



National Pricing Model Technical Specification 2012-2013

Version 1.1

Note: This version clarifies the treatment and use of the Length of Stay variables in calculating the price weights for those patients with ICU hours.

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Table of acronyms and abbreviations

Acronym/ abbreviation	Description
ABF	Activity based funding
ALOS	Average length of stay
AR-DRG	Australian Refined Diagnosis Related Groups
CSO	Community Service Obligation
DoHA	Department of Health and Ageing
DVA	Department of Veterans' Affairs
ED	Emergency Department
ICU	Intensive Care Unit
IHPA	Independent Hospital Pricing Authority
LOS	Length of Stay
MDB	Major Diagnostic Block, used in Urgency Related Groups
NEP	National Efficient Price
NHCDC	National Hospital Cost Data Collection
NHRA	National Health Reform Agreement
NWAU	National Weighted Activity Unit
PHE	Public Hospital Establishment (data collection)
PHI	Private health insurance
TTR	Teaching, Training and Research
UDG	Urgency Disposition Groups
URG	Urgency Related Groups

1 Overview of process

The National Health Reform Agreement (NHRA) sets out the intention of the Australian Government and state and territory governments to work in partnership to improve health outcomes for all Australians. One of the ways in which the Agreement aims to achieve this is through the implementation of national ABF. To determine how this would be applied to hospital services, and the price to be used as the reference for the Commonwealth to determine its funding contribution, the Agreement provides for the establishment of an independent pricing authority in relation to specific aspects of funding and pricing of hospital and related services. This is the Independent Hospital Pricing Authority (IHPA), which was subsequently established under the *National Health Reform Act 2011*.

IHPA has issued a *National Efficient Price Determination 2012-2013 (the Determination)*, which sets out the determinations for 2012-13 in relation to each of its legislative functions, namely:

- a. the 2012-13 National Efficient Price (NEP12) for health care services provided by public hospitals where the services are funded on an activity basis
- b. development and specification of classification systems for health care and other services provided by public hospitals
- c. adjustments to the NEP to reflect legitimate and unavoidable variations in the costs of delivering health care services
- d. except where otherwise agreed between the Commonwealth and a state or a territory – the public hospital functions that are to be funded in that state or territory by the Commonwealth
- e. publication of a report setting out the NEP for the coming year and any other information that would support the efficient funding of public hospitals.

The Table below references the relevant sections in the *Determination*.

Table 1 – Sections of the *National Efficient Price Determination 2012-2013* referenced in this document

Component	Section of <i>Determination</i>
National efficient price	Chapter 2
<i>Acute admitted services</i>	
AR-DRG trim points, flags for designated same day payment AR-DRG and unbundled ICU AR-DRG, National Weighted Activity Unit (NWAU) weights for same day payment AR-DRGs, short stay outliers (fixed and per diem), long stay outliers (per diem), inliers, Intensive Care Unit (ICU) rates per day, Paediatric Adjustment, Private Patient Service Adjustment	Appendix C
Indigenous Adjustment, Outer Regional, Remote and Very Remote Adjustments	Chapter 5
Private Patient Accommodation Adjustment	Appendix B
Specialised children's hospitals	Glossary
Definition of a level 3 ICU or paediatric ICU (PICU)	Glossary
<i>Emergency department services</i>	
Urgency Related Groups v 1.2 classification and NWAU weights	Appendix C
Urgency Disposition Groups v 1.2 classification and NWAU weights	Appendix C
Emergency departments in-scope for ABF	Glossary
Definitions of emergency department role levels	Glossary

Non-admitted services	
Non-admitted patients - Tier 2 List	Glossary
List of specified Non-admitted patient services	Appendix A

This document has been produced as an accompaniment to the *Determination*. It provides the technical specifications for how IHPA developed the ABF models for the service streams to be funded on this basis from 1 July 2012 (acute admitted, emergency department and non-admitted outpatient care). It also shows how the NWAU were developed, and provides guidance to hospitals, Local Health Networks and state and territory health authorities on how to apply these to hospital activity.

ABF requires the identification of discrete units of output that are comparable across hospitals. Systems for classifying outputs have been applied separately to different ABF service streams. In addition, under the current national application of ABF, a common unit has been developed across all ABF service streams, known as a national weighted activity unit or NWAU. This is the unit to which NEP12 is applied as a reference for the Commonwealth, to determine its share of funding for activity undertaken by hospitals (aggregated at a Local Hospital Network level).

To develop NWAU, and to determine the NEP12, IHPA collated activity and cost data for each of the ABF service streams to be funded on an activity basis in 2012-13, as follows:

- acute admitted care
- emergency department
- non-admitted outpatient care.

The data was sourced from various national data collections supplemented by other data provided by states/territories. The classification systems and sources of cost and activity data applying to each service stream are shown in Table 2.

Table 2 – Summary of classification systems and sources of cost and activity data by service stream

Service stream	Classification ¹	Cost data	Activity data
Acute admitted care	Australian Refined Diagnosis Related Groups (AR-DRG) version 6.x	National Hospital Cost Data Collection (NHCDC) Round 14 (2009-10) Supplemented by data on Teaching Training and Research. Additional analysis using the Public Hospital Establishments (PHE) national minimum data set (NMDS)	Admitted patient care (APC) NMDS, enhanced to capture data from jurisdictions on time in a level 3 ICU or PICU by episode
Emergency department care	<i>Level 3B to 6 emergency departments: Urgency Related Group (URG) version 1.2 (See Determination Table 2)</i> <i>Level 1 to 3A emergency departments: Urgency Disposition Groups (UDG) (level 1 to 3A emergency departments) v1.2 (See Determination Table 3)</i>	NHCDC Round 14 (2009-10)	<i>Level 3B to 6 emergency departments: Non-admitted patient emergency department care national minimum data set enhanced to capture ICD-10-AM diagnosis to assign to a Major Diagnostic Block (MDB), used for assignment to URG</i> <i>Level 1 to 3A emergency departments: Emergency services ABF DSS</i>
Non-admitted care (outpatients only)	Tier 2 Outpatient Clinic Definitions (see <i>Determination</i>)	Supplementary costing of non-admitted clinics based on Non-admitted patient ABF minimum data set for 2010-11, using NHCDC submission formats	Non-admitted Patient ABF DSS and Non-admitted Patient Aggregate DSS, enhanced to capture Tier 2 clinic

Classification systems within each service stream were applied uniformly across all available data. Although these systems have been developed to explain variation in cost between different outputs within the stream, there is known additional systematic variation. To account for this, various adjustments were modelled and where justified, they were implemented.

Once agreement was reached on the average costs and relative weights of various classes within each service stream, and on adjustments, the data were projected to reflect 2012-13 prices and relativities. Finally, these data are fed into the development of the NEP12.

The overall process to determine NEP12 is shown in Figure 1 below.

