key stakeholders and academia was instrumental in developing the activities of the three committees. The active involvement of MoPH policy makers was similarly crucial in providing the guidance, resources and institutional commitment towards achieving the goals of improving contracting appropriateness/fairness, MoPH spending efficiency and provider practices. The use of financing as a leverage to introduce the new initiative was also a major advantage to incentivize stakeholders. In addition, the multi-pronged approach to inter-related goals was highly beneficial, and allowed the committees to build on each others' efforts and undertake a wide range of interventions.

The trainings provided to MoPH's medical controllers (stationed at all hospitals for approval of admissions) were important in building their capacity for admission criteria implementation, as well as using evidence-based material to empower their role as gatekeepers for hospital admission. The extensive use of hospitalization data throughout this process has been critical in increasing the knowledge of the MoPH regarding the coverage it provides to uninsured persons in Lebanon, thus providing the basis for the interventions undertaken. Many hospitals have responded favorably to the recent changes, although a more formal assessment has yet to be undertaken. The close partnership between the Syndicate of Private Hospitals and MoPH was key to supporting the new hospital contracting system.

The Lebanese health care system has exhibited considerable resilience and sustained its achievements in a context of political instability.<sup>7</sup> Collaborating with the private sector based on transparent and



participatory governance enhanced commitment of all parties to shared goals and provided a framework to manage diversity and optimize the use for national resources. The MoPH role as facilitator and steward of the partnership was enhanced by the introduction of a fairer and more appropriate contracting model based on local evidence that also helped counter prevailing political and confessional/religious favoritism. The new hospital contracting system is one example of a merit system that the MoPH succeeded in introducing and gaining the acceptability by a major player in the health sector: the private hospitals.

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## References

1. United Nations Department of Economic and Social Affairs. 2015 Revision of World Population Prospects. Available at <https://esa.un.org/unpd/wpp/Download/Standard/Population/> (accessed 22 August 2016)
2. Ammar W. Health beyond Politics. Beirut: World Health Organization; 2009.
3. Ammar W, Wakim R, Hajj I. Accreditation of Hospitals in Lebanon: a challenging experience. *Eastern Mediterranean Health Journal* 2007; 13(1):138–149.
4. World Health Organization. Global Health Observatory data. Available at [http://who.int/gho/mortality\\_burden\\_disease/en/](http://who.int/gho/mortality_burden_disease/en/) (accessed 22 August 2016)
5. World Health Report 2010 on Health Care Financing. Geneva: World Health Organization; 2010.
6. Economist Intelligence Unit Healthcare: Healthcare, health outcomes and cost: a 166-country comparison 2014.
7. Ammar W, Kdouh O, Hammoud R, Hamadeh R, Harb H, Ammar Z, Atun R, Christiani D, Zalloua PA: Health system resilience: Lebanon and the Syrian Refugee Crisis. *Journal of Global Health* (in publication).
8. Ministry of Public Health, Lebanon. National Health Accounts 2012. Available at <http://www.moph.gov.lb/en/Pages/8/141/national-health-accounts> (accessed 22 August 2016)
9. Ammar W. Health System and Reform in Lebanon. Beirut: World Health Organization; 2003.
10. Ministry of Public Health, Lebanon. Statistical Bulletin 2012. Available at <http://www.moph.gov.lb/en/Pages/8/327/statistical-bulletins> (accessed 22 August 2016)

11. Kronfol N., Khalife J., Romanos J., Makouk J., Noun P., Ammar W. Observations on the Ministry of Public Health program of support to the hospitalization of patients in Lebanon. *Lebanese Medical Journal* 2014; 62(1):33-9
12. Daher M., Hussein H., Kasparian R., Kasparian C. La Démographie Médicale Au Liban. Pléthore, Féminisation et Rajeunissement. *Journal Medical Libanais* 1998; 46 (1): 43-46.
13. World Health Statistics 2015. Geneva: World Health Organization.
14. Ammar W, Khalife J, El-Jardali F, Romanos J, Harb H, Hamadeh G, Dimassi H. Hospital accreditation, reimbursement and case mix: links and insights for contractual systems. *BMC Health Services Research* 2013; 13:505

