

Casemix, readmissions and patient perspectives in Lebanon: impact of the national hospital pay-for-performance initiatives.

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Purpose & Goals

To describe the development and evaluate the impact of hospital pay-for-performance (P4P) in Lebanon.

Ultimately, to contribute to improved design and implementation of value-based healthcare, particularly in limited resource settings.

1. Describe how and why hospital P4P was developed.
2. Analyze the impact of P4P integration on healthcare effectiveness.
3. Describe how routine data and casemix index may be used for hospital performance.
4. Analyze the impact of P4P on hospital readmissions.
5. Explore patient perspectives on hospital care, and contribute insights that may improve P4P design and effectiveness.

Papers

1. Khalife J., Rafeh N., Makouk J., El-Jardali F., Ekman B., Kronfol N., Hamadeh G., Ammar W. (2017). **Hospital Contracting Reforms: The Lebanese Ministry of Public Health Experience.** Health Systems & Reform. 3(1):34–41.
2. Khalife J., Ammar W., Emmelin M., El-Jardali F., Ekman B. (2020). **Hospital performance and payment: impact of integrating pay-for-performance on healthcare effectiveness in Lebanon.** Wellcome Open Research. 5:95.
3. Khalife J., Ammar W., El-Jardali F., Emmelin M., Ekman B. **Impact of pay-for-performance on hospital readmissions in Lebanon: An ARIMA-based intervention analysis using routine data.** *submitted*
4. Khalife J., Ekman B., Ammar W., El-Jardali F., Al Halabi A., Barakat E., Emmelin M. (2023). **Exploring patient perspectives: A qualitative inquiry into healthcare perceptions, experiences and satisfaction in Lebanon.** PLOS ONE. 18(8):e0280665.

Pay-for-performance

- Contract theory considers incomplete contracts and information problems.
- Information asymmetry: moral hazard and adverse selection.
- Principal-agent relation as a type of contract.
- Linking pay to performance aligns interests of agent and principal.

Pay-for-performance in healthcare

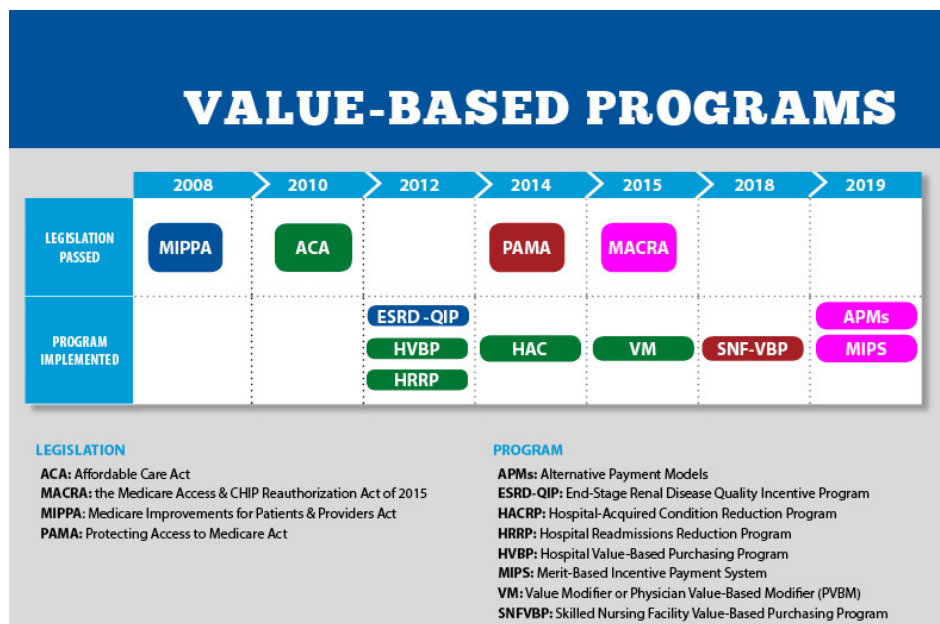
- Mixed findings have characterized P4P impact.
- Using a realist approach may be more helpful to examine how P4P affects outcomes and in what contexts.
- Few at-scale experiences of hospital-based P4P.

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Hospital pay-for-performance

- Advancing Quality Program, northwest England.
- Premier Hospital Quality Incentive Demonstration, US.
- Financial Incentive for Quality Improvement, France.
- Value-Based Purchasing (VBP), US.
- Hospital Readmissions Reduction Program (HRRP), US.
- Hospital-Acquired Condition Reduction Program (HACRP), US.

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www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/Value-Based-Programs

Hospital VBP program (CMS, US)

Total performance score with 25% weight on each of:

1. Mortality, complications, healthcare-associated infections.
2. Patient safety.
3. Patient experience.
4. Efficiency and cost reduction.

Casemix

- A proxy for severity of illness.
- Originally intended for cost-containment.
- Different applications e.g. risk-adjustment, reimbursement.
- Typically, not a performance target.
- Usually based on Diagnosis Related Groups (DRGs).

Readmissions

- Readmission reduction is an important health system goal.
- Planned and unplanned readmissions.
- All-cause and specific-cause readmissions.
- Risk of readmission affected by patient, community and hospital factors.
- Mixed evidence of P4P impact on readmissions.

