Independent Hospital Pricing Authority

Bundled pricing for maternity care

Final Report of IHPA and the Bundled Pricing Advisory Group

November 2017

IHPA

Final report – Bundled pricing for maternity care

Contents

Executive summary

IHPA believes that there are a number of chronic or long term care models that are amenable to a pricing approach spanning a longer time period than a single service. Following public consultation, IHPA declared its intention in the *Pricing Framework for Australian Public Hospital Services 2016-17* to investigate a bundled pricing approach for public hospital services.

Bundled pricing is where a single price is determined to cover a full package of care over a defined period of time, spanning multiple events and settings of care. The intention is for resources and funding to be easier for hospitals to manage, to allow financial flexibility to encourage improved models of care or greater standardisation of evidence-based care, and drive better service delivery in the long run which should lead to better patient outcomes and lower costs.

IHPA convened an advisory group in early 2016 comprised of jurisdictions, peak bodies, clinicians and consumer advocates to develop a bundled pricing approach for maternity care. This decision was based on the high volume of services and cost of maternity care in public hospitals, a clear start and end point to care, and the scope for improving service delivery.

The Bundled Pricing Advisory Group has considered a variety of issues over 2016 and 2017:

- how bundled payment schemes for maternity care operate overseas;
- data analysis on service delivery to maternity patients in public hospitals;
- scope of patients, services and stages of care for inclusion in a maternity bundle;
- how the bundled price would be calculated; and
- implementation considerations.

In mid-2017, the Advisory Group completed the development of a preferred bundled pricing model for maternity care. An overview of the proposed model was included in the *Consultation Paper on the Pricing Framework for Australian Public Hospital Services 2018-19*.

IHPA and the Advisory Group have identified significant barriers to implementation of the bundled pricing model which preclude its implementation at this time. The primary barrier to implementation is the absence of unique patient identifiers in IHPA's national data collections which it is hoped will be addressed by Australian governments in the future.

IHPA has prepared a final report which summarises the work by the Advisory Group and to act as a guidebook to inform future policy decision making regarding the introduction of bundled pricing approaches in the Australian public hospital funding context.

IHPA would like to thank the jurisdictional, clinical and other stakeholder members of the Advisory Group for contributing their time, skills, experiences and expertise to develop a preferred bundled pricing model for maternity care.

1. Policy rationale for bundled pricing

This chapter outlines the national activity based funding system, the role of the Independent Hospital Pricing Authority, the current pricing approach and value-based pricing alternatives.

1.1 Overview

IHPA prices most public hospital services on per episode basis which is based on the average cost of care. This approach has led to efficiencies in the delivery of public hospital services. However, IHPA believes that there are some long term and chronic conditions which may benefit from a price which covers service delivery over a longer time period than a single service. This approach would give hospital managers the financial flexibility to consider alternative models of care. IHPA has therefore investigated the feasibility of an alternative 'bundled pricing' approach.

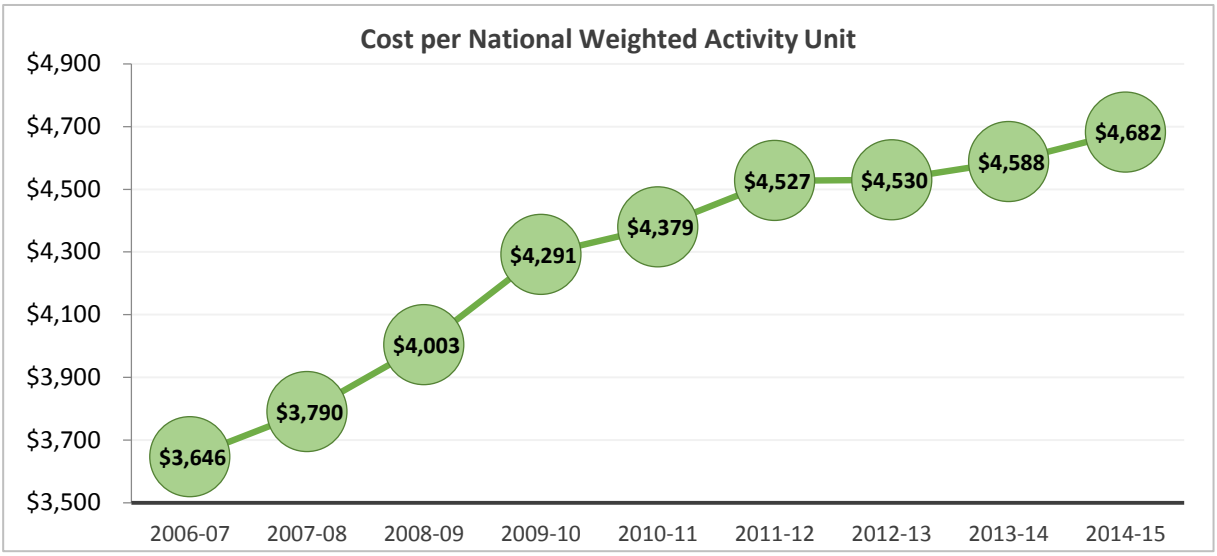
1.2 Background on the national activity based funding system

The Independent Hospital Pricing Authority (IHPA) was established under the *National Health Reform Act 2011* (the Act) and the *National Health Reform Agreement* (the Agreement) to oversee the implementation of a national activity based funding (ABF) system for Australian public hospitals. IHPA's functions include determining the National Efficient Price (NEP) and National Efficient Cost (NEC) which outlines the price paid for care in ABF and block funded public hospitals, as well as developing the underlying classification and coding systems, counting rules and data collection requirements to support implementation.

The national ABF system promotes improved efficiency in the delivery of public hospital services by paying an 'efficient price' for each service delivered. This pricing approach replaced the previous use of block grants. IHPA groups patient care which is clinically similar and resource homogenous into 'classes' which receive a single price based on the average cost of an episode of care for each class. This approach sends a price signal for hospital managers to review their cost structures and identify opportunities to provide services more efficiently (a concept called 'technical efficiency'). National ABF also promotes access to public hospital services by tying funding to the volume and type of public hospital services provided (casemix). The building blocks of national ABF provide transparency through nationally consistent and comparable data sets for public hospital services which gives system managers better insight into service delivery.

Since the introduction of IHPA's pricing approach based on the average cost of discrete episodes of care from 2011-12, the annual growth in the cost per public hospital service (adjusted by casemix) has been reduced as shown at Figure 1. To the extent that it has made resources more productive, ABF has provided an opportunity to treat more patients and increase community access to care.

Figure 1: Cost per National Weighted Activity Unit



While ABF provides a price signal for public hospitals to provide services more efficiently (technical efficiency), it does not consider whether the provision of that service is the most effective way to care for the patient (allocative efficiency). It could also provide a financial incentive for hospitals to prioritise service volume over patient outcomes.

Under the Act and the Agreement, IHPA must have regard to relevant expertise and best-practice within Australia and internationally in performing its functions. To this end, IHPA has investigated alternative approaches to pricing public hospital services which are used elsewhere and could support the objectives of improving the efficiency, effectiveness and financial sustainability of the public hospital system. Some alternative models could be accommodated under an ABF approach, while others would require larger changes to funding arrangements.

1.3 Bundled payments

A bundled payment is an approach whereby a single payment is provided to cover a full package of care over a defined period of time, spanning multiple episodes and settings of care.[i] Payment is not tied to volume or type of services delivered. This approach differs from traditional fee-for-service or ABF approaches whereby providers are paid separately for each service or episode of care. Bundled payments may take into consideration quality and outcomes, provide different levels of flexibility regarding how, where and what volume of services are delivered and introduce varying levels of financial risk to spur a change in how care is delivered by providers.

Not all bundled payment schemes involve the creation of an entirely new payment system. For example, France, Germany, the Netherlands and Sweden have modified their prices for admitted care to account for readmissions. In Germany, since 2004 hospitals have only received a single episode-based payment that includes costs for hospital readmission for the same reason within certain time limits (usually within thirty days).[ii] Similarly in Sweden, hospitals in Stockholm County do not receive a second payment for hip or knee replacement patients where they are readmitted for complications from surgery within two years from discharge.[iii]

While bundled payments have been piloted for decades, full implementation is relatively new. Policy advocates suggest that the evidence indicates bundled payments lead to increased coordination of care, enhanced quality of care, and less fragmentation across the health system which improves patient health outcomes and lowers costs for payers and providers.[iv]

The literature also notes drawbacks and risks associated with bundled payments in health care. These include potentially limiting access to care for patients whose costs exceed the bundled payment or to maximise the financial benefit to the provider, the administrative burden of new data reporting requirements to track care delivered to patients, and the potential for significant financial losses to providers where there is insufficient adjustment for patient characteristics.[v] Robust risk adjustment to account for differences in patient complexity, monitoring patient outcomes and stop-loss financial mechanisms have been proposed to mitigate these issues.[vi]

Evaluation of bundled payment schemes is limited. For example, the US Agency for Healthcare Research and Quality reviewed studies between 1985 and 2011 and found that they were mostly observational and descriptive. The report concluded that there was weak but consistent evidence that bundled payments have been effective in cost containment without major effects on quality.[vii] The Organisation for Economic Cooperation and Development (OECD) reviewed various bundled payment schemes in Europe covering maternity care, chronic disease management and elective surgeries. While they differed in their design, the OECD observed improvements in the quality of care or the same quality maintained at a lower level of provision and that it had a downward effect on costs, with the exception of diabetes care in the Netherlands.[viii] Many bundled payment schemes have been introduced gradually, with the initial stages voluntary. This has had a confounding influence on evaluations as participants generally perform better than the national average. This may either mitigate or exaggerate the impact of bundled payments.

Bundled payment schemes led by the US Centers for Medicare & Medicaid Services

In 2010, the United States Congress passed the *Patient Protection and Affordable Care Act* which required the Centers for Medicare & Medicaid Services to trial new payment initiatives to contain rising health costs and redirect expenditure towards patient outcomes. 'Bundled Payments for Care Improvement' links Medicare payments to the effective management of a population or episode of care and includes opportunities for shared savings or two-sided risk. Bundled payments are being trialled with providers for 48 different conditions or treatments.

'Fee-for-service' reimbursement is aggregated into payment for broader bundles of care, such as both the admission and community rehabilitation, to promote integration and reduce costs.

Under these models, Medicare continues to make fee-for-service payments but these are later reconciled against a benchmark amount which includes a discount (typically 3%). Participants must repay Medicare payments exceeding the benchmark. Trials have recently moved from the initial 'risk-free' period to now be 'risk-bearing', whereby providers will now face a financial loss if their costs are above the bundled payment amount.

Quantitative reviews of the scheme were completed in February 2015[ix] and August 2016.[x] The results are promising, with an increase in the share of patients discharged to home health care, a relative decline in the inpatient hospital length of stay and a slight decrease in the cost to Medicare. However, it is difficult to draw conclusions about the impact of the scheme at this time due to the short time-frames for the study and small sample sizes.[xi]

Bundled pricing in the Australian public hospital funding context

IHPA has identified a number of chronic and long term care conditions that are amenable to a pricing approach spanning a longer time period than a single service. In the 2015-16 and 2016-17 Consultation Papers on the *Pricing Framework for Australian Public Hospital Services* (Pricing Framework Consultation Paper), IHPA publicly canvassed support for the introduction of bundled pricing for some public hospital services. In this context, a bundled pricing approach would

involve a single price per patient which reflects the average cost of treating a condition across multiple services, episodes and settings of care. IHPA canvassed three care models which were considered potentially amenable to bundled pricing:

- Uncomplicated maternity care – for example, a single payment for non-admitted antenatal and postnatal non-admitted services and admission for birth;
- Hip and knee replacements – for example, a single payment for non-admitted, admitted, and sub-acute services; and
- Stroke – for example, bundle ABF payments across care types and weighted for complexity.

IHPA received strong stakeholder support for further investigating a bundled pricing approach in future years, in particular for maternity care. The approach would build on implementation of a bundled price for home delivered chronic disease services in NEP15 which reflects one month of service delivery and had the objective of reducing the bureaucratic overhead of regular reporting.

IHPA considers that a bundled pricing approach could support principles outlined in its *Pricing Guidelines* including price equivalence across settings, fostering clinical innovation and improving efficiency and timely/quality care. While the configuration of health services is the responsibility of states and territories as system managers, a bundled price can broaden the possibilities for care redesign as hospital managers would no longer be financially deterred by a pricing approach based around traditional care settings and tied to the volume of services. A bundled price could also help drive greater standardisation along evidence-based pathways for the delivery of antenatal and postnatal care. It would also simplify payments for public hospital services in a way which is easily understood.

2. Why choose maternity care?

This chapter outlines the rationale for introducing a bundled pricing approach for maternity care, the establishment of an advisory group to lead this work and bundled payment schemes overseas.

2.1 Consideration of a new pricing approach for maternity services

IHPA received stakeholder support in response to the Pricing Framework Consultation Papers 2016-17 and 2017-18 for investigating a bundled pricing approach for maternity care. IHPA and stakeholders considered that maternity care was suitable for bundled pricing for a variety of reasons including:

- It was believed to have a relatively predictable care pathway, with clear start (ten weeks gestation) and end points (six weeks postpartum) to the pathway which should allow for identification of clinically warranted and unwarranted variation in care.
- Maternity care involves a high volume of patients and services and there appeared to be variation in outcomes and costs, meaning that small improvements in service delivery could result in significant efficiencies to the health system.
- Some clinical stakeholders advised that it could potentially support greater use of new models of care, such as midwife-centred continuity of care models which are associated with higher patient satisfaction and significant reductions in the intervention rate.[xii]
- Bundled payment schemes for maternity care were identified in operation overseas which could provide a model for implementation in the Australian public hospital funding context.

