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Improving health outcomes through hospital funding arrangements

Research paper

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Acknowledgement of Country

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The development of this paper was overseen by Commissioners Catherine de Fontenay and Alison Roberts. The staff team comprised Persis Eskander, Nicholas Sladden, Timothy Griffin, Rachel Burgess, Marcelo Muñoz, Dominique Lowe and Miriam Veisman-Apter.

Summary

Key points

- **Hospitals are funded primarily through activity-based funding, which incentivises higher volumes of care and cost controls, but does not directly promote the safety or quality of care.**
- **In 2017, the Australian Government introduced funding adjustments intended to reduce the rate of hospital acquired complications (HACs). The PC used data on admissions to public hospitals to establish whether this adjustment affected the rate of HACs.**
- **The HAC funding adjustment had a sizeable effect, and was associated with about a 25% reduction in the likelihood of a complication occurring in those states and territories where the financial penalties were passed on to the relevant local hospital networks.**
- **These initial findings suggest financial mechanisms could be effective in lifting the quality of care. These tentative conclusions, however, should be interpreted with caution and further work is needed before expanding the use of these measures.**

Government funding influences the capacity and incentives of hospitals and clinicians to deliver high-quality healthcare to Australian consumers. Australian governments largely fund public hospitals through activity-based funding (ABF), which reflects the number of people treated in hospitals and the complexity of their conditions. While ABF has incentivised higher volumes of care using limited resources, it does not provide direct financial incentives for better outcomes in care.

A number of countries are experimenting with supplementing activity-based funding with financial mechanisms aimed at improving the outcomes of care. The Australian Government developed a set of financial mechanisms nationally to improve safety outcomes. From mid-2018, new funding adjustments meant that hospitals would not be fully compensated for treatment costs incurred due to hospital acquired complications (HACs). HACs affect 3% of all episodes of care in public hospitals (IHACPA 2026; SCRGSP 2024). There was also an adjustment for avoidable readmissions in 2021, and an adjustment so that hospitals receive no payment for any treatment that resulted in a sentinel event (unforeseen death or injury).

The PC used public hospitals data to assess whether the HACs funding adjustment changed the likelihood of a complication occurring. The analysis compared the risk of HACs in those states and territories that passed on the funding adjustment to their relevant Local Hospital Networks, to those that absorbed the impacts within their health budgets from July 2018 to February 2020.

Funding adjustments had a sizeable effect on reducing the likelihood of hospital acquired complications

In the jurisdictions that passed on the funding adjustment, the risk of a person experiencing at least one HAC fell from about 2.3% to 1.7% – about a 25% reduction.

While these results are promising, interpreting them requires caution. Obtaining information from jurisdictions on the timing of, approach to, and policies that existed during the implementation of the HACs funding adjustment was challenging. The results are also pronounced just prior to and in the early stages of the implementation. It is possible that states and hospitals began to raise awareness of HACs and push to lower the rate of HACs in anticipation of the policy, rather than be influenced by the funding change itself; but we cannot be certain of this interpretation. We also cannot be certain that the reduction is not merely reflecting a change in coding practices.

There is variability in the performance of the funding adjustment across the different types of HACs included in the PC's analysis.[1] Further work is required to understand whether this reflects how amenable to improvement different types of HACs are.

The scale of the decline in HACs settled over time, perhaps because there was less focus on HACs as time passed, or because hospitals had already implemented their policies to reduce HACs.

More evidence is needed to support the case for expanding the use of financial mechanisms

Understanding the effect on the targeted outcome is an important first step but further analysis is required to account for net impacts of the financial mechanism. For example, hospitals may have responded to the HACs funding adjustment by shifting their efforts towards activities that would reduce HACs and away from other activities not captured by the financial mechanism. We cannot be certain that patient safety improved overall. Better data collection and reporting on patient-reported outcome measures would help capture a fuller picture of whether this shift was beneficial in improving outcomes.

Gathering data on a broader list of complications would allow governments to trial expanding financial incentives to other types of complications.

Finally, financial mechanisms should not be the sole approach used by governments to improve care outcomes. The HACs funding adjustment was likely supported by a package of other initiatives that also played a role, such as promoting awareness of HACs. Prior research suggests the strongest impacts result from a combination of financial incentives and programs to raise awareness of an issue.

[1] The analysis focused on 7 of the 15 most prevalent complication categories. In 2017-18 (the year prior to the implementation of the funding adjustment) these complication categories accounted for almost 90% of all HAC occurrences.

Are financial mechanisms effective in reducing HACs?

Key points

- **In 2018, the Australian Government implemented an adjustment to public hospital funding based on hospital-acquired complications (HACs).**
  - The funding adjustment reduces the amount of funding a local hospital network (LHN) receives based on the prevalence of HACs.
  - A risk-adjustment model accounts for patient characteristics that influence the likelihood of HACs, ensuring hospitals that treat higher-risk patients are not disproportionately penalised.
- **This paper looks at the impact of the funding adjustment through a quasi-experimental study comparing the prevalence of the seven most common and expensive HACs in states and territories that passed the funding adjustment on to their LHNs (treatment group) with those that did not pass on the adjustment (control group).**
  - We employ a difference-in-differences model to assess changes in the probability of an episode resulting in at least one of the studied HACs, comparing pre- and post-implementation periods as well as participating and non-participating jurisdictions.
- **The funding adjustment was associated with a reduction of about 25% in the probability of the studied HACs occurring.**
  - This equates to a reduction in the rate of one of these HACs occurring from about 2.3% to 1.7%.
  - The funding adjustment was associated with statistically significant reductions in five HAC categories, which together accounted for more than 70% of HAC episodes.
- **Further research is needed to determine whether the focus on HACs affected other dimensions of care, and whether the improvement in HACs reflects a change in coding practices rather than real improvements.**

1. Introduction

Australia has relied on activity based funding (ABF) to fund its hospitals since the early 1990s, as do many OECD countries (OECD 2016, p. 47). Hospitals receive compensation for each procedure, in line with its average cost. ABF has proven effective at delivering hospital services in high volumes and at low cost, keeping public hospital cost escalation below health-related inflation in Australia (Huxtable 2023, pp. 1, 57). However, ABF does not necessarily promote quality and safety of care (OECD 2016, p. 42).

Countries have experimented with supplementary financial mechanisms in order to incentivise a greater focus on the quality and safety of care. These financial mechanisms have generally taken the form of a small penalty if certain negative outcomes take place (or a reward if positive outcomes occur). For example:

- the US Value-based Purchasing Program (VBPP) redistributes funding toward high-performing hospitals. Under the program, 2% of hospitals' Medicare funding is withheld and used to reward high-performing hospitals. Performance is scored against a range of metrics including mortality and complications, consumer experience, efficiency and cost reduction (Centres for Medicare & Medicaid Services 2024)
- the UK's Best Practice Tariffs (BPTs): Hospitals were paid a BPT when they met a set of criteria for processes of care that align with best practice. The BPT reflected the average cost of providing that care; alternatively, they received a conventional or base price when they did not meet the criteria (OECD 2016). Recently these tariffs were combined with other elements to form part of the variable element of payment to hospitals (NHS England 2025).
- Norway's Quality-based Financing Scheme (QBF) is a supplementary payment that rewards hospitals for their reporting quality, minimum performance level, best performance and best relative performance across a range of indicators. Indicators range across several areas and the reward payment is weighted against their relative contribution. Indicators are based on outcome (weighted 50%), patient satisfaction (weighted 30%) and process of care (weighted 20%) (Huus and Baardseng 2019).

How successful different financial mechanisms are in influencing outcomes has been extensively evaluated, consistently finding mixed results (Milstein and Schreyoegg 2016; Scott et al. 2018; Scott and Ouakrim 2011; Slawomirski et al. 2024b). For example, one study identified a positive impact on about half of the outcomes being targeted, although the success rate was slightly less for those mechanisms looking only at hospital care (Scott et al. 2018). Studies of higher quality tend to find a lesser effect (Slawomirski et al. 2024b).

Australia has experimented less with financial mechanisms for quality and safety than some other OECD countries. From 2011 to 2014 there were rewards for meeting targets of timeliness in elective surgery and emergency departments, and some are still in place as part of state and territory hospital service agreements (box 1).

Recently Australia introduced a financial penalty for certain types of hospital-acquired complications. Funding adjustments were introduced gradually in Australia's public hospitals from 2017 to ensure that hospitals would not recover the full incremental costs incurred because of HACs and avoidable hospital readmissions (AHRs) and would not receive any payment for treatment in sentinel events.[2] This research paper seeks to measure the impact of this financial penalty on rates of hospital-acquired complications. The introduction of the penalty seems to have had a significant impact on HAC rates. We discuss the evidence and the implications.

[2] A sentinel event is defined as an unanticipated or unusual event that results in death or serious physical injury.

Box 1 – Financial mechanisms for quality and safety in Australian hospitals

From 2011 to 2014, as part of the original NHRA, the Australian Government committed $1.55 billion to incentivise states and territories to meet annual National Elective Surgery Targets (NEST) and National Emergency Access Targets (NEAT):

- NEST: 100% of patients in each urgency category for elective surgery would be seen within the clinically recommended times. It also set targets for the number of days a patient should wait if they exceeded the clinically recommended times and required the 10% of patients who had waited the longest beyond the clinically recommended time for surgery to be seen within that year.
- NEAT: 90% of all patients presenting to an emergency department either be admitted, referred to another hospital for treatment, or discharged within four hours (AMA 2023, pp. 5–6).

Meanwhile, a number of performance-based incentives for hospitals have been implemented by state and territory governments. For example:

- Queensland uses performance payments, which aim to incentivise high-quality and high-priority activity, support innovation and evidence-based practice, deliver additional capacity through clinically- and cost-effective models of care, and disincentivise care that provides insufficient or no benefit for patients. This includes payments for hospitals offering high-value services such as virtual care, advance care planning discussions and Hospital in the Home (Queensland Health 2022).
- In South Australia, a Priority Actions Incentive Program is in place to address ramping and improve hospital performance. The Program involves an incentive payment of $20,000 for every week where the transfer of care occurs in fewer than 30 minutes for at least 66% of patients and a redistribution of $200 from the local hospital network (LHN) back to the department for every ambulance hour lost on the ramp (SA Health 2023, p. 19).
- The Northern Territory has previously paid LHNs for meeting at least two of five select key performance indicators (KPIs) (and offered a higher payment for meeting at least four). In 2020-21, for example, these KPIs included target levels of potentially preventable hospitalisation, hospital acquired complications, mental health 20-day readmissions, telehealth and coding timeliness (NT DoH 2020, p. 14).

2. The implementation of a funding adjustment for hospital-acquired complications (HACs)

The 2017–20 Addendum to the National Health Reform Agreement (NHRA) introduced performance-based financial incentives into public hospital funding arrangements. These measures were designed to strengthen the focus on safety and quality in hospital care by linking a portion of funding to performance on key safety indicators. The incentives target sentinel events (wholly preventable incidents resulting in death or serious harm), hospital-acquired complications (HACs) (box 2) and avoidable hospital readmissions (AHRs).

The adjustments were developed through broad consultation and implemented gradually. The funding adjustment for sentinel events was implemented in July 2017 (clause I63), followed by the HAC adjustment in July 2018 (clause I68) and the AHR adjustment in July 2021 (IHACPA 2023c). The adjustment for HACs was preceded by a ‘shadow year’ in 2017-18, in which jurisdictions were informed of how their funding would have changed as a result of the HAC penalty, but the adjustment was not applied.

Sixteen high-priority HACs were defined, and thirteen of these were selected as the focus of the financial penalty. While these mechanisms were introduced nationally, jurisdictions varied in both the timing and method of implementation. This variation provided a natural experiment that allowed the PC to apply quasi-experimental methods to study the effect of the HAC funding adjustment.

Box 2 – What are HACs?

HACs are health complications, such as pressure ulcers, infections or fractures, that develop while a patient is in hospital, where risks can be reduced through clinical actions such as greater surveillance of bloods or a greater number of skin checks for ulcers (ACSQHC 2024b).

The national list of HACs was developed by the Australian Commission on Safety and Quality in Health Care (ACSQHC) over six years in collaboration with the Independent Health and Aged Care Pricing Authority (IHACPA) (ACSQHC 2024a) and in consultation with consumer representatives, health experts and policymakers (Slawomirski et al. 2025). The 16 complication categories (ACSQHC 2024b) were chosen because they were well measured and likely to be amenable to hospital actions; but there are many other hospital-acquired complications (Duckett and Jorm 2018).