Patient perspectives

- Patients/people-centeredness increasingly emphasized.
- Satisfaction: consumerist theories and unclear role of expectation.
- Patient experience tools, e.g. HCAHPS.
- Mixed findings on relation with outcomes.
- No impact found of US VBP on patient experiences.
- Study designs, tool precision.

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Health system in Lebanon

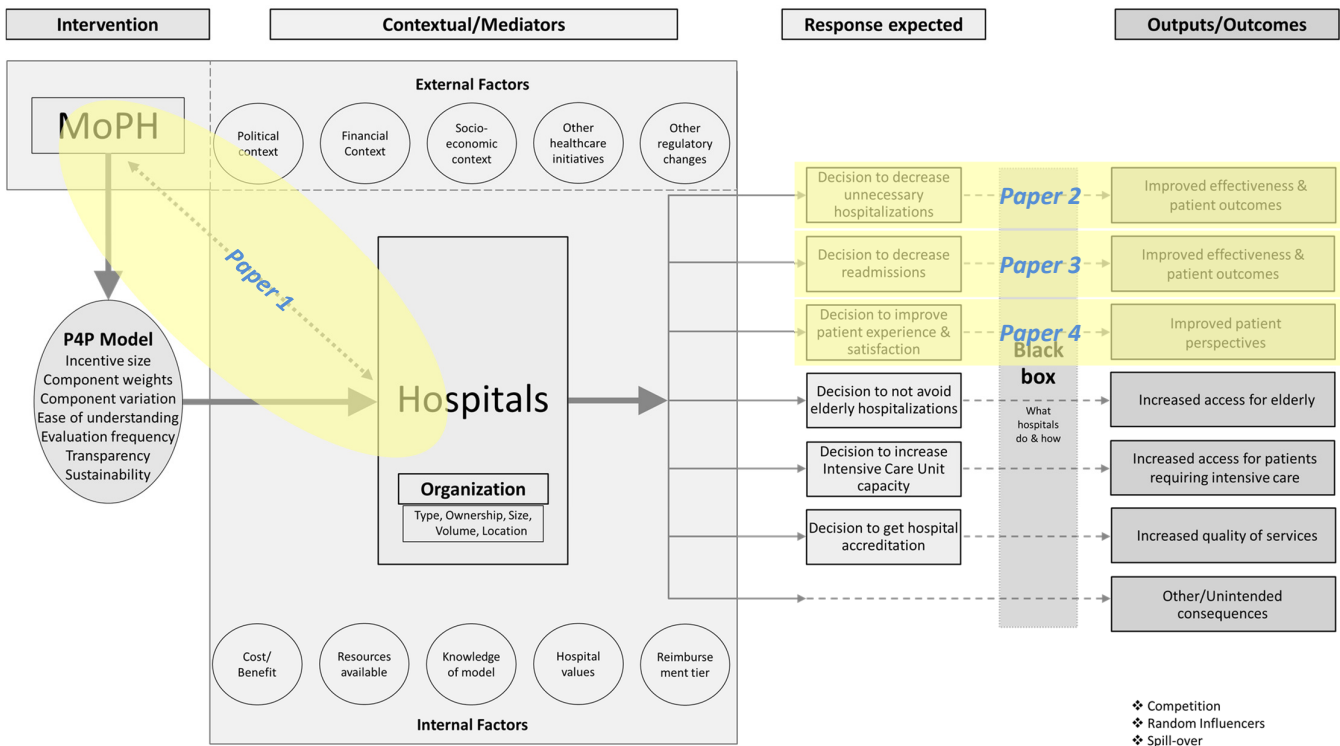
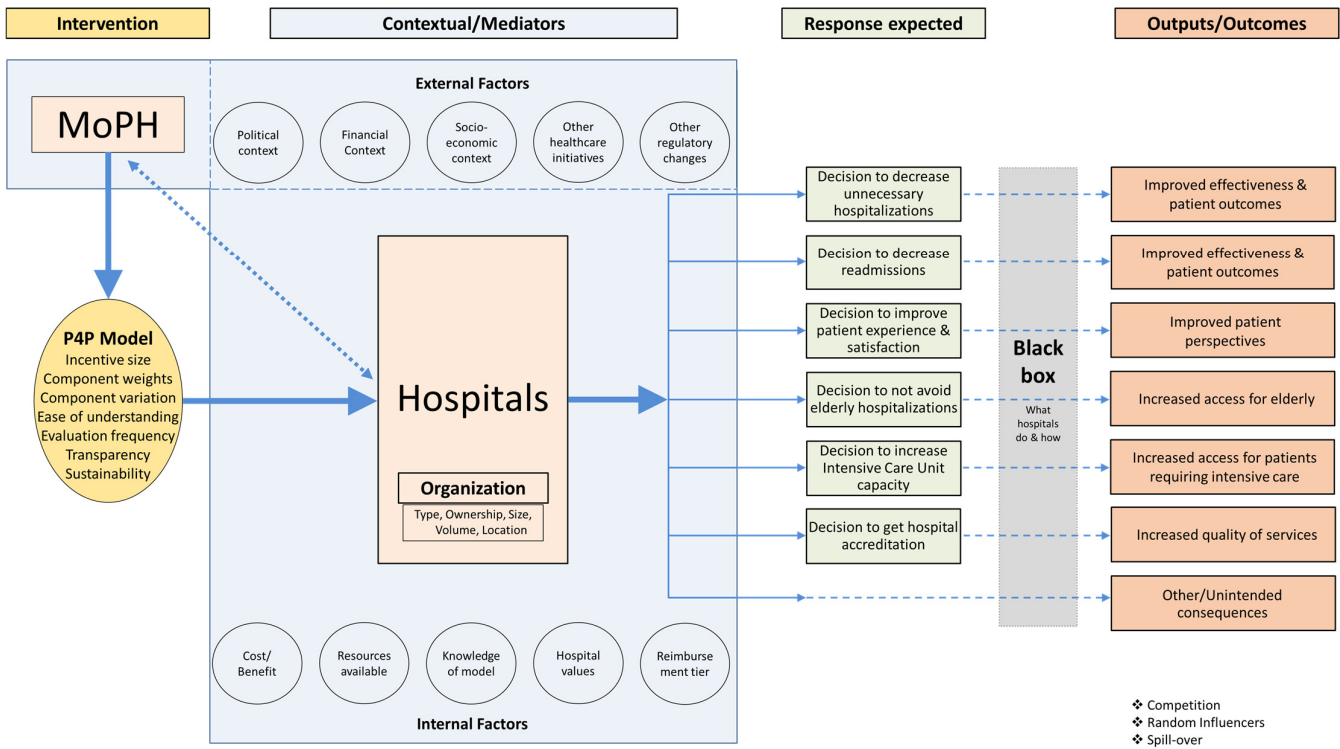
- Most of the population is:
 - Covered by public payers
 - Serviced by private providers
- Hospitalization:
 - 40% of Total Health Expenditures
 - 64% of MoPH budget
- MoPH:
 - Covers hospitalization of non-insured citizens (52%) since 1962
 - 10-15% patient co-payment
 - Contracts 146 public and private hospitals
- About 2 million refugees since 2013.
- Economic crisis onset at end-2019, Covid-19 since 2020.

