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Supporting Information

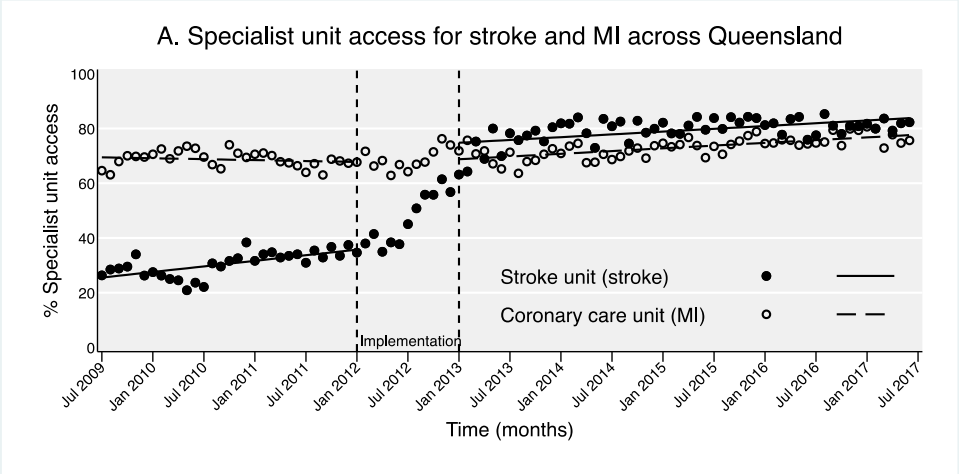
Supplementary methods and results

**This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.**

Appendix to: Grimley R, Kim J, Dewey HM, et al. The impact of pay-for-performance incentives for stroke unit access on public hospital costs and use, Queensland, 2012–17: interrupted time series analysis. *Med J Aust* 2025; doi: 10.5694/mja2.52607.

Supplementary information

Figure 1. Impact of stroke unit access pay-for-performance incentives on the proportion of people with acute stroke admitted to designated stroke care units and of people with myocardial infarction (MI) to coronary care units*



* Source: Grimley RS, Collyer TA, Andrew NE, et al. Impact of pay-for-performance for stroke unit access on mortality in Queensland, Australia: an interrupted time series analysis. Lancet Reg Health West Pac 2023; 41: 100921. Reproduced under Creative Commons licence.

Supplementary methods

1. Further information regarding incentive design and calculation

In 2012, when incentives were introduced, publicly funded hospital care was provided for a population of 4.6 million by 39 hospitals and 76 small rural health centres serving an area of 1,727,000 km^2. During the study period, 97% of all acute stroke and 95% of acute myocardial infarction admissions in Queensland were initially in public hospitals (Box 2).

Fundamental design features for the P4P program were determined by the overarching "Quality Improvement Payment" scheme parameters, including the size of the available funds, and requirement for measurable targets with evidence of a direct association with better patient outcomes. The clinical network provided input into the definition of target population, distribution of available funding pool, performance targets, and implementation mechanisms, including the requirement for inclusion of clinical quality measures and performance targets. Location and geographic responsibility of stroke units were determined according to clinical network planning to situate stroke units in all large metropolitan and regional hospitals that provide specialist care in Queensland. Following P4P implementation in 2012, the number of stroke units rose from seven (five in major, one in inner regional, one in outer regional cities) to 20 (12 in major, six in inner regional, two in outer regional cities).

The incentive schedule included biannual payments to hospitals (not directly to clinical teams) contingent on achievement of measurable targets (Box 1). An initial start-up incentive was paid on submission of plans for the development of new or the upgrading of existing stroke units (July–December 2012), approved by the clinical network following peer review according to national guidelines. Subsequent biannual payments were contingent on achieving incremental performance targets for stroke unit access, initially in stroke unit hospitals to develop capacity in these "referral hubs" and followed by health district-wide access targets aimed at stimulating equity of access and integrated systems across geographic health service districts. In July 2015, the payment was transitioned from target-based to a maintenance phase of 10% loading on the activity-based funding payment for people with stroke as primary diagnosis admitted to an endorsed stroke unit.