IHPA notes that bundled pricing for maternity care could drive a change in how and what services are delivered, with the impact dependent on the scope of patients, stages of care and services in the bundle, as well as the degree of risk adjustment and the pricing approach. For example, a single price across the antenatal and birth stages of care could send a price signal which supports a greater focus by public hospitals on preventative care during the antenatal period to reduce the complexity of the birth. Alternatively, a price per stage of care could drive greater standardisation in antenatal and postnatal service delivery.

2.2 Bundled Pricing Advisory Group

In response to positive stakeholder feedback, IHPA advised in the Pricing Framework 2016-17 that it would convene a Bundled Pricing Advisory Group comprised of jurisdictions, clinicians and other key stakeholders to develop a bundled pricing approach for use in future years. The diverse skill set, experiences and perspectives of different stakeholders on the Advisory Group ensured that the development of a model would appropriately consider design and implementation issues.

The focus of the Advisory Group was to provide informed feedback to IHPA in its development of a bundled pricing model for maternity care for possible future implementation. The terms of reference for the Advisory Group included providing advice to IHPA on:

- the merits of introducing the approach, informed by local and international schemes;

- the technical requirements for introducing a bundled pricing approach, including the patient cohort and the care pathway of service delivery;
- any implementation issues to be addressed prior to implementation, particularly data collection considerations;
- the preferred bundled pricing model for maternity care; and
- a toolkit to guide IHPA's consideration of future bundled pricing approaches for other public hospital services.

The Advisory Group included participation from key government, clinical and other stakeholders in the public hospital maternity sector, including representatives from the:

- Australian College of Midwives;
- Clinical Advisory Committee;
- Commonwealth Government and all state and territory health departments;
- Maternity Choices Australia;
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists; and
- Women's Healthcare Australasia.

Feedback from peak bodies, clinicians and the public in response to the bundled pricing consultation questions in the Pricing Framework Consultation Papers 2017-18 and 2018-19 were also considered by the Advisory Group and IHPA in developing a bundled pricing model.

2.3 Payment approaches for maternity care overseas

Section 131 of the Act and Clause B9 of the Agreement require IHPA to draw on relevant expertise and best practice within Australia and internationally when performing its functions.

Bundled payments schemes for public hospital services were identified in England, Canada and New Zealand which offer learnings. Multiple state-level and private initiatives were also identified in the United States, including the Arkansas Perinatal Bundle[xiii], Community Health Choice's Maternity and Newborn Care Bundled Payment Pilot in Houston Texas[xiv], Geisinger's ProvenCare Perinatal initiative[xv] and trials by Medicaid HMOs, such as in south-east Texas[xvi] and New York State.[xvii]

These and other bundled payment schemes for maternity care fall into three general types: (1) a comprehensive bundle covering all stages of care (which may have a single payment across settings or per stage); (2) a bundle which sets the payment to encourage use of midwives and birth centres; or (3) blended rates for the birth episode regardless of the mode of birth.[xviii]

The objectives of bundled payments for maternity care is summarised in a policy document by the Health Care Payment Learning & Action Network which includes public and private health care providers in the United States of America.[xix] Policy objectives include:

- Increasing the percentage of vaginal births and decreasing unnecessary caesarean births;
- Increasing the percentage of births that are full-term and decreasing preterm and early elective births;
- Decreasing complications and mortality, including readmissions and neonatal intensive care unit use;

- Providing support for childbearing women and their families in making critical decisions regarding the prenatal, labour and birth, and postpartum phases of maternity care and respecting those choices;
- Increasing the level of coordination across providers and settings of maternity care; and
- Consistently providing a women and family-centred experience.

Other objectives of bundled payment schemes include improving the collection of diagnoses data during the antenatal and postnatal stages of care, in the case of National Health Service (NHS) England, reducing the cost of maternity care, in the case of the United States' private initiatives by insurers, and ensuring continuity of the carer, in the case of New Zealand and British Columbia.

The primary challenges in implementing these bundled payment schemes have been difficulty in tracking patient service delivery over time, across settings and providers, distribution of the bundled payment to multiple providers and ensuring appropriate risk adjustment to account for differences in patient risk and complexity profiles.[xx]

NHS England Maternity Pathway Payment System

The Maternity Pathway Payment System was introduced from 2012-13 by NHS England and replaced fee-for-service arrangements for birth and block grants for community midwifery services.[xxi] The scheme involves a single prospective funding amount ('tariff') provided to an NHS commissioner which pays providers for primary and hospital care incurred during pregnancy, birth and postnatal care. The purpose of the scheme has been to give providers the financial flexibility to focus on the provision of high-quality, coordinated care as well as to support the introduction of a new patient-level data collection for maternity care.

Separate tariffs are paid for each stage of care, with IHPA advised that this decision was due to instances of women giving birth in a different hospital and the difficulty in predicting the care required across stages of care.[xxii] The tariff is based on the average cost of a stage of care and allows for different levels of payment depending on the risk and complexity profile of the maternity patient.[xxiii] The patient risk and complexity profile is determined prospectively within the first few booking appointments and is split into standard, intermediate and intensive pathways. The tariff for the birth episode does not consider mode of birth, as to discourage unnecessary caesareans.

Since its introduction, the tariff for standard and intermediate pathways has been increased to 'over-reward' providers in recognition that some women may change complexity within a stage of care. The proportion of patients who are classified to the intermediate and intensive pathways has also increased over time as new patient factors are added for determining risk levels.[xxiv]

IHPA has not identified any public review of the effectiveness of the scheme, although it has been advised that it provides a greater level of transparency regarding the delivery of maternity services and standardisation in the packages of care offered to mothers. A significant challenge in introducing the scheme has been concerns from providers regarding the administrative burden of a new data collection to track patients across services and identify their risk profile. While the new payment approach could have been delayed until the new data collection was implemented, its early introduction spurred compliance with data reporting requirements.

Lead Maternity Provider models – New Zealand and British Columbia

New Zealand and British Columbia have similar bundled payment schemes for maternity care which encourage the delivery of antenatal, admitted and postnatal care by publicly funded independent midwives, obstetricians or general practitioners. Both schemes use a 'Lead Maternity Carer' who is contracted by the government to coordinate a woman's care. 'Continuity of carer' models have been found to be associated with higher patient satisfaction, lower rates of unwarranted interventions and are potentially lower cost.[xxv]

The Lead Maternity Carer receives a bundled payment per 'module of care' which is split into the first and second trimesters, third trimester, labour and birth and postnatal period.[xxvi] Most services are delivered by the Carer, which generally hold hospital privileges, while allowing for partial payments for consultation with specialists or where birth is managed by hospital staff. In British Columbia, there is a maximum of 60 billable courses of care, with a Carer on average delivering 30 courses of care annually. There are expectations set out by health departments regarding the standard of care for women and a minimum level of service delivery.

For New Zealand, the vast majority of Lead Maternity Carers are midwives (93.4%), while the proportion is lower in British Columbia (13.2% in 2013-14). A review of comparable statistics provided by the OECD indicates that Australia, New Zealand and Canada have similar perinatal outcomes overall.[xxvii] The lower rate of growth in interventions in New Zealand (caesarean section, instrumental births, induction and epidurals) and higher levels of patient satisfaction have been linked to the introduction of the midwife-led contracting model.[xxviii]

3. Data sources

This chapter discusses the data sources which have been used to map the delivery of maternity services in Australian public hospitals. IHPA has relied on national data collections to ensure that the results of its analysis reflect national service delivery patterns.

3.1 Data collections

IHPA requires accurate activity, cost and expenditure data on public hospital services from state and territory health departments on a timely basis to perform its core determinative functions, such as the National Efficient Price (NEP). Section 131 of the *National Health Reform Act 2011* states that IHPA is to determine the data requirements and standard to apply, for activity based funding purposes, in relation to data to be provided by jurisdictions to support these functions.

As a bundled pricing approach for maternity care would reflect the actual costs of delivering maternity care across episodes and settings, it is equally important that the price be based on robust and complete data which reflects arrangements at a national level.

While there are a variety of national data sets used by IHPA to develop the NEP, the three primary collections used by the Advisory Group to examine maternity service delivery were:

- Admitted Patient Care National Minimum Data Set: An annual and mandatory patient-level collection of public hospital data for admitted acute separations (i.e. episodes of care where the patient was admitted to hospital or hospital-in-the-home arrangements);
- Non-Admitted Patient National Best Endeavours Data Set: An annual collection on a best endeavours basis of patient-level public hospital data for non-admitted service events (hospital services provided in a community setting such as an outpatient clinic);
- National Hospital Cost Data Collection: An annual and voluntary collection of public hospital data which covers all settings of care and accounts for 93.6% of admitted acute separations in the latest publicly available data (2014-15).

These collections cover all settings of care where maternity services are routinely delivered and include public hospital patients who would be in the scope of a bundled pricing approach.

Other national data sources which have informed the Advisory Group's consideration of maternity services are data collections for emergency department presentations in public hospitals, the Commonwealth Department of Health's Medicare Benefits Schedule data (for primary care) and the Australian Institute of Health and Welfare's (AIHW's) National Perinatal Data Collection (for patient characteristics not available in IHPA's data and for comparison).

IHPA has also considered qualitative sources which can provide context about service delivery patterns for maternity patients and insight into best practice care. These include national and state and territory maternity guidelines, such as the National Clinical Practice Guidelines for Antenatal care, as well as government and scholarly literature on the efficacy and characteristics of bundled payments for maternity care in the United Kingdom and the United States of America.

3.2 Scope of the analysis

A precondition to introducing bundled pricing for hospital services is the ability to identify the activity and costs of service delivery for patients across multiple episodes and settings of care. Identifying the average cost of service provision for a group of similar patients is required to determine a bundled price and identifying which patient accessed which service is necessary to reconcile hospital activity against a patient for funding purposes (to prevent double payment).

The scope of the analysis was determined and refined by IHPA and the Advisory Group over the course of 2016 to capture as much of the care journey for maternity patients in public hospitals using the most clinically and statistically robust method possible.

Probabilistic matching method

The public hospital activity and cost data which is submitted to IHPA by state and territory health departments for activity based funding purposes does not include identifiers which could be used to map service delivery to maternity patients across settings of care. For example, the patient identifier for the birth episode is not consistent with the patient identifiers recorded for the non-admitted antenatal and postnatal services. While there is a 'person identifier' specification in the data collections which could theoretically enable mapping of service delivery within a setting of care, the identifier is not consistent or has been randomised by the jurisdiction for patient privacy.

In the absence of unique patient identifiers, IHPA has developed a probabilistic matching approach which matches the birth episode to antenatal and postnatal non-admitted services based on shared patient characteristics as reported across the two data sets. Characteristics which have been used for matching purposes include patient sex, birth date, country of birth, Indigenous status, geographic area, state and hospital establishment. This matching process could also be extended to other settings, such as emergency care. However, matching services across further data sets reduces the accuracy of the matching. IHPA matched readmissions to the birth episode using the Medicare PIN to inform its review of service delivery patterns, which reflects de-identified information on a patient's Medicare card as provided to the public hospital.

There are significant limitations to a probabilistic matching method rather than direct linkage using patient identifiers, which has led to excluding some aspects of the data. These include:

- Multiple patients were identified with the same characteristics which meant that it was not possible to identify service delivery. IHPA excluded these patients from its analysis.
- Inconsistent recording of patient characteristics at the time of service which led to the inability to match all non-admitted services to a birth episode. Jurisdictions advised that the accuracy of reporting for non-admitted care has improved over recent years, with the implication that matching using non-admitted data from earlier years was not as reliable.
- In some cases, non-admitted services had no corresponding birth episode identified. For example, if the matching used one year of data, a birth episode may not be identified as it could be in the preceding or subsequent year. This may also occur where antenatal or postnatal care is provided by a different hospital as the matching approach requires all services to be delivered at the same hospital. IHPA therefore excluded these services.

Patients who had zero antenatal and postnatal non-admitted services were excluded from the analysis. The Advisory Group advised that public patients should have at least one antenatal and postnatal service event, even those treated under 'shared care' arrangements which is where antenatal or postnatal care is shared between a general practitioner and a hospital.

IHPA has excluded private patients from the analysis as these patients do not access public antenatal care and would therefore not be eligible to receive a bundled price. Incidents of zero service events were generally interpreted as reflecting poor data matching and their exclusion prevented the average number of services per patient being reduced. However, excluding approximately 33% of patients with zero postnatal service events may overstate the average number of services provided to patients where there was no data matching issue.

As IHPA's analysis sought to investigate the actual costs of service delivery, a patient must have all services with a cost recorded in order to be included in the analysis. This has a significant impact on the sample by excluding 44% of services, given that the costing of non-admitted services is comparatively recent. The consistency and accuracy of the costing has also improved over time as it now informs the price of non-admitted services, as opposed to the previous reliance on costing studies to determine the prices. Excluding patients who accessed services which were not costed has resulted in an over-representation of patients in larger metropolitan hospitals. These hospitals are more likely to submit non-admitted cost data which is of better quality.

Exclusion of patients with zero service events also excluded maternity patients in Victoria and South Australia. These jurisdictions did not submit patient-level data on non-admitted services to IHPA for the years analysed and therefore no information was available for matching purposes.

Services included in the analysis

The scope of the analysis has been patients with a birth episode in a public hospital as recorded using the birth-related Diagnosis Related Groups (DRGs). This approach accounts for all live births in public hospitals including planned home births which are considered 'hospital-in-the-home' and are classified as an admitted episode. The DRGs cover the admitted period including labour, birth and postnatal care delivered prior to discharge. The DRGs are structured by mode of birth:

- Caesarean birth: O01A, O01B and O01C.
- Vaginal birth requiring operating room procedures: O02A and O02B.
- Vaginal birth: O60A, O60B and O60C.