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Components & weights of P4P

#	Component	2018	2014
1	Accreditation	30%	40%
2	Casemix index	45%	35%
3	Patient satisfaction	20%	10%
4	ICU cases & beds	2%	5%
5	Readmissions	2%	-
6	Elderly cases proportion	1%	-
7	Surgical-Medical proportion	-	5%
8	Deduction proportion	-	5%

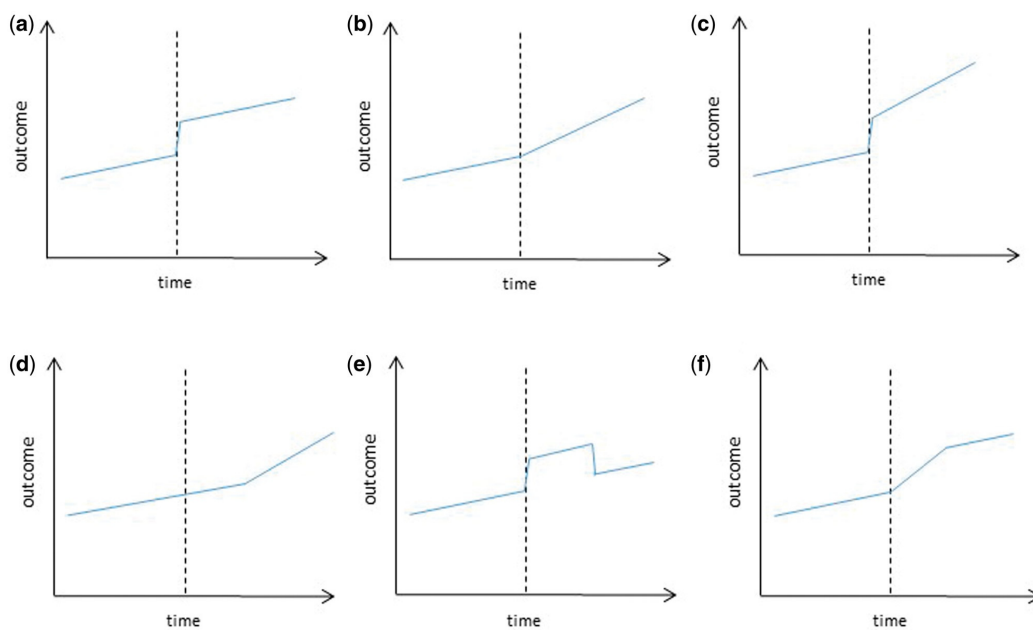
Conceptual framework



Interrupted time-series analysis

- Relies on abrupt interruptions not being a feature of natural time series.

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Bernal JL, Cummins S, Gasparrini A. Interrupted time series regression for the evaluation of public health interventions: a tutorial. *International Journal of Epidemiology* 2016;46(1):348-55.