HACs cause direct harm to patients

HACs have serious consequences for patient outcomes and experiences (ACSQHC 2018, p. 3). Patients who acquire a HAC can experience pain or trauma; severe cases lead to preventable deaths (ACSQHC 2018).

In cases where HACs are not responsible for significant harm to patients, they still prolong a patient's recovery time. This delay in discharge due to a HAC may then result in a patient experiencing subsequent HACs (IHPA 2018, p. 17).

HACs also increase the cost of care in hospitals

HACs are also costly to the health system. A HAC will generally increase the complexity of care a patient requires and the length of their hospital stay – both factors increasing the cost of the admission (IHACPA 2023c). IHACPA estimated the risk-adjusted incremental cost of treating HACs (not inclusive of the entire episode of care in which the HAC occurred) was approximately $280 million in 2017-18 (IHPA 2017a, p. 52).

The funding adjustment reduces hospital funding for preventable HACs

The funding adjustment is designed to reduce payments to hospitals for care that involves a HAC. How this adjustment is calculated for each patient episode, and how it is applied across the system, determines the strength and visibility of the financial incentive.

In simple terms, when a patient experiences a HAC, the hospital receives less funding for that episode of care. The adjustment aims to create a financial incentive for hospitals to improve safety and reduce preventable harm.

How the funding adjustment is calculated for each episode

Most of the funding for public hospitals is based on the ABF model. Under this model, the funding for different services is measured using national weighted activity units (NWAUs), with one NWAU representing

a hospital service whose cost is at the national average. This allows for standardisation and comparison between services and across hospitals (NHFB 2023).

A patient episode of higher complexity has higher NWAUs. An episode with more interventions is more likely to be assigned to a diagnosis-related group with higher complexity, and hence more NWAUs.

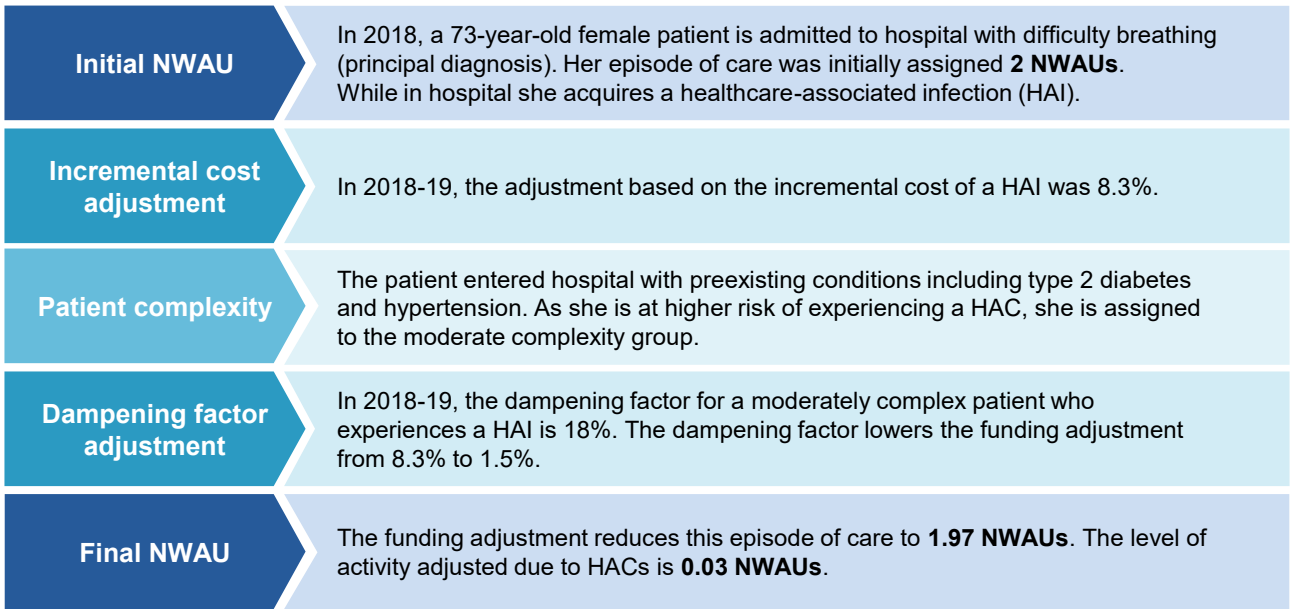
A hospital will receive funding based on the total number of NWAUs they deliver, multiplied by the 'National Efficient Price' (NEP) – the average cost of delivering an NWAU (IHACPA 2025; NHFB 2023).

Under the HAC funding adjustment, the incidence of a HAC will reduce the NWAUs (and hence the funding) attached to the associated episode. IHACPA calculates the exact size of the reduction by:

1. examining the NWAUs associated with the primary diagnosis (the reason the patient is in hospital)
2. applying a percentage reduction based on the cost of treating the HAC and patient factors such as age and pre-existing health conditions, which are outside hospital control (Webster et al. 2023).[3]

The final NWAU then excludes some or all HAC-related costs and determines the amount of government funding the hospital receives (figure 1)

Figure 1 – The funding adjustment is based on the incremental cost of HACs and patient complexity



Source: IHACPA (2023b, p. 4); IHPA (2018, p. 29).

[3] This means hospitals are not unduly penalised for complications that are less preventable, such as those involving older or higher-risk patients (IHPA 2018, pp. 2–4).

How the funding adjustment is applied to total funding

Under the NHRA 2020-25[4], the Australian Government funds public hospitals through a combination of:

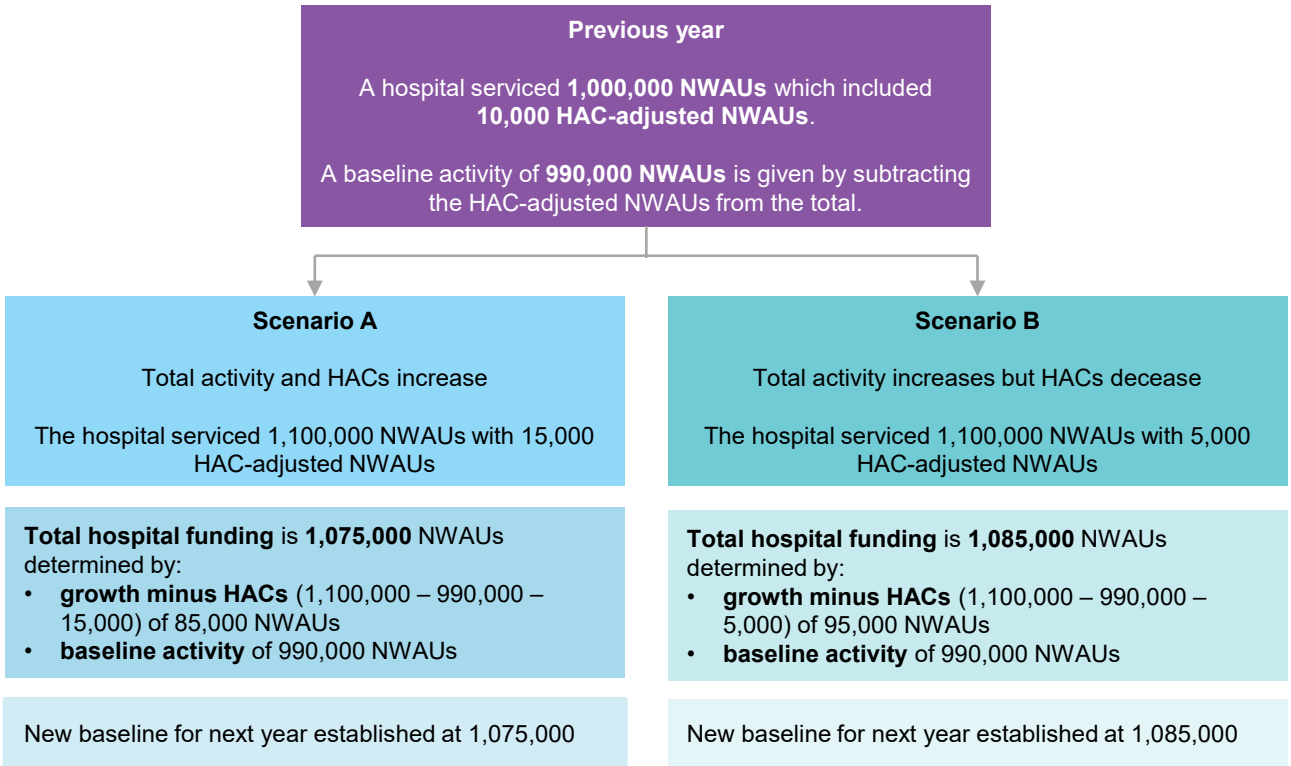
- base funding – equal to its contribution in the previous year
- growth funding – which covers 45% of efficient growth in hospital services, calculated from year-to-year changes in hospital activity (measured in NWAUs) and changes in price (measured in the NEP) (NHFB 2024, p. 13), up to a cap of 6.5% annual growth. (The effect of the cap is discussed below.)

The HAC adjustment is applied to the growth funding but also affects the level of base funding in subsequent years. It is not the total number of HAC-affected episodes that drives the adjustment, but rather the change in the number of HAC-affected NWAUs between years.

If a hospital's total HACs (as measured by HAC-adjusted NWAUs) decrease from one year to the next, the Australian Government's contribution increases. Alternatively, if total HACs increase from one year to the next, funding decreases relative to the base year (figure 2). The HAC-adjusted NWAUs then become the baseline for the next year's funding.

In effect, hospitals are rewarded or penalised based on the yearly change in the number of HAC-affected episodes, compared to the previous year. Changes in one year have longer lasting effects by altering future baseline funding.

Figure 2 – The funding adjustment impacts the marginal change in HAC-adjusted NWAUs



Source: NHFB (2024, pp. 71–73).

[4] A new National Health Reform Agreement has been signed in 2026.

Jurisdictions have discretion in whether to pass on the HAC financial penalty

While the funding adjustment described above was introduced nationwide, there were several potential sources of variation.

- States and territories retained considerable discretion in how to apply the funding adjustment. They could choose whether to pass on the adjustment to their Local Hospital Networks (the LHNs). Some jurisdictions chose not to pass on the funding adjustment to their LHNs in the years that we are considering (2018 to 2020). We use this difference between jurisdictions as part of our estimation strategy.
- In 2018-19, one jurisdiction exceeded the 6.5% cap on government funding, but no other jurisdictions exceeded the cap before July 2020 (NHFB pers. comm, 18 September 2024). The funding adjustment was therefore not relevant for that jurisdiction. We have not chosen to make changes to the estimation strategy to take this into account. Instead, we have assumed that the jurisdiction could make the funding adjustment anyway, in the year that it exceeded the cap.
- The LHNs retain some discretion in deciding whether to pass on this funding adjustment to each hospital, according to its HAC rates. We do not have data on the decisions made by each LHN and cannot use this as part of our estimation strategy.

3. Estimating the impact of the funding adjustment on the likelihood of a HAC

We analysed data from the Admitted Patient Care National Minimum Dataset (APC-NMDS), covering every admitted patient episode in public hospitals in Australia from 2013-14 onwards. The dataset is administered by the Australian Institute of Health and Welfare, through its National Health Data Hub.

The onset of the COVID-19 pandemic created major disruptions to hospital admission volumes, patient and case mix, funding and resourcing from March 2020 (AIHW 2022, 2023a, 2023b; IHACPA 2020). Participants suggested these factors likely overwhelmed the effects of the HAC funding adjustment. Additionally, IHACPA suspended the funding adjustment for patients admitted with COVID-19, introducing further potential bias (IHACPA 2023a, p. 42). Therefore, we limited our study period to the 20 months from the introduction of the funding adjustment to February 2020 inclusive. This limited our ability to study the longer-term effects of the HAC funding adjustment.

Treatment and control groups

Through engagement with states and territories, the PC learned five jurisdictions passed down the funding adjustment to their Local Hospital Networks (LHNs) from its rollout in the 2018-19 financial year, and other jurisdictions did not do so right away. The final treatment group was made up of three of these jurisdictions, as two were excluded from this study due data availability. Two jurisdictions who did not pass down the funding adjustment to LHNs in 2018 to 2020 made up our control group.

Variation within the treatment group in the implementation of the adjustment could not be analysed because documentation of implementation specifics, including timing and design, was not provided.