The Tier 2 Non-Admitted Services classes which were included in the analysis cover antenatal and postnatal services which was considered as routinely accessed by most maternity patients or by a significant minority of patients as agreed by the Advisory Group. These services are:

- 20.40 'Obstetrics – management of pregnancy without complications'
- 20.53 'Obstetrics – management of complex pregnancy'
- 40.28 'Midwifery and maternity'
- 20.34 'Endocrinology' (medical consultation)
- 40.46 'Endocrinology' (allied health / clinical nurse specialist interventions)
- 40.09 'Physiotherapy'
- 40.11 'Social work'

The Tier 2 class 20.54 'Maternal Fetal Medicine' was also included in the analysis, but does not count towards the total number of services per patient. The Advisory Group advised that it should instead be used to flag high risk patients. The foetal medicine (20.53) and complex obstetrics

(20.54) classes were introduced in 2015-16 to better account for the higher cost per service event of treating high risk patients and were previously grouped under the general obstetrics class (20.40). As the time period used for IHPA's primary data analysis predates this split, the type of obstetrics services provided to patients is generally not able to be differentiated.

The in-scope Tier 2 classes are the vast majority of services accessed by patients. For example, the next five classes in terms of service usage by matched maternity patients is shown at Table 1.

Table 1: Other non-admitted services which are accessed by maternity patients

Tier 2 class	% of total service events
20.38 'Gynaecology'	0.8%
20.05 'General medicine'	0.8%
40.23 'Nutrition/dietetics'	0.6%
40.34 'Specialist mental health'	0.6%
20.02 'Anaesthetics'	0.5%

Note: IHPA has included classes with over 10,000 matched service events.

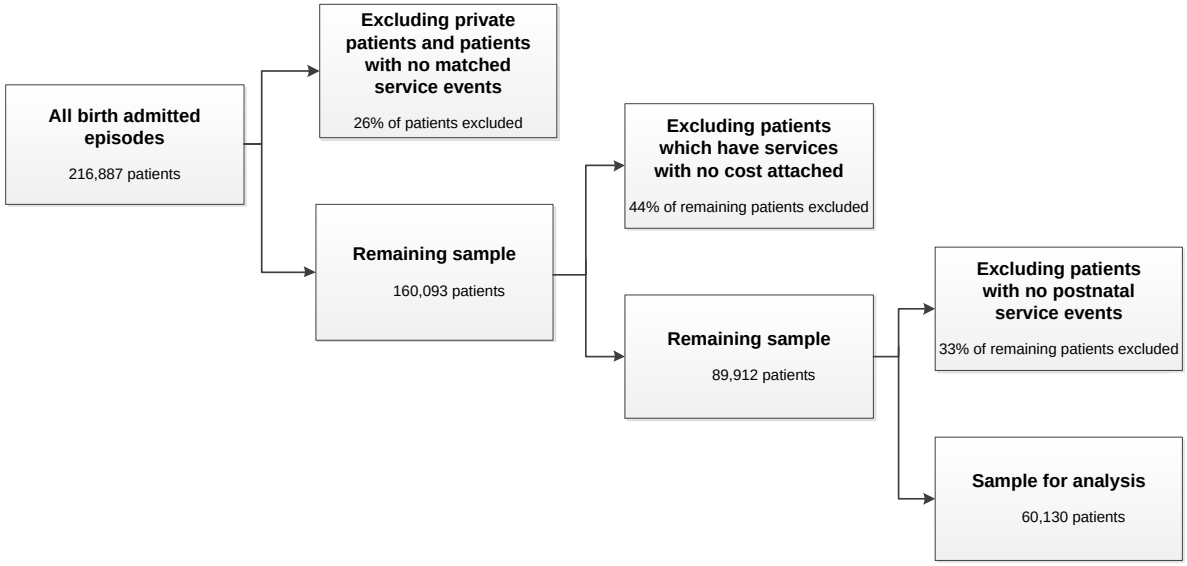
Of the in-scope Tier 2 classes, 93% of all antenatal and postnatal service events were to the obstetrics and midwifery classes. The Advisory Group considered that a case could be made for reducing the in-scope classes for the maternity bundle to only include these main classes.

IHPA also reviewed utilisation of other non-admitted services by maternity patients, noting that maternity pathways may differ across public hospitals and jurisdictions. However, no other Tier 2 classes were identified which had a significant volume of maternity patients accessing them (over 1%). A description of which services are included under Tier 2 classes can be accessed here.

Time period

The time period used for analysis has been linked 2013-14 and 2014-15 activity and cost data. At the time, this was the latest available national data. Linking data sets across multiple years meant that IHPA could account for the approximately 70% of maternity patients who receive care across multiple financial years (i.e. where antenatal or postnatal service events were provided in the preceding or subsequent year). Only the time period which would capture maternity patients who fully completed their care journey were used for analysis. The exclusions to the data and its impact on the sample size for analysis is shown at Figure 2.

Figure 2: Patient sample size



Remaining patient sample

IHPA considered that the remaining sample of approximately 60,000 maternity patients across Australia provided a robust data set for reaching conclusions regarding service delivery patterns for maternity care and for developing an indicative bundled pricing approach.

While useful for the purposes of gaining a clearer picture of service delivery patterns, IHPA acknowledges that the data approach is not robust enough to be used for Commonwealth funding purposes for public hospital services as it would not allow for a fully accurate reconciliation of activity against each patient to prevent double payments.

4. Provision of maternity care

This chapter discusses the delivery of maternity services in Australian public hospitals as analysed using public hospital data and implications for developing a bundled pricing approach.

4.1 Overview of maternity care

Routine maternity care covers antenatal care from approximately ten weeks gestation, which is the first scheduled appointment, to postnatal care which ends six weeks after the birth episode. It spans multiple settings of care, including the non-admitted setting for antenatal and postnatal care, the admitted acute setting for birth and potentially the emergency setting for some patients.

Most mothers give birth in conventional labour wards, with a small proportion choosing birth centres, home births or giving birth before reaching the hospital.[xxix] Maternity care is one of the leading causes of hospital admission in 2014-15 with approximately 360,000 admitted acute separations in public hospitals under the Major Diagnostic Category (MDC) for 'Pregnancy, childbirth and the puerperium'. The DRGs for minor complexity vaginal delivery (O60C) and minor complexity caesarean delivery (O01C) were the third and eleventh highest volume DRGs respectively in public hospitals.

There were 226,232 birth episodes in public hospitals in 2014-15 as reported in IHPA data. The AIHW reported 307,844 women as giving birth in 2014, with 73% doing so in public hospitals.[xxx] Vaginal births are the most common mode of birth for maternity patients, although caesarean births make up approximately 29% of the total as shown at Table 2.

Table 2: Birth episodes by DRG, 2014-15

Diagnosis Related Group	Separations	% of total (rounded)
O01A – 'Caesarean delivery, major complexity'	7,556	3.3%
O01B – 'Caesarean delivery, intermediate complexity'	28,180	12.5%
O01C – 'Caesarean delivery, minor complexity'	30,933	13.7%
O02A – 'Vaginal delivery with operating room procedures, major complexity'	1,846	0.8%
O02B – 'Vaginal delivery with operating room procedures, minor complexity'	5,337	2.4%
O60A – 'Vaginal delivery, major complexity'	21,184	9.4%
O60B – 'Vaginal delivery, intermediate complexity'	63,113	27.9%
O60C – 'Vaginal delivery, minor complexity'	68,083	30.1%
Total	226,232	100%

The Productivity Commission notes that some births by caesarean are potentially preventable. Data on the 'Caesareans for selected primiparae' in public hospitals, which is an indicator of the appropriateness of maternity care, indicates that South Australian and the Northern Territory are approximately 5% above the national average in 2014.[xxxi]

Analysis by the Australian Commission on Safety and Quality in Health Care also indicates that there is also variation across public hospitals in the age-standardised rate of caesarean births with a 2.4 fold difference between geographic catchments in 2010-11.[xxxii]

4.2 Non-admitted services provided to women

Almost all expectant mothers in Australia received non-admitted antenatal care in 2014 according to data from the AIHW.[xxxiii] The National Clinical Practice Guidelines for Antenatal care, which are nationally agreed guidelines for antenatal care, recommend ten (for a first pregnancy) or seven (for subsequent pregnancies) antenatal visits per maternity patient across the nine months of pregnancy.

While sources of information on the proportion of women receiving postnatal care are limited, states and territories have advised that women should receive at least one home visit following hospital discharge. IHPA's analysis indicates that approximately 67% of patients had at least one service event and 33% of patients had no record of a postnatal service event. It is unknown whether this figure is accurate, given issues regarding the accuracy of the matching method, but there was agreement by the Advisory Group that postnatal service delivery could be improved.

Non-admitted antenatal and postnatal care is high volume, with 820,331 service events for the Tier 2 Non-admitted Services class 'Obstetrics' (20.40) and 1,975,153 service events for the non-admitted class 'Midwifery and Maternity' (40.28) in 2014-15.

Volume of non-admitted care

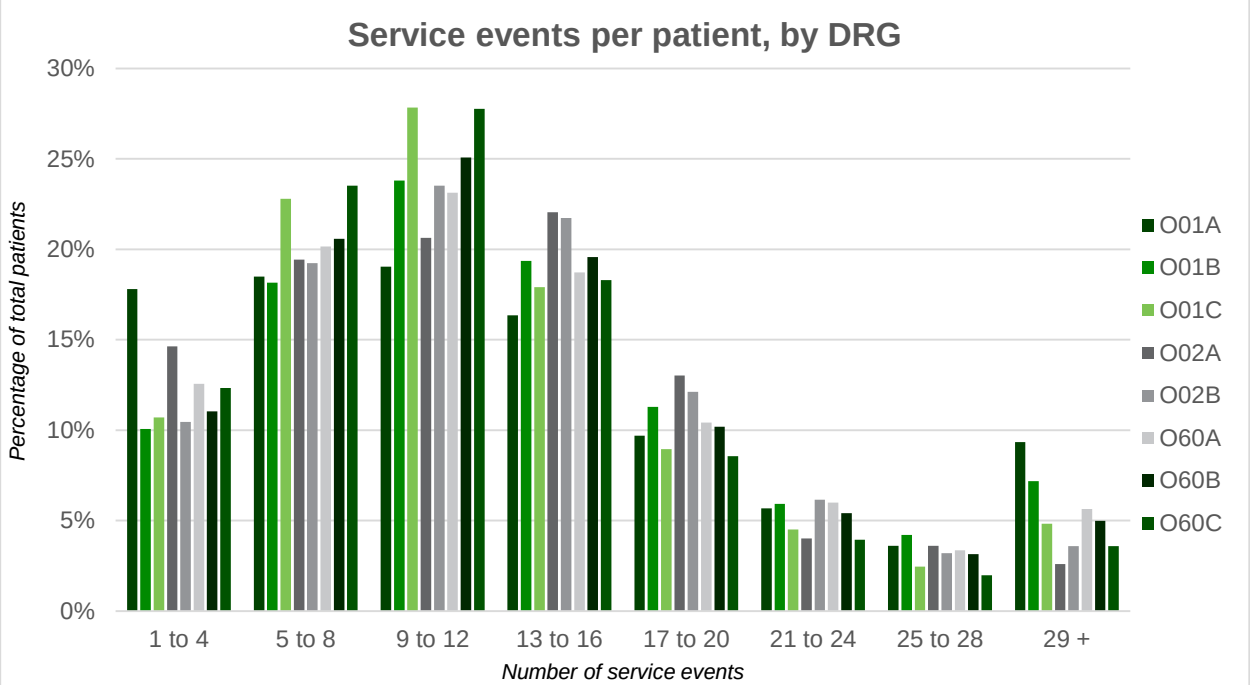
Using the matched sample data for 2013-14 and 2014-15, IHPA identified a national rounded average of 13 non-admitted service events per public hospital patient across the antenatal and postnatal stages of care. IHPA also identified that the DRG which a patient is assigned for the birth episode is the strongest predictor of their total number of service events as shown at Table 3.

Table 3: Average service events per maternity patient, by DRG, matched 2013-14 and 2014-15 sample data

Diagnosis Related Group	Average (mean) service events		
	Total	Antenatal	Postnatal
O01A – 'Caesarean delivery, major complexity'	13.8	10.4	3.4
O01B – 'Caesarean delivery, intermediate complexity'	14.1	10.9	3.3
O01C – 'Caesarean delivery, minor complexity'	12.5	9.4	3.0
O02A – 'Vaginal delivery with operating room procedures, major complexity'	12.2	8.8	3.4
O02B – 'Vaginal delivery with operating room procedures, minor complexity'	12.8	9.1	3.7
O60A – 'Vaginal delivery, major complexity'	13.2	9.7	3.5
O60B – 'Vaginal delivery, intermediate complexity'	13.0	9.4	3.5
O60C – 'Vaginal delivery, minor complexity'	11.8	8.2	3.6
Total	12.7	9.2	3.4

While the DRG of the birth episode is a strong predictor of antenatal and postnatal service delivery, there is significant variation across all groups in the number of service events per patient (Figure 3). This is not fully explained by their DRG grouping for the birth episode.

Figure 3: Spread in service events per patient, by DRG, matched 2013-14 and 2014-15 sample data



Patients with four or fewer service events in IHPA's data is not consistent with the perinatal data published by the AIHW which indicates that 5% of patients had four or fewer antenatal visits in 2014.

IHPA also identified significant variation in the average number of service events per patient across states and territories, with an up to four service event difference on average between the highest and lowest jurisdiction, and a significant spread within jurisdictions.

For some jurisdictions, the higher number of average service events may reflect outlier hospitals. For example, data analysis undertaken by New South Wales found that the average service events per maternity patient was reduced from 14.7 to 12.5 if patients with more than 30 service events and public hospitals with a very high number of service events per patient were excluded.

IHPA's analysis also found significant variation at the Local Hospital Network and public hospital level. The finding that some hospitals had a far higher proportion of patients with a low number of service events accords with AIHW data that indicates that 7% of very remote patients and 8% of Tasmanian patients had less than the World Health Organisation minimum of four antenatal visits.[xxxiv]

Type of non-admitted care

Most women receive their care predominately from the obstetrics and midwifery classes, but some patients also access physiotherapy, endocrinology and social work services (Table 4).