For calculating the incentive payment, stroke unit access was defined as admission to a clinical network-endorsed stroke unit for any period during the acute care episode and calculated centrally according to administrative data and discharge diagnosis codes (Table 1). We included all adults (18 years or older) with primary diagnoses of acute stroke and length of stay greater than one day; we excluded people with intracerebral haemorrhage treated only in neurosurgical units, as this is a different management pathway. We did not stipulate a minimum admission duration, but the proportion of admission time spent in the stroke unit was monitored and reported biannually to monitor for gaming. People with primary diagnoses of acute stroke were considered eligible for stroke unit admission without restriction.

Eligibility of stroke units for incentive payments required endorsement by the Queensland Statewide Stroke Clinical Network, and was contingent on review of processes with regard to national guidelines,(1) submission of clinical performance data for more than 75% of all acute stroke admissions to the Australian Stroke Clinical Registry, and performance within two standard deviations of mean performance across Queensland hospitals on eight indicators of quality of clinical care. This information was integrated with feedback on performance in biannual clinical network quality improvement forums and an externally facilitated quality improvement program delivered to individual hospitals from 2014. Overall implementation of the incentive payment scheme was led by the clinical network and supported by the commissioning branch of Queensland Health. The payment scheme, including ongoing integration with the stroke clinical quality improvement collaborative network, was ongoing at the date of publication, with endorsement of stroke units transitioning to a national stroke unit credentialing process led by the Australian Stroke Coalition (https://australianstrokecoalition.org.au/portfolio/certification).

Myocardial infarction was chosen as the control condition because it is an acute vascular event affecting people with similar demographic characteristics to those who experience stroke, but with a model of care involving admission to a geographically discrete specialist unit (coronary care units). In addition, no significant systematic changes to funding or financial incentives were undertaken in Queensland for myocardial infarction during the study period.

(1) Stroke Foundation. Australian and New Zealand Living clinical guidelines for stroke management. 2024. https://informme.org.au/en/Guidelines/Clinical-Guidelines-for-Stroke-Management (viewed Jan 2025).

Table 1. International Classification of Diseases, tenth revision, Australian modification (ICD-10-AM) diagnosis codes for stroke and myocardial infarction

ICD-10-AM code	Description
Stroke	
I61.0 to I61.9	Intracerebral haemorrhage
I62.0, I62.1, I62.9	Other nontraumatic intracerebral haemorrhage
I63.0 to I63.6, I63.8, I63.9	Cerebral infarction
I64	Stroke, not specified as haemorrhage or infarction
Acute myocardial infarction	
I21.1 to I21.3	ST elevation myocardial infarction,
I21.4	Non-ST elevation myocardial infarction
I21.9	Acute myocardial infarction, unspecified

Supplementary results

Figure 2. Mean age of people admitted to Queensland public hospitals with stroke or myocardial infarction, 2009–2017*