¹ Details of each of the classifications are available from:

www.ihpa.gov.au/internet/ihpa/publishing.nsf/Content/ABF-Price-Model-Reference-Classifications-for-2012-13

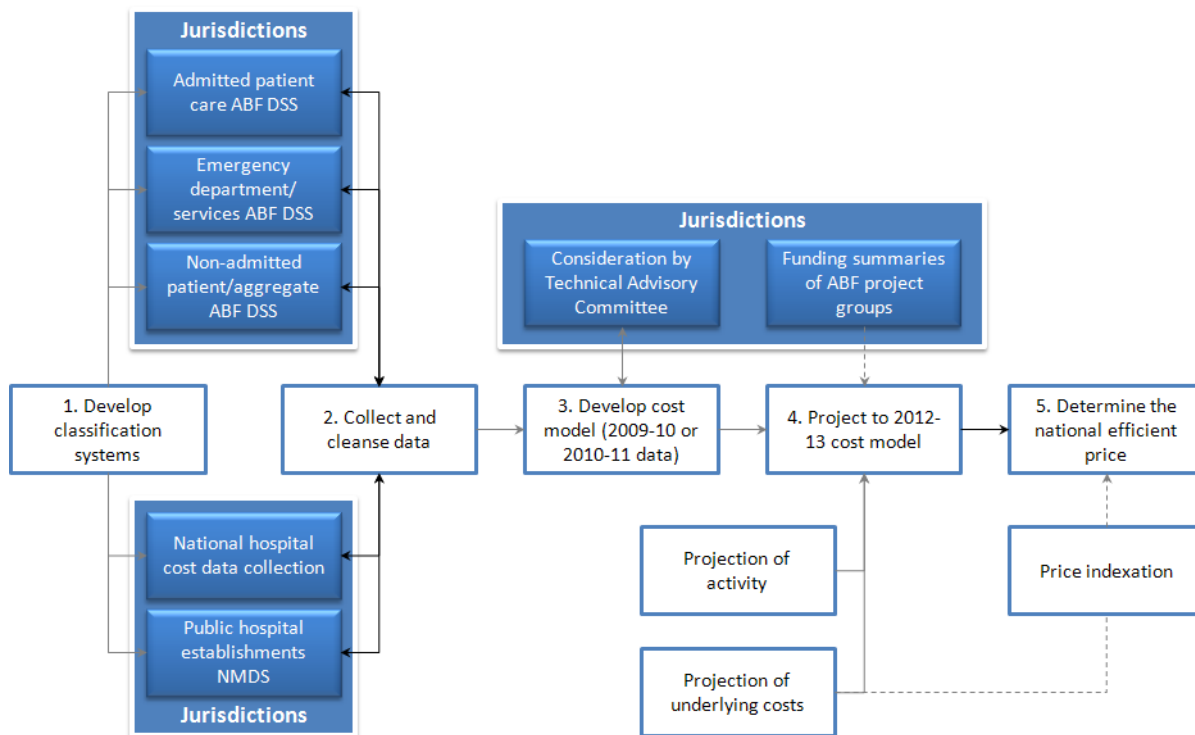


Figure 1 – Process to determine the National Efficient Price 2012-13

2 Acute admitted care cost model

2.1 General Issues

2.1.1 Funding unit

An 'episode of admitted patient care'² is the funding unit for acute admitted patients. It is "[t]he period of admitted patient care ... characterised by only one care type"³, and covers the period of care from admission to discharge. Admission and/or discharge can be physical or statistical. Physical admission/discharge is where the patient presents to the hospital with an acute condition and is admitted to the hospital, and/or is treated for an acute condition and goes home or care is transferred to another facility. Statistical admission/discharge is where the patient commences a new episode of care within the same hospital admission for subacute or other care, or the patient ceases to become acute after admission for acute care and continues their stay in hospital as a subacute patient.

2.1.2 Scope

Acute admitted care is that provided to patients who undergo a facility's formal admission⁴ processes, where the clinical intent or treatment goal is the provision of acute care, or the patient is a baby born in hospital, or is nine days old or less at the time of admission⁵ and has been qualified for one or more days⁶.

Scope for ABF

National arrangements for ABF will apply to a subset of acute admitted episodes, defined by the funding source and election status for the patient and the type of hospital in which the episodes occurs. The specifications related to funding source and election status are shown in Attachment B.

In *public hospitals*, ABF will apply to patients with a funding source⁷ of 'Australian Health Care Agreements', 'private health insurance', 'self-funded' and 'reciprocal health care agreements' or 'other hospital or public authority contracted care'.

In *private hospitals*, ABF will apply to patients with a funding source of 'Australian Health Care Agreements' and 'reciprocal health care agreements'. For episodes with a funding source of 'other hospital or public authority contracted care', ABF will only apply where the election status⁸ reported for the episode is 'public'.

All other episodes (e.g. those funded through the Department of Veterans' Affairs and compensable patients) are excluded from scope of funding.

² See object class *Episode of admitted patient care* [METeOR identifier: 268956].

³ Ibid.

⁴ See glossary item *Admission* [METeOR identifier: 327206].

⁵ See data element *Care type* [METeOR Identifier: 270174], values: 1 Acute care; 7 Newborn care.

⁶ See data element *Number of qualified days for newborns* [METeOR identifier: 270033]

⁷ See data element *Funding source for hospital patient* [METeOR identifier: 339080], values: 01 Australian Health Care Agreements; 02 Private health insurance; 03 Self-funded; 10 Other hospital or public authority (contracted care); 11 Reciprocal health care agreements (with other countries); 12 other.

⁸ See data element *Admitted patient election status* [METeOR identifier: 326619]. Values of 1 Public, 2 Private and 9 Not stated are in scope for all funding sources except 10 Other hospital or public authority (contracted care) (only 1 Public is in scope) and 12 Other (only 1 Public is in scope).

In the *Determination*, IHPA has recommended a definition of services in-scope for the application of ABF. For 2012-13 the services in scope for ABF will be agreed on a bilateral basis between each state and territory and the Australian Government.

Table 3 – Acute admitted episodes in scope for ABF

Variable	Episodes that meet the inclusion criteria		
Care type	1 Acute care 7 Newborn care and qualified days > 0		
Funding source/ Election status	Funding source	Public hospitals	Private hospitals
	01 Australian Health Care Agreements	Included	Included
	02 Private health insurance	Included	Excluded
	03 Self-funded	Included	Excluded
	10 Other hospital or public authority (contracted care)	Included	Included where election status is public
	11 Reciprocal health care agreements	Included	Included
Hospital size & location	As recommended in the <i>Determination</i> . For 2012-13 the hospital in scope for ABF will be agreed on a bilateral basis between each state and territory and the Australian Government.		
Error AR-DRGs	Episodes with an 'error' AR-DRG are not assigned an NWAU, and therefore are excluded from ABF. These include AR-DRGs v6.x 960Z, 961Z, and 963Z.		

Scope for developing NWAU

In developing NWAU, the scope of episodes varied in the following respects:

- No episodes were excluded on the basis of funding source/election status. This approach was taken to ensure the sample used for the development of NWAU was maximised and reflected the overall costs for the hospital.
- A preliminary definition of hospitals that are to be block funded was applied⁹. The adoption of a revised set of criteria for hospital to be block funded made no material difference to the NHCCDC sample used for analysis.