Table 4: Service utilisation by non-admitted class, matched 2013-14 and 2014-15 sample data

Tier 2 Non-Admitted Services class	% of total patients who access the Tier 2 class	% of total service events for all patients
20.34 Endocrinology	4%	2%
20.40 Obstetrics	71%	33%
40.09 Physiotherapy	7%	2%
40.11 Social work	2%	1%

Tier 2 Non-Admitted Services class	% of total patients who access the Tier 2 class	% of total service events for all patients
40.28 Midwifery and maternity	97%	61%
40.46 Endocrinology	4%	2%

This data also suggests that most maternity patients receive antenatal and postnatal care from both an obstetrician and a midwife at some stage.

In 2015-16, obstetrics services were split into three classes to account for differences in the complexity of the pregnancy. This allows for greater insight into which types of patients are accessing obstetrics services. While there is a low sample size once a probabilistic matching approach is applied to 2015-16 data, IHPA has identified an even split between pregnancies with and without complications accessing obstetrics services (see Table 5).

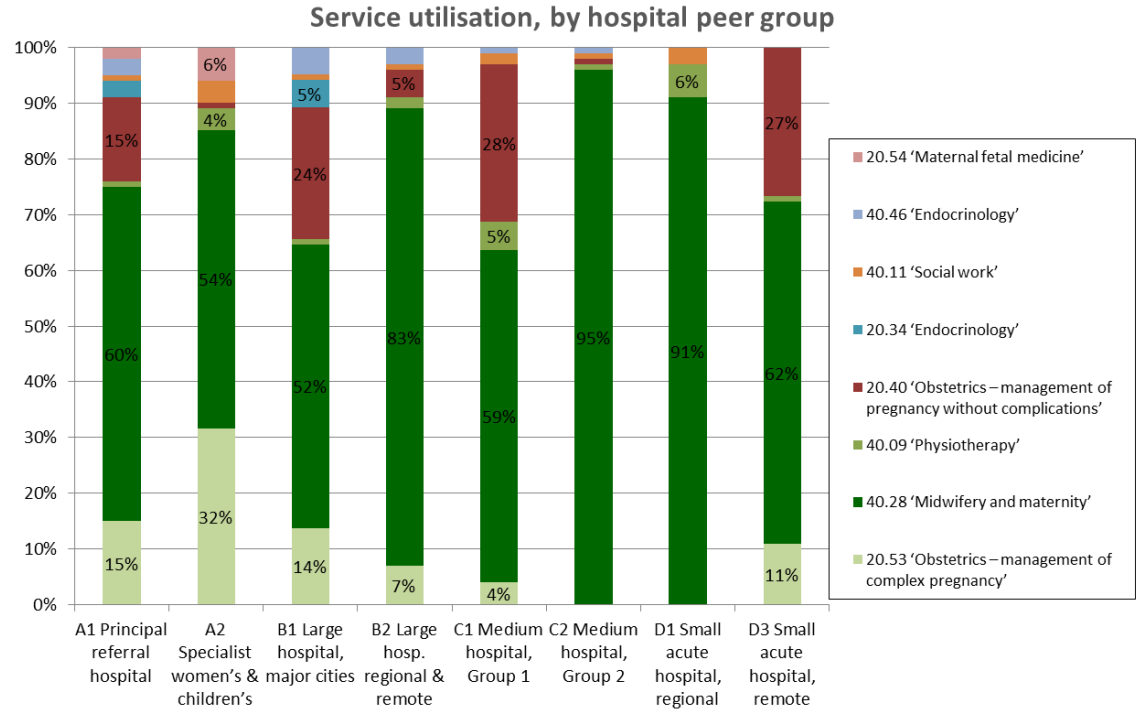
Table 5: Relative proportions regarding access to obstetrics services, matched 2015-16 data

Tier 2 Non-Admitted Services class	% of total service events to the obstetrics classes
20.40 Obstetrics – management of pregnancy without complications	47%
20.53 Obstetrics – management of complex pregnancy	47%
20.54 Maternal fetal medicine	6%

IHPA identified significant differences across public hospitals, particularly by peer group, in the proportion of service events to the maternity classes as shown at Figure 4. Matched 2015-16 data was used to identify relative use of the new obstetrics classes.

It is not known the degree by which this variation reflects legitimate differences in the clinical need of patients, differences in the service offerings within those hospitals, issues with the reporting of non-admitted services or issues with the probabilistic matching method which may be compounded by low sample sizes.

Figure 4: Proportion of total service events, by hospital peer group, matched 2015-16 data



4.3 Non-routine services provided to women

Some maternity patients have risk profiles or experience complications during pregnancy which require treatment within an emergency setting or an antenatal or postnatal admission to hospital.

Antenatal admissions

Women may be admitted to hospital during the antenatal period for a variety of clinically warranted reasons including a threatened pregnancy, false labour or an antepartum haemorrhage, or clinically avoidable reasons, such as inability to access non-admitted care. There were approximately 86,000 separations for the antenatal DRGs in ABF hospitals in 2014-15.

Postnatal readmissions

Women may also be readmitted to hospital during the postnatal period for a variety of reasons. Some readmissions are unplanned and potentially preventable (e.g. complications which occur due to early hospital discharge), while others are planned and unavoidable (e.g. readmission for birth following a prior admitted stay for antenatal care). The leading cause of readmission has been identified as due to infection, with the high volume principal diagnoses being 'Puerperal sepsis', 'Infection of obstetric surgical wound' and infections of the breast associated with childbirth. For newborns, the leading cause of readmission was neonatal jaundice.

Using the Medicare PIN to match admitted episodes to a patient, IHPA identified a readmission rate of 3% for maternity patients in 2013-14 (Table 6).

Table 6: Readmission rate by maternity DRG, 2013-14

Diagnosis Related Group	Total
O01A – 'Caesarean delivery, major complexity'	7%
O01B – 'Caesarean delivery, intermediate complexity'	5%
O01C – 'Caesarean delivery, minor complexity'	3%
O02A – 'Vaginal delivery with operating room procedures, major complexity'	6%
O02B – 'Vaginal delivery with operating room procedures, minor complexity'	3%
O60A – 'Vaginal delivery, major complexity'	5%
O60B – 'Vaginal delivery, intermediate complexity'	3%
O60C – 'Vaginal delivery, minor complexity'	2%
Total	3%

Emergency care

Some women may require emergency care during the antenatal and postnatal period for similar reasons as outlined above. The Advisory Group also advised that for some jurisdictions it may reflect admissions practice. Jurisdictional analysis provided to IHPA indicates that approximately 10% of vaginal delivery patients have emergency presentations during the antenatal or postnatal stages of care. There were approximately 113,000 obstetric-related presentations (as identified using Major Diagnostic Block 3K) for the antenatal DRGs in ABF hospitals in 2014-15.

5. Costs of service delivery

This chapter discusses the total cost and cost per patient of delivering maternity services in Australian public hospitals and the implications for developing a bundled pricing approach.

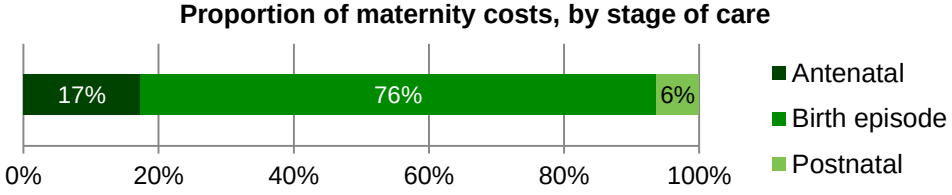
5.1 The overall costs of maternity care

Care of childbearing women and newborns is one of the leading reasons for accessing public hospital services in Australia and also a key driver of public hospital costs. IHPA has identified the total cost to public hospitals of caring for women during pregnancy, birth and during the postnatal period using the National Hospital Cost Data Collection (NHCDC):

- Birth episode: The highest cost of routine maternity care is incurred during the admission for birth. The total cost of birth episodes for women in ABF and block funded public hospitals has been identified as approximately $1.51 billion in 2014-15 as reported under the birth DRGs in the NHCDC. The greatest cost was for births through a minor complexity vaginal delivery (DRG O60C) which was $533 million, followed by births through minor complexity caesarean delivery (DRG O01C) with a cost of $436 million. This is despite having less than half the number of maternity patients (approximately 111,000 episodes compared to 44,000 episodes).
- Antenatal admissions: Pregnancy-related admissions to public hospital by patients during the antenatal period (as reported under the O66 DRGs) had a total cost of $140 million in ABF and block funded public hospitals in 2014-15 as reported in the NHCDC.
- Postnatal readmissions: The DRGs for postpartum hospital readmissions (as reported under the O61 and OO4 DRGs) had a total cost of $47 million in ABF and block funded public hospitals in 2014-15 as reported in the NHCDC.
- Emergency presentations: Emergency presentations which were obstetric-related (Major Diagnostic Block 3K) had a total cost of $50.6 million in ABF and block funded public hospitals in 2014-15 as reported in the NHCDC.
- Non-admitted antenatal and postnatal care: The total cost of non-admitted obstetrics and midwifery services in ABF and block funded public hospitals was $408.6 million in 2014-15 as reported in the NHCDC. This figure accounts for the main maternity Tier 2 classes which make up 92% of services accessed by maternity patients. The cost of the remaining 8% of services which are not specifically maternity-related is not included.

The analysis indicates that the highest cost areas of maternity care are the birth episode and non-admitted service delivery during the antenatal and postnatal stages of care. A breakdown of costs by setting of care is provided at Figure 5.

Figure 5: Proportion of maternity costs



The volume of services and total expenditure on the delivery of maternity services means that relatively minor improvements in the cost per maternity patient could generate significant cost savings to public hospitals.

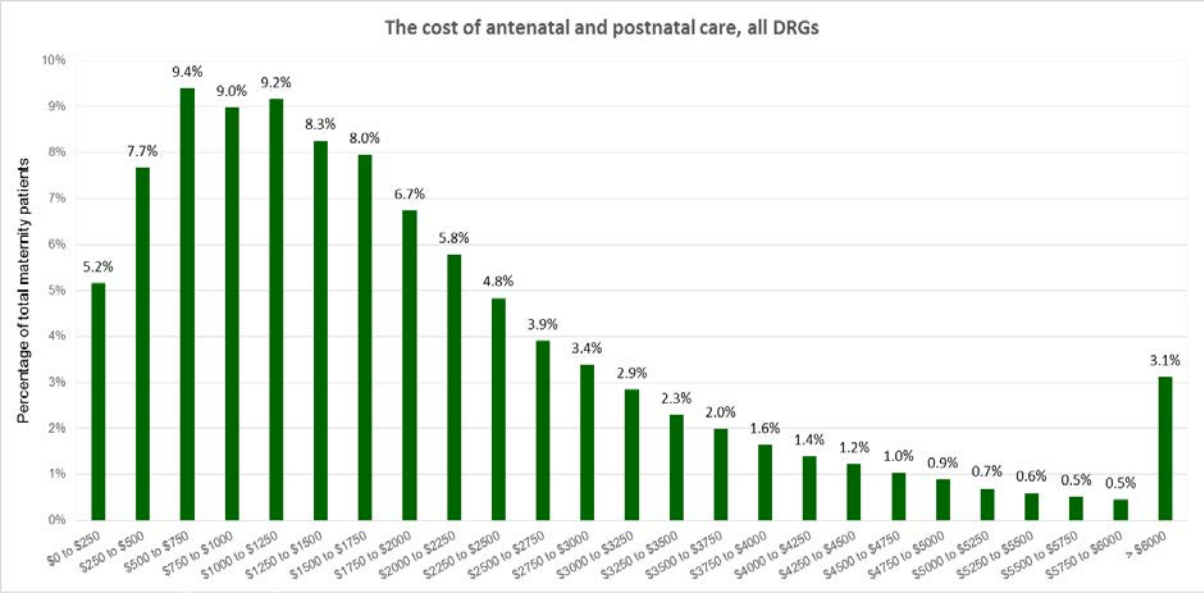
5.2 Differences in maternity costs

IHPA has sought to better understand the variation in costs across maternity patients through applying the probabilistic matching approach to 2013-14 and 2014-15 cost data. This analysis has focused on the admitted birth episode and non-admitted settings as this covers routine maternity care and accounts for the majority of maternity public hospital costs.

The average national cost per maternity patient was identified as $2,104 for non-admitted care, of which $1,550 is antenatal and $554 is postnatal care. For comparison purposes, the average cost to deliver non-admitted care which complied with the *National Antenatal Care Guidelines* with at least one postnatal service event was estimated at $1,343 to $2,156, depending on which clinic types are accessed (midwifery or obstetrics) and whether or not it was a first pregnancy. The average cost of care therefore appears to be sufficient to deliver to national standards.

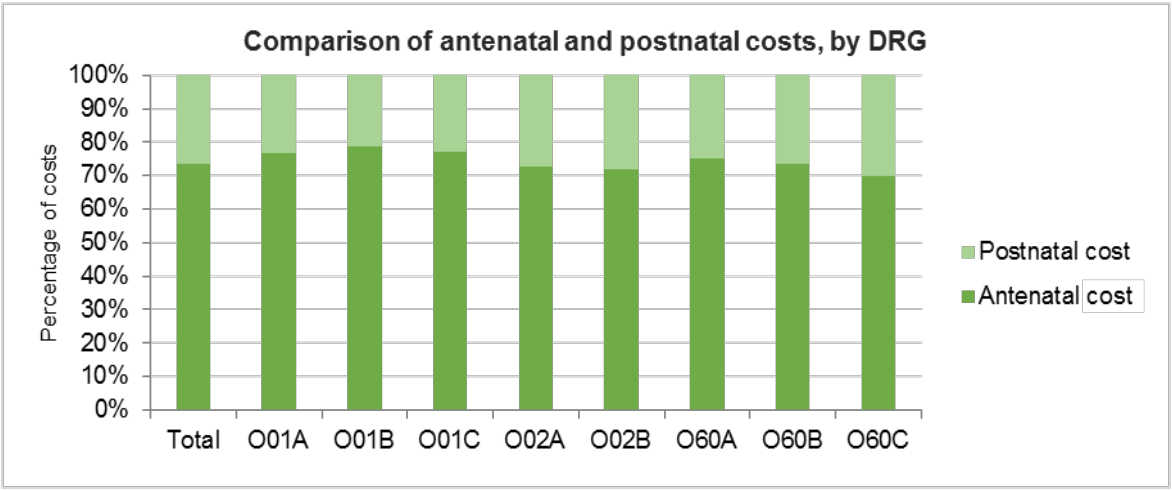
The costs of non-admitted antenatal and postnatal care appear to be comparatively similar across most maternity patients compared to other settings (see Figure 6). This finding accords with advice from the Advisory Group that maternity patients generally have a similar total number of antenatal services but of a different type, with the exception of very high risk patients. Difference in non-admitted costs is therefore primarily determined by the type of service which is accessed. For example, the costs of antenatal care by an obstetrician are higher than a midwife.