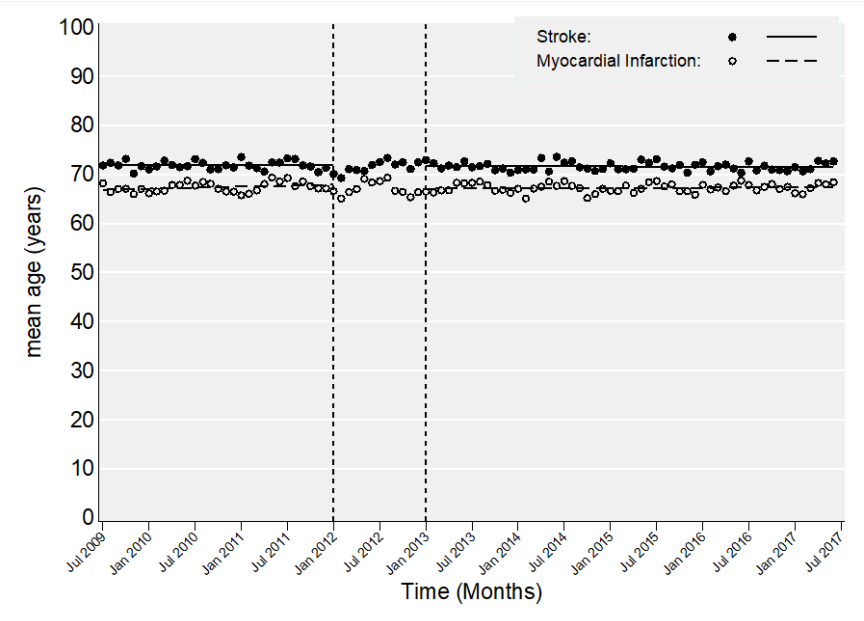


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Figure 3. Proportion of women among people admitted to Queensland public hospitals with stroke or myocardial infarction, 2009–2017*

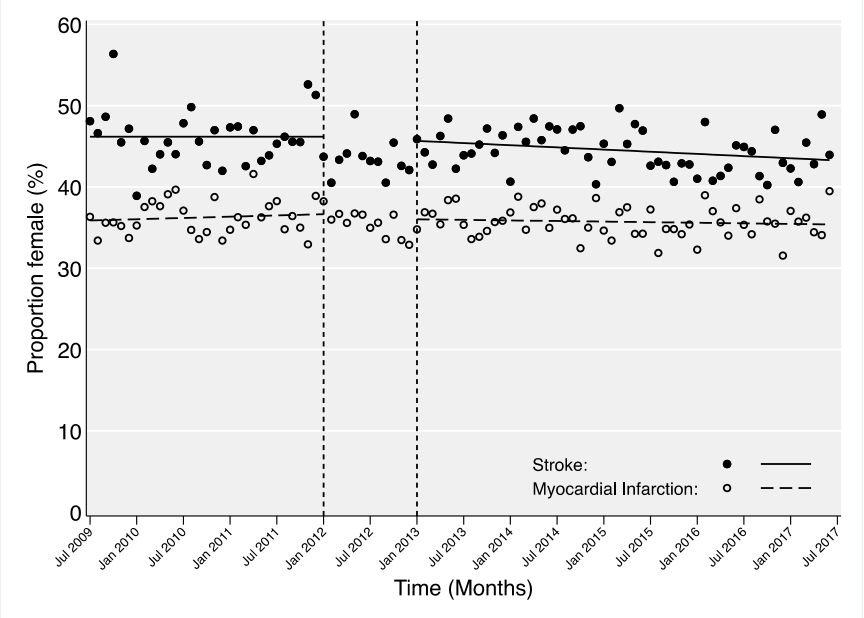

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Table 2. Effect of Quality Improvement Payments program (stroke unit access) on median hospital lengths of stay for people admitted with stroke or myocardial infarction: interrupted time series analysis