Table 6 below shows estimates of the number of establishments and episodes in-scope of ABF, based on analysis of the 2009-10 Admitted patient care (APC) national minimum data set (NMDS), together with the number of hospitals and episodes contributing cost data.

Other factors impacting scope include:

- Where a patient is admitted through an emergency department within the scope of ABF for emergency care, this component of cost has been removed from the episode and funded through the emergency care funding model.
- Depreciation and other capital related costs (where reported) have been removed.
- Based on supplementary data supplied by states and territories, teaching, training and research (TTR) costs have been adjusted so that indirect TTR costs are included within the acute admitted costs. Direct TTR costs have been excluded and will be block funded.
- From 2014-15, a separate funding model will apply to mental health. In the meantime, acute admitted mental health is included in the funding for acute admitted care.

⁹ The preliminary definition included (a) all hospitals located in remoteness area of *Major Cities of Australia* (b) Hospitals located in remoteness area of *Inner Regional* or *Outer Regional Australia* and had more than 1,800 weighted acute episodes in 2009-10; and (c) Hospitals located in remoteness area of *Remote* or *Very Remote Australia* and had more than 2,500 weighted acute episodes in 2009-10.

2.1.3 Classification

Australian Refined Diagnosis Related Groups (AR-DRGs) are used to classify acute admitted care. The version applying for funding from 2012 is 6.x. This is a modified version from 6.0, mainly splitting some classes to better delineate resources associated with subclasses of patients.

2.2 Analysis of costs to derive NWAU for acute admitted care

This section provides an overview of the steps involved in developing the NWAU for acute admitted care. Detailed information in relation to each of the components of the model is included further below. Broadly, the steps involved in developing the NWAU for acute admitted care were:

- prepare data
- develop sample weights
- classify episodes into relevant categories including inliers, short and long stay outliers, designated same day payment AR-DRGs, paediatric status, Indigenous status and remoteness area status
- determine funding level for ICU Adjustment and deduct associated costs
- derive initial parameters for same day payment AR-DRG episodes, short stay outliers, inliers and long stay outliers
- re-weight parameters to ensure predicted costs align with actual costs
- derive Paediatric, Indigenous and Outer Regional, Remote and Very Remote Adjustments
- incorporate costs from cost modelled sites
- estimate deductions to be applied for private patient episodes.

These steps are described in further detail below.

2.2.1 Data preparation

Preparing the data involved the following steps:

- Restrict the sample to hospitals in scope for ABF.*
- Join the NHCDC patient costing data with the APC NMDS.* Around 0.5% of episodes reported in the NHCDC could not be matched to episodes reported in the APC (see Table 7).
- Check AR-DRG grouping.* For around 0.4% of records the AR-DRG reported in the NHCDC did not match the AR-DRG reported in the APC. In these cases the AR-DRG reported in the APC was used for analysis.
- Check other NMDS variables (e.g. funding source).* For some other variables the value reported in the NHCDC did not match those in the APC record. The values reported in the APC were used in the analysis.

Trim extreme cases that were clearly errors. There were approximately 22,000 episodes (around 0.5%) removed from the NHCDC data due to extreme values identified (see Table 4). These included 20,000 episodes where costs reported were less than \$20.

Table 4 – Acute admitted episodes removed from analysis of NHDC

Step	No of episodes removed
Inconsistent AR-DRG and length of stay; i.e. episodes with same-day DRG (e.g. Z60C Rehab, Same Day)	10
Length of stay greater than or equal to 365 days	15
Total costs in-scope (after removing depreciation and ED costs) less than \$20	20,000
With an error AR-DRG	270
Costs in-scope (after removing depreciation and ED costs) greater than expected (based on analysis of cost and length of stay and whether value studentised residual/z-score for the observation fell within -10 and +10 at the state/territory or national level)	2,050
Total	22,345

- e. *Re-allocate costs of unqualified neonates to mothers.* Most states and territories reported costs for unqualified neonates separately. These were re-allocated to the appropriate episode for the mother of the neonate, which is the convention for costing and funding these episodes nationally.
- f. *Remove depreciation and emergency department costs.* A total of \$400 million (2.2% of total reported costs) was removed for depreciation costs and \$869million (4.7% of total reported costs) for the emergency department cost buckets.
- g. *Adjust costs for TTR to ensure direct TTR costs are excluded from admitted acute care and indirect TTR costs are included in admitted acute care.* Jurisdictions were asked to resubmit NHDC data reflecting the approach agreed (i.e. with direct TTR costs excluded and indirect TTR included in the acute costs). Subsequent adjustments were required for Victoria, Western Australia and South Australia. These adjustments applied across all products including acute admitted care. For Victoria, direct TTR costs had been included in the cost data. It was estimated these costs were 3.14% of reported acute admitted, emergency department and outpatient costs. This proportion was removed from these costs. Specific amounts were provided for Western Australian hospitals, and these were deducted from the acute admitted costs, equivalent to -5.1% of acute costs. Details of total direct and indirect TTR costs were supplied by South Australian hospitals. Indirect costs had not been included in admitted acute costs. It was estimated that 50% of total TTR costs related to indirect TTR costs and this amount was added to the acute admitted costs for each of the hospitals. This was the equivalent of adding 2.7% to acute costs. The total adjustments for acute admitted costs are shown in the Table below.

Table 5 – Adjustments for teaching, training and research (TTR)

Adjustment	Vic.	WA	SA
TTR effect on acute admitted costs	-\$142m	-\$98.8m	\$42.4m
% of reported acute admitted costs	-3.14%	-5.1%	+2.7%

- h. *Join supplementary intensive care data provided by jurisdictions.* This included intensive care hours for episodes occurring in a Level 3 ICU or PICU.

- i. *Flag intensive care eligible episodes (those occurring in Level 3 ICU or PICUs within selected AR-DRGs) and adjust length of stay for whole days spent in intensive care.* There were 31,313 episodes flagged as eligible for an ICU Adjustment, with around 1.794 million ICU hours reported. Lengths of stay were reduced by around 57,500 days in total for these episodes.

Table 6 – Number of hospitals reporting to the NHCDC sample and reported episode compared with the full population of public hospitals, 2009-10

	Costed sample			Full population		
	ABF	Other	Total	ABF	Other	Total
Acute admitted						
<i>Establishments</i>						
Patient costed	146	74	220	146	74	220
Cost modelled	11	58	69	11	58	69
Not costed				22	385	407
Total	157	132	289	179	517	696
% participating in costing				87.7%	25.5%	41.5%
<i>Episodes</i>						
Patient costed	4,033,590	109,723	4,143,313	4,104,201	115,095	4,219,296
Cost modelled	98,596	113,409	212,005	98,404	112,223	210,627
Not costed				246,080	240,327	486,407
Total	4,132,186	223,132	4,355,318	4,448,685	467,645	4,916,330
% in costing hospitals				94.5%	48.6%	90.1%

Note: Definition of ABF hospital reflects the definition recommended in the Determination. The actual hospitals included in scope for ABF will be determined by bilateral agreement between jurisdictions and the Australian Government.