Two states and territories told the PC of pre-existing financial mechanisms aimed at improving the safety and quality of hospital care. One jurisdiction was excluded from the estimation as it introduced its own HAC adjustment policy within the pre-policy period that had different characteristics to the Commonwealth adjustment. The other jurisdiction made more minor changes and remained part of the treatment group.

The likelihood of HACs was estimated

The variation between treatment and control jurisdictions allows us to run a differences-in-differences model to identify the effect of the policy. We estimated the likelihood of a HAC in each admitted patient episode, using a logistic regression. We compared the difference in the likelihood of HACs across the control and treatment groups between July 2016 and June 2018 (the pre-policy period) to the trend between July 2018 and February 2020 (the post-policy period). The full details of the estimation (including sensitivity checks) are in appendix B.

The analysis focused on the seven most prevalent and expensive HAC categories. In 2017-18 (the year prior to the implementation of the funding adjustment), these seven accounted for almost 90% of all HAC occurrences (IHACPA 2026)[5] and five of the same seven HACs required above-average resources to address them (IHPA 2017b, p. 2).[6] We ran models on both an aggregate of these seven HACs and on each individually.

Some patient characteristics play a significant role in the risk of a HAC occurring, as discussed above. To control for this, we accounted for patient risk factors in our analysis, including age, gender, the type of diagnosis related group (DRG), major diagnostic category (MDC), Charlson score (an index of comorbidity), intensive care unit (ICU) status, admission status (whether emergency admission occurred) and transfer status (whether the patient was transferred from another hospital).

We included hospital fixed effects to control for unobserved, time-invariant differences, such as variations in quality, risk-profiles or reporting intensity. We also included time fixed effects to account for changes that affected all hospitals over time that could cause HACs to move independently of the financial incentive. This could include nation-wide changes such as reporting rules, coding intensity or new clinical guidelines. However, these fixed effects cannot eliminate the possibility that other concurrent changes – such as hospital management practices, policies, patient demographics and service volumes – may also have affected HAC rates.

Relationship to prior literature

A recent academic study (Slawomirski et al. 2025) has also examined how the introduction of the penalties affected the likelihood of thirteen categories of HACs. While the study drew on the same dataset to answer the question, they adopted a different methodology. They examined the time-series of the aggregate level of HACs (with some adjustment for the risk characteristics of each patient) and tested for a break in the time series. They treated all states as having implemented the HAC penalties.

In contrast, we estimate the likelihood of a HAC at the level of an individual patient, adjusting for patient and hospital characteristics, and from our consultations we are able to distinguish the jurisdictions that implemented the penalty.

Slawomirski et al. (2025) found that the introduction of the HAC penalty did lead to a significant decline in HAC rates of between 17% and 26% depending on the model. This magnitude is comparable to the magnitudes found in our analysis.

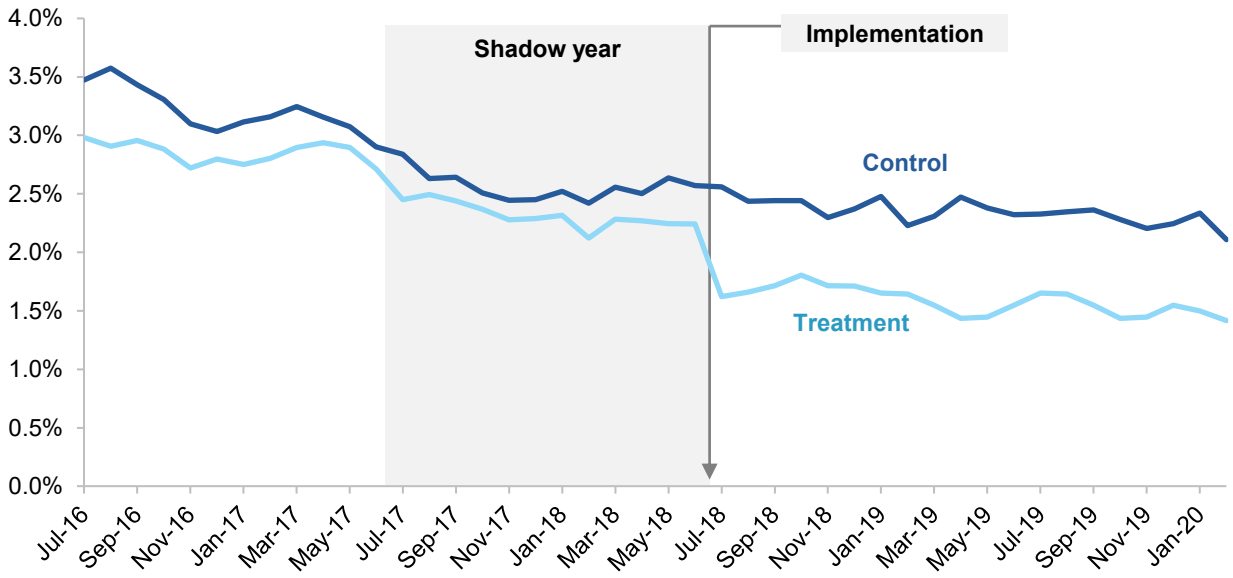
[5] These are healthcare-associated infections (27.3%), cardiac complications (16.1%), surgical complications requiring unplanned return to theatre (14%), delirium (13.2%), respiratory complications (10.1%), endocrine complications (7%) and medication complications (1.9%).

[6] These are healthcare-associated infections (8.6%), cardiac complications (11.2%), delirium (9.7%), respiratory complications (15.8%) and surgical complications requiring unplanned return to theatre (10.5%) (IHPA 2017b, p. 2).

The funding adjustment led to a 25% decline in HACs

Our differences-in-differences model results suggests the introduction of the funding adjustment, when controlling for patient and hospital factors, was associated with a decrease in the probability of a HAC occurring by 25.2% across the seven HACs studied (appendix B). Based on the treatment group's 12-month average HAC rate as a baseline, our model indicates the introduction of the funding adjustment was associated with a decrease in the likelihood of a HAC from 2.31% to 1.73%, or 0.59 percentage points (figure 3).[7] This result is relatively large, comparable to eight years of ageing or one Charlson score (appendix B).

Figure 3 – The HAC rate in the treatment group fell by more than the control group in and around implementation of the funding adjustment



Source: PC estimate using AIHW NHDH data.

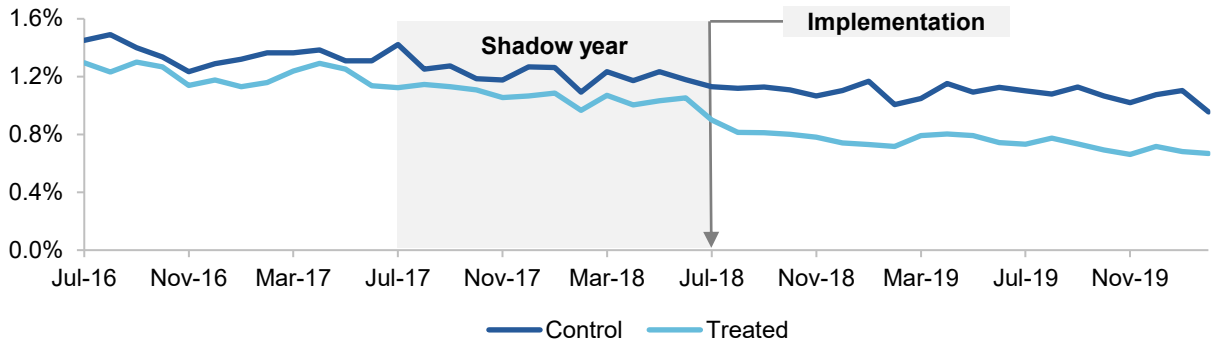
While the funding adjustment was associated with an aggregate reduction in HACs, separating the analysis by HAC category showed this effect was due to five HAC categories: healthcare-associated infections (24.6% decrease in probability of occurrence), respiratory complications (26.7% decrease), delirium (28.9% decrease), endocrine complications (27.2% decrease) and cardiac complications (30.1% decrease) (figure 4) (appendix B). Together these five HAC categories amount to more than 70% of annual episodes of care with at least one HAC.

The remaining two HAC categories – surgical complications and medication complications – had statistically insignificant results, indicating that the funding adjustment did not have an observable association with the prevention of these HACs. This variation may indicate some categories of HACs are more difficult for hospitals to reduce than others.

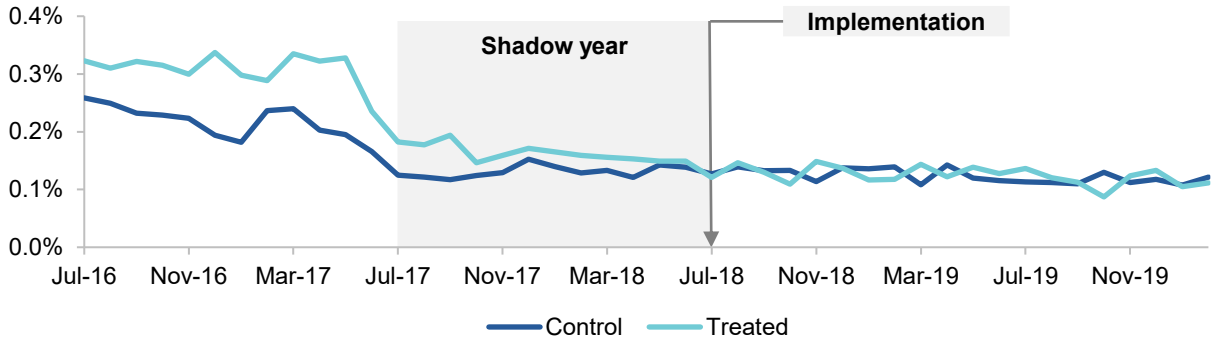
[7] Note the difference in rates between here and appendix B as we derive two baseline HAC rates with the funding adjustment reduced HAC rates by between 0.59 and 0.78 percentage points.

Figure 4 – The funding adjustment was associated with a significant decline in five HACs