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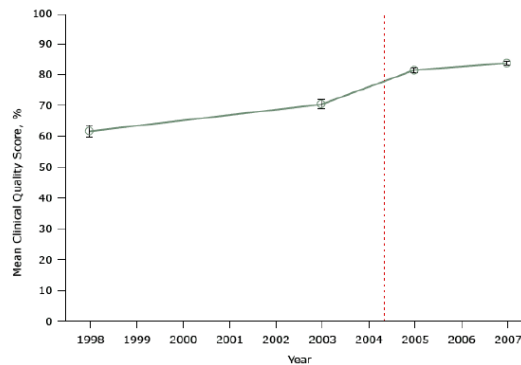


Figure 2. Mean clinical quality scores for diabetes at 42 practices participating in a study evaluating the effect of the United Kingdom's pay-for-performance policy. The scale for scores ranges from 0% (no quality indicator was met for any patient) to 100% (all quality indicators were met for all patients). Dashed line indicates when the pay-for-performance policy was implemented (April 2004). Figure is based on data extracted from Table 1 in Campbell SM, Reeves D, Kontopantelis E, Sibbald B, Roland M. Effects of pay for performance on the quality of primary care in England. *N Engl J Med* 2009;361(4):368-78 (21).

Naci, H. and S. B. Soumerai (2016). "History Bias, Study Design, and the Unfulfilled Promise of Pay-for-Performance Policies in Health Care." *Prev Chronic Dis* 13: E82.

Study design

#	Goals	Design	Data collection	Participants	Period	Main analysis
1	Describe how and why hospital P4P was developed in Lebanon.	Observational and primarily qualitative.	Project documents, discussions with key personnel	Key personnel involved in ESPISP-2 project	2009-2014	Descriptive analysis
2	Analyze the impact of P4P integration on healthcare effectiveness in Lebanon; Describe how routine data and casemix may be used for hospital performance.	Quasi-experimental, retrospective cohort, ITS.	MoPH hospitalization database	1,353,025 hospitalized cases	2011-2016	ITS analysis using Newey-OLS regression
3	Analyze the impact of P4P on hospital readmissions in Lebanon.	Quasi-experimental, retrospective cohort, ITS.	MoPH hospitalization database	1,333,691 hospitalized cases	2011-2019	ITS analysis using ARIMA
4	Explore patient perspectives on hospital care in Lebanon, and contribute insights that may improve P4P design and effectiveness.	Qualitative, cross-sectional.	Eight focus group discussions	42 persons previously hospitalized during the preceding 3 months.	2017	Qualitative content analysis

Main findings – Paper 1

- Hospitals had variable severity of illness.
- Accreditation standards were numerous, challenging reduction.
- P4P as a tool to increase transparency and fairness in MoPH-hospitals relation.
- Participatory governance.
- Multi-pronged approach to interrelated goals.
- Redistribution of hospitals across reimbursement tiers:

Hospital tier	Before P4P		After P4P	
High	44	34%	38	29%
Medium	58	45%	51	40%
Low	28	22%	40	31%
Total	130	100%	129	100%

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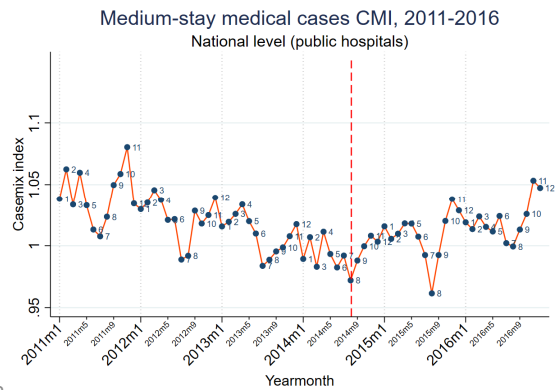
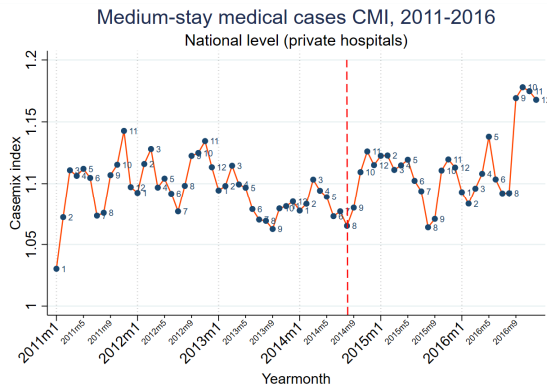
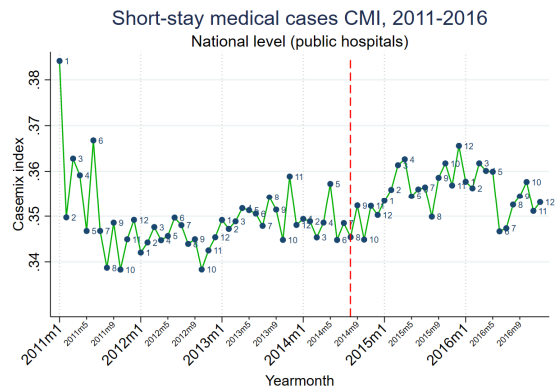
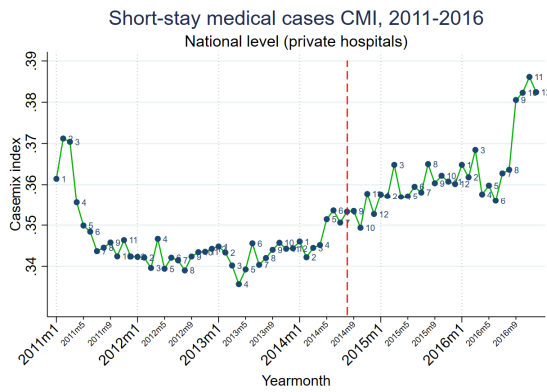
Main findings – Paper 2

ITS using casemix summary results, adjusted for seasonality, 2011-2016.