Table 7 – Characteristics of the NHCDC sample for patient costed sites, NHCDC 2009-10

	NSW	Vic.	Qld	WA	SA	Tas.	ACT	NT	Total
<i>NHCDC patient costed data supplied</i>									
Hospitals(a)	68	49	31	14	8	4	2	3	179
Episodes '000	1,317	1,113	793	339	252	94	82	89	4,081
Episodes in NHCDC not matched with APC	16	1	2	0	0	0	0	1	21
Total costs \$m	6,194	4,036	3,828	1,663	1,371	550	462	351	18,456
<i>Remove costs out of scope</i>									
Remove depreciation costs \$m	207	-	55	30	48	20	14	27	400
Remove emergency department cost buckets \$m	361	239	106	49	52	31	31	-	869
<i>Adjust costs for TTR \$m</i>		-142		-99	73				-167
<i>Include in supplementary data intensive care</i>									
Number of eligible ICU episodes	6,110	8,861	7,458	2,147	4,403	1,616	347	371	31,313
Intensive care hours for eligible ICU episodes '000	335	703	293	104	231	104	10	13	1,794
LOS adjustment for eligible ICU episodes (days) '000	10.56	24.42	7.96	3.37	7.25	3.35	0.26	0.35	57.51
<i>Final data set used for cost model</i>									
Number of episodes '000	1,317	1,113	793	339	252	94	82	89	4,081
Total in-scope costs \$m	5,626	3,797	3,668	1,584	1,271	498	417	325	17,186
<i>Final data set - weighted observations</i>									
Episodes '000	1,441	1,281	829	372	276	95	83	90	4,467
Total in-scope costs \$m	6,064	4,326	3,778	1,722	1,371	506	418	326	18,512

2.2.2 Sample weights

The NHCD provides a sample of all acute admitted activity in public hospitals. To ensure the resulting calculations for the NWAU were appropriate for the full population of acute admitted activity as reflected in the APC NMDS, observations from the NHCD were:

- assigned to specific groups (strata)
- assigned a sample weight to reflect the extent to which the episode was representative of the whole population of acute activity within those strata as reported in the APC NMDS.

2.2.3 Classification of patient costed episodes in relevant categories

Prior to analysing costs, each episode was assigned to categories reflecting the relevant adjustments to be made through the NWAU model. The steps involved included:

- Flag same day episodes that occur in AR-DRGs designated for a separate same day payment.* There were 122 AR-DRGs designated for separate same day payment which are specified in the *Determination* (Appendix C). Multi-day stay episodes with these AR-DRGs were not flagged and were treated under the same methods applied for inliers, short stay outlier and long stay outliers.
- Apply the L3H3 method to the full APC NMDS for hospitals in scope for ABF, to identify trim points for short stay and long stay outliers.* The method was applied by analysing lengths of stay after they had been adjusted to remove ICU days for eligible episodes, and after excluding same day episodes occurring in AR-DRG designated for a separate same day payment. The steps were:
 - *Calculating the national mean length of stay for each AR-DRG.*
 - *Calculating the low trim point for each AR-DRG.* This was based on the calculation: national mean length of stay/3. The result was truncated. This means that it was rounded down to the next lowest integer (e.g. if the result was 3.6, the trim point was set to 3).
 - *Calculating the high trim point for each AR-DRG.* This was based on the calculation: national mean length of stay*3. The result was rounded to the nearest integer (e.g. 10.2 would result in the trim being set to 10, and 10.7 would result in the trim point being set to 11).
 - Episodes with a length of stay equal to either of the trim points were considered inlier episodes.
 - Trim points are specified in the *Determination* (Appendix C).
- Assign all episodes to one of the following categories:*
 - same day payment AR-DRG
 - inlier
 - short stay outlier
 - long stay outlier.

- d. *Flag episodes that are eligible for the Paediatric Adjustment.* These are episodes that:
- Occur in one of the hospitals that have been identified as having a significant role as a specialised paediatric service, which are listed in the *Determination* (Glossary), AND
 - have an AR-DRG which is not within the *Major diagnostic category 15 Newborns and other neonates*, AND
 - the age of the patient at admission is 16 years or less.
- e. *Flag episodes that are eligible for the Indigenous Adjustment.* These are episodes with Indigenous status¹⁰ of:
- 1 Aboriginal but not Torres Strait Islander origin
 - 2 Torres Strait Islander but not Aboriginal origin
 - 3 Both Aboriginal and Torres Strait Islander origin.
- f. *Flag episodes that are eligible for the Outer Regional, Remote and Very Remote Adjustments.* These are episodes where the patient's place of usual residence¹¹ has been assigned to a remoteness area¹² of:
- RA2 - Outer regional Australia
 - RA3 - Remote Australia
 - RA4 - Very remote Australia
 - Migratory.
- Three flags are used: one for Outer Regional Australia, one for Remote Australia and one for Very Remote Australia and Migratory. The remoteness area of the usual residence of a patient was determined using the following process:
- The patient's postcode of usual residence was mapped to remoteness areas (see Supplementary Table 1).
 - If the postcode was missing or invalid, then the supplied SLA code is used (see Supplementary Table 2).
 - If the SLA code was also missing or invalid, then the Remoteness Area category of the hospital is used. The remoteness code of the hospital was based on the remoteness area of the ABS collection district within which the hospital was located.
- g. *Flag episodes eligible for ICU Adjustment.* As discussed above these are episodes that occur in hospitals with a Level 3 ICU or PICU that occur in AR-DRGs where less than 50% of episodes involve a stay in a Level 3 ICU or PICU (see the *Determination* - Appendix C).
- h. *Flag private episodes.* These are episodes with a funding source¹³ of 'private health insurance' or 'self-funded'.

¹⁰ See data element *Indigenous status* [METeOR identifier: 291036].

¹¹ See data element *Area of usual residence* [METeOR identifier: 386783].

¹² Remoteness areas are defined in the *Australian Standard Geographic Classification (ASGC)*, which is maintained by the Australian Bureau of Statistics (see: www.abs.gov.au). The 2006 ASGC Remoteness Area classification was used to classify patients' place of residence and locality of hospitals.

2.2.4 Determine ICU Adjustment level and deduct associated costs

Patient level data for episodes in hospitals with a Level 3 ICU or PICU with ICU hours reported were analysed to estimate an average cost per ICU hour using a linear regression model. The resulting estimate was later converted into a cost weight by expressing the amount relative to average cost per episode.

For ICU eligible episodes, total estimate ICU costs for each eligible episode were calculated using the estimated ICU cost per hour and the reported number of ICU hours. This amount was deducted from the in-scope costs used for modelling the same day payment AR-DRG, inlier, short stay outlier and long stay outlier costs and associated adjustments, but added back in for the ICU Adjustment.