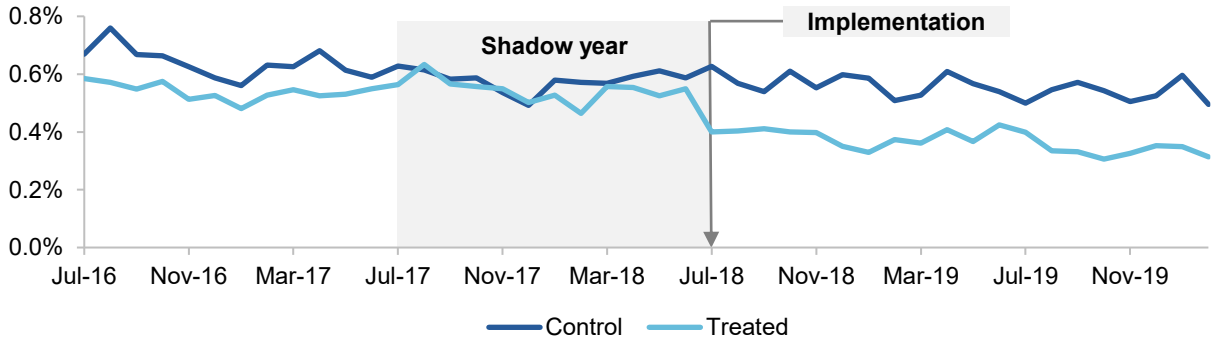
a. Healthcare-associated infections



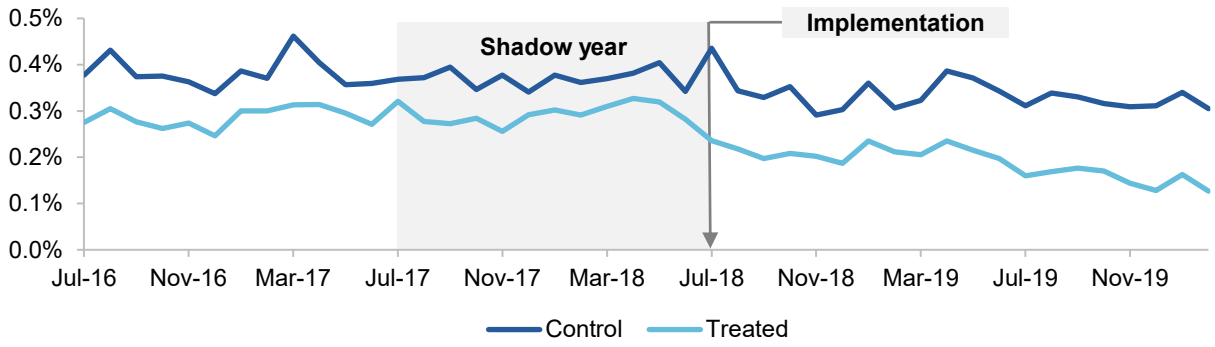
b. Respiratory complications



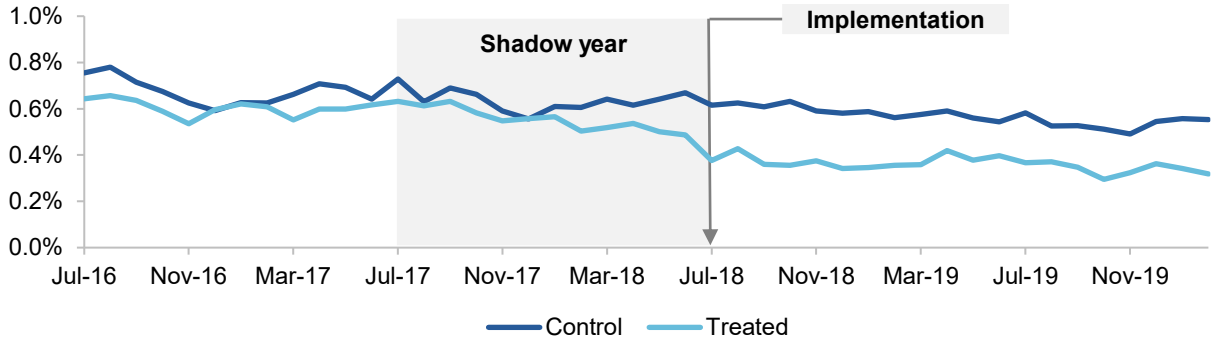
c. Delirium



d. Endocrine complications



e. Cardiac complications



Source: PC estimates using AIHW NHDH data.

4. Interpretation of the findings

Although the funding adjustment was small, it had a significant impact

It is notable that the HAC funding adjustment had such a large impact, considering the size of the financial penalty is relatively small.

To give a rough idea of the size of the financial incentive, we draw on IHACPA's estimate of the adjustment in the number of NWAUs due to HACs, in each state and territory, in 2018-19 (as described in figure 2) (IHACPA 2026). Based on our empirical exercise, we concluded the three jurisdictions in the treatment group reduced their HAC rates by about a quarter, which would have saved about $20 million. This is an extremely small benefit in the context of total hospital budgets which totalled $103 billion in 2023-24 (SCRGSP 2026). And it should be interpreted as an upper bound estimate, as it does not account for costs incurred by hospitals and LHNs in their effort to reduce HAC rates. Therefore, the adjustment may have served as more of a means of sharpening focus on HACs than as an actual fiscal incentive.

Awareness of the adjustment itself, in addition to the actual financial incentives, may have helped shaped its impact. Several jurisdictions reported the process of developing and implementing the mechanism itself raised awareness of HACs and created a shared understanding of patient safety, with improved measurement and reporting prompting performance discussions between health departments and LHNs. The process of generating consensus on what contributes to (or detracts from) value when implementing a financial mechanism can also generate substantial benefit (Slawomirski et al. 2024a).

> Implementation science would suggest that how schemes are implemented across complex, adaptive organisations like hospitals systems plays a crucial role. In fact, the financial aspect of p4p [paying for performance] may be a red herring, designed to focus attention on key practices and, crucially, formalise continuous data feedback to the relevant clinical teams. (Slawomirski et al. 2024b)

Some jurisdictions also reinforced the salience of the adjustment by reporting the financial implications of HACs on LHN budgets. In these jurisdictions, accountability for safety and quality was more clearly devolved, aligning financial incentives between governments and LHNs. In those jurisdictions, LHN decision-makers and clinicians were likely more aware of HACs.

Hospitals may have pre-empted the introduction of the adjustment

The treatment jurisdictions saw a decline in their HAC rate in the months leading up to the implementation of the funding adjustment. A decline of similar magnitude is not apparent among the control jurisdictions (figure 3). Our analysis suggests the effect was progressively stronger month-on-month in the lead up to implementation (appendix B).

Pre-emptive practice changes in anticipation of the funding adjustment may be responsible for some of this decline, given the lead-in time to implementation. The funding adjustment was announced in April 2016 when the 2017–20 Addendum to the NHRA was signed (IHPA 2017a, p. 45). IHACPA shadowed the funding adjustment prior to implementation for 12 months over the 2017-18 financial year (IHPA 2017a, pp. 52–53). IHACPA also consulted on the design of the funding adjustment with all state and territory governments. While it is difficult to ascertain the degree of awareness at the LHN and hospital level, particularly regarding the financial impact of the funding adjustment, it is apparent that action was taken in advance of the funding adjustment to reduce HAC rates.[8] Again, this suggests that the HAC penalty mainly had an effect by focusing the attention of public hospital management on HAC rates.

However, the funding adjustment was just one of several national initiatives aimed at enhancing patient safety in acute care, including several that occurred around the same time as the adjustment's implementation. Some of these measures may have already contributed to reducing rates before the adjustment was introduced (Slawomirski et al. 2025).

The design of the adjustment may have caused a ratchet effect

Our evidence suggests that the funding adjustment may have had a once-off effect on HAC rates, rather than a sustained downward trend. As shown in figure 3, HAC rates fell sharply around the introduction of the funding adjustment and had stabilised at a lower level by 2019. IHACPA's analysis shows a similar pattern, with HAC-adjusted NWAUs declining year-on-year between July 2018 and June 2020 in the treatment jurisdictions and 72% of the total reduction occurring in 2018-19 (IHACPA 2026).

The incentives embedded in the adjustment help explain this outcome. First, hospitals may have focused initially on preventing the most easily avoided complications. Once the low-cost improvements are exhausted, hospitals face weaker incentives to pursue further reductions because the remaining HACs are harder to shift, and additional efforts may not yield sufficient returns. This implies that beyond the early gains, the marginal cost of further reducing HACs faced by hospitals may exceed the benefits under the HAC-adjustment policy. In effect, the policy has potentially exhausted its influence in its existing form.

Second, continuously achieving lower HAC rates risks creating an unsustainably low baseline that is used in future calculations. This exposes hospitals to penalties if their rate increases later, even if the rate still below the pre-policy implementation level. This is known as a 'ratchet effect' and it can discourage further efforts.

Limitation 1: Possible impact on other dimensions of care

While these findings are encouraging, there are certain alternative hypotheses that cannot be ruled out without further work.

First, this study has not measured the impact of the HAC penalty rollout on other dimensions of care. It is possible that when hospitals were encouraged to focus on HAC rates, less attention could be devoted to other important dimensions of care. Health professionals have limited time and attention. Further research is

[8] Limited information makes it difficult to discern the specific policy responses by LHNs and hospitals.

needed to determine whether the increased attention devoted to HACs had negative impacts on other dimensions of care.

Limitation 2: Reduction in HACs or change in record-keeping?

Second, the analysis relies on consistent and accurate clinical recordkeeping, yet HAC reporting has historically lacked robustness. A 2013 study commissioned by IHACPA and the ACSQHC found errors tended to produce false negatives, leading to under-reporting of HACs (KPMG 2013, p. 11). This is a less significant concern where consistent errors over time affect both the pre-implementation and post-implementation rates equally. However, the prospect of financial penalisation may have incentivised an uplift in coding practices post-implementation, causing a break in this consistency. Stakeholders we consulted observed that the funding adjustment enhanced data accuracy by increased focus on HACs.

The sharp decline in HAC rates observed in July 2018 raises concerns regarding potential coding discrepancies that may have contributed significantly to our results. The HAC penalty may encourage systematic under-reporting or misreporting of HACs to optimise funding allocation. We cannot rule out the possibility the HAC penalty had no effect on actual HAC rates, and it simply contributed to a change in coding practices. However, we raised this possibility with state, territory and Australian Government health authorities in our interviews, and all considered it unlikely.

Overall, the available evidence indicates any change in HAC coding practices was due to an increased focus on coding rather than to strategic manipulation. If hospitals were manipulating the scheme, they would have increased their reported HAC rates in 2017-18 (the 'shadow rollout' year), in order to measure a large reduction when the scheme started in 2018-19. In fact, there was a significant *reduction* in HAC rates in the shadow rollout year.

5. Conclusion

The evidence for whether financial mechanisms are effective at improving outcomes, processes of care or safety and quality is mixed, often showing modest or no effect (OECD 2017, p. 98; Scott et al. 2018; Scott and Ouakrim 2011; Slawomirski et al. 2024a). Factors influencing their effectiveness include the nature of the target outcome, the funding and governance systems already in place and the design of the mechanism.

How a financial mechanism is implemented, even where its design is evidence-based, can also influence its effectiveness. The characteristics of the Australian hospital and healthcare systems must therefore be accounted for. The evaluation of the funding adjustment on HACs helps to ground these insights in the Australian context.

Financial incentives are dampened

While financial penalties can act as strong motivators to change behaviour in theory, the idiosyncrasies of Australia's hospital funding arrangements and the ongoing challenges to the financial sustainability of hospitals may temper this assumption when applying penalties to Australia's hospitals.

The complex funding flows passing through states, territories and LHNs can wash away funding loss experienced by the hospital. In most Australian jurisdictions, hospitals and LHNs are funded through service agreements, which set a notional budget for the level of activity they expect in a given year. This budget is provided in advance and then reconciled at the end of the financial year to reflect the actual level of activity. Any adjustments, for example for safety and quality, are applied retrospectively during reconciliation.

The application of penalties during this process can be ineffective due to several common practices.

- Funding adjustments can be easily balanced out by changes to activity levels in hospitals (for example, by increasing activity to cover the amount that would otherwise be penalised) or by other ad hoc injections of funding (such as during the COVID-19 pandemic), particularly when the penalties are small.
- Reconciliation can be a complex process involving several adjustments to funding, which mean penalties can be crowded out and overlooked. In at least one state, the funding adjustments relating to changes in HACs are no longer itemised in service agreements.
- Reconciliation processes are occasionally suspended when recalling funding may not be financially viable for an LHN to absorb, and so penalties are not always applied. More broadly, Grattan Institute concludes that budget bailouts are dampening financial incentives (Breadon and Baldwin 2025).

While penalties provide a strong signal on what governments are prepared to pay for, Australia's experience with implementing the funding adjustment on HACs suggests the signal could also be lost in the long run among the complexity of Australia's funding arrangements.

Stakeholders raised concerns about the impact of financial penalties on hospitals with increasingly constrained resourcing (AMA 2016, p. 1; Queensland Nurses' Union 2016, p. 6). Reductions in funding through penalties may lead to lean staffing, fewer beds and less investment in safety and quality. For example, penalties applied to hospitals in the United States exacerbated inequalities between hospitals, leaving poorly performing hospitals even worse off (Hsu et al. 2020; Kim et al. 2022).

Likewise, incentives structured as rewards may disappear in practice if a hospital faces other losses it cannot absorb. The lesson is that financial rewards and penalties are challenging to impose when hospitals face tight budgets and complex incentives.

Incentives must reach those who can shift practice

The complexity of Australia's hospital funding system, which for most jurisdictions involves funding coming from two levels of government, passing through LHNs and distributed to hospital departments, creates an implementation challenge. Financial mechanisms implemented at the national level could be devolved down to relevant decision makers in the Australian hospital system but in practice this pass-through has not always occurred.

While targeting financial mechanisms at the state and territory government- or LHN-level may signal the intention to achieve change, this has limitations. For financial mechanisms to be most effective at improving patient outcomes, they should have salience for hospitals. This could be achieved by passing through the financial impacts directly to hospitals whose efforts are required to achieve target outcomes. Hospital managers would then work to raise the salience of outcomes with clinicians.

Internationally, financial mechanisms are typically directed at hospitals, but this feature has attracted criticism. Some argue that rewards/penalties should reach at least to the hospital department level to be effective[9] (Scott and Ouakrim 2011, pp. 12, 15; Scott and Yong 2016, p. 4). But given the current HAC

[9] A pay-for-performance scheme in Denmark demonstrated the impact of targeting incentives beyond the hospital level. The scheme rewarded or penalised hospitals for either exceeding or falling short of a threshold percentage of long-term patients with a case manager. In one region, two hospitals redistributed payments to hospital departments based on their performance, while the remaining two did not, preferring to share incentive payments across the hospital. Performance was found to be on average five percentage points higher for hospitals that exposed departments directly to the financial mechanism in the two years following introduction of the incentive scheme (Kristensen et al. 2016).

incentive had a strong impact when passed on to LHNs, hospital managers are finding ways to shift practitioner behaviour.