Case type	Hospitals	Before intervention			After intervention			
		Monthly CMI coefficient	TREND		TREND		LEVEL	
			% (CI)	Explained by	% (CI)	Explained by	% (CI)	Explained by
Medical	All	0.975	↘ 0.10% (0.06 - 0.13%)		↗ 0.11% (0.02 - 0.21%)	Medium-stay cases	↗ 2.25% (0.51 - 3.98%)	Short-stay cases
	Public	0.941	↘ 0.17% (0.11 - 0.23%)	Medium-stay cases	↗ 0.15% (0.06 - 0.22%)	-	-	-
	Private	0.989	↘ 0.06% (0.01 - 0.11%)		↗ 0.19% (0.06 - 0.32%)	Short-stay cases	↗ 2.70% (0.15 - 5.24%)	Short-stay cases
Surgical	All	1.284	↗ 0.05% (0.01 - 0.10%)	-	↗ 0.14% (0.06 - 0.21%) ¹	-	-	-
	Public	1.179	-	No trend	↗ 0.13% (0.02 - 0.24%)	-	-	-
	Private	1.326	↗ 0.12% (0.03 - 0.21%)	-	↗ 0.24% (0.13 - 0.35%) ²	-	-	-
Mixed	All	1.783	-	No trend	-	No trend	-	-
	Public	1.964	-		-	No trend	-	-
	Private	1.689	-		↗ 0.35% (0.10 - 0.60%) ³	-	-	-

¹p=0.06, ²p=0.11, ³p=0.33 ; no significant change between pre and post-intervention

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Description	ICD/CPT code	Major effects	Notes
Neoplasms	C00-D49	Increased ss-CMI (87%)	Greatest change on ss-CMI ↓10,179 cases, net Mainly due to malignant neoplasm of breast and acute lymphoblastic leukemia Concurrent with increase in chemotherapy Z51.1 ↑11,666 cases
Intestinal infectious diseases (category)	A00-A09		↓961 ms-cases; ↑263 ss-cases
Diarrhea and gastroenteritis of presumed infectious origin	A09	Increased ms-CMI (25%)	Greatest change on ms-CMI ↓2,237 ms-cases; ↑179 ss-cases
Unspecified non-infective gastroenteritis and colitis	K52.9	Decreased ms-CMI (2%)	↑745 ms-cases; ↑108 ss-cases
Abdominal and pelvic pain (category)	R10-R10.4		↓2,970 ms-cases, net
Abdominal and pelvic pain, other/unspecified abdominal pain	R10, R10.4	Increased ms- and ss-CMI	↓1,975 ms-cases; ↑174 ss-cases
Influenza and pneumonia	J09-J18	Decreased ms-CMI (4%)	↑3,909 ms-cases; ↑298 ss-cases
Pneumonia, non-specific	J18		↓1,456 ms-cases
Pneumonia, specific	J18.0, J18.9		↑4,692 ms-cases
COPD	J44-J44.9	Increased ms-CMI (5%)	↑1,306 ms-cases, net
COPD with acute exacerbation	J44.1		↑625 ms-cases
COPD, non-specific	J44		↓234 ms-cases
Acute bronchitis	J20-J20.9	Decreased ms-CMI (3%)	↑1,145 ms-cases
	J20		↑747 ms-cases
Essential hypertension	I10		↓957 ms-cases; ↑174 ss-cases
Ischemic heart diseases	I20-I25.9	Decreased ms-CMI (7%)	↓1,100 ms-cases; ↑275 ss-cases Mainly due to angina pectoris and acute myocardial infarction
Fever of unknown origin	R50	Increased ms-CMI (3%)	↓989 ms-cases; ↓12 ss-cases
Stroke	I64	Decreased ms-CMI (2%)	↓383 ms-cases; ↑12 ss-cases
Respiratory distress of newborn, non-specific	P22		↓334 ms-cases
Respiratory distress of newborn, specific	P22.0		↑287 ms-cases
Vaginal delivery	F9410L1	Increased surgical CMI (43%)	↓3,939 cases Greatest change in absolute and in CMI share among all ICD/CPT codes
Percutaneous Transluminal Coronary Angioplasty (PTCA)	X2983/6	Increased surgical CMI (36%)	↑778 cases

ss: short-stay, ms: medium-stay, COPD: chronic obstructive pulmonary disease.