Figure 6: Spread of costs for non-admitted antenatal and postnatal care



The majority of non-admitted costs are for the antenatal stage compared to the postnatal stage as shown at Figure 7. This is explained by the longer length of the antenatal period which is approximately nine months compared to six weeks postpartum for the postnatal period.

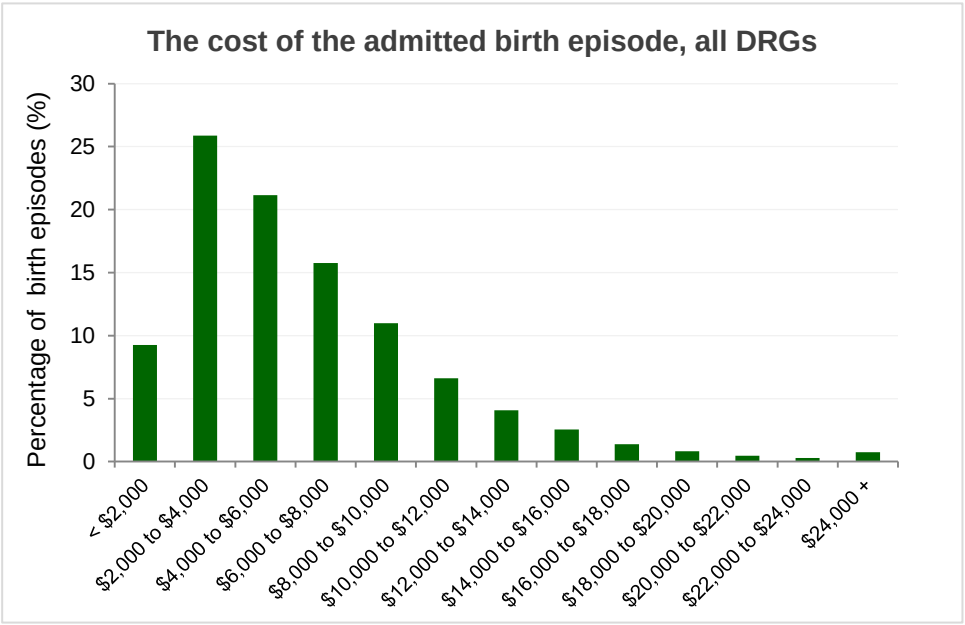
Figure 7: Comparison of antenatal and postnatal costs



The comparatively smaller degree of variation in non-admitted costs indicates that there is less scope for substantial savings per patient from redesigning care to reduce antenatal or postnatal costs. However, the significant overall cost of non-admitted antenatal and postnatal care means that small improvements will still lead to significant savings to the health system.

The costs of the admitted birth episode significantly differ between patients as shown at Figure 8. The most significant cost driver for the birth episode is mode of birth (spontaneous, assisted and caesarean), with the average minor complexity vaginal delivery ($4,777) costing more than double the average minor complexity caesarean delivery ($9,962) in 2014-15. This is followed by whether the admission has a minor, intermediate or major comorbidities and complexity level.

Figure 8: Spread of costs for the admitted birth episode



The degree of variation in admitted costs indicates that there is significant scope for savings to public hospitals from clinically warranted reductions in the rate of interventions during birth. The greater materiality of costs would also allow hospital managers to make significant investments in altering their models of care to better manage patient complexity and comorbidities. However, the high cost variation also means that including the setting in a bundled pricing approach would significantly increase the financial risk for hospitals in cases of unavoidable service delivery (such as unexpected complications) as it would substantially under-price complex patients.

5.3 Factors that impact on the cost of maternity care

IHPA sought to better understand the primary drivers of non-admitted costs and how this differs between patients. This is an important step for risk adjustment purposes to ensure that more complex or high risk patients are not under-priced under a bundled pricing approach.

Differences in the cost of the birth episode

The AR-DRG classification system is used in admitted acute care to provide a clinically meaningful way of relating the types of patients treated in a hospital to the resources it requires. Differences in the cost of the birth episode in 2014-15 using DRGs are shown at Table 7.

Table 7: Birth episode costs by DRG

Diagnosis Related Group	Average admitted cost
O01A – 'Caesarean delivery, major complexity'	$16,094
O01B – 'Caesarean delivery, intermediate complexity'	$11,599
O01C – 'Caesarean delivery, minor complexity'	$9,962
O02A – 'Vaginal delivery with operating room procedures, major complexity'	$11,364
O02B – 'Vaginal delivery with operating room procedures, minor complexity'	$8,151
O60A – 'Vaginal delivery, major complexity'	$9,165
O60B – 'Vaginal delivery, intermediate complexity'	$6,273
O60C – 'Vaginal delivery, minor complexity'	$4,777

The DRG classifies discrete episodes of care on the basis of diagnoses, procedures and complexity. The DRG which a maternity patient is classified to for the birth episode largely reflects the mode of birth, followed by other complexities and comorbidities. For example, a spontaneous vaginal birth where the mother had mild to moderate pre-eclampsia has a clinical complexity score which results in an 'intermediate complexity' vaginal delivery (O60B).

DRGs are developed and refined based on clinical and statistical analysis of variation and development in care, and are updated every two years to reflect changes in clinical practice, and to ensure the classifications remain clinically relevant and robust. As such, the DRG system was found to offer the best current means of differentiating between the care provided to maternity patients in the admitted acute setting.

IHPA has reviewed its data sets to identify whether alternative patient or service characteristics offer strong explanatory power for differences in the cost of birth, as to move away from a reliance on the DRG which groups patients on their mode of birth. For example, the NHS England Maternity Pathway Payment System determines a patient's risk and complexity profile using a rich data set of patient diagnoses and is agnostic on the mode of birth. This approach means that low risk caesarean and vaginal birth patients can receive the same price, providing a strong financial incentive for hospitals to reduce clinically avoidable interventions.

IHPA has identified that the English model uses variables which are generally not available in IHPA's data collections. While there are diagnoses which could identify a patient's risk profile, such as 'Supervision of normal first pregnancy' (Z340) or for 'Supervision of other high risk pregnancy' (Z358), these codes are only recorded for patients who have antenatal admissions. IHPA notes that many patient risk factors are recorded in the National Perinatal Data Collection which is a separate national patient-level data collection held by the AIHW.

Maternal age and Indigenous status were found to offer some explanatory power regarding the costs of the birth episode but are less significant and consistent than the mode of birth and combined diagnoses which are used to group patients to a DRG.

Maternal age influenced the likelihood of interventions, for example 27% of 20-34 year olds had a caesarean compared to 36% for those aged 35 to 39 and 42% for over 40 years. Aboriginal and Torres Strait Islander women had an average cost which was 18% higher than non-Indigenous women despite a higher likelihood of a vaginal delivery and more remote patients were generally more costly to treat. These higher costs for these episodes are not maternity-specific and are currently accounted for through adjustments to the National Efficient Price. Overall, no factors were identified which were comparable to the DRG for explaining the costs of the birth episode.

Differences in the cost of non-admitted care

The Tier 2 Non-Admitted Services classification groups non-admitted services based on the specialisation of the clinic which a patient attends, with the assumption that clinic type is a proxy for the patient's clinical condition. For example, a patient attending a hospital clinic to see an endocrinologist for management of their diabetes would group to the 'Endocrinology' (20.34 and 40.46) classes. Each service event (i.e. visit) is separately classified and priced. As mothers have multiple service events during the antenatal and postnatal periods, the public hospital will therefore receive multiple prices under an ABF approach.

As service events are separately classified, the Tier 2 classification is not comparable to the patient-based AR-DRG classification which determines a single class covering all service provision to a patient during an episode of admitted care based on their diagnoses and procedures. Classifying patients is difficult in the non-admitted setting due the limited number of patient characteristics which are reported in the non-admitted data sets. In contrast, the NHS England Maternity Pathway Payment System does classify patients during the non-admitted antenatal and postnatal period as it has access to a much richer data set including information on patient risk and complexity which allows for analysis on its impact on non-admitted costs.

Review of factors impacting on non-admitted antenatal and postnatal costs

IHPA undertook a literature review to identify factors that impact on the cost of non-admitted maternity care and which could be used to flag outlier patients for data analysis.

Defining a maternity patient's risk level is difficult[xxxv] and there is a lack of consensus on what impact factors have on maternal morbidity.[xxxvi] This complicates assessments of what proportion of pregnancies are low or high risk, although it is generally agreed that maternal morbidity is rising. Examples can be seen in a 2003 study in the United States found that 1 in 3 women have at least one obstetric complication or pre-existing medical condition[xxxvii] and a 2011 study in Ireland found the incidence of maternal morbidities exclusive of caesarean delivery was 1 in 6.[xxxviii]

IHPA identified a variety of indicators of a 'normal birth' or 'low risk pregnancy'. These generally include women who are between 20 to 34 years, have a single baby born spontaneously in the vertex position, a gestation length of 37 to 41 weeks and the mother and infant are in good condition.[xxxix] While not all of these are in national data sets, the cohort approximately accounts for 91,682 patients in ABF hospitals in 2014-15 or 43% of total (using DRG O60C and age).

In developing a list of risk and complexity factors for analysis, IHPA identified that indicators generally fall under the categories below.[xl]

Table 8: Characteristics impacting on maternal risk and complexity

Characteristics	Examples
Pre-existing health conditions	Examples include epilepsy, cancer, renal disease, hepatitis B or C, pre-existing diabetes, physical disability, mental health conditions.
Physical and social characteristics	Examples include obesity, remoteness, indigenous status, socio-economic disadvantage, alcohol consumption, substance use, private health insurance status and smoking.
Maternal age	Examples include teenage pregnancies and advanced maternal age (over 35 years, over 40 years).
Previous pregnancy complications	Examples include previous caesarean section, three or more consecutive miscarriages and previous foetal abnormality.
Complications that arise during pregnancy	Examples include gestational diabetes, hypertension, pre-eclampsia, anaemia, parity, prolonged pregnancy and poor foetal growth.
Complications arising during labour and delivery	Examples include labour onset type, preterm delivery, premature rupture of membranes, perineal tears and postpartum haemorrhage.

Under these categories, there are hundreds of conditions which can impact on pregnancies. For example, there are 105 conditions in the *National Midwifery Guidelines for Consultation and Referral* (published by the Australian College of Midwives and endorsed by the Royal Australasian College of Obstetricians and Gynaecologists) where it is recommended that a woman's maternity care should be referred to an obstetrician or tertiary care.[xli]

Given the high number of indicators, there have been attempts to determine a shortlist based on prevalence and maternal burden. The AIHW has identified pre-existing and gestational diabetes, pre-existing and gestational hypertension, pre-eclampsia, antepartum haemorrhage and postpartum haemorrhage as good indicators for maternal morbidity.[xlii] The AIHW also reports against 'National Core Maternity Indicators' and IHPA has identified smoking during pregnancy, whether antenatal care was provided in the first trimester and whether a caesarean section had medical/obstetric indication as potentially useful indicators.[xliii]

Many of these factors are flagged in the diagnoses data as recorded in the patient's medical record during their admitted stay for birth. However, diagnosis codes are only recorded in the admitted setting and, to a lesser extent, for emergency care. This means that they can only be linked to patients using probabilistic matching across settings. Diagnoses are also only recorded whether the condition had an impact on that hospital episode and was known. For example, a woman may have a single live birth (diagnosis code Z37.0) and be a smoker (diagnoses code Z72.0). However, the smoking status will only be recorded if it were considered relevant to labour and delivery and was disclosed. Diagnoses data is therefore not capturing all medical and social factors experienced by women and how they impact on the costs of maternity care.

Analysing variables in the non-admitted data set

The non-admitted data set does not contain diagnosis information, but does contain a limited number of patient-based variables which can be used to examine the relationship between patient factors and non-admitted antenatal and postnatal costs.

IHPA examined whether the variables offer explanatory power for differences between patients in their non-admitted costs using the matched 2013-14 and 2014-15 sample cost data and concluded that:

Advanced maternal age

Maternal age was not found to be a strong predictor of differences in non-admitted costs. Women of most ages have a similar average number of antenatal and postnatal service events. Women who are 40 years and over had an average of one additional service event and women who were 35 years and older had an increasing proportion of service events to an obstetrician (with 32% of service events to the obstetrics classes for women aged 20 to 34 years compared to 36% for 35 to 39 years and 40% for 40 years and older). This increased service volume corresponds with an increased overall non-admitted cost for women of advanced maternal age. However, the cost difference was found to be pronounced only from 40 years of age (11% higher).

Remoteness

The remoteness of where a woman resides did not offer consistent explanatory power for differences in non-admitted costs. On average, remote patients had significantly higher total costs, but very remote patients had lower total costs and number of service events (see Table 9).