Financial mechanisms should align with health practitioners' and providers' goals and motivations (Scott and Ouakrim 2011, p. 10). Healthcare workers have intrinsic motivations to provide high-quality care. Financial mechanisms that do not align with these motivations risk being met with resistance and damaging care.

Next steps

Given the success of the HAC penalty in reducing the HAC rate, it is worth considering what further steps could be taken.

First, there is a risk that the 'ratchet effect' could be disincentivising further improvements in HAC rates, as discussed above. It might be preferable to measure HAC rates against a set baseline, such as the 2025-26 year, and to reward improvements relative to that baseline. It might also be desirable to adjust the baseline for total patient numbers, so that a hospital is not penalised if its admission numbers grow.

Second, the HAC penalty has focused on 13 types of HACs, although there are 16 high-priority HACs defined. There are many other complications that can arise while in hospital, and actions taken by the hospital may affect their likelihood. It seems reasonable to explore expanding the HAC incentive scheme to the last three high-priority HACs, and to a broader set of HACs.

A. Consultations

In preparing this report, the PC consulted with a range of individuals and government agencies (table A.1) and convened a workshop on 8 October 2024 on the analytical methodology for estimating the impact of the HAC funding adjustment (table A.2). Two external referees also provided feedback on the report (table A.3).

The PC is grateful to all those who participated.

Table A.1 – People and organisations we consulted with

ACT Health Directorate, ACT Government
Australian Commission on Safety and Quality in Health Care (ACSQHC)
Australian Institute of Health and Welfare (AIHW)
Clinical Excellence Commission, NSW Government
Commission on Excellence and Innovation in Health, South Australian Government
Department of Health and Aged Care, Australian Government
Department of Health, SA Government
Department of Health, Tasmanian Government
Department of Health, Victorian Government
Department of Health, WA Government
Independent Health and Aged Care Pricing Authority (IHACPA)
Lukasz Slawomirski, Menzies Institute for Medical Research, University of Tasmania
Ministry of Health, NSW Government
National Health Funding Body (NHFB)
NT Health, Northern Territory Government
Queensland Health, Queensland Government

Table A.2 – External workshop participants

Prof Jeff Borland (University of Melbourne)
Dr Susan Mendez (University of Melbourne)
Prof Anthony Scott (Monash University)

Table A.3 – External reviewers

Lukasz Slawomirski (University of Tasmania)
Prof Jeff Borland (University of Melbourne)

B. Estimating the impact of the HAC-related funding adjustment

This appendix provides information on the PC's approach to estimating the impact of the funding adjustment on hospital acquired complications (HACs). Sections B.1 and B.2 discuss the data and methodology, and section B.3 presents detailed results.

B.1 Patient level data used to estimate the impact of the funding adjustment

Our primary question was: what effect (if any) did the HAC-related funding adjustment have on the probability of a HAC occurring?

To answer this question, the PC used public hospital admissions data from the Australian Institute of Health and Welfare's (AIHW) National Health Data Hub (NHDH). The NHDH contains the Admitted Patient Care National Minimum Dataset (APC NMDS) (AIHW 2024b). Data in the NMDS is mandatorily and uniformly reported by all states and territories. The APC NMDS provides annual administrative information about care provided to admitted patients in Australian hospitals (METEOR 2023).[10]

Each observation covers an episode of care with information in three categories, spanning over 50 variables. The NMDS includes demographic details (age, gender, residence), hospital administration data (public or private sector), and clinical information such as admission method (elective or emergency), principal diagnosis, type of care received (acute, subacute, rehabilitation, mental health), length of stay, cause of diagnosis, preexisting chronic conditions and treatments provided (METEOR 2023).

Certain episodes were trimmed from the dataset

Episodes were trimmed from the original dataset to align with Independent Health and Aged Care Pricing Authority's (IHACPA) HAC identification methodology (ACSQHC 2019). Trimming occurred if:

- **the funding adjustment was not applied to that category of episode**. The funding adjustment only applies to admitted acute episodes in public hospitals. Non-acute admitted episodes, emergency presentations and all episodes in private hospitals are not subject to an adjustment even if a HAC occurs (IHACPA 2023c). Mental health admissions were also excluded because these episodes fall under a different classification stream (IHACPA 2024). Block-funded public hospitals should have been trimmed but were not as these hospitals cannot be identified in the NHDH. Episodes were also trimmed if they included same-day chemotherapy, same-day haemodialysis and the following care types: newborn (unqualified days), hospital boarder, posthumous organ procurement.

[10] The NHDH does not contain hospital data from Western Australia and the Northern Territory (AIHW 2024a).

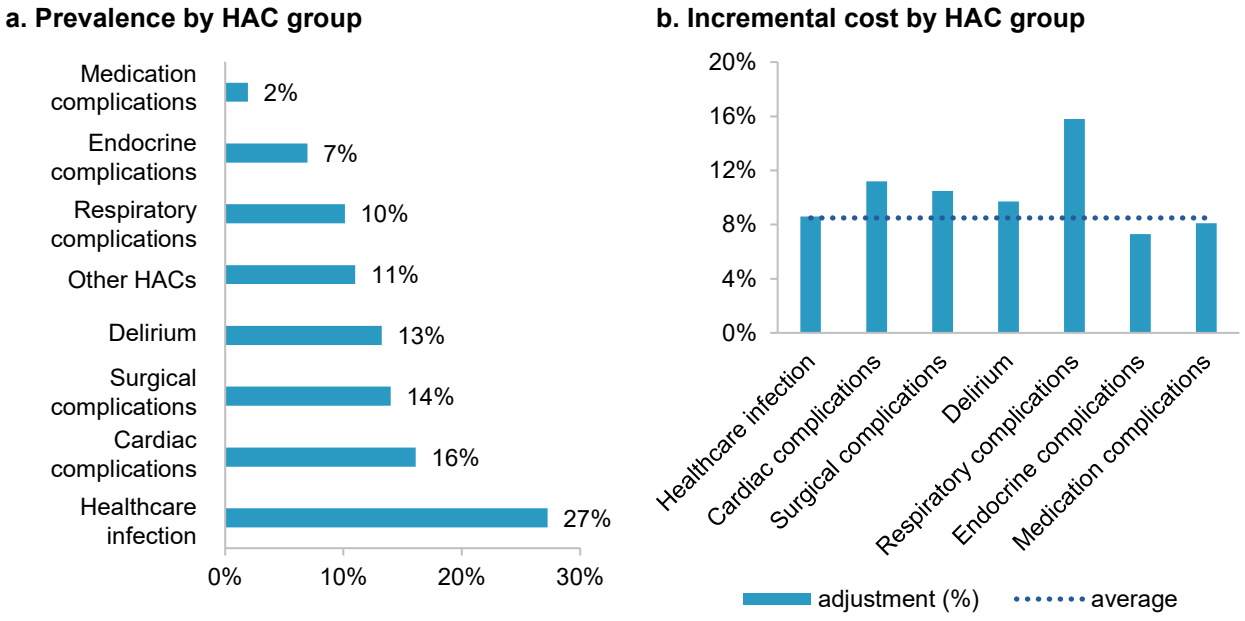
- **they were outliers**. Episodes were trimmed if they were considered outliers under IHACPA's risk-adjustment methodology. These included long-stay patients (patients with a length of stay greater than 200 days), patients aged over 95 years and episodes where the patient died (IHPA 2018, p. 12).
- **they came from hospitals with poor quality coding**. Episodes were trimmed if they occurred in hospitals with high data quality risks. These included if the hospital had fewer than 100 episodes annually, if less than 1% of episodes were flagged with a condition arising during hospital, or if more than 10% of their episodes could not report on the condition onset status (IHPA 2018, pp. 11–12).

This study focuses on seven HAC categories

As the NHDH does not contain a HAC identifier, we created a method of identifying when HACs occurred in an episode. We did this by mapping hundreds of diagnosis codes[11] to Condition Onset Flags (COFs) that indicated whether a condition arose during the hospital episode (as opposed to being pre-existing or the reason for admission). Conditions that occurred during the hospital episode and met IHACPA's criteria were flagged as HACs.

The HAC identification process is complex and data intensive, requiring unique diagnosis-to-COF mappings for each HAC and needing to reflect changing diagnosis codes that changed over time. To balance complexity with analytical power, we chose to focus on the seven most prevalent and expensive HACs, accounting for over 90% of all HAC prevalence and costs (figure B.1).

Figure B.1 – In 2017-18, the largest share of total costs came from seven complication categories



Source: IHACPA (2026); IHPA (2017b, p. 2).

[11] Codes were from the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

B.2 Methodology

Analytical approach: difference-in-differences methodology

We used a difference-in-differences (DiD) framework to determine the effect of the funding adjustment, given the asymmetrical implementation serves as a natural experiment (box B.1).

Our pre-policy period was July 2016 to June 2018. To avoid the confounding effects of the COVID-19 pandemic, our post-policy period was limited to July 2018 to February 2020.

As the funding adjustment was implemented nationally, identifying an appropriate control group (where the policy was absent) to compare against a treatment group (where the funding adjustment was applied) was a challenge. The variation in whether states and territories decided to pass down the funding adjustment to their local hospital networks (LHNs) (or absorb the impact within their health budgets) was used to divide states and territories into these groups.

The treatment group contained the three states and territories that applied the funding adjustment before February 2020 and were included in the NHDH. The control group contained the two states and territories that did not pass on the funding adjustment before February 2020 and were included in the NHDH. One jurisdiction was excluded because it implemented a HAC adjustment policy with different features during the pre-policy period.

Box B.1 – How does a difference-in-differences method identify a causal effect?

Difference-in-differences is a statistical technique that makes use of longitudinal data to estimate the effect of a specific intervention or treatment (such as a passage of law or enactment of policy). The technique compares changes in the variable of interest among a population that is subject to the treatment (treatment group) and a population that is not (control group), controlling for other independent characteristics and factors.

To estimate a causal effect using a difference-in-differences method, several assumptions must be satisfied. Most notably, this approach requires that in the absence of the treatment, the difference between the treatment and control group is constant over time (parallel trends assumption). However, additional control variables can be added to the specification to account for time-varying factors that might affect the difference between the two groups over time. Other assumptions are that the treatment is unrelated to outcomes before the treatment, and that the composition of treatment and control groups is stable over time.

Source: Angrist and Pischke (2009, pp. 169–182), PC (2020, p. 338).

DiD model specifications

The latent dependent variable in this analysis was the probability of a HAC occurring in admitted acute episode i at hospital j in month-year t. First, a binary variable was created where each observation was assigned a value of 1 if at least one HAC occurred, otherwise it was assigned a value of 0. Then a logit regression was used to estimate the DiD model. Logit regressions are a form of generalised linear model used to predict the probability of a binary outcome. This approach was selected to address the possibility of dependence between multiple HACs. That is, the presence of one HAC in an episode may increase the likelihood of subsequent

HACs but the structure of the data does not allow analysts to identify which HAC occurred first (IHPA 2018, p. 17). Therefore, we only estimate the probability of one (or several) HACs occurring.

We estimated the effect of the funding adjustment on the probability of a HAC occurring, taking into consideration patient risk factors and applying both hospital and month fixed effects (table B.1). The standard errors were clustered by hospital and month year to address within cluster correlation.[12]

Equation (1) is the primary model.

$$Log\ Odds\ (HAC_{ijt} = 1) = \beta_0 + \beta_1 treated_{ij} + \beta_2 post_t + \beta_3 (treated_{ij} \times post_t) + \sum_{n=1}^{k} \theta_k X_{ijt} + \gamma_j + \lambda_t + \varepsilon_{ijt} \quad (1)$$

To estimate the effect of the funding adjustment on the probability of a specific HAC category occurring we replaced the dependent variable in equation (1) with the probability of HAC(a) occurring in admitted acute episode i at hospital j in month/year t, where (a) refers to a singular HAC category (equation (1.1)).

$$Log\ Odds(HAC(a)_{ijt} = 1) = \beta_0 + \beta_1 treated_{ij} + \beta_2 post_t + \beta_3 (treated_{ij} \times post_t) + \sum_{n=1}^{k} \theta_k X_{ijt} + \gamma_j + \lambda_t + \varepsilon_{ijt} \quad (1.1)$$

Table B.1 – Variables in the DiD model

Variable	Description
HAC_{ijt}	Binary dependent variable (= 1 if at least one HAC occurred in episode i in month/year t, 0 otherwise)
$treated_{ij}$	Dummy variable (= 1 if episode i happened in a treated state or territory, 0 otherwise)
$post_t$	Dummy variable (= 1 if episode i happened after the policy is implemented, 0 otherwise)
$treated_{ij} \times post_t$	Interaction variable (= 1 if episode i in hospital j is in a treated state or territory and month/year t is in the post-policy period, 0 otherwise)
X_{ijt}	Patient risk factors
γ_i	Dummy variables (hospital fixed effects)
λ_t	Dummy variables (month/year fixed effects)
ε_{ijt}	Random disturbance term

The intercept and coefficients for $treated_{ij}$ and $post_t$ are removed when a DiD regression includes fixed effects.