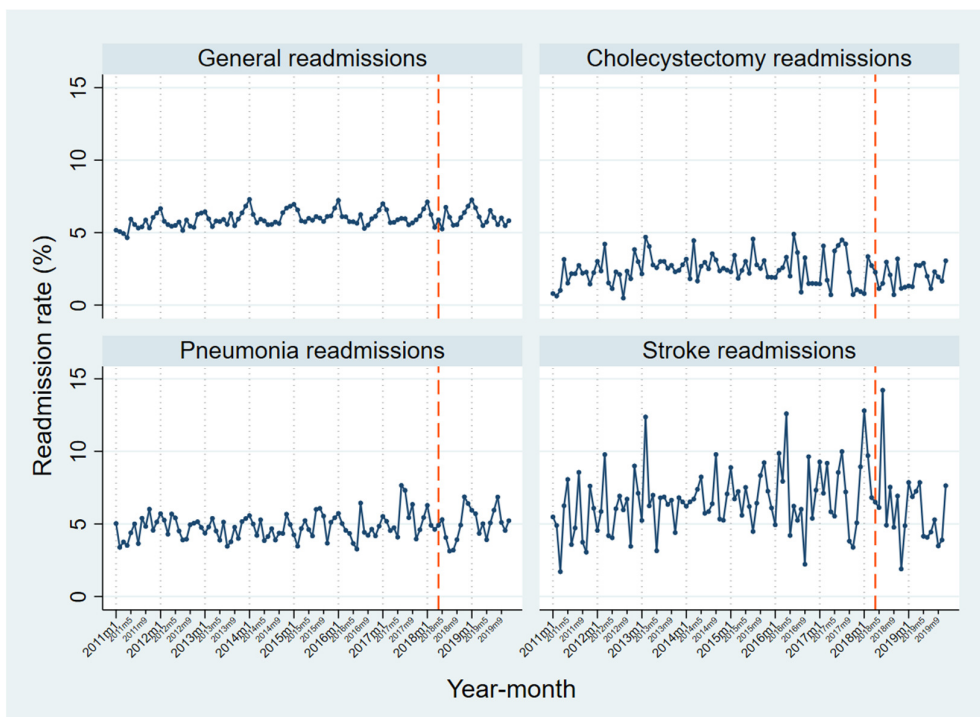
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Main findings – Paper 3

- Cholecystectomy readmissions decreased by 5.9% (CI 0.1%-11.8%).
- Stroke readmissions decreased by 13.6% (CI 3.1%-24.2%).
- No evidence of impact on general and pneumonia readmissions:
 - Not at all-hospitals level.
 - Not among small, medium and large hospitals.
- No evidence of change on myocardial infarction, cataracts surgery, appendectomy.

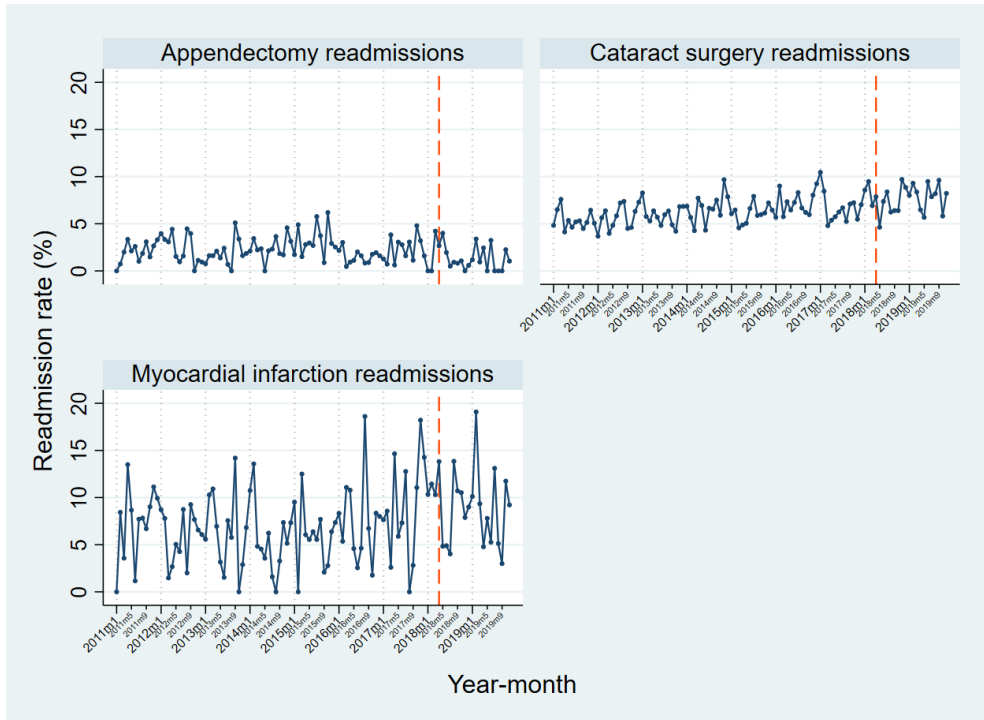
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30-day readmission rates for P4P conditions, 2011-2019.



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30-day readmission rates for non-P4P conditions, 2011-2019.