	Stroke	Myocardial infarction	Difference (95% CI)
Acute length of stay			
Level (days), median (95% CI)			
Start historical control period	6.5 (6.0, 7.0)	5.3 (5.1, 5.5)	***1.2 (0.7, 1.7)***
End historical control period	5.5 (5.2, 5.9)	4.8 (4.6, 4.9)	***0.8 (0.3, 1.2)***
P4P introduction effect*	*-0.2 (-0.9, 0.5)*	*-0.29 (-0.57, 0.03)*	*0.1 (-0.7, 0.9)*
Start P4P period	4.9 (4.7, 5.1)	4.3 (4.2, 4.4)	***0.6 (0.4, 0.9)***
End P4P period	4.7 (4.4, 4.9)	4.4 (4.3, 4.5)	***0.3 (0.01, 0.5)***
Rate of change (days per month) (95% CI)			
Historical control period	**-0.03 (-0.06, -0.01)**	**-0.02 (-0.03, -0.01)**	***-0.02 (-0.04, -0.01)***
P4P period	**-0.00 (-0.01, 0.002)**	0.00 (-0.002, 0.01)	***-0.01 (-0.02, 0.001)***
Difference	***0.03 (0.001, 0.05)***	***0.02 (0.01, 0.03)***	*0.01 (-0.02, 0.04)*
Total length of stay			
Level (days), median (95% CI)			
Start historical control period	10.0 (8.6, 11.3)	5.5 (5.3, 5.7)	***4.5 (3.1, 5.8)***
End historical control period	9.3 (8.4, 10.2)	5.0 (4.9, 5.2)	***4.3 (3.4, 5.2)***
P4P introduction effect*	*-0.7 (-2.5, 1.1)*	*-0.3 (-0.5, 0.0)*	*-0.5 (-2.2, 1.3)*
Start P4P period	8.3 (7.8, 8.9)	4.5 (4.4, 4.7)	***3.8 (3.2, 4.4)***
End P4P period	7.8 (7.1, 8.5)	4.6 (4.5, 4.8)	***3.2 (2.5, 3.9)***
Rate of change (per month)			
Historical control period	-0.02 (-0.09, 0.04)	**-0.02 (-0.03, -0.01)**	*-0.00 (-0.07, 0.06)*
P4P period	-0.01 (-0.03, 0.01)	0.00 (-0.002, 0.006)	*-0.01 (-0.03, 0.01)*
Difference	*0.01 (-0.06, 0.08)*	***0.02 (0.01, 0.03)***	*-0.01 (-0.08, 0.06)*
Rehabilitation length of stay†			
Level (days), median (95% CI)			
Start historical control period	29.9 (27.7, 32.2)	—	—
End historical control period	25.6 (23.4, 27.8)	—	—
P4P introduction effect*	*2.1 (-2.7, 6.8)*	—	—
Start P4P period	25.6 (23.4, 27.8)	—	—
End P4P period	21.9 (20.6, 23.2)	—	—
Rate of change (per month)			
Historical control period	**-0.16 (-0.28, -0.04)**	—	—
P4P period	-0.03 (-0.08, 0.02)	—	—
Difference	*0.12 (-0.003, 0.25)*	—	—

CI = confidence interval; P4P = Pay-for-performance. Bold: Statistically significant.

* Difference between level at beginning of intervention period and level predicted from control period data.

† 9460 people who received rehabilitation care after stroke.

Table 3. Effect of Quality Improvement Payments program (stroke unit access) on median hospital costs per patient (2017 dollars) for patients admitted with stroke or myocardial infarction: interrupted time series analysis