Table 9: Average non-admitted costs, by remoteness

Remoteness area	Average number of service events per patient	Average non-admitted cost per patient
Major city	13.49	$2,117
Inner regional	11.24	$2,085
Outer regional	10.05	$1,961
Remote	11.88	$3,156
Very remote	6.49	$1,477

It is difficult to determine whether this reflects actual service provision or matching limitations as care is not matched to a patient where it is provided by a different hospital or is under a 'shared care' arrangement. This finding accords with 2013 data provided by the AIHW from the National Perinatal Data Collection which indicated that more remote areas had a higher proportion of women with under five antenatal visits (8% for women in remote areas and 11% for very remote areas compared to 5% for major cities).[xliv]

Socio-economic disadvantage

Regardless of the degree of relative socio-economic disadvantage for the area where they live, IHPA has found that women have a similar average and median number of service events and costs as identified using the Australian Bureau of Statistics' Index of Relative Socio-economic Disadvantage. While service delivery was generally similar, women from areas of higher socio-economic disadvantage had an average of one less service event and a slightly higher proportion of women with under five antenatal service events (see Table 10).

Table 10: Average non-admitted costs, by area of socioeconomic disadvantage

Socioeconomic disadvantage (1 = most disadvantaged)	Proportion of patients	Average number of service events per patient	Average non-admitted cost per patient
1	9%	12.44	$1,794
2	9%	12.50	$2,041
3	7%	12.34	$2,127
4	12%	13.65	$2,064
5	12%	11.50	$1,862
6	13%	14.26	$2,356
7	10%	10.76	$1,918
8	11%	12.82	$2,194
9	9%	12.91	$2,358
10	8%	13.09	$2,369

This finding accords with published 2014 data from the National Perinatal Data Collection indicating that the most disadvantaged areas had a slightly higher proportion of women with under five visits (7% compared to 4% in the least disadvantaged).[xlv]

Indigenous status

Similar to women in rural and remote areas, Aboriginal and Torres Strait Islander women had three fewer service events on average and a total cost which was 10% lower than non-Indigenous patients. This is despite having a higher cost per service event. This finding is corroborated by published 2014 data from the National Perinatal Data Collection which indicated that a significantly higher proportion of Indigenous women have under five antenatal visits.[xlvi]

Number of clinic visits

The number of antenatal and postnatal service events is the greatest predictor of a patient's non-admitted cost. However, it is not a patient-based variable and does not consider whether care was clinically warranted. Patients in the top 10% in non-admitted cost were found to have an average of 19 antenatal service events and seven postnatal service events, which is more than double the average.

Clinic type

The type of clinic accessed by a patient is another strong predictor of non-admitted costs. For example, the Tier 2 Non-Admitted Services obstetrics class (20.40) had a cost which was 19% higher than the midwifery and maternity class (40.28) in 2014-15. This variable is also not patient-based and is only a rough approximation of clinical need depending on the type and level of services offered to maternity patients across public hospitals.

Analysis of diagnosis data

Using the matched sample data, IHPA reviewed the relationship between different patient conditions as recorded during the birth episode as an 'additional diagnosis' and their relationship with non-admitted costs. In undertaking this analysis, IHPA grouped together diagnosis codes which were clinically similar, had a high enough patient volume and where there was a material cost difference which could be useful for risk adjustment purposes as presented at Table 11.

Table 11: Shortlist of flags for identifying outlier patients

Description	Matched patients	Difference in non-admitted service events compared to patients without the condition	Difference in total non-admitted cost compared to patients without the condition
Anaemia	15,507	+ 1.0	+ 14%
Gestational diabetes	10,065	+ 3.6	+ 35%
Pre-existing diabetes	666	+ 9.3	+ 112%
Maternal care for known or suspected foetal problems	7,225	+ 1.4	+ 17%
Other specified diseases and conditions[xlvii]	6,260	+ 1.3	+ 14%
Hypertension[xlviii]	6,075	+ 1.5	+ 16%
Endocrine, nutritional and metabolic diseases	2,175	+ 1.9	+ 23%
Mental health disorders	1,685	+ 1.8	+ 23%
Multiple delivery/parity	1,402	+ 3.4	+ 50%
Diseases of the digestive system	1,241	+ 1.2	+ 14%
Diseases of the circulatory system	1,018	+ 0.7	+ 2%
Obesity	945	+ 1.5	+ 14%
Diseases of the respiratory system	419	+ 0.2	+ 0%
Diseases of the skin and subcutaneous tissue	372	+ 0.2	+ 9%

Additional diagnoses which were identified as having a material impact on the costs of non-admitted antenatal and postnatal care and with significant patient volume were pre-existing and gestational diabetes, anaemia, hypertension and multiple births. These variables were identified as risk factors in the maternity literature and IHPA was advised that they are used as clinical flags for determining the volume and type of antenatal services provided to women. Other risk factors in the literature, such as previous obstetric history, did not carry material cost difference.

Patient groupings used in the NHS England Maternity Pathway Payment System

As previously discussed, the NHS England Maternity Pathway Payment System has determined patient-based criteria for determining the risk level and appropriate bundled payment for mothers during the antenatal, birth and postnatal periods. There are three levels of payment depending on the risk profile – standard, intermediate and intensive.

IHPA matched the diagnosis codes used by NHS England to group patient's antenatal and postnatal care to ICD-10-AM to determine whether these factors can similarly explain differences in non-admitted costs in Australia.

The risk levels were found to offer explanatory power for differences in non-admitted costs as shown at Table 12. However, the difference in costs predominately reflected the additional diagnoses which were already identified, particularly diabetes, anaemia and multiple births.

Table 12: Average non-admitted costs, by risk level

Risk level	Average number of service events per patient	Average non-admitted cost per patient
Standard	12.18	$1,982
Intermediate	12.83	$2,135
Intensive	13.92	$2,457

Diagnosis Related Groups

IHPA found that the DRG of the birth episode offers significant explanatory power for differences between patients in their non-admitted antenatal and postnatal costs. This may be because patient diagnoses are considered during the antenatal stage and are also considered in DRG assignment, as well as the impact of the complexity of the birth on what postnatal services are offered. The difference in the cost of patients grouped by birth DRG is provided at Table 13.

Table 13: Cost of non-admitted care, by DRG

Diagnosis Related Group	Average number of non-admitted service events	Total non-admitted cost
O01A – 'Caesarean delivery, major complexity'	13.8	$2,606
O01B – 'Caesarean delivery, intermediate complexity'	14.1	$2,389
O01C – 'Caesarean delivery, minor complexity'	12.5	$2,020
O02A – 'Vaginal delivery with operating room procedures, major complexity'	12.2	$2,190
O02B – 'Vaginal delivery with operating room procedures, minor complexity'	12.8	$2,148
O60A – 'Vaginal delivery, major complexity'	13.2	$2,347
O60B – 'Vaginal delivery, intermediate complexity'	13.0	$2,136
O60C – 'Vaginal delivery, minor complexity'	11.8	$1,912

Grouping women by their birth episode indicates that there is a higher non-admitted antenatal and postnatal cost for women who have complex DRGs. The largest average cost difference was found to be 36% between minor complexity vaginal delivery and a major complexity caesarean delivery patients.

Through regression modelling, IHPA identified the DRG of a patient's birth episode is the most reliable predictor of a patient's non-admitted costs. However, there remains significant variation between women which have been grouped by DRGs (Table 14).

Table 14: Proportion of patients above and below the average non-admitted cost, by DRG

Diagnosis Related Group	Less than half the average non-admitted cost	Double the average non-admitted cost
O01A Caesarean, Major Complexity	12%	35%
O01B Caesarean, Intermediate Complexity	10%	28%
O01C Caesarean, Minor Complexity	10%	27%
O02A Vag OR Proc Major Complexity	10%	28%
O02B Vag OR Proc Minor Complexity	9%	28%
O60A Vaginal Delivery, Major Complexity	10%	30%
O60B Vaginal Delivery, Inter. Complexity	10%	29%
O60C Vaginal Delivery, Minor Complexity	11%	29%

The cost variation within DRG groupings could partially reflect limitations in the accuracy of using a patient's DRG to predict what services they access across three stages of care. For example, a woman may experience a low risk pregnancy, but have complications during labour and birth which results in a caesarean birth and DRG. In contrast, a woman who receives antenatal care for a high risk patient would have higher non-admitted costs and give birth by a planned caesarean. These patients would be grouped together and receive the same bundled price. The variation in costs also reflects differences in the volume and type of services which are offered to patients of similar profiles across Australia as well as differences in the cost of that care.

One of the primary motivations for investigating a bundled pricing approach for maternity care to consider whether spending on maternity services could be reallocated to better support patient outcomes at less cost to the hospital system. An investigation of maternity costs reveals significant variation across public hospitals and jurisdictions in service delivery. The Advisory Group advised that addressing this variation could lead to significant savings to government while potentially improving or at least retaining quality care.

6. Scope of the bundled pricing approach

This chapter discusses the design decisions required to develop a bundled pricing model for maternity care and the recommendation of the Bundled Pricing Advisory Group.

6.1 Design principles

In order to develop a bundled pricing approach for maternity care, it is necessary to reach a decision on which settings of public hospital care, stages of maternity care and patient groups are considered to be in the scope of the "bundle".

To inform the Advisory Group's consideration of these issues, design principles were developed to guide consideration of which bundled pricing characteristics would drive the greatest value. The principles draw on IHPA's requirements under the Act and Agreement, the principles in the Pricing Guidelines as included in the annual Pricing Framework, as well as being informed by the learning from successful and unsuccessful bundled payment schemes overseas. It was considered that a successful bundled pricing approach would align with these principles.

Design principles for a bundled pricing approach	
Supporting service innovation	It should support the objective of providing hospital managers with the financial flexibility to implement new models of care.
Materiality	The quantum of expenditure in the bundle prices should be significant enough to provide an incentive for hospital managers to review their current service delivery arrangements with a view to improving allocative efficiency.
Unexplained variation	It should target patients, setting and stages of care which would derive the most benefit from increased flexibility in service design. For example, including postnatal readmissions within scope could lead to the under-pricing of very complex patients who are accessing these services for clinically warranted reasons.
Equitable risk adjustment	It should not discourage clinically necessary care. This issue can be mitigated through a higher price for high risk and complex patients or through excluding these patients from the scope of the bundle.
Supporting effective care	It should not provide a financial penalty for hospitals to align care delivery with evidence-based best practice. This issue can be considered through comparing the average cost of care against the cost of delivering best practice, or through explicitly developing a price which reflects best practice.
Administrative ease	The benefits of a bundled price should be balanced against the administrative burden of collecting new data elements and the added complexity which it may introduce to the National Pricing Model.

6.2 Settings of care

Service delivery to maternity patients spans the non-admitted, admitted and emergency settings of public hospital care. Some care settings are part of a routine maternity pathway, while others are only accessed by a subset of high risk or complex patients. The Advisory Group decided as a general principle that routine care should be included and additional care excluded to ensure that there was no financial penalty for patients who access it for clinically warranted reasons.

Settings which were recommended for inclusion

The Advisory Group recommended the inclusion of the admitted setting of care for the birth episode within the scope of the bundled pricing approach. Non-admitted antenatal and postnatal services are also accessed by nearly all women and data analysis has identified significant variation in service delivery. The Advisory Group therefore recommended including the non-admitted setting. These settings of care account for the vast majority of maternity costs and service volume which means there is a significant opportunity for health system efficiencies.

Settings which were recommended for exclusion

The Advisory Group recommended excluding settings of care which most patients do not access and where doing so could be a proxy for additional care for high risk or complex patients. This would exclude emergency care, antenatal admissions and postnatal readmissions. Excluding these settings mitigates the risk of hospitals being financially penalised for providing additional care to these patients. Readmissions to public hospitals are also being separately considered as part of the work to develop a pricing and funding approach for avoidable hospital readmissions.

6.2 Stages of maternity care

The scope of the bundled pricing approach could encompass service delivery across the antenatal period (at ten weeks gestation), birth episode and postnatal period (ending at six weeks postpartum). The more stages of care which are included in the scope of the bundled pricing approach, the greater the overall materiality of the bundled prices as it captures a greater proportion of costs and service volume.

In IHPA's assessment, the antenatal period appears to offer the greatest volume and level of variation in service provision, while the birth episode incurs the highest costs and offers the greatest opportunity for efficiencies if rates of intervention can be reduced. While postnatal service delivery is comparatively less significant, its inclusion could potentially address issues of under-provision of care following hospital discharge. Including all stages of care would increase the materiality of the bundled prices and allow hospital managers to make significant investments in altering their models of care to better manage patient complexity and comorbidities, but could increase the financial risk to hospitals associated with the under-pricing of some patients.

The Advisory Group recommended including all stages of maternity care in the scope of the bundled pricing approach as it offers the greatest opportunity for service redesign. This approach recognises the interrelationship between stages, for example the risk level as determined in the first trimester of pregnancy is a major determinant of the antenatal care provided, the mode of birth and complexity of the birth episode and the postnatal services which are provided. It also provides a transparent figure regarding the overall cost of routine maternity care which can inform decisions regarding service provision by system and hospital managers.

6.3 Patient population

The Advisory Group considered a variety of options regarding maternity patients which could be included in a bundled pricing approach, mainly grouped by the DRG for the birth episode.