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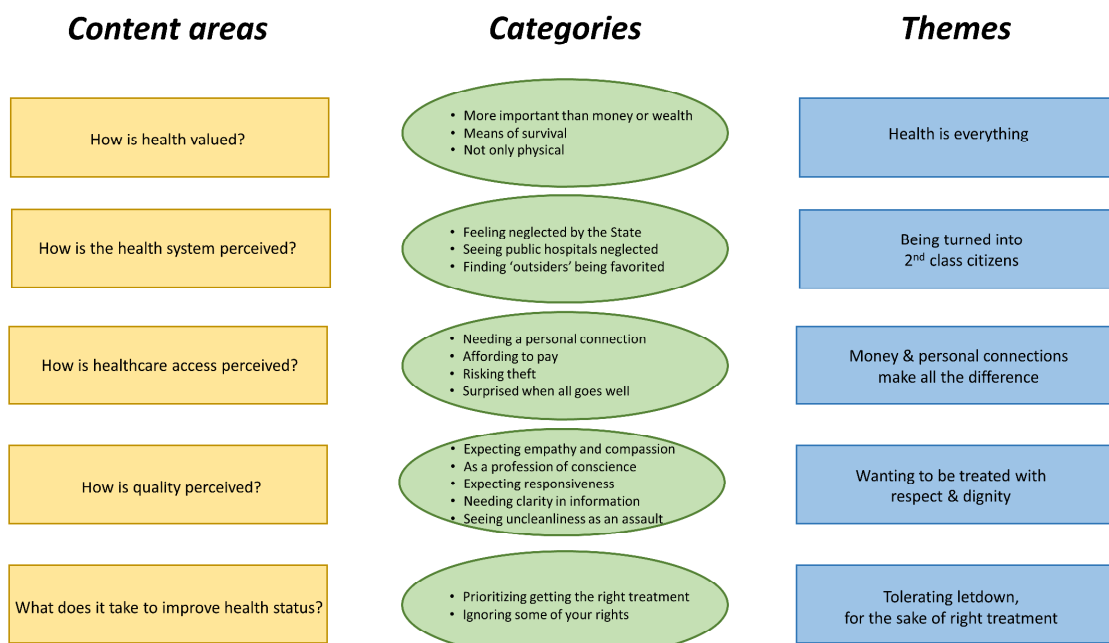
Final ARIMA models and results across four readmission types, 2011-2019.

	General cases			Pneumonia			Cholecystectomy			Stroke		
Model	(1,0,0) (1,0,0) ₁₂			(1,0,0) (1,1,0) ₁₂			(1,0,0) (1,1,0) ₁₂			(0,0,1) (0,1,1) ₁₂		
BIC	79.1			215.9			252.2			364.4		
Level coeff., p, (95%CI)	0.256	0.075	(-0.026 to 0.537)	-0.154	0.658	(-0.837 to 0.528)	-0.714	0.048	(-1.420 to -0.008)	-1.637	0.012	(-2.907 to -0.367)
Constant	5.825	<0.001	(5.571 to 6.080)	0.081	0.520	(-0.166 to 0.328)	0.084	0.450	(-0.134 to 0.302)	0.274	0.011	(0.063 to 0.485)
AR	0.348	<0.001	(0.192 to 0.503)	0.270	0.037	(0.017 to 0.523)	0.071	0.585	(-0.184 to 0.326)	-	-	-
SAR	0.664	<0.001	(0.510 to 0.817)	-0.597	<0.001	(-0.774 to -0.420)	-0.502	<0.001	(-0.708 to -0.296)	-	-	-
MA	-	-	-	-	-	-	-	-	-	-0.056	0.693	(-0.331 to 0.220)
MAR	-	-	-	-	-	-	-	-	-	-0.870	<0.001	(-1.190 to -0.550)
Sigma	0.344	<0.001	(0.299 to 0.388)	0.973	<0.001	(0.866 to 1.080)	1.188	<0.001	(1.018 to 1.358)	2.281	<0.001	(1.924 to 2.638)
Log likelihood	-41.1	-	-	-134.9	-	-	-152.9	-	-	-221.1	-	-
Kolmogorov-Smirnov test	-	0.480	-	0.899	-	-	-	0.950	-	-	0.389	-
Ljung-Box test	-	0.806	-	0.739	-	-	-	0.949	-	-	0.900	-

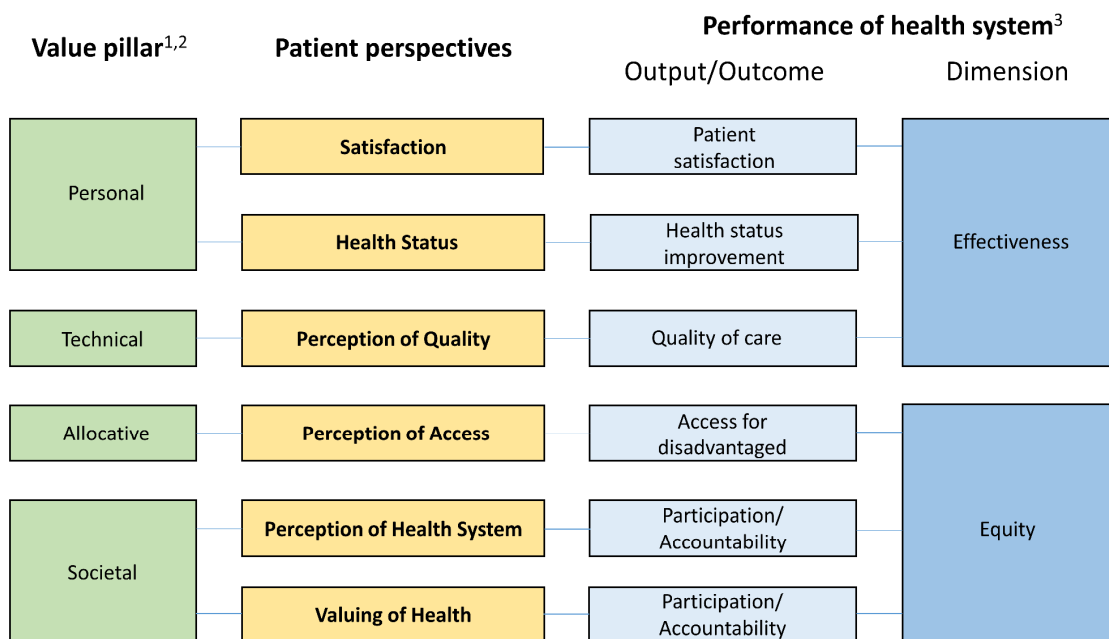
BIC: Bayesian information criterion, (S)AR: (seasonal) autoregressive term, (S)MA: (seasonal) moving average term.