	Stroke	Myocardial infarction	Difference (95% CI)
Acute costs			
Level (dollars), median (IQR)			
Start historical control period	8 829 (8 180, 9 478)	11 976 (11 366, 12 585)	***-3 147*** ***-(4 036, -2 257)***
End historical control period	8 593 (7 999, 9 187)	13 519 (12 989, 14 049)	***-4 926*** ***(-5 722, -4 130)***
P4P introduction effect*	*-846 (-1 942, 249)*	***-3 565*** ***(-4 539, -2 591)***	***2 718*** ***(1 252, 4 184)***
Start P4P period	7 641 (7 221, 8 061)	10 646 (10 254, 11 038)	*-3 005* *(-3 580, -2 430)*
End P4P period	8 901 (8 345, 9 457)	13 575 (13 262, 13 887)	***-4 674*** ***(-5 312, -4 036)***
Rate of change (dollars per month) (95% CI)			
Historical control period	-8.1 (-44.0, 27.7)	**53.2 (21.4, 85.1)**	***-61.4 (-109.3, -13.4)***
P4P period	**23.8 (7.3, 40.2)**	**55.3 (43.7, 66.8)**	***-31.5 (-51.6, -11.4)***
Difference	*31.9 (-7.5, 71.3)*	*-2.0 (-31.8, 35.9)*	*29.9 (-22.1, 81.8)*
Total costs			
Level (dollars), median (IQR)			
Start historical control period	14 219 (12 278, 16 160)	12 568 (11 983, 13 153)	*1 651* *(-376, 3 679)*
End historical control period	15 104 (13 694, 16 513)	15 068 (14 512, 15 623)	*-36* *(-1 479, 1 551)*
P4P introduction effect*	*-1 692* *(-4 440, 1 056)*	***-4 278*** ***(-5 280, -3 275)***	*2 584* *(-339, 5 511)*
Start P4P period	13 808 (12 729, 14 887)	11 910 (11 531, 12 289)	***1 898*** ***(754, 3 042)***
End P4P period	15 857 (14 354, 17 359)	14 940 (14 671, 15 208)	*917* *(-609, 2 443)*
Rate of change (dollars per month) (95% CI)			
Historical control period	30.5 (-67.1, 128.1)	**86.2 (53.9, 118.4)**	-55.7 (-158.5, 47.1)
P4P period	38.7 (-5.2, 82.5)	**57.2 (46.4, 68.0)**	-18.5 (-63.7, 26.7)
Difference	*8.1 (-98.9, 115.1)*	*-29.0 (-63.0, 5.0)*	*37.2 (-75.1, 149.4)*
Rehabilitation costs†			
Level (dollars), median (IQR)			
Start historical control period	25 622 (21 814, 29 431)	—	—
End historical control period	25 108 (21 224, 28 993)	—	—
P4P introduction effect*	*-2 671* *(-11 929, 6 587)*	—	—
Start P4P period	22 224 (18 393, 26 055)	—	—

	Stroke	Myocardial infarction	Difference (95% CI)
End P4P period	27 707 (25 412, 30 002)	—	—
Rate of change (dollars per month) (95% CI)			
Historical control period	-17.7 (-234.4, 198.9)	—	—
P4P period	107.8 (26.2, 189.4)	—	—
Difference	*125.5 (-106.0, 357.1)*	—	—

CI = confidence interval;; P4P = Pay-for-performance.

Bold: Statistically significant.

* Difference between level at beginning of intervention period and level predicted from control period data.

† 9460 people who received rehabilitation care after stroke.

Table 4. Effect of Quality Improvement Payments program (stroke unit access) on summed Hospital Costs (acute and total) to Queensland public hospitals (2017 dollars) for patients admitted with stroke or myocardial infarction: interrupted time series analysis

	Stroke	Myocardial infarction	Difference (95% CI)
Total Queensland acute hospital costs			
Level (million dollars/month), (95% CI)			
Start historical control period	8 829 (8 180, 9 478)	11 976 (11 366, 12 585)	**-3 147** **-(4 036, -2 257)**
End historical control period	8 593 (7 999, 9 187)	13 519 (12 989, 14 049)	**--4 926** **(-5 722, -4 130)**
P4P introduction effect*	*-846 (-1 942, 249)*	***-3 565*** ***(-4 539, -2 591)***	***2 718*** ***(1 252, 4 184)***
Start P4P period	7 641 (7 221, 8 061)	10 646 (10 254, 11 038)	-3 005 (-3 580, -2 430)
End P4P period	8 901 (8 345, 9 457)	13 575 (13 262, 13 887)	**-4 674** **(-5 312, -4 036)**
Rate of change (million dollars/month per month) (95% CI)			
Historical control period	-8.1 (-44.0, 27.7)	53.2 (21.4, 85.1)	**-61.4 (-109.3, -13.4)**
P4P period	23.8 (7.3, 40.2)	55.3 (43.7, 66.8)	**-31.5 (-51.6, -11.4)**
Difference	*31.9 (-7.5, 71.3)*	*-2.0 (-31.8, 35.9)*	*29.9 (-22.1, 81.8)*
Total Queensland hospital costs			
Level (million dollars/month), (95% CI)			
Start historical control period	14 219 (12 278, 16 160)	12 568 (11 983, 13 153)	1 651 (-376, 3 679)
End historical control period	15 104 (13 694, 16 513)	15 068 (14 512, 15 623)	-36 (-1 479, 1 551)
P4P introduction effect*	*-1 692* *(-4 440, 1 056)*	***-4 278*** ***(-5 280, -3 275)***	*2 584* *(-339, 5 511)*
Start P4P period	13 808 (12 729, 14 887)	11 910 (11 531, 12 289)	**1 898** **(754, 3 042)**
End P4P period	*15 857* *(14 354, 17 359)*	*14 940* *(14 671, 15 208)*	917 (-609, 2 443)
Rate of change (million dollars/month per month) (95% CI)			
Historical control period	30.5 (-67.1, 128.1)	**86.2 (53.9, 118.4)**	-55.7 (-158.5, 47.1)
P4P period	38.7 (-5.2, 82.5)	**57.2 (46.4, 68.0)**	-18.5 (-63.7, 26.7)
Difference	*8.1 (-98.9, 115.1)*	*-29.0 (-63.0, 5.0)*	*37.2 (-75.1, 149.4)*