Table 7 provides details of the number of episodes for which the ICU Adjustment was made (31,313 episodes) and the impact on lengths of stay (approximately 57,500 days in total).

2.2.5 Initial parameters for same day, outlier and inliers episodes

Initial parameters were derived for same day payment AR-DRG episodes, short stay outlier episodes, inlier and long stay outlier episodes. The steps involved were as follows:

- a. *Same day payment AR-DRG episodes.* Calculate the mean cost per episode.
- b. *Inlier episodes:* Calculate the mean cost per episode.
- c. *Short stay outlier episodes.* These were split into:
 - Surgical AR-DRGs, where a 'fixed' cost component was calculated using the operating theatre, special procedure suites and prostheses cost buckets) and a mean cost per day for 'variable' costs (all other cost buckets).
 - Medical and other AR-DRGs, where a mean cost per day was calculated.
- d. *Long stay outlier episodes.* The mean inlier cost was assigned to each episode as a base amount. A per diem for each outlier day was also assigned using the results of a regression model in which length of stay was used to explain variation in cost. The model was estimated using all episodes including inliers and outliers, but excluding designated same day payment AR-DRG episodes. This model yielded estimates of the mean cost per day.

Table 8 shows the number episodes in the NHCDC patient costed sample that correspond to each of these categories. Approximately 79% of episodes reported to the NHCDC were inlier episodes accounting for around 82% of costs. A further 18% of episodes related to same day payment episodes accounting for 5% of costs. Short stay outliers account for 2% of sample and 2% of costs. Long stay outliers account for 2% of episodes and 11% of costs.

¹³ See data element *Funding source for hospital patient* [METeOR identifier: 339080], values: 01 Australian Health Care Agreements; 02 Private health insurance; 03 Self-funded; 10 Other hospital or public authority (contracted care); 11 Reciprocal health care agreements (with other countries); 12 other.

Table 8 – NHCDC sample – Inlier, same day AR-DRGs, short stay and long stay outlier episodes and associated costs, 2009-10

	NSW	Vic.	Qld	WA	SA	Tas.	ACT	NT	Total	%
Number of episodes '000:										
Inlier episodes	1,090	826	622	259	202	75	68	78	3,219	79%
Same Day AR-DRG episodes	174	254	146	69	39	15	12	9	718	18%
Short stay outlier episodes	23	19	14	5	5	1	1	1	70	2%
Long stay outlier episodes	30	14	12	7	6	2	1	2	73	2%
Total episodes	1,317	1,113	793	339	252	94	82	89	4,081	100%
Costs in scope \$m										
Inlier episodes	4,666	3,089	3,070	1,261	1,047	407	359	264	14,164	82%
Same Day AR-DRG episodes	207	299	157	100	56	20	19	13	871	5%
Short stay outlier episodes	94	73	61	24	20	13	6	4	296	2%
Long stay outlier episodes	660	335	380	199	148	58	33	44	1,856	11%
Total episodes	5,626	3,797	3,668	1,584	1,271	498	417	325	17,186	100%

Figure 2 illustrates the approach taken. Average costs per episode (the green line) will typically increase as length of stay increases. To establish an appropriate funding level, episodes within an AR-DRG are partitioned into the four categories described above and costs analysed to yield the relevant parameters. The resulting funding model is shown in the red line. At various lengths of stay funding levels will tend to exceed average costs (usually for episodes with shorter lengths of stay) and at others funding levels will tend to be less than average lengths of stay (usually for episodes with longer lengths of stay), creating incentive to better manage length of stay and costs.

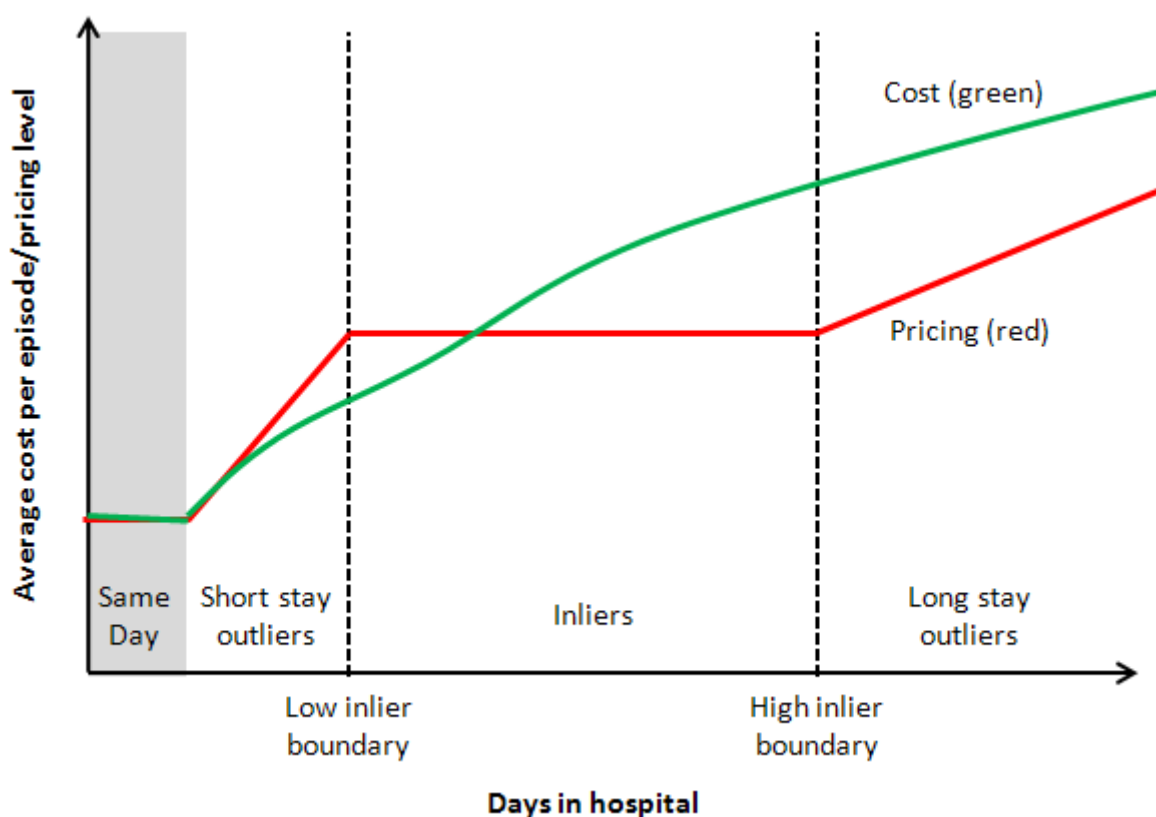


Figure 2 – Initial parameters for the assignment of cost weights

Figure 3 provides an example of the model with a particular AR-DRG. Figure 3 shows the reported average cost per episodes by length of stay and also plots the funding levels arising from applying the

initial parameters. For same day payment episodes and episodes with a length of stay of one day funding levels will typically reflect average cost. For episodes with a length of stay between 2 days and 10 days funding levels will tend to be more than average costs. Beyond 10 days funding levels will tend to be less than average cost.