The coefficient of interest, β_3, measures the effect of the funding adjustment on the treated group. The value is expressed in log-odds. To make interpreting this result more intuitive, this is converted to an odds ratio by taking the exponential i.e., e^{β_3}. The odds ratio for β_3 tells us how the odds of a HAC occurring change for the treated group because of the funding adjustment. It is a relative term, which means it provides the direction and magnitude of the funding adjustment's impact, relative to a baseline (or starting) probability. To determine the absolute (percentage point) change, we refer to the baseline which, in this case, is the pre-policy rate of episodes with at least one HAC in the treated group. Further, the odds of an event occurring is distinct from its probability. These two measures express similar concepts, but they operate on different scales. A simple formula allows us to convert one to the other (box B.2).

[12] The panel nature of data means that episodes at the same hospital are observed over time. It is likely that these observations are correlated with each other more so than episodes drawn randomly from the population. Similarly, episodes occurring over same period are likely to be correlated with each other more so than observations at random time periods. Failing to consider this within-cluster correlation can result in a type I error.

Box B.2 – The difference between probability, odds and odds ratio

Probability refers to the likelihood that an event will occur. It ranges from 0 to 100%.

Odds refer to the proportion between the probability an event will occur and the probability that it will not occur. It cannot go below zero but has no upper bound.

$$\text{Odds of experiencing a HAC} = \frac{\text{probability a HAC occurs}}{1 - \text{probability a HAC occurs}}$$

Odds ratio refers to proportion between the odds that an event will occur given treatment and odds that an event will occur without treatment. Its range is unlimited in both directions.

$$\text{Odds ratio of a HAC } \left(e^{\beta_3}\right) = \frac{\text{odds of experiencing a HAC with the funding adjustment}}{\text{odds of experiencing a HAC without the funding adjustment}}$$

Source: Dodge (2008).

We estimated percentage point (absolute) and percentage (relative) change due to the funding adjustment. First, we calculated a baseline probability range (box B.3), then converted it to odds and multiplied it by the odds ratio representing the impact of the funding adjustment (equation (2)).[13] This gives us the odds conditional on the funding adjustment. The odds can then be returned to a probability estimate conditional on the funding adjustment (equation (3)):

$$\text{odds given the funding adjustment} = \frac{\text{baseline probability}}{(1 - \text{ baseline probability})} \times e^{\beta_3} \quad (2)$$

$$\text{probability given the funding adjustment} = \frac{\text{odds given the funding adjustment}}{(1 + \text{odds given the funding adjustment})} \quad (3)$$

The difference between the baseline probability and the probability given the funding adjustment is the percentage point change attributable to the funding adjustment (equation (4)):

$$\text{percentage change} = \left(\frac{\text{probability given the funding adjustment}}{\text{baseline probability}}\right) - 1 \quad (4)$$

[13] This step is necessary because the odds ratio must be multiplied by the odds estimate not the probability estimate.

Box B.3 – Two estimates of the baseline probability of a HAC occurring

We took two estimates of the baseline probability of a HAC occurring as the upper and lower bounds of a baseline probability range.

Estimate 1: IHACPA reported rate of episodes with at least one HAC in 2017-18.

Using the number of episodes with at least one HAC reported by IHACPA for the seven HAC categories studied, and the three states and territories in our treatment group we estimated that the baseline probability of a HAC occurring in 2017-18 (the year prior to the implementation of the funding adjustment) was 3.08% (IHACPA 2026).

Estimate 2: PC estimate of the rate of episodes with at least one HAC in the pre-policy period.

Using the number of episodes with at least one HAC across the states and territories in the treated group, for the seven HAC categories studied we estimated that the baseline probability of a HAC occurring between July 2016 and 2018 was 2.31% (table B.3).

Accounting for the role of patient risk factors …

Patient characteristics play a significant role in the risk of a HAC occurring. Patient risk factors will vary by patient mix, creating differences over time and between hospitals. These will not be accounted for in a standard DiD regression and are therefore important to identify and control for in the analysis.

IHACPA investigated a range of potential patient risk factors using statistical analysis and clinical review to determine the significance and relevance of each factor. Based on this process, a final set of risk factors for complication categories 1–14 was determined (IHPA 2018, p. 19). We included the full set of patient risk factors in our analysis:

- Patient age: ranging from 0 to 95 years old
- Patient gender[14]
- Diagnosis related group (DRG) type: categorises all episodes into either medical or intervention
- Major diagnostic category: 24 groups identifying the types of condition
- Charlson score: an index of comorbidity – ranging from 0 to 16 – that considers the number and severity of existing health conditions on the probability of mortality within one year of hospitalisation
- Intensive care unit (ICU) status: whether the patient entered the ICU during the episode
- Admission status: whether admission occurred on an emergency, rather than elective, basis
- Transfer status: whether the patient was transferred from another hospital.

… and variation between hospitals and over time

There are also likely to be unobservable factors that can affect HAC rates. Such factors could be constant across hospitals but vary over time (such as the introduction of a nation-wide public health campaign), or constant over time but vary across hospitals (such as the demographic characteristics of patients at each

[14] Patient gender was not a relevant characteristic for the following complication categories: surgical complications requiring unplanned return to theatre, endocrine complications and cardiac complications.

hospital). As the same hospital establishments were studied over the same period, we controlled for these differences by including both time[15] and hospital fixed effects.

B.3 Results

Summary statistics

Descriptive statistics show the variation in HAC rates between the treatment and control groups and by HAC categories in the pre- and post-policy periods (table B.2).

Table B.2 – Summary statistics for treatment and control groups before and after the funding adjustment

	Pre-treatment	Post-treatment	Pre-control	Post-control
Number of hospitals	188	218	110	106
Number of episodes	2,211,540	1,951,791	1,874,218	1,606,085
Total episodes with a HAC	57,090	32,059	54,123	37,677
Healthcare-associated infection	25,302	14,722	24,216	17,482
Surgical complications	7,358	2,222	6,745	2,006
Respiratory complications	5,214	2,531	3,317	2,083
Medication complications	2,762	1,677	2,336	1,122
Delirium	12,019	7,160	11,430	8,926
Endocrine complications	6,421	3,727	7,173	5,477
Cardiac complications	12,827	7,040	12,303	9,131

Source: PC estimates based on AIHW NHDH data.

Logit regression results

The effect of the funding adjustment was tested using equation (1) and returned a 0.299 log-odds decrease in the probability of a HAC occurring in treated states and territories (table B.3). The coefficient of interest in equation was statistically significant ($p < 0.001$), with 95% confidence intervals of −0.287 and −0.131. All patient risk factors were statistically significant.

[15] Time fixed effects are calculated at the month level.

Table B.3 – HACs rates fell more in the treatment group compared to control group

Results for equation 1

	Coefficient	Standard error	95% CI
Effect of the funding adjustment	-0.299***	0.049	[-0.395 to -0.202]
Age	0.031***	0.001	[0.029 to 0.033]
Female (relative to male)	0.031***	0.009	[0.013 to 0.049]
ICU status	2.130***	0.057	[2.018 to 2.241]
Emergency admission	0.603***	0.040	[0.526 to 0.681]
Transfer status	0.448***	0.044	[0.361 to 0.534]
Charlson score	0.268***	0.006	[0.256 to 0.28]
Intervention (relative to medical)	1.144***	0.038	[1.028 to 1.176]
MDC (relative to 00 Pre MDC)			
01 Nervous system	-1.754***	0.121	[-1.992 to -1.517]
02 Eye diseases and disorders	-3. 835***	0.152	[-4.133 to -3.537]
03 Ear, nose, mouth and throat	-2.693***	0.114	[-2.916 to -2.47]
04 Respiratory system	-1.924***	0.104	[-2.127 to -1.72]
05 Circulatory system	-1.839***	0.116	[-2.066 to -1.612]
06 Digestive system	-1.915***	0.117	[-2.151 to -1.694]
07 Hepatobiliary system and pancreas	-1.689***	0.106	[-1.897 to -1.481]
08 Musculoskeletal system	-1.333***	0.119	[-1.566 to -1.1]
09 Skin, subcutaneous tissue and breast	-2.265***	0.123	[-2.505 to -2.025]
10 Endocrine, nutritional and metabolic diseases	-1.652***	0.112	[-1.871 to -1.434]
11 Kidney and urinary tract	-2.042***	0.120	[-2.278 to -1.807]
12 Male reproductive system	-2.450***	0.125	[-2.696 to -2.205]
13 Female reproductive system	-2.264***	0.141	[-2.541 to -1.987]
14 Pregnancy, childbirth and puerperium	-0.579***	0.151	[-0.875 to -0.283]
15 Newborns and other neonates	1.665***	0.405	[0.87 to 2.459]
16 Blood, blood forming organs and immunology	-2.209***	0.113	[-2.431 to -1.987]
17 Neoplastic disorders	-1.305***	0.148	[-1.595 to -1.015]
18 Infectious and parasitic diseases	-1.437***	0.090	[-1.613 to -1.26]
19 Mental, behavioural and neurodevelopmental	-7.634***	0.111	[-7.852 to -7.416]
21 Injury, poison and toxic effect drugs	-1.803***	0.116	[-2.03 to -1.575]
22 Burns	-1.125***	0.146	[-1.411 to -0.838]
23 Factors influencing health status	-2.624***	0.139	[-2.898 to -2.351]

Number of observations (n) = 7,621,032. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Source: PC estimates based on AIHW NHDH data.

Taking the results from our primary model, and using equations (2) to (5) and the baseline probabilities reported in box B.3, we estimated that the probability of a HAC occurring in the treatment group – across the seven HAC categories studied – associated with the introduction of the funding adjustment fell by 25.38%, from 2.31% to 1.73% (or 0.59 percentage points) using the lower bound estimate of baseline probability. Using the upper bound estimate, the associated percentage reduction becomes 25.23%, which is equivalent to a drop from 3.08% to 2.31% (or 0.78 percentage points).

Estimating the effect of the funding adjustment on each HAC category

We ran seven separate logit regressions using equation (1.1) to understand the effect of the funding adjustment on each HAC category, and therefore, identify the HAC categories driving the results in table B.4.

Of the seven HAC categories included in the study, four showed a statistically significant decline associated with the introduction of the funding adjustment. These were healthcare-associated infections, respiratory complications, delirium and cardiac complications. However, as discussed above, the parallel trends assumption is not met when episodes with delirium formed the dependent variable. This means we cannot infer that the decline in patients experiencing delirium in hospital was associated with the policy, so these results are excluded.

The full results for healthcare-associated infections complications, respiratory and cardiac complications are provided in table B.5. Understanding why these three HAC categories showed a significant response to the funding adjustment requires further research beyond the scope of this report, particularly regarding the actions LHNs and hospitals took in response to the funding adjustment.

The probability of healthcare-associated infections occurring in the treatment group due to the funding adjustment fell by 16%. Using the upper bound baseline probability this is a reduction from 1.05% to 0.88% (or 0.17 percentage points). Taking the lower bound estimate, this is a reduction from 0.86% to 0.72% (or 0.14 percentage points).

The probability of respiratory complications occurring in the treated group due to the funding adjustment fell by 23%. Using the upper bound baseline probability this is a reduction from 0.29% to 0.22% (or 0.07 percentage points). Taking the lower bound estimate, this is a reduction from 0.17% to 0.13% (or 0.04 percentage points).