**Table 1: List of conditions for admission criteria development**

Aortic valve replacement due to atrial stenosis/regurgitation	Gastric bypass	Plasmapheresis
Asthma	Gastroenteritis & dehydration in children <5years	Prostatic stent
Bronchiolitis	Headache	Renal colic
Carpel tunnel syndrome	Hemorrhoidectomy	Septoplasty
Cataract	Hepatitis A	Sinusotomy
Chest pain	Hypertension	Spondylolisthesis
Cholecystectomy	Hysterectomy	Tonsillectomy
Chronic obstructive pulmonary disease	Idiopathic thrombocytopenic purpura	Tonsillitis
Cochlear implant	Laminectomy & discectomy	Total hip replacement
Colporrhaphy	Mastectomy	Total knee replacement
Community-acquired pneumonia	Orchiopexy	Tympanostomy & myringotomy
Coronary artery bypass graft	Otitis media	Varicocele
Febrile neutropenia	Ovarian cyst	Vitrectomy
Fever in children <5years		

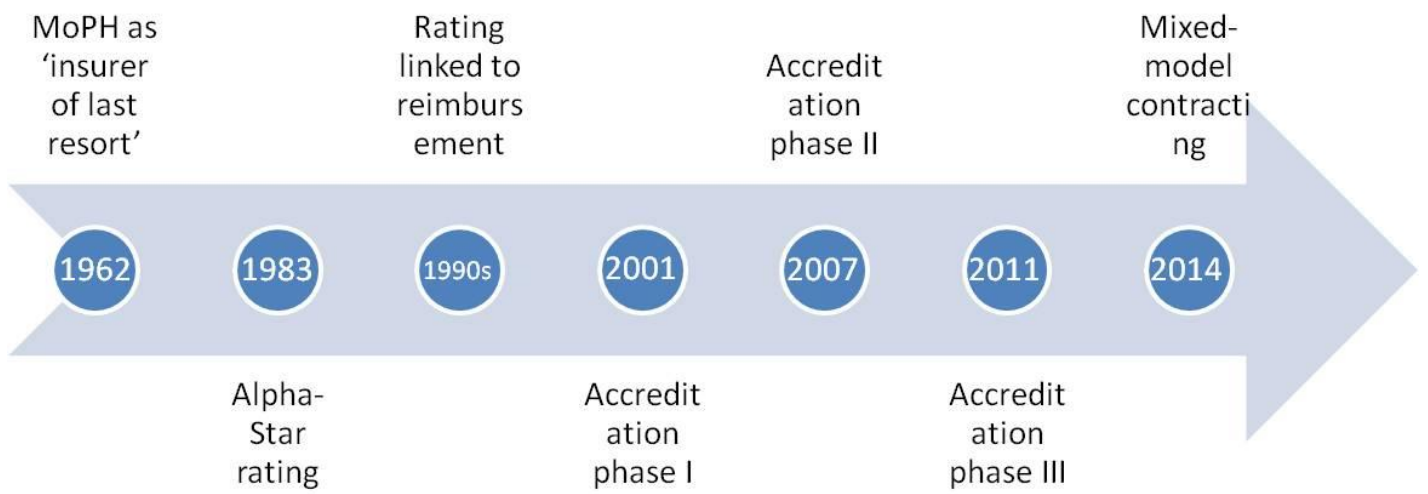
**Table 2: Group-level changes in hospital reimbursement rate tiers**

<b>Tier</b>	<b>Before</b>		<b>After</b>	
High	44	34%	38	29%
Medium	58	45%	51	40%
Low	28	22%	40	31%
<b>Total</b>	130		129	

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**Table 3: Changes in cost and length of stay of medical hospitalization cases (excluding surgical cases) since June 2011**

	<b>June 2011 -- May 2012</b>	<b>June 2012 -- May 2013</b>	<b>June 2013 -- May 2014</b>	<b>December 2014 -- June 2015</b>
<b>Total cost (1,000 LBP)</b>	94,160,183	112,632,757	123,684,592	52,977,762
<b>Number of cases, total</b>	93,340	96,842	105,000	47,372
<b>Number of cases, average per month</b>	7,778	8,070	8,750	6,767
<b>% change</b>	-	3.8%	8.4%	-22.7%
<b>Cost per case, average (1,000 LBP)</b>	1,009	1,163	1,178	1,118
<b>% change</b>	-	15.3%	1.3%	-5.1%
<b>Inpatient days, total</b>	379,412	397,748	430,099	183,187
<b>Cost per inpatient day, average (1,000 LBP)</b>	248	283	287	289
<b>% change</b>	-	14.1%	1.6%	0.6%
<b>Average length of stay</b>	4.06	4.11	4.10	3.87



**Figure 1: Timeline of MoPH hospital contracting reforms**

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