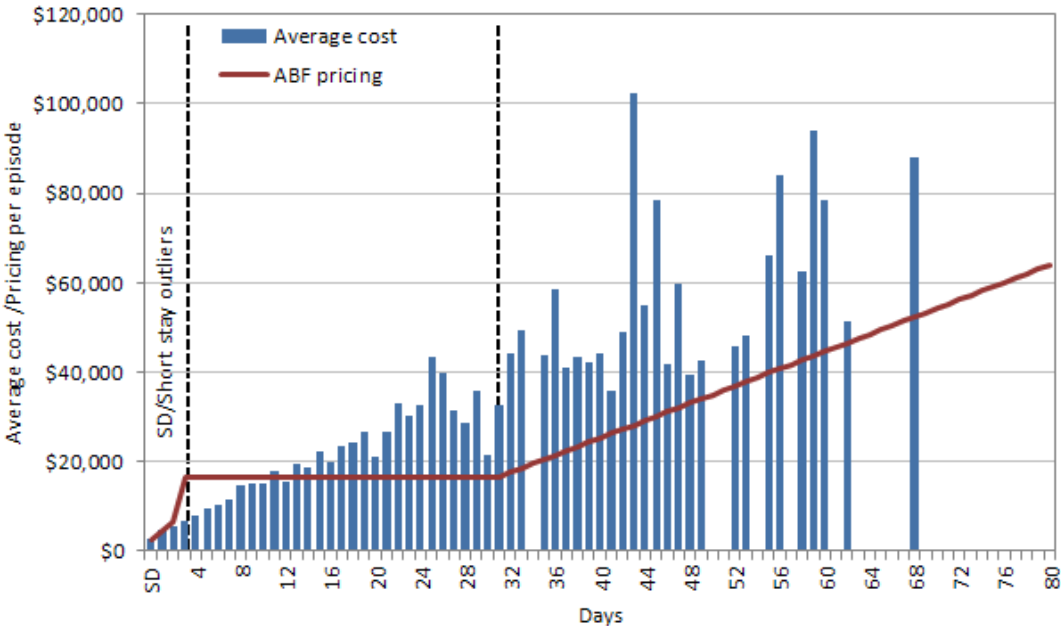


Figure 3 – Example of an AR-DRG - Estimated initial parameters for funding model and average cost by length of stay

2.2.6 Calculation of additional adjustments

Three adjustments were calculated based on factors considered to have a material impact on the cost of acute services. These were:

- a. *Paediatric Adjustment.* IHPA was advised that costs in specialised paediatric hospitals were higher than other hospitals. Empirical analysis of cost data established that while costs of episodes for specialised paediatric hospitals were significantly higher in some AR-DRG this was not always the case and in some AR-DRGs, costs were lower than for other hospitals. Therefore it was decided to implement a set of adjustments at the AR-DRG level that reflect the differences in cost between specialised paediatric hospitals and other hospitals. The calculation of an adjustment involved the following steps:
 - Episodes in the cost data sample were partitioned into those eligible for a Paediatric Adjustment (see section 2.2.3.d) and others.
 - Using the weighted episodes yielded by applying the model parameters derived from applying the same day payment AR-DRGs, inlier, short stay outlier and long stay outlier (see section 2.2.5), the average cost per weighted episode was calculated for each group.
 - The ratio of the average cost per weighted episodes for paediatric episodes to the average cost per weighted episodes for other episodes was calculated for each AR-DRG. This formed the basis of the paediatric cost adjustment for each AR-DRG and reflects the extent to costs in specialised paediatric hospitals were higher, or in some instances lower, than for other hospitals.

- The adjustments were calculated for all AR-DRGs, except AR-DRGs which are within the *Major diagnostic category 15 Newborns and other neonates*.
- b. *Indigenous Adjustment and Outer Regional, Remote and Very Remote Adjustments*. These issues were considered together through the following processes:
- A multivariate least squares weighted regression model was estimated in which the Indigenous status flag and the outer regional, remote and very remote area flags were included as dummy variables as factors explaining variation in the average cost per weighted episode. Weighted episodes include the adjustments for same day payment AR-DRGs, inlier, short stay outlier and long stay outlier and the Paediatric Adjustment. The co-efficient estimated from this model indicated the extent to which these factors explained variation in the average cost per weighted episode.
 - The analysis yielded an adjustment for Indigenous patients and three adjustments for patients resident in outer regional, remote and very remote areas, which are specified in the *Determination*.
 - The Adjustments are additive so that for Indigenous patient residing in outer regional, remote or very remote areas this yields an adjustment based on adding the Indigenous Adjustment to the Outer Regional, Remote or Very Remote Adjustment. For example, for an Indigenous person residing in a Very Remote location, the Indigenous Adjustment is added to the Very Remote Adjustment.

Table 9 shows the number episodes in the NHCDC patient costed sample for which these Adjustments apply. The Paediatric Adjustment applies for around 4% of the sample, the Indigenous Adjustment to 5% and the Outer Regional, Remote and Very Remote Adjustments to 10%. Around 3% of the sample has both the Indigenous and one of the Outer Regional, Remote or Very Remote Adjustments.

Table 9 – NHCDC sample – Episodes for which Paediatric, Indigenous, and Remoteness Area Adjustments apply

	NSW	Vic.	Qld	WA	SA	Tas.	ACT	NT	Total	%
Paediatric Adjustment										
Episodes eligible for loading '000	52	42	35	23	20	-	-	-	172	4%
Other episodes '000	1,266	1,071	758	316	232	94	82	89	3,909	96%
Total episodes '000	1,317	1,113	793	339	252	94	82	89	4,081	100%
Indigenous Adjustment										
Episodes eligible for loading '000	42	11	56	20	10	3	2	61	205	5%
Other episodes '000	1,275	1,102	738	319	242	91	81	28	3,876	95%
Total episodes '000	1,317	1,113	793	339	252	94	82	89	4,081	100%
Remoteness Area Adjustment										
Episodes eligible for loading '000	62	68	129	21	18	31	3	88	420	10%
Other episodes '000	1,255	1,046	664	319	233	63	80	1	3,660	90%
Total episodes '000	1,317	1,113	793	339	252	94	82	89	4,081	100%
Indigenous & Remoteness Area Adjustments										
Episodes eligible for loading '000	6	4	33	4	2	1	0	61	111	3%
Other episodes '000	1,312	1,110	760	335	250	93	82	28	3,970	97%
Total episodes '000	1,317	1,113	793	339	252	94	82	89	4,081	100%

2.2.7 Integration of cost modelled hospitals

All calculations to this point were based on patient level cost data from the NHCDC. Costs were also available from cost modelled hospitals. For cost modelled hospitals, the NHCDC results are provided as an average cost per AR-DRG. These costs cannot be directly broken down to reflect costs for various types of episodes within each AR-DRG (e.g. inliers and outliers).