The probability of cardiac complications occurring in the treated group due to the funding adjustment fell by 28%. Using the upper bound baseline probability this is a reduction from 0.51% to 0.37% (or 0.14 percentage points). Taking the lower bound estimate, this is a reduction from 0.43% to 0.31% (or 0.12 percentage points).

Table B.4 – Results for equation 1.1 with HAC-specific variable as dependant variable

	HAC3	HAC4	HAC6	HAC10	HAC11	HAC13	HAC14
Treatment effect	**-0.285*** **	**-0.039**	**-0.311*** **	**0.19***	**-0.342*** **	**-0.318** **	**-0.371*** **
Age	0.026***	0.013***	0.029***	0.027***	0.061***	0.012***	0.042***
Female (relative to male)	0.17***	-0.076**	-0.241***	0.053	-0.134***	0.021	-0.059***
ICU status	1.952***	1.835***	2.146***	1.73***	1.979***	1.364***	2.525***
Emergency admission	0.567***	0.023	0.603***	0.667***	0.86***	0.755***	0.42***
Transfer status	0.428***	0.297***	0.188***	0.332***	0.405***	0.432***	0.265***
Charlson score	0.27***	0.176***	0.203***	0.751***	0.199***	0.374***	0.156***

	HAC3	HAC4	HAC6	HAC10	HAC11	HAC13	HAC14
Intervention DRG	0.957***	1.971***	1.076***	0.234***	1.315***	0.642***	1.193***
MDC (relative to 00 Pre MDC)							
01 Nervous	-1.651***	-1.611***	-0.738***	-0.772***	-1.416***	-1.521***	-1.352***
02 Eye diseases	-4.286***	-2.98***	-4.053***	-2.747***	-3.614***	-2.563***	-2.931***
03 ENMT	-2.979***	-2.176***	-1.835***	-1.761***	-2.381***	-2.113***	-1.882***
04 Respiratory	-2.241***	-1.512***	-1.495***	-0.641***	-1.744***	-1.405***	-0.784***
05 Circulatory	-2.099***	-0.912***	-2.131***	-0.634***	-1.979***	-1.393***	-0.496***
06 Digestive system	-1.821***	-0.97***	-1.204***	-1.273***	-1.988***	-1.186***	-1.202***
07 Hepatobiliary	-1.54***	-1.433***	-1.591***	-0.93***	-1.702***	-0.989***	-0.96***
08 Musculoskeletal	-1.262***	-0.893***	-1.227***	-0.435***	-0.75***	-1.305***	-0.86***
09 Skin	-2.27***	-1.404***	-2.141***	-1.065***	-2.191***	-1.563***	-1.483***
10 Endocrine	-1.932***	-1.272***	-1.73***	-1.266***	-1.739***	-0.077	-1.09***
11 Kidney	-1.912***	-1.544***	-2.169***	-1.201***	-2.028***	-1.321***	-1.239***
12 Male reproductive	-2.327***	-1.959***	-2.75***	-1.449***	-2.096***	-2.257***	-1.626***
13 Female reproductive	-2.241***	-1.59***	-2.001***	-1.413***	-2.229***	-2.045***	-1.421***
14 Pregnancy, and childbirth	-0.397*	-0.296*	-1.603***	-1.261***	-2.075***	-0.145	-0.545***
15 Newborns	2.11***	0.874***	-0.593**	-1.969*	-3.757***	-0.07	-0.181
16 Blood	-2.039***	-1.831***	-2.063***	-1.788***	-2.312***	-1.663***	-1.236***
17 Neoplastic	-0.845***	-1.027***	-1.67***	-1.175***	-1.48***	-0.865***	-0.681***
18 Infectious diseases	-1.749***	-0.736***	-1.491***	-0.502***	-1.209***	-0.799***	-0.326***
19 Mental and behavioural	-7.849***	-5.89***	-6.492***	-7.262***	-8.493***	-7.634***	-5.965***
21 Injury and poison	-1.58***	-1.084***	-1.037***	-1.195***	-1.372***	-1.399***	-1.389***
22 Burns	-0.73***	-0.63**	-0.99***	-0.6***	-0.517*	-0.805***	-1.189***
23 Other factors	-2.425***	-2.166***	-2.211***	-1.701***	-2.884***	-1.919***	-2.144***

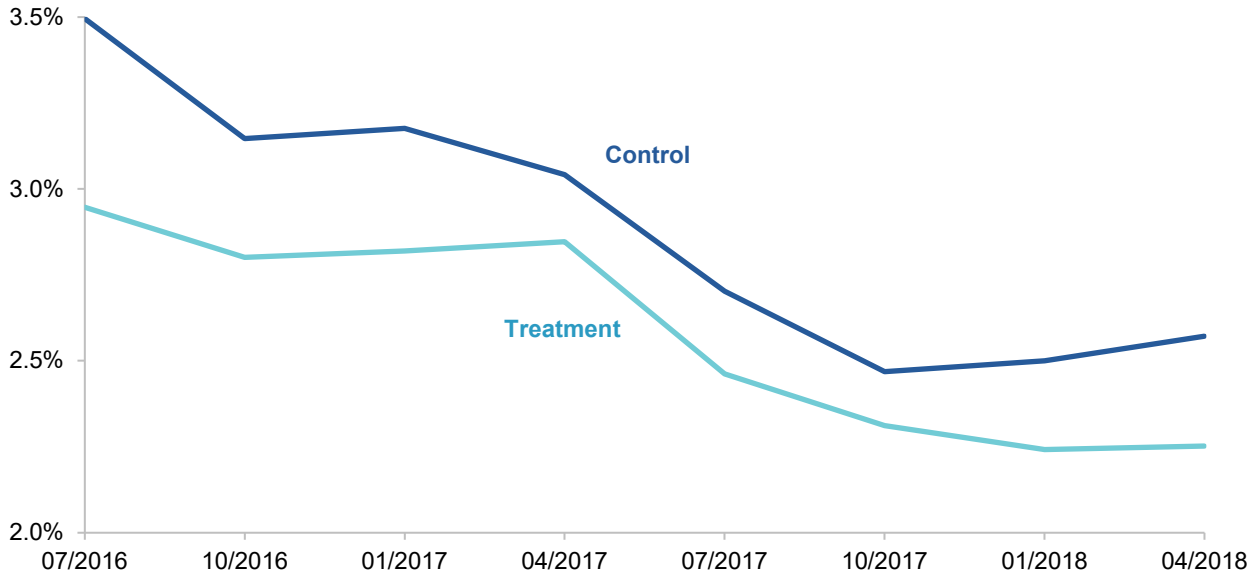
Number of observations (n) = 7,621,032. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Source: PC estimates based on AIHW NHDH data.

Parallel trends assumption

A crucial precondition for a DiD regression is that the parallel trends assumption is satisfied (box B.1). In other words, if the control group is an adequate counterfactual for the treatment group, then both groups should behave similarly prior to the funding adjustment. A visual examination of the rate of episodes with at least one HAC between the treatment and control groups before the funding adjustment was implemented shows that while the magnitude of HAC rates differed, the two groups followed similar trends (figure B.2).

Figure B.2 – Aggregate HAC rates followed similar trends before the funding adjustment



Source: AIHW NHDH data.

However, this was not always the case when the data was disaggregated across the HAC categories in our study. Second, parallel trends were also examined by testing for the presence of placebo effects (table B.6). To test for placebo effects, we applied two modifications to equations (1) and (1.1). The study was restricted to the pre-policy period (July 2016 to June 2018), and placebo interventions were tested at two different points in time. The placebo (1) intervention was set in January 2017 and the placebo (2) intervention in July 2017.

Since the parallel trends assumption relies on the treatment and control groups following similar patterns in the pre-policy period, there should be no statistically significant impact associated with the placebo interventions. When p-values are greater than 0.05, the coefficients for placebo (1) and placebo (2) are statistically insignificant. The primary model (equation 1) passed the placebo effects test, however equation (1.1) failed when the dependent variable was episodes with the HACs surgical complications, medication complications or delirium.

Finally, the placebo effects test returned insignificant results for all supplementary analyses reported in this appendix suggesting that results in the main DiD specification remain robust.

Policy-base sensitivity analysis

We conducted two further sensitivity tests, removing ICU and testing for pre-emptive effects.

First, we tested the model's sensitivity to ICU admissions. A hospital patient entering the ICU during an episode of care increases the risk of that patient experiencing a HAC. For this reason, it is one of the patient risk factors included in equation (1). However, it may also be the case that experiencing one or more HACs increases the risk of a patient entering ICU. This is known as reverse causality and its presence can obfuscate the direction of causality, invalidating our results. To test that the inclusion of episodes of care where patients entered ICU was not causing the statistically significant result in equation (1), a modified regression was run excluding any episodes of care where a patient spent time in ICU. Table B.6 shows the coefficient of interest remains statistically significant at the 0.1% level and the magnitude of the effect remains similar to the primary model.

In figure B.2, a decline in HAC rates begins before the implementation date of the funding adjustment. This decline is larger for the treatment group than the control group. A decline in HAC rates during the second half of 2017-18 suggests the presence of pre-emptive effects.

The funding adjustment was announced in April 2016. This announcement included that implementation would begin in 2018-19 and that the effect of the adjustment would be shadowed for the preceding year (DHAC 2016, pp. 17–18). In September 2016, states and territories were invited to consult on the proposed design of the adjustment. The final design was published in July 2017 (IHPA 2016, 2017b). Stakeholders reported the policy announcement and subsequent development made HACs more salient to state and territory health departments well before the funding adjustment was implemented. Efforts to manage and mitigate HACs likely led to this decline prior to July 2018.

To test this hypothesis, we ran three additional regressions with modified intervention dates. Pre-emptive test (1) set the intervention date in January 2018, pre-emptive test (2) set it in March 2018, and pre-emptive test (3) in May 2018. If the decline in HAC rates is due to changes made by jurisdictions in the treatment group in anticipation of the funding adjustment, there should be a statistically significant difference compared to the control group. Table B.6 shows for all three pre-emptive tests the effect of the funding adjustment remains statistically significant at the 0.1% level. Further, the size of the effect increased as the test intervention date approached the true intervention date, implying that the anticipatory changes in expectation of the funding adjustment increased over time.

Table B.6 – Sensitivity analyses bolstered the robustness of our results

Results for modified equation 1 with sensitivity analyses

	Excluding ICU	Pre-emptive test (1)	Pre-emptive test (2)	Pre-emptive test (3)
Effect of the funding adjustment	-0.301***	-0.230***	-0.251***	-0.279***
Age	0.034***	0.031***	0.031***	0.031***
Female (relative to male)	0.064***	0.031***	0.031***	0.031***
ICU status	N/A	2.129***	2.129***	2.130***
Emergency admission	0.635***	0.604***	0.604***	0.604***
Transfer status	1.151***	0.447***	0.447***	0.447***
Charlson score	0.300***	0.268***	0.268***	0.268***
Intervention (relative to medical)	1.391***	1.102***	1.102***	1.102***
MDC (relative to 00 Pre MDC)				
01 Nervous system	-2.479***	-1.753***	-1.754***	-1.754***
02 Eye diseases and disorders	-4.583***	-3.835***	-3.835***	-3.835***
03 Ear, nose, mouth and throat	-3.429***	-2.692***	-2.693***	-2.693***
04 Respiratory system	-2.607***	-1.922***	-1.923***	-1.923***
05 Circulatory system	-2.815***	-1.837***	-1.838***	-1.838***
06 Digestive system	-2.753***	-1.921***	-1.922***	-1.922***
07 Hepatobiliary system and pancreas	-2.444***	-1.688***	-1.688***	-1.689***
08 Musculoskeletal system and connective tissue	-2.088***	-1.331***	-1.332***	-1.332***

	Excluding ICU	Pre-emptive test (1)	Pre-emptive test (2)	Pre-emptive test (3)
09 Skin, subcutaneous tissue and breast	-3.063***	-2.263***	-2.264***	-2.264***
10 Endocrine, nutritional and metabolic diseases	-2.340***	-1.651***	-1.652***	-1.652***
11 Kidney and urinary tract	-2.845***	-2.041***	-2.042***	-2.042***
12 Male reproductive system	-3.193***	-2.449***	-2.450***	-2.450***
13 Female reproductive system	-2.987***	-2.263***	-2.263***	-2.264***
14 Pregnancy, childbirth and puerperium	-1.157***	-0.578***	-0.578***	-0.579***
15 Newborns and other neonates	1.770***	1.666***	1.665***	1.665***
16 Blood, blood forming organs and immunology	-2.939***	-2.208***	-2.209***	-2.209***
17 Neoplastic disorders	-2.086***	-1.304***	-1.304***	-1.304***
18 Infectious and parasitic diseases	-2.093***	-1.436***	-1.436***	-1.436***
19 Mental, behavioural and neurodevelopmental	-8.369***	-7.634***	-7.632***	-7.636***
21 Injury, poison and toxic effect drugs	-2.822***	-1.801***	-1.802***	-1.802***
22 Burns	-2.084***	-1.124***	-1.124***	-1.124***
23 Factors influencing health status	-3.584***	-2.623***	-2.624***	-2.624***

Number of observations (n) = 7,432,889; 7,621,032. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Source: PC estimates based on AIHW NHDH data.