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Main findings – Paper 4



Relating patient perspectives to value-based care and health systems performance.

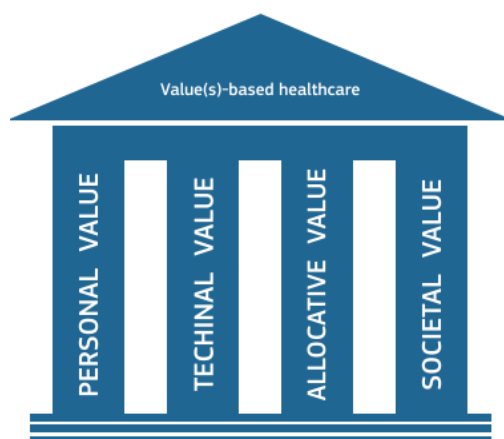


¹ Smith PC. et al (2020). Building on value-based health care: Towards a health system perspective. European Observatory Policy Briefs. World Health Organization.

² European Commission (2019). Defining Value in 'Value-Based Healthcare'. Report of the Expert Panel on effective ways of investing in Health.

³ Kruk M., Freedman L. (2008). Assessing Health System Performance in Developing Countries: A Review of the Literature; p. 263-276.

Defining 'value'



European Commission (2019). Defining Value in 'Value-Based Healthcare'. Report of the Expert Panel on effective ways of investing in Health.

Conclusions...

1. P4P developed to improve fairness and transparency, and to improve effectiveness.
2. Participatory governance is useful in engaging stakeholders.
3. P4P integration in Lebanon improved healthcare effectiveness.
4. Casemix index can be used to improve hospital performance in limited resource settings, as can routine data.
4. P4P can reduce some types of readmissions, but requires careful design and comprehensive contextual understanding.
5. ITS analysis can be useful to evaluate P4P impact, when appropriately used.

Conclusions

7. Patients in Lebanon value health highly, support improving public hospitals, and countering influence of personal connections and money.
8. Broader consideration of patient perspectives makes P4P more responsive.
9. Patient perspectives include Satisfaction, Valuing of health, Health status, and perceptions of Quality, Access and the Health system.
10. Relating patient perspectives to performance and value-based care may be helpful to develop health systems that are people-centered.

Thank you

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REPUBLIC OF LEBANON MINISTRY OF PUBLIC HEALTH **Hospital Performance Card** الجمهورية اللبنانية وزارة الصحة العامة

GENERAL INFORMATION

Hospital Name: **Example Hospital**

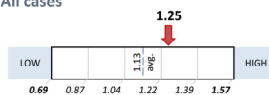
Performance Report Year: **2019**

Period of dataset used: 2017 (CMI, ICU, elderly); 2016+2017 (readmissions); 2018 (patient satisfaction); 2015 (accreditation)

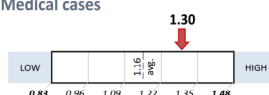
KEY PERFORMANCE INDICATORS

A. CASE-MIX INDEX (CMI)

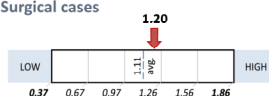
• All cases



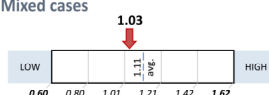
• Medical cases



• Surgical cases



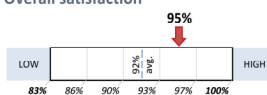
• Mixed cases



B. PATIENT SATISFACTION

Category	Hospital	National Average
Admission desk	90%	96%
Doctor interaction	94%	94%
Nurse interaction	94%	95%
Pain relief	93%	95%
Dignity and respect	98%	93%
Cleanliness	100%	93%
Recommendation	85%	90%
Receipt	96%	77%

• Overall satisfaction



C. ACCREDITATION

• Status at last accreditation round: **Accredited**

D. 30-DAY READMISSION RATE

Condition	Hospital	National Average	Low (-2sd)	High (+2sd)
Cholecystectomy	2.8%	3.8%	0%	8.4%
Stroke	5.1%	7.6%	0%	15.9%
Pneumonia	6.3%	5.1%	0%	11.3%
General (all)	5.1%	5.6%	2.2%	9.0%

E. ICU PROPORTION

- Case proportion (ICU/total cases): **12.7%**
- Beds proportion (ICU/total beds): **18.6%**

F. ELDERLY ADULT PROPORTION

- Elderly proportion of adult cases: **39.4%**

SCORING RESULT

Hospital score distance from national average (z-score)

0.763

New reimbursement category

T1

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What are values?

1. Personal value
Patient goals, patient-centeredness, shared decision-making.
2. Technical value
Best possible outcomes using available resources.
3. Allocative value
Equitable distribution of resources across population subgroups.
4. Societal value
Contribution of healthcare towards social cohesion, connectedness, solidarity.