CI = confidence interval; P4P = Pay-for-performance.

Bold: Statistically significant.

* Difference between level at beginning of intervention period and level predicted from control period data.

Table 5. Effect of Quality Improvement Payments program (stroke unit access) on emergency department re-presentations and non-elective hospital re-admissions within 30 days of discharge for patients admitted with stroke or myocardial infarction: interrupted time series analysis

	Stroke	Myocardial infarction	Difference (95% CI)
People re-presenting to emergency department within 30 days of discharge			
Level, proportion (95% CI)			
Start historical control period	8.7% (7.0%, 10.5%)	16.5% (15.6%, 17.4%)	***-7.8%*** ***(-9.8%, -5.9%)***
End historical control period	10.4% (8.5%, 12.3%)	17.2% (15.9%, 18.5%)	***-6.8%*** ***(-9.1%, -4.4%)***
P4P introduction effect*	*-0.3%* *(-3.7%, 3.0%)*	*1.8%* *(-0.6%, 4.2%)*	*-2.1%* *(-6.3%, 2.0%)*
Start P4P period	10.9% (9.9%, 11.9%)	19.3% (18.2%, 20.3%)	***-8.4%*** ***(-9.9%, -7.0%)***
End P4P period	15.1% (13.9%, 16.3%)	21.5% (20.2%, 22.7%)	***-6.4%*** ***(-8.1%, -4.7%)***
Rate of change, percentage points per month (95% CI)			
Historical control period	0.06 (-0.05, 0.17)	0.02 (-0.05, 0.09)	*0.04 (-0.09, 0.16)*
P4P period	**0.08 (0.04, 0.12)**	**0.04 (0.005, 0.08)**	*0.04 (-0.01, 0.09)*
Difference	*0.02 (-0.09, 0.14)*	*0.02 (-0.06, 0.10)*	*-0.00 (-0.14, 0.14)*
Patients with non-elective hospital re-admission within 30 days of discharge			
Level, proportion (95% CI)			
Start historical control period	5.9% (4.3%, 7.4%)	13.1% (12.3%, 13.8%)	**-7.2%** **(-8.9%, -5.5%)**
End historical control period	6.5% (5.4%, 7.7%)	13.3% (12.4%, 14.2%)	**-6.7%** **(-8.2%, -5.2%)**
P4P introduction effect*	*0.5%* *(-1.8%, 2.8%)*	***2.1%*** ***(0.4%, 3.8%)***	*-1.7%* *(-4.5%, 1.2%)*
Start P4P period	7.3% (6.5%, 8.2%)	15.5% (14.7,16.3%)	**-8.2%** **(-9.4%, -7.0%)**
End P4P period	11.3% (10.1%, 12.5%)	16.9% (15.8%, 18.0%)	**-5.6%** **(-7.3%, -4.0%)**
Rate of change, percentage points per month (95% CI)			
Historical control period	0.02 (-0.06, 0.11)	0.01 (-0.04, 0.06)	*0.02 (-0.08, 0.11)*
P4P period	**0.07 (0.04, 0.11)**	0.03 (-0.01, 0.06)	*0.05 (0.001, 0.10)*
Difference	*0.05 (-0.04, 0.14)*	*0.02 (-0.04, 0.08)*	*0.03 (-0.07, 0.14)*

CI = confidence interval; P4P = Pay-for-performance. Bold: Statistically significant.