Therefore, the process adopted to integrate the cost modelled data was as follows:

- a. The parameters resulting from the analysis of patient cost sites were applied to the activity reported through the APC NMDS for each cost modelled hospital. This yielded an estimate of the cost per weighted episode for each AR-DRG for the cost modelled hospitals.
- b. For each AR-DRG, the cost per weighted episode for cost modelled hospitals was combined with the cost per weighted episode for patient costed hospitals. Observations were weighted to reflect the number of episodes from cost modelled and patient costing sites.
- c. Parameters for the NWAU model were then recalculated to reflect the inclusion of the cost modelled sites.

2.2.8 Private patients

Private patient episodes in scope for ABF include those episodes occurring in a public hospital with a funding source of either '02 Private health insurance' or '03 Self funded'.

The NHRA requires that in setting the NEP, IHPA take into account costs of private patients that are met through alternative funding sources. These alternative sources include medical benefits payments by the Australian Government, private health insurance benefits payments and payments made by patients. After consultation and consideration of the issues the following approach was adopted:

- a. Costs for all episodes were escalated by 3% to reflect that not all costs associated with private episodes are captured in the NHCDC. For private episodes medical costs may be managed by the attending private practice doctors (visiting medical officers) through their own practice, or in other cases through a private practice trust fund managed by the hospital. In most situations these costs are not able to be captured in the NHCDC. To take account of these effects, the impact of higher proportions of private episodes on reported costs were estimated using a regression model. The model resulted in an escalation factor for each hospital. The factor was applied at the hospital level but results in an increase in estimated costs of around 3% in total.
- b. An estimate was developed of medical costs that are covered by medical benefits, private health insurance medical gap insurance benefits or out of pocket payments by patients. Not all medical costs are covered by these funding sources, particularly for registrars and junior medical officers. The following components were removed from the reported costs of private episodes:
 - 100% of the pathology cost bucket (direct and indirect)
 - 100% of the imaging cost bucket (direct and indirect)
 - 75% of the ward medical cost bucket (direct and indirect)
 - 37.5% of the operating room cost bucket (direct and indirect)
 - 37.5% of the special procedure suite cost bucket (direct and indirect)
 - 15% of the critical care cost bucket(direct and indirect).
- c. All reported prostheses costs were removed from the reported costs for private episodes.
- d. A Private Patient Service Adjustment was calculated at the AR-DRG level, although for some AR-DRG with small samples, adjustments were made. The discount was calculated as:

(Total predicted costs less removed medical and prostheses costs)/ Total predicted costs

The total deductions for private patients effectively offsets the 3% increase described above.
- e. In addition to medical and prostheses cost, private patients are also charged for accommodation. A Private Patient Accommodation Adjustment is made to account for revenue received in relation to these charges was based on the state/territory average level of benefits paid in 2009-10 by private health insurers for same day and overnight episodes in public hospitals by state and territory. The amounts for these deductions are detailed in the *Determination* (Appendix B).

Table 10 describes the number of private episodes in the NHCDC. Approximately 9.9% of episodes relate to patients with a funding source of private health insurance and a further 1.3% to patients with a funding source of '03 self funded'. The Private Patient Adjustments results in the removal of approximately 25% of costs for these episodes (which effectively represents 2.5% of in-scope costs for all episodes reported through the NHCDC). The deductions for accommodation charges results in the removal of a further 20% of costs.

It should be noted that a further 3.8% of the sample have a funding source/election status that will not be in-scope for ABF ('Other' in Table 10). These have been included in the sample for the purpose of developing the NWAU weights, but are excluded from ABF.

Table 10 – Private episodes in the NHCDC sample

	NSW	Vic.	Qld	WA	SA	Tas.	ACT	NT	Total	%
Episodes by Funding Source/Election status '000										
Public	1,032	962	725	292	223	76	73	85	3,468	85.0%
Private health insurance	209	99	33	24	19	13	5	0	403	9.9%
Self funded	23	14	14	0	1	-	0	0	53	1.3%
Other	54	38	21	23	9	4	5	3	157	3.8%
Total	1,317	1,113	793	339	252	94	82	89	4,081	100.0%

2.2.9 Calculation of NWAU

The final step in the process involves conversion of all costs and adjustments to cost weight values (NWAU) by dividing the cost by the mean modelled cost for all in-scope episodes.

2.3 Assigning NWAU to admitted patient data

2.3.1 Key steps

This section describes how the NWAU resulting from the analysis of costs described in the previous sections can be applied to admitted patient activity data to assign NWAU to acute admitted episodes for payment purposes. The end of the section describes the program code that has been developed to enable users to implement the model.

The key steps in determining NWAU for acute admitted activity are:

- Data preparation, including adjusting length of stay for ICU eligible episodes and classifying episodes into relevant categories.
- Applying weights for same day payment AR-DRGs, short stay outliers, long stay outliers and inliers.
- Applying the Paediatric, Indigenous, Outer Regional, Remote, Very Remote, Private Patient Service and Private Patient Accommodation Adjustments.
- Classifying episodes as either In-scope for ABF or Other.

Therefore, NWAU are calculated in a staged manner. To enable this, a set of intermediate 'NWAU' are calculated before the final NWAU is determined for each episode. These are shown in Table 11 below.

Table 11 – Weights used for assignment of the final NWAU to acute admitted episodes

Weight	Description
NWAU Base	The weights derived after applying the initial weights for Same Day AR-DRGs, short stay outliers, long stay outliers and inliers.
NWAU2	The weights derived from applying the Paediatric Adjustment to the NWAU Base.
NWAU3	The weights derived from applying the Indigenous and Outer Regional, Remote and Very Remote Adjustments to NWAU2.
NWAU4	The weights derived after adding the ICU Adjustment for eligible ICU episodes.
NWAU	The final NWAU weight after applying the Private Patient Service Adjustment and the Private Patient Accommodation Adjustment.

2.3.2 Data preparation

There are four tables that are the inputs to the calculation of the NWAU. These are described in Table 12. The first table is the local version of the APC NMDS. The other three are reference tables that are available from the *Determination* or Supplementary Tables.

Table 12 – Tables required for assignment of NWAU

Table	Description	Available from:	Variable to link with APC data
Admitted patient care data set	This is the local version of the APC NMDS. As discussed below, values of relevant variables in the table need to be mapped to the equivalent national data items and values.	Local sources	Not applicable
NWAU_parameters	This is a national table with relevant parameters specific for each AR-DRG (e.g. inlier weights). This is based on the <i>Determination</i> (Appendix C). Variables within this table are described in Attachment A.	<i>Determination</i> (Appendix C)	AR-DRG V6.x
PC_to_RA	This is a national table of all post codes mapped to 2006 ASGC Remoteness Area.	Supplementary Table 1	Post code of usual residence
SLA_to_RA	This is a national tables of all SLAs for 2009/2010 mapped to 2006 ASGC Remoteness Area.	Supplementary Table 2	Area of usual residence

Thirteen variables are required from the admitted patient data set (based on the structure of the APC NMDS) for the NWAU assignment process. These are as follows:

- Establishment ID
- Age (years) at admission
- Indigenous status
- Postcode of usual residence
- Area of usual residence (SLA of patient's residence under ASGC)
- Care type
- Funding source for hospital patient
- Admitted patient election status
- AR-DRG version 6.x
- Same day patient flag
- Number of qualified days for newborns
- Length of stay¹⁴
- Eligible ICU hours.