Scope of patients	
Low risk / uncomplicated patients	Women who have low risk pregnancies are ideal for inclusion in a bundled pricing approach as variation in service delivery and patient outcomes is unlikely to reflect clinically warranted variation. Governments and clinicians have raised concern regarding continued significant variation in service delivery, costs and outcomes for these patients. A bundled price may potentially provide a price signal to support other policy initiatives. However, identifying low risk women is not possible in IHPA's data collections. The Productivity Commission's *Report on Government Services 2016* indicates that 'low risk' patients are spread across the different modes of delivery and it is estimated that approximately 20% of maternity patients are 'low risk' primiparous women and a further 20% are 'low risk' multiparous women.[xlix]
Vaginal delivery patients	One option is to include patients who had a minor to intermediate complexity vaginal delivery (DRGs O60B and O60C) for their birth episode. This option uses the DRG as a proxy to identify low risk pregnancies. Vaginal delivery patients may benefit from standardisation in antenatal and postnatal service delivery pathways and lower variation means that there is less financial risk for public hospitals even if the costs of the admitted stay were bundled into a single price. Non-admitted service delivery is relatively similar, with a similar average number of service events and patients primarily accessing the midwifery and maternity class.
Minor to intermediate complexity vaginal and caesarean delivery patients	Another option is to include women who gave birth through minor to intermediate complexity vaginal delivery or a minor complexity caesarean delivery (O01C). This option considers that patients who have a minor complexity caesarean may have a similar risk and complexity profile to low risk patients and, if a single price is determined, address issues of unwarranted interventions. Similar non-admitted service delivery could also allow for care standardisation and/or predictability in funding levels. Non-admitted service delivery is relatively similar between patient groups in the bundle, with a similar average number of non-admitted service events. However, minor complexity caesarean section delivery patients did have a higher proportion of service events to obstetrics classes and fewer postnatal service events. While this maternity bundle includes patients with similar non-admitted costs, they do have significantly different admitted costs. Robust risk adjustment would be required to adjust for clinically warranted variation.
All maternity patients	The final option would involve including most, if not all maternity patients. This option offers the largest potential efficiency gains from a bundled pricing approach. The greater materiality of the bundle increases the financial benefit of redesigning care to improve patient outcomes. However, it includes patients with significant differences in their clinical profile, service delivery patterns and non-admitted and admitted costs. This option would require the greatest degree of risk adjustment to ensure that the bundled pricing approach does not penalise hospitals for providing clinically necessary care.

IHPA had originally envisaged that the bundled pricing approach would be for uncomplicated maternity care. The Advisory Group expressed a preference for including all or most maternity patients in the bundled pricing approach if possible. This would be supported by robust risk adjustment to ensure that there was not a significant issue of under-pricing high risk and complex patients. Including all patients would increase the overall impact of the pricing approach and extend the benefits of service redesign to all patients.

6.3 Exclusions

The Advisory Group approved including most maternity patients within the bundled pricing approach. However, exclusions remain appropriate where patients would not benefit from the incentives of a bundled price towards service redesign, such as 'very sick patients'. Excluded patients and services would continue to be priced under existing ABF arrangements.

Shared care and private patients

While there may be value in encouraging greater coordination of care between the primary and public hospital settings, general practitioner, private obstetrician and private midwife services would be excluded from the scope of any bundled pricing approach as they are out of scope for pricing under the National Health Reform Agreement. Where patients have zero service events with a public hospital due to accessing private services or whether patients elect as private for birth, they can be identified and excluded from a bundled pricing approach.

Some public hospitals have formal 'shared care' arrangements with these practitioners whereby antenatal care is delivered jointly by the private practitioner and the public hospital.[l] There is no ability to definitively identify shared care in IHPA's data sets and these patients are captured for the small number of service events which are delivered by the public hospital. IHPA is sourcing Medicare Benefits Schedule (MBS) data which has been linked with public hospital activity data in an attempt to identify 'shared care' patients.

Publicly available information on shared care arrangements is limited, with estimates varying from 14%[li], 27%[lii] to 29%[liii] of public maternity patients. IHPA has reviewed public claims for the shared care MBS items and, assuming that patients visiting GPs and billing using this item are admitted to public hospitals, there appears to be upwards of 24% of public patients under shared care arrangements. IHPA has also identified a low average number of antenatal service events (fewer than 4) for some hospitals which appears to reflect established shared care programs.

The Advisory Group recommended that shared care and private patients be included for the portion of their care delivered by public hospitals. This would involve setting a lower bundled price for these patients which reflects minimum expectations regarding service delivery to all maternity patients.

Newborn care

Some bundled payment schemes for maternity care include the baby, while others include only care for the woman.[liv] For most women, newborn costs and services are included in the package of care provided to mothers including being grouped in the birth episode and included as part of the non-admitted postnatal check-ups. As this care cannot be separately identified from the mother, the Advisory Group supported its inclusion within the bundled pricing approach.

In the case where a baby requires newborn care in a special care nursery, or neonatal intensive care unit, the baby is separately admitted (described as a 'qualified neonate'). The Advisory Group recommended the exclusion of care for qualified neonates from the scope of the bundled pricing approach to ensure that separate newborn care remains adequately funded.

The Advisory Group did not reach a recommendation on whether to include non-admitted care for 'unqualified neonates' (healthy newborns) in the scope of the bundled pricing approach. However, IHPA notes that the inclusion of this care may preclude mothers with qualified neonates from the scope of the bundled pricing approach.

The inclusion of non-admitted care for unqualified neonates in the bundled pricing approach could be difficult due to data matching issues. Using a probabilistic matching method for the linked 2013-14 and 2014-15 data, IHPA only identified 11% of mothers as having qualified neonates with postnatal services recorded. The average number of service events was 4. The high service volume may indicate that this care is additional to routine postnatal care. The number of unqualified neonates which were mapped varied significantly by jurisdiction and IHPA is not aware of whether this is a problem with the matching method or reflects jurisdictional variation in how postnatal service events for the mother and baby are coded.

Number of service events

For very high cost patients (top 10% in cost) in the non-admitted antenatal and postnatal stages, the number of service events is the largest predictor of their cost. Although this number is not itself a patient characteristic, the high volume of services accessed by these patients does indicate that they are likely to have a different clinical profile. The Advisory Group therefore recommended that patients with over double the average number of service events should be excluded from the scope of the bundled pricing approach to ensure that hospitals are not financially penalised for treating complex patients. This excludes 6% of patients.

Complex non-admitted classes

In 2015-16, two new non-admitted classes were introduced for classifying patients with complex pregnancies – Maternal Fetal Medicine (Tier 2 class 20.54) and 'Obstetrics - management of complex pregnancy' (20.53). Patients accessing these non-admitted classes were considered for possible risk adjustment purposes or exclusion from the scope of the bundled pricing approach.

IHPA identified that, while patients accessing these non-admitted classes do have higher costs, their service delivery is similar to patients who have a birth episode in the more complex DRGs. While excluding patients who access the Maternal Fetal Medicine class would only remove 1% of patients in 2015-16, the Advisory Group recommended that the class rather than the patients be excluded from the scope of the bundled pricing approach, whereby it would be priced under ABF.

IHPA identified that excluding patients who access the complex obstetrics class would remove 24% of patients in 2015-16 from the bundled pricing approach. Given that patients accessing the class mostly group to the complex DRGs for the birth episode, it was decided that the additional cost of these patients was already accounted for if the DRG was used for risk adjustment.

Analysis of diagnosis data

IHPA did not identify any diagnoses with enough patients and high costs to warrant exclusion from a bundled pricing approach. For example, HIV positive patients have a cost which is 200% above the average non-admitted cost. However, there are only 14 patients that are HIV positive and IHPA considers that their higher costs would be offset by lower costs for some other patients.

As part of the annual pricing process, IHPA keeps a watching brief on high-cost patients, and if significant cohorts were identified in the future, consideration could be given to excluding them from the bundle or introducing additional patient loadings into the pricing approach.

7. Design of the pricing approach

This chapter outlines different options for the mechanics of the pricing approach in the bundled pricing model and the recommendations of the Bundled Pricing Advisory Group.

The Advisory Group determined that a single bundled price would be determined per maternity patients which would be comprised of three separate portions: the admitted birth episode, antenatal and postnatal care. These portions could be bundled together into a single price which reflects the average cost of care for similar patients, or separately calculated and then combined.

7.1 Pricing the admitted portion of the bundled prices

Birth episodes are priced under ABF using the AR-DRG classification which reflects patient complexity as determined by diagnoses, interventions and length of stay. DRGs are developed through clinical input and analysis of cost data to explain variation in the cost of admitted care.

IHPA's analysis has shown that a maternity patient's DRG for birth is the strongest predictor of admitted costs and that the differences in admitted costs between different patient groups (as identified by DRG) are significant. IHPA has also undertaken preliminary cost ratio analysis which suggests that removing the DRG for determining the admitted price would lead to the significant under-pricing of many patients and hospitals.

IHPA notes that there are disadvantages to using the DRG. As it is retrospective, the DRG considers mode of birth without regard to whether interventions were avoidable. As a result, patients with similar risk profiles may receive separate DRGs depending on whether they had a vaginal or caesarean delivery which reduces the incentive for hospital managers to invest in service redesign to reduce the rate of avoidable interventions.

Moving away from a reliance on the DRG to differentiate between patient complexity levels requires significant clinical and jurisdictional consultation and comprehensive data analysis. IHPA has not been able to identify risk factors which offer similar predictive power to the DRG for the costs of admitted care for maternity patients. As the data required to develop this pricing approach was not identified as available in other national data collections, IHPA would have to source new data elements which would impose an administrative burden on jurisdictions. It would also take multiple years before the elements would be collected.

The Advisory Group decided that, on balance, using the DRG for birth is appropriate as it has been refined over multiple years and avoids the cost variation and financial losses that may otherwise arise. For example, this could occur if caesarean and vaginal births were grouped together. Therefore, the Advisory Group recommended the design of a bundled pricing approach which retains the DRG price weight for birth. This option could be reconsidered in future years once an initial model has been bedded down.

7.2 Pricing the non-admitted portion of the bundled prices

As discussed in Chapter 5, there are only a limited number of patient variables available which offer explanatory power for differences between patients in their non-admitted costs. The available pricing options for the non-admitted portion of the bundled price were identified as:

- **Option 1 –** A consistent price for non-admitted care across all patients.
- **Option 2 –** Separate prices for each patient group (identified by birth DRG).

While variation is smaller for non-admitted care, there remain material differences in the volume, clinic type and cost of non-admitted care across patient groups. For example, there is a 35 per cent difference in non-admitted costs between patients which had the least complex vaginal delivery DRG for birth and patients who had the most complex caesarean delivery DRG for birth.

IHPA identified that a patient's DRG for birth has the greatest explanatory power in national data sets for the costs of non-admitted antenatal and postnatal service delivery. Although diabetes and multiple births offer greater predictive power for differences in non-admitted costs between patients, even after accounting for these factors there remains a difference of 20% between patients in the least and most complex DRGs for birth.

The Advisory Group considered that this cost variation within a single non-admitted bundle is not appropriate and therefore recommended that non-admitted prices be separately calculated for patient groups using their DRG for the birth episode.

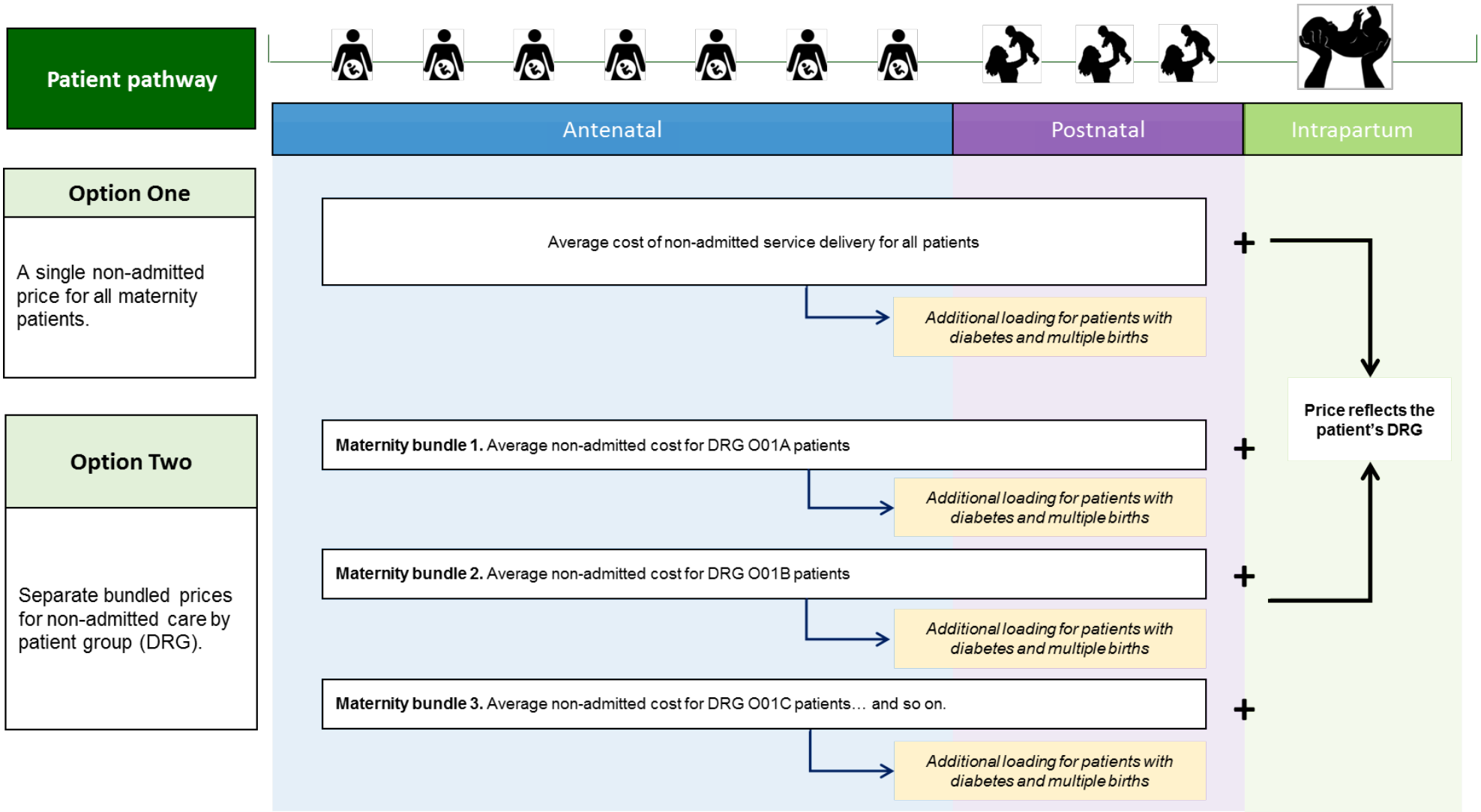
7.3 Risk adjustment / patient loadings to bundled prices

Robust risk adjustment is a feature of most bundled payment schemes overseas and was recommended by the Advisory Group for non-admitted care. As it is recommended that the admitted portion of care would continue to be priced using DRG price weights, it is envisaged that existing adjustments for admitted care would continue to also apply.