* Difference between level at beginning of intervention period and level predicted from control period data.

RECORD statement, extended from the STROBE statement: checklist of items that should be reported in observational studies using routinely collected health data

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	**Design**: Interrupted time series analysis using linked, patient-level hospital admission and costing datasets **Conclusions:** Pay-for-performance quality incentives had no impact on hospital LOS, costs, or readmissions. By improving quality of care and survival, without increasing hospital utilisation or costs, this pay-for-performance incentive program was associated with improved value for healthcare expenditure.	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	**Abstract Design:** Longitudinal cohort study using interrupted time series analysis on linked, patient-level hospital datasets**.** **Abstract Setting:** All public hospitals in Queensland, Australia. **Participants:** All first adult admissions >1 day for stroke or MI, 1/72009 to 30/6/2017. **Abstract Design:** on linked, patient-level hospital datasets**.**
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported	**Introduction:** Despite widespread use, there is limited information on the overall impact of hospital P4P programs on the value of healthcare		
Objectives	3	State specific objectives, including any prespecified hypotheses	**Abstract Objectives:** To assess the impact on hospital resource utilisation and costs of pay-for-performance financial incentives for stroke unit access in Queensland hospitals **Introduction:** We aimed to examine the effect of the Queensland stroke unit access P4P incentive on hospital costs, length of stay, and hospital re-admission.		
Methods					
Study Design	4	Present key elements of study design early in the paper	***Study Design:*** A population based, longitudinal cohort study using linked hospital admission, emergency department (ED) and hospital costing datasets		

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	***Study population, setting, and data sources:*** The study includes data from three periods: (1) pre-incentive "historical control" period from 1/7/2009 – 31/12/2011; (2) 12 month censored "implementation" period (1/1/2012y – 31/12/2012); and (3) "P4P" period from 1/1/2013 – 30/6/2017. We included all adult patients 18 years or older, admitted for >1 day to Queensland public hospitals with a primary discharge diagnosis of either acute stroke or a non-incentivised control condition of acute myocardial infarction (MI)		
Participants	6	*(a) Cohort study* - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study* - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study* - Give the eligibility criteria, and the sources and methods of selection of participants *(b) Cohort study* - For matched studies, give matching criteria and number of exposed and unexposed *Case-control study* - For matched studies, give matching criteria and the number of controls per case	**Study population, setting, and data sources** We included all adult patients 18 years or older, admitted for >1 day to Queensland public hospitals with a primary discharge diagnosis of either acute stroke or a non-incentivised control condition of acute myocardial infarction (MI) Non-Queensland residents, those admitted solely to private hospitals, and patients with intracerebral haemorrhage managed solely under a neurosurgical unit were excluded	RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided. RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided. RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.	**Study population, setting, and data sources:** with a primary discharge diagnosis of either acute stroke or a non-incentivised control condition of acute myocardial infarction (MI) based on primary discharge diagnosis coding (Supporting Table 1) **Methods Data sources**
Variables	7	Clearly define all outcomes, exposures, predictors, potential	**Methods: Outcome measures:**	RECORD 7.1: A complete list of codes and algorithms used to classify exposures,	**Methods Statistical Analysis:** Analyses were not adjusted for co-