References

ACSQHC (Australian Commission on Safety and Quality in Health Care) 2018, *Hospital-Acquired Complications Fact Sheets*, https://www.safetyandquality.gov.au/sites/default/files/migrated/Short-Hospital-Acquired-Complications-Factsheets-all-HACs.pdf (accessed 17 July 2024).

—— 2019, *Hospital-Acquired Complications (HACs) List - Specifications - Version 3.1*, https://www.safetyandquality.gov.au/publications-and-resources/resource-library/hospital-acquired-complications-hacs-list-specifications-version-31-12th-edn (accessed 12 December 2024).

—— 2024a, *Development of the hospital-acquired complications (HACs) list*, https://www.safetyandquality.gov.au/our-work/indicators/hospital-acquired-complications/development-of-the-hospital-acquired-complications-hacs-list (accessed 21 June 2024).

—— 2024b, *Hospital-acquired complications (HACs)*, Government, Australian Commission on Safety and Quality in Health Care.

AIHW (Australian Institute of Health and Welfare) 2022, 'COVID-19 disruptions led to lowest number of public elective surgeries performed in over a decade', 7 December, https://www.aihw.gov.au/news-media/media-releases/2021/december/covid-19-disruptions-led-to-lowest-number-of-publi (accessed 17 July 2024).

—— 2023a, '$48 billion health system response to COVID-19 in Australia', 29 November, https://www.aihw.gov.au/news-media/media-releases/2023/2023-november/48-billion-health-system-response-to-covid-19-in-australia (accessed 24 July 2024).

—— 2023b, 'Hospitalisation numbers continued to be affected by the pandemic in 2021–22', 31 May, https://www.aihw.gov.au/news-media/media-releases/2023/may/hospitalisation-numbers-continued-to-be-affected-b (accessed 13 November 2024).

—— 2024a, *National Health Data Hub*, https://www.aihw.gov.au/reports-data/nhdh (accessed 13 December 2024).

—— 2024b, *National Health Data Hub: Data and Data Items*, https://www.aihw.gov.au/reports-data/nhdh/data (accessed 12 December 2024).

AMA (Australian Medical Association) 2016, *AMA Submission on the IHPA Consultation Paper on the Pricing Framework for Australian Public Hospital Services 2017-18*, 31 October.

—— 2023, *What happens when we fund hospitals to perform*.

Angrist, JD and Pischke, J-S 2009, *Mostly harmless econometrics: an empiricist's companion*, Princeton University Press, Princeton, New Jersey Oxford.

Breadon, P and Baldwin, E 2025, *Smarter spending: Getting better care for every hospital dollar*, November, Grattan Institute.

Centres for Medicare & Medicaid Services 2024, *The Hospital Value-Based Purchasing Program*, https://www.cms.gov/medicare/quality/initiatives/hospital-quality-initiative/hospital-value-based-purchasing (accessed 1 July 2024).

DHAC (Department of Health and Aged Care) 2016, *2017 - 2020 Addendum to the National Health Reform Agreement*, April.

Dodge, Y 2008, 'Odds and Odds Ratio', *The Concise Encyclopedia of Statistics*, Springer New York, New York, NY, pp. 391–393, http://link.springer.com/10.1007/978-0-387-32833-1_292 (accessed 3 June 2025).

Duckett, S and Jorm, C 2018, *All complications should count: Using our data to make hospitals safer*, February, Grattan Institute, https://grattan.edu.au/wp-content/uploads/2018/02/897-All-complications-should-count.pdf (accessed 21 June 2024).

Hsu, HE, Wang, R, Broadwell, C, Horan, K, Jin, R, Rhee, C and Lee, GM 2020, 'Association between federal value-based incentive programs and health care–associated infection rates in safety-net and non–safety-net hospitals', American Medical Association, *JAMA network open*, vol. 3, no. 7, pp. e209700–e209700.

Huus, AM and Baardseng, TN 2019, 'Quality-based financing – the Norwegian experience', *OECD Journal on Budgeting*, vol. 19, no. 3.

Huxtable, R 2023, *Mid-Term review of the National Health Reform Agreement Addendum 2020-2025*.

IHACPA (Independent Health and Aged Care Pricing Authority) 2020, *COVID-19 Response: Costing and pricing guidelines*, 23 June, https://www.ihacpa.gov.au/sites/default/files/2022-02/COVID-19%20Response%20-%20Costing%20and%20pricing%20guidelines.pdf (accessed 13 November 2024).

—— 2023a, *National Benchmarking Portal Technical Specifications*, April, https://www.ihacpa.gov.au/sites/default/files/2023-05/National%20Benchmarking%20Portal%20-%20Technical%20Specifications%20April%202023.PDF (accessed 13 November 2024).

—— 2023b, *Pricing and funding for safety and quality: Hospital acquired complications*, January, https://www.ihacpa.gov.au/sites/default/files/2023-01/IHACPA_Hospital_Acquired_Complications_Fact_Sheet.PDF (accessed 17 July 2024).

—— 2023c, *Safety and quality*, Government, IHACPA, https://www.ihacpa.gov.au/health-care/pricing/safety-and-quality (accessed 24 April 2024).

—— 2024, *Mental health care*, https://www.ihacpa.gov.au/health-care/classification/mental-health-care (accessed 13 December 2024).

—— 2025, *National Efficient Price Determination*, https://www.ihacpa.gov.au/health-care/pricing/national-efficient-price-determination (accessed 16 May 2025).

—— 2026, *Hospital Acquired Complications*, National Benchmarking Portal, https://benchmarking.ihacpa.gov.au/extensions/ihpanbp/index.html?_gl=1*im2wc8*_ga*ODY2MDAyNzM3LjE3MDc4MDIzODE.*_ga_RT9SCTSN40*MTcxODc2NDExMi42OC4wLjE3MTg3NjQxMTIuMC4wLjA.#/periodic-insights/hac-trends (accessed 21 June 2024).

IHPA (Independent Health Pricing Authority) 2017a, *Pricing Framework for Australian Public Hospital Services 2018-19*, November, https://www.ihacpa.gov.au/sites/default/files/2022-02/Pricing%20Framework%20for%20Australian%20Public%20

Hospital%20Services%202018%E2%80%9319.pdf (accessed 17 July 2024).

—— 2016, *Consultation Paper on the Pricing Framework for Australian Public Hospital Services 2017-18*, September, https://www.ihacpa.gov.au/sites/default/files/2022-02/consultation_paper_on_the_pricing_framework_2017-18_0.pdf (accessed 16 May 2025).

—— 2017b, *Risk adjustment model for Hospital Acquired Complications – Technical Specifications*, July, https://www.ihacpa.gov.au/sites/default/files/2022-02/risk_adjustment_model_for_hospital_acquired_complications_-_technical_specifications_v1.0_july_2017.pdf (accessed 21 June 2024).

—— 2018, *Pricing and funding for safety and quality: Risk adjustment model for Hospital Acquired Complications*, March, https://www.ihacpa.gov.au/sites/default/files/2022-02/Pricing%20and%20funding%20for%20safety%20and%20quality%20-%20Risk%20adjustment%20model%20for%20Hospital%20Acquired%20Complications%202018-19.pdf (accessed 23 July 2022).

Kim, H, Mahmood, A, Hammarlund, N and Chang, CF 2022, 'Hospital value-based payment programs and disparity in the United States: A review of current evidence and future perspectives', *Frontiers in Public Health*.

KPMG 2013, *National set of high priority hospital complications - Final report*, 19 December, Australian Commission on Safety and Quality in Health Care, https://www.safetyandquality.gov.au/sites/default/files/migrated/National-set-of-high-priority-hospital-complications-Dec-2013.pdf (accessed 21 June 2024).

Kristensen, SR, Bech, M and Lauridsen, JT 2016, 'Who to pay for performance? The choice of organisational level for hospital performance incentives', Springer, *The European Journal of Health Economics*, vol. 17, pp. 435–442.

METEOR (Metadata Online Registry) 2023, *Admitted patient care NMDS 2024–25*, https://meteor.aihw.gov.au/content/775630 (accessed 12 December 2024).

Milstein, R and Schreyoegg, J 2016, 'Pay for performance in the inpatient sector: A review of 34 P4P programs in 14 OECD countries', *Health Policy*, vol. 120, no. 10, pp. 1125–1140.

NHFB (National Health Funding Body) 2023, *Funding types*, Public Hospital Funding, https://www.publichospitalfunding.gov.au/public-hospital-funding/funding-types#:~:text=A%20NWAU%20represents%20a%20measure,weighting%20it%20for%20clinical%20complexity (accessed 27 June 2024).

—— 2024, *Calculation of Commonwealth National Health Reform Funding 2020 - 2025*, September, https://www.publichospitalfunding.gov.au/sites/default/files/documents/2024-09/calculation_of_national_health_reform_funding_2020-2025.pdf (accessed 13 November 2024).

NHS England (National Health Service) 2025, *2025/26 NHS Payment Scheme – Annex C: Guidance on best practice tariffs*, https://www.england.nhs.uk/long-read/25-26-nhsps-annex-c-guidance-on-best-practice-tariffs/ (accessed 26 February 2026).

NT DoH (Northern Territory Department of Health) 2020, *Top End Health Service 2020-21 Service Delivery Agreement*.

OECD 2017, *Tackling wasteful spending in health*.

—— 2016, *Better Ways to Pay for Health Care*, OECD Health Policy Studies, OECD Publishing.

PC (Productivity Commission) 2020, *National Transport Regulatory Reform*, 7 April, https://www.pc.gov.au/inquiries/completed/transport/report/transport.pdf (accessed 14 November 2024).

Queensland Health 2022, *Queensland Health Service Agreement 2022/23 - 2024/25*.

Queensland Nurses' Union 2016, *Submission to the Independent Hospital Pricing Authority*, October.

SA Health 2023, *Central Adelaide Local Health Network 2023-24 Service Agreement*.

Scott, A, Liu, M and Yong, J 2018, 'Financial Incentives to Encourage Value-Based Health Care', *Medical Care Research and Review*, vol. 75, no. 1, pp. 3–32.

—— and Ouakrim, DA 2011, *Using financial incentives to improve the performance of hospital clinicians: a rapid review*, Sax Institute.

—— and Yong, J 2016, *Submission to the Independent Hospital Pricing Authority Discussion Paper on the Pricing Framework for Australian Public Hospital Services 2017-18*, Melbourne Institute of Applied Economic and Social Research.

Slawomirski, L, Hensher, M, Campbell, J and deGraaff, B 2024a, 'Pay-for-performance and patient safety in acute care: A systematic review', *Health Policy*, vol. 143, p. 105051.

——, ——, —— and —— 2024b, *Pay-for-performance: the case for trying something different*, Health Services Daily, https://www.sciencedirect.com/science/article/pii/S0168851024000617 (accessed 20 December 2024).

——, Otahal, P, Hensher, M, Campbell, J, Newell, S and de Graaff, B 2025, 'Financial penalty associated with a decline in hospital-acquired complications in Australia', *Health Policy*, vol. 161, p. 105416.

SCRGSP (Steering Committee for the Review of Government Service Provision) 2026, *E Health - Report on Government Services 2026*, https://www.pc.gov.au/ongoing/report-on-government-services/health/ (accessed 8 April 2026).

—— 2024, *Public Hospitals - Report on Government Services 2024*, https://www.pc.gov.au/ongoing/report-on-government-services/2024/health/public-hospitals (accessed 17 July 2024).

Webster, SBG, Neville, SE, Nobbs, J, Ching, J and Van Gool, K 2023, 'Incorporating Safety and Quality Measures Into Australia's Activity-Based Funding of Public Hospital Services', *Health Services Insights*, vol. 16, http://journals.sagepub.com/doi/10.1177/11786329231187891 (accessed 21 June 2024).