As discussed in Chapter 5, IHPA sought to identify patients with materially higher costs and determine whether they would warrant application of patient loadings to the non-admitted portion of the bundled price. Diabetes, multiple births, maternal care for known or suspected foetal problems and anaemia were identified as offering significant predictive power for non-admitted costs. After accounting for DRG-specific bundles, patients with diabetes and multiple births continue to have materially higher non-admitted costs and the Advisory Group recommended loadings to the non-admitted portion of the bundled price for these patients.

The impact of these design decisions on the bundled pricing model is shown at Figure 9.

Figure 9: Proposed bundled pricing approach for maternity care



8. Modelling of impact

This chapter discusses the preliminary results of IHPA's modelling of the impact of introducing the proposed bundled pricing model for maternity care.

8.1 Financial impact on health services

IHPA undertook preliminary modelling of the expected financial impact of introducing the proposed bundled pricing model, while noting that the significant data limitations to the probabilistic matching approach have a confounding influence on interpreting the results.

IHPA assessed the impact of bundled pricing for maternity care by examining the:

- Cost ratio: The ratio between the actual cost of care and the predicted cost (which is used to derive a price). A cost ratio greater than one means that costs exceed funding, whilst a cost ratio less than one means that costs are less than the funding provided.
- Financial impact: The difference between the price which is currently paid for those services under ABF and the price proposed under a bundled pricing approach.

'Current funding' was calculated using the DRG and Tier 2 price weights in NEP17 which were applied to the 2014-15 reference cost. Victoria and South Australia are not included as these jurisdictions did not submit patient-level non-admitted cost data for those years.

Findings

Given that the admitted portion of the bundled pricing approach is proposed to be based on the DRG, IHPA found there is no impact from the introduction of bundled pricing for admitted care. For non-admitted care, the extent of the impact depends on a combined effect of whether:

- The number and type of service event per patient is close to the national average.
- The cost per service event is close to the price under ABF.

The impact of DRG-specific bundles on cost ratios varied by group but generally improves alignment between the actual cost and the price. Introducing a bundled pricing approach appears to benefit most jurisdictions with regards to their cost ratio, except for New South Wales.

The financial impact of DRG-bundles varies, while a single price generally has a negative financial impact. Most jurisdictions would financially benefit, except for New South Wales. The jurisdictional impact is primarily determined by:

- The number of service events per patient, for example New South Wales has 15 service events per patient on average compared to 10 for Queensland.
- The type of services which are delivered, for example the relative usage of midwifery (less costly) and obstetrics (more costly) services.

Overall, the analysis confirms that a single bundle would significantly increase the degree of cost variation and that DRG-specific bundles would better account for the higher non-admitted costs of more complex maternity patients.

9. Implementation

This chapter discusses the issues regarding the implementation of a bundled pricing approach as identified by stakeholders through public consultation and by the Bundled Pricing Advisory Group.

9.1 Implementation considerations

While the Advisory Group has not comprehensively identified implementation issues which would need to be resolved prior to the introduction of a bundled pricing approach, multiple issues were raised by the Advisory Group in the course of a developing a draft bundled pricing model. Issues were also raised by the public through the Pricing Framework Consultation Paper. These include:

- Movement of patients between hospital establishments during pregnancy: Patients may receive antenatal or postnatal care in a different hospital to the birth episode. However, the probabilistic matching approach which is being used in the absence of unique patient identifiers would not be able to identify these patients.
- Pregnancy spanning multiple financial years: Approximately 70% of patients access maternity care across multiple financial years which is a challenge for distributing payments to public hospitals. One approach could be to determine a provisional price which reflects the average proportion of costs incurred by that point in delivering care. The impact of this issue can be reduced by separate prices per stage of care.
- Patients who leave the care pathway: Some patients may not complete a full care journey for maternity care for a variety of reasons. For example, a patient may move overseas or change from public to private care. In the absence of patient identifiers, this is difficult to identify. Other patients may experience a stillbirth which means that they would require different care to that covered by the approach. The Advisory Group has recommended that women who experience a late miscarriage or stillbirth continue to be included in the bundled pricing approach for the portion of maternity care which they received.
- Back-casting: Introduction of a new pricing approach may complicate the calculation of Commonwealth growth funding which is based on changes on the price and volume of public hospital services across years. A decision on this issue may require a decision by health ministers. If back-casting were to occur, it may be complicated if new data items were introduced to support implementation of bundled pricing.
- Shared care arrangements: IHPA data does not identify shared care arrangements which span the primary, private and public hospital settings. While IHPA is sourcing Medicare Benefits Schedule data, some Members have expressed concern regarding its ability to fully identify shared care. Without being identify these patients, they are likely having a downward impact on the average cost of care which influences bundled prices.
- Monitoring the impact: As the intention of a bundled pricing approach is to incentivise changes in service delivery, it should be considered whether to monitor and evaluate its impact through performance metrics, whether that be the average number of service events or patient-focused outcome measures. This is particularly important to identify instances where health services are ‘stinting’ (i.e. withholding care to patients) to maximise the financial benefit under the bundled price.

As the intent of the Advisory Group was to design a draft bundled pricing model, solutions to implementation issues were not identified. Many of these issues require significant consultation with jurisdictions and the Administrator of the National Health Funding Pool to determine the appropriate course of action or the introduction of new data reporting requirements.

9.2 Barriers to implementation

In developing a bundled pricing approach for maternity care, the Advisory Group have identified significant barriers to implementation of a bundled pricing model nationally. These issues are not limited to the maternity sector, but reflect wider limitations in the completeness, accuracy and access to health system data. The barriers to implementation which have been identified include:

- The lack of unique patient identifiers: National data sets currently used by IHPA do not contain unique patient identifiers which would enable the service delivery patterns of maternity patients to be reliably traced across episodes and settings. Until such time as a single patient identifier is included in administrative datasets, bundled pricing will not be feasible at a national level.
- Significant variation in models of care: Non-standardised care pathways across the jurisdictions are a problem for gaining consensus for a bundled price as care is delivered in such a variety of settings throughout states and territories that without major changes to care provision some will be financially disadvantaged.
- Limited non-admitted patient-level information: Due to the lack of patient-level diagnostic information in non-admitted data sets, IHPA has had a limited number of variables for use in determining differences in the risk and complexity levels of maternity patients. It has also lead to a reliance on using the DRG of the birth episode as a proxy for these metrics across all three stages of care which decreases the clinical accuracy of the approach.

10. Preconditions to bundled pricing

This chapter discusses preconditions for introducing bundled pricing in the Australian public hospital funding context, as identified in the course of developing a model for maternity care.

10.1 Preconditions to introducing a new bundled pricing approach

Over the course of past investigative and developmental work, IHPA and the Advisory Group have identified necessary preconditions for the successful implementation of bundled pricing for maternity care and bundled pricing schemes generally within Australian public hospitals. These range from technical requirements for practical implementation to high level issues regarding stakeholder engagement and buy-in required for successful implementation across the health system. The preconditions identified by the Advisory Group for introducing new value-based approaches should serve as an initial test prior to the introduction of these schemes in the future.

While this is far from an exhaustive list of the prerequisites to introducing a bundled pricing approach, the key preconditions identified by IHPA and the Advisory Group were:

The ability to accurately track patients across services and care settings

The ability to track a patient across multiple episodes and settings of care is central to the design and successful implementation of bundled pricing for any health service. This is particularly relevant for maternity care which spans the non-admitted and admitted settings for most patients, with some also requiring emergency care and accessing care across hospital establishments.

A unique patient identifier would allow for accurate identification of similarities and differences between patients in their care pathways which can inform the development of bundled prices and a robust risk adjustment approach. A unique patient identifier would also support implementation of the approach including the ability to reconcile hospital activity against a patient for payment purpose, to account for service delivery across hospital establishments and financial years and where patients leave the pathway or are otherwise no longer eligible to receive a bundled price.

Obtaining linked patient data would also provide broader benefits to the health system, including public health research, allowing hospitals to review their care pathways and to develop other value-based healthcare proposals.

Stakeholder engagement

Strong clinical and stakeholder support has been identified overseas as a key component of the introduction of value-based healthcare measures such as bundled pricing. A bundled price for maternity care must be uniquely calibrated to the needs of the patient, clinicians and health system administrators. As with inter-governmental funding agreements more generally, this is only achievable with a high level of stakeholder engagement and consultation.

Thorough consultation should be sustained over the development, implementation and operation of any bundled pricing approach and continue to include all interested parties such as government agencies, clinicians, consumers and peak bodies.

Evidence indicates there are significant differences in models of care across and within jurisdictions. Clinical consultation is particularly important to understanding the impact of funding arrangements and price signals on models of care and the ability of policy makers to achieve the desired policy objectives.

Making the case for new pricing approaches

The introduction of new pricing approaches at the national level requires genuine engagement from system and hospital managers for its effective implementation. At multiple points in developing the bundled pricing model for maternity care, the Advisory Group advised IHPA that further discussion and communication was required on the benefits of introducing the new approach including specifics regarding how it would alter current care and evidence to support these claims. This feedback was also received in response to Pricing Framework Consultation Papers for 2016-17 and 2017-18.

An important aspect of building clinical support for a new initiative is clearly communicating the benefit for patients. For example, identifying significant differences in models of care across hospitals and jurisdictions which are not serving patient needs and where change could be supported through a new pricing approach. This requires substantial clinical consultation to understand the impact a price signal based on the average cost of care would have on hospital managers and whether this would enable innovative models of patient care rather than rationing of services.

Another important aspect of building jurisdictional support is communicating how the benefits of the new approach outweigh the costs and administrative burden of implementation, including possibly new data collection requirements. This is important where the success of the bundled pricing approach is dependent on compliance with the new administrative requirements, such as the collection of diagnoses data in the community setting for the NHS England Maternity Pathway Payment System. One way to clearly communicate the benefits of the approach is through trialling the scheme as to provide evidence of its feasibility and desirability within the Australian public hospital funding context and to address any issues which were identified before wider implementation.[lv]

11. Next steps

This chapter discusses the next steps for bundled pricing approaches in the context of the national activity based funding system and includes proposals for progressing these initiatives.

11.1 Bundled pricing for maternity care

Since March 2016, IHPA and the Advisory Group have made significant progress in understanding service delivery and cost drivers in maternity care, reviewing schemes overseas and considering the design aspects of a bundled pricing for maternity care. However, IHPA will not introduce a bundled pricing approach for maternity care in 2018-19 given a number of implementation issues which have yet to be resolved as well as the significant barriers to implementation which have been identified in the course of developing a draft model.

The proposed bundled pricing model for maternity care as developed by the Advisory Group will be considered by the Pricing Authority for implementation in future years, subject to progress in wider work to address the barriers to implementation in the health system.

Given the significant jurisdictional, clinical and other stakeholder input which has gone into designing a bundled pricing approach, the bundled pricing model should be considered by governments, private health insurers and hospitals in developing their value-based approaches for maternity care which move away from an outputs focus to look instead at outcomes.

11.2 Addressing the preconditions to bundled pricing

IHPA intends to continue to monitor developments in the maternity and health sector which could support the introduction of a bundled pricing approach in the future. For example:

- The AIHW 'Maternity Model of Care Classification System' provides consistent descriptors and definitions for the range of models of care available and was endorsed as a new national data standard from 2015-16, but is not currently mandatory for collection. Access to this data or its integration into IHPA's data sets in the future would provide greater insight into models of care across jurisdictions and hospitals to inform discussions regarding the expected impact of a bundled pricing approach. The data set would also enable the identification of shared care arrangements in public hospitals.
- IHPA will continue to investigate opportunities for linkage between its data sets, the AIHW National Perinatal Data Collection and the Commonwealth Department of Health's Medicare Benefits Schedule data to gain a more complete picture of maternity care and access additional patient-based variables which could inform the pricing approach.
- In the Pricing Framework Consultation Paper 2018-19, IHPA canvassed whether there is support for the introduction of unique patient identifiers across services and settings of care. The inclusion of Individual Healthcare Identifiers in national data sets could resolve issues regarding the tracking of service delivery over time which is the primary impediment to introducing a bundled pricing approach for maternity care or other conditions spanning multiple settings of care. Subject to feedback, IHPA will work with Australian governments to consider this issue given its wider value for the health system in terms of developing new pricing approaches, monitoring care and undertaking healthcare research.

11.3 Bundled pricing for other conditions

In the Pricing Framework Consultation Paper 2016-17, IHPA sought public feedback on which conditions could benefit from a bundled pricing approach. Stakeholders suggested a variety of conditions and treatments which could benefit from a 'value-based' focus including elective joint replacement and stroke care, for patients at risk of or in the early stages of chronic disease and end of life care. Some conditions of these may be more amenable to the introduction of a bundled pricing approach than maternity care due to less service variation and greater clinical agreement regarding what the objectives of the pricing approach would be. IHPA notes that there are also numerous schemes to draw learnings from overseas.

IHPA intends to revisit support for introducing a bundled pricing approach for other conditions in future years through the annual Pricing Framework, following completion of the current focus on developing pricing and funding approaches for safety and quality. Investigating bundled pricing for other conditions will be informed by learnings from the work for maternity care.

IHPA is also canvassing support for investigating the introduction of other value-based pricing methods at the national level, such as capitation payments and whether a block funding approach at the national level could support its adoption within states and territories.

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Independent Hospital Pricing Authority

Level 6, 1 Oxford Street
Sydney NSW 2000

Phone 02 8215 1100
Email enquiries.ihpa@ihpa.gov.au
Twitter @IHPAnews

www.ihpa.gov.au

IHPA