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
		confounders, and effect modifiers. Give diagnostic criteria, if applicable.		outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	variates as the data were derived from a complete unselected population, and the prime interest was the impact of the intervention at the health system level.
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	**Methods: Outcome measures:**		
Bias	9	Describe any efforts to address potential sources of bias	**Methods Statistical Analysis:** Analyses were not adjusted for co-variates as the data were derived from a complete unselected population, and the prime interest was the impact of the intervention at the health system level.		
Study size	10	Explain how the study size was arrived at	Complete cohort – **Study population, setting, and data sources:** We included all adult patients 18 years or older, admitted for >1 day to Queensland public hospitals with a primary discharge diagnosis of either acute stroke or a non-incentivised control condition of acute myocardial infarction (MI)		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	**Methods Statistical Analysis** The proportion of people reaching an outcome during each quarter was used for binary outcomes, and the median value for continuous outcomes, as LOS and costing data was highly right-skewed		
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions	**Methods Statistical Analysis** Interrupted time series analysis methods[1] were used Time series regression models were fitted to monthly data for each cohort		

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
		(c) Explain how missing data were addressed (d) *Cohort study* - If applicable, explain how loss to follow-up was addressed *Case-control study* - If applicable, explain how matching of cases and controls was addressed *Cross-sectional study* - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	and study period using generalized least-squares estimations and transformation using the Prais-Winsten method (lag 1month) which produced the best correction for autocorrelation. Change of level (absolute values) and slope (trend over time) were then assessed between historical control and P4P periods in the stroke cohort, and between stroke and MI cohorts using Linden's post estimation methods Patients with incomplete or missing costing data were excluded in analysis of relevant costing outcomes (Figure 1, Table 2).		
Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	***Methods Data sources:*** Data were linked between emergency department and admitted patient datasets, and the Queensland Department of Health National Hospital Cost Data Collection by the Queensland Department of Health Research Linkage Group; and provided to the research team in de-identified format.
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	***Methods Data sources:*** Data were linked between emergency department and admitted patient datasets, and the Queensland Department of Health National Hospital Cost Data Collection by the Queensland Department of Health Research Linkage Group
Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (*e.g.*, numbers potentially eligible, examined for eligibility, confirmed	Table 2	RECORD 13.1: Describe in detail the selection of the persons included in the study (*i.e.,* study population selection) including filtering based on data quality, data availability and linkage. The selection	***Results:*** Figure 1.

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
		eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram		of included persons can be described in the text and/or by means of the study flow diagram.	
Descriptive data	14	(a) Give characteristics of study participants (*e.g.*, demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) *Cohort study* - summarise follow-up time (*e.g.*, average and total amount)	***Results:*** Table 2 Supporting information Figures 2,4 ***Results:*** costing details were missing for part of the total initial acute event in 458 (1.9%) patients with stroke and 438 (1.1%) patients with MI; and for rehabilitation episodes in 593 patients with stroke (6.3% of 9460 patients receiving rehabilitation		
Outcome data	15	*Cohort study* - Report numbers of outcome events or summary measures over time *Case-control study* - Report numbers in each exposure category, or summary measures of exposure *Cross-sectional study* - Report numbers of outcome events or summary measures	Table 2, Figures 2-4, Supporting tables 2-5		
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	**Results**, **Supporting tables** 2-5 **Results**, **Supporting tables** 2-5, **Methods**: To estimate the immediate impact of P4P introduction on outcomes, the modelled level at the beginning of the P4P period (January 2013) was compared with a counterfactual control estimate extrapolated from historical control trends (July2009-December2011).		
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	NA		

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Discussion					
Key results	18	Summarise key results with reference to study objectives	**Discussion** para 1: The Queensland Health stroke unit QIP program, had no impact on costs or hospital utilisation.		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	**Discussion Limitations**	RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	**Discussion Limitations** These analyses are observational, and causal associations can only be implied. It is possible that there were contemporaneous influences on our outcomes including changes in composition of the study population, policy, or outcome measurement which we were unable to identify.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	**Conclusions;** The potential for P4P and funding incentives to improve value in healthcare is supported by this example		
Generalisability	21	Discuss the generalisability (external validity) of the study results			
Other Information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based			
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	