(See Attachment A for further information)

All these are APC NMDS data elements, or can be derived from these data elements, except for post code of usual resident and ICU hours. Post code of usual residence has been supplied along with the

¹⁴ Length of stay is calculated as follows: For same day episodes (date of admission = date of discharge) the length of stay is set to 1. For overnight episodes length of stay is equal to the difference in days between date of discharge and date of admission less leave days. For episodes with a care type of newborn, length of stay is equal to qualified days.

APC NMDS in previous years by states and territories. ICU hours are strictly only required for hospitals with a level 3 ICU or PICU. These additional data items will be included in the ABF Admitted Patient Care Data Set Specification (DSS) for 2012-13.

The data set must include AR-DRG Version 6.x. If this is not available, additional steps will be required to regroup the data using this version. Specifications for AR-DRG Version 6.x are available on the IHPA website.

Local hospital ID should be mapped to the National Hospital Establishment ID used for submitted data to the APC NMDS.

Values reported for all other variables need to be mapped to the national APC NMDS values, as specified in METeOR.

During the data preparation stage:

- a. Additional data items need to be joined to the admitted patient file either by joining the relevant files using the relevant linking variable.
- b. Episodes other than acute are excluded based on care type and number of qualified days for newborns. Acute episodes are those where care type is '1' or care type is '7' and the number of qualified days is greater than 0.
- c. ICU eligible episodes are identified using the ICU_Flag (see Table 13). ICU hours for these episodes are multiplied by the ICU Adjustment (ICU_Adj). The resulting cost weights are added to values at a later stage in the processing (see Figure 6).
- d. The number of ICU days for eligible episodes is also calculated (by dividing total ICU hours by 24, rounded down to the nearest integer) and used to create the ICU adjusted length of stay variable (denoted as Adj_LOS). The adjusted length of stay variable is calculated by subtracting the calculated number of ICU days from the length of stay for the episode, although episodes must have a minimum length of stay of 1 day. For episodes not eligible for ICU adjustment (when ICU_Flag=0), the adjusted length of stay is equal to the episode length of stay. The Adj_LOS variable is then used in the first stage of calculating the NWAU Base (see Figure 4).
- e. Relevant flags to assist processing are created. These are shown in Table 13.

Table 13 – Episodes flags to assist assignment of NWAU

Flag	Variable	Description
<i>ABF hospital</i>	ABF_Status	The status of the hospital with respect to ABF. Hospitals in-scope for ABF have a value of '1'. Other hospitals have a value of '0'. This has been determined by bilateral agreement between each jurisdiction and the Australian Government
<i>Remoteness area of hospital</i>	RA	The Remoteness Area of the ABS Collection District in which a hospital is located. This may be used for identifying whether episodes should be allocated an Outer Regional, Remote or Very Remote Adjustment (where post code or SLA values are insufficient).
<i>Specialised paediatric hospital</i>	Paed_Est	Flags that a hospital is eligible for applying the Paediatric Adjustment (=1). The list of hospitals is available from the <i>Determination</i> (Glossary).

Flag	Variable	Description
<i>Hospital with level 3 ICU/PICU</i>	ICU_Est	Flags that a hospital has an ICU or PICU of level 3 (=1). These hospitals are those listed in the <i>Determination</i> (Glossary).
<i>Same day DRG flag</i>	SD_DRG_Flag	Set to 1 for episodes where the AR-DRG is a designated same day payment AR-DRG (SD_DRG = 1) and the episodes is a same day episode (SDFlag = 1). Set to 0 for all other episodes. (See the <i>Determination</i> - Appendix C.)
<i>Short stay outlier flag</i>	SSO_Flag	Set to 1 where the ICU adjusted length of stay (Adj_LOS) is less than the lower trim point (Adj_LOS < Lower) and the episode does not meet the criteria for a same day AR-DRG weight (SD_DRG_Flag is not equal to 1). Set to 0 for all other episodes.
<i>Long stay outlier flag</i>	LSO_Flag	Set to 1 where the ICU adjusted length of stay is greater than the upper trim point (LOS > Upper). Set to 0 for all other episodes.
<i>Inlier flag</i>	Inlier_Flag	Set to 1 where the episode ICU adjusted length of stay is greater than or equal to the lower trim point and less than or equal to the upper trim point (Lower ≤ Adj_LOS ≤ Upper) for the AR-DRG, and the episode does not meet the criteria for a same day AR-DRG weight (SD_DRG_Flag is not equal to 1). Set to 0 for all other episodes.
<i>ICU episode flag</i>	ICU_Flag	Set to 1 for episodes that occur in an AR-DRG where ICU is unbundled (that is ICU_Bundled_flag = 0) AND the hospital is a hospital with a level 3 ICU or PICU (ICU_Est = 1) and the number of ICU hours reported > 0. Set to 0 for all other episodes. See <i>Determination</i> (Glossary) for a listing of hospitals with Level 3 ICU or PICU, and the <i>Determination</i> (Appendix C) for listing of AR-DRGs where the ICU cost is unbundled for payment purposes.
<i>Paediatric Flag</i>	Paed_Flag	Set to 1 where: <ul style="list-style-type: none"> The episode occurs within one of the hospitals that have been identified as having a significant role as a specialised paediatric service. See the <i>Determination</i> (Glossary) AND <ul style="list-style-type: none"> The AR-DRG which is not within the Major Diagnostic Category 15 (Newborns and other neonates). AND <ul style="list-style-type: none"> The age of the patient at admission is 16 years or less. Set to 0 for all other episodes.
<i>Indigenous flag</i>	Indig_Flag	Set to 1 where the Indigenous status for the patient is 1, 2 or 3. Set to 0 for all other episodes.

Flag	Variable	Description
<i>Remoteness area flags:</i>		Set to 0 for all other episodes. Identify the remoteness area of the episode through the following process:
<i>Outer Regional area flag</i>	OReg_Flag	<ul style="list-style-type: none"> Map the post code of the patient to remoteness area using the mapping available from PC_to_RA file. If post code is not available or invalid, map the SLA to remoteness area using the mapping available from the SLA_to_RA file. If SLA is not available or invalid, use the remoteness area of the hospital.
<i>Remote area flag</i>	Rem_Flag	Where the remoteness area of the patient's usual residence is:
<i>Very Remote area flag</i>	VRem_Flag	<ul style="list-style-type: none"> Outer regional (RA2), set OReg_Flag to 1 Remote (RA3), set Rem_Flag to 1 Very Remote (RA4), set VRem_Flag to 1
<i>Private episode flag</i>	Private_flag	Set to 1 if the funding source for the episode is private health insurance or self-funded (2 or 3). Set to 0 for all other episodes.
<i>Overnight episode flag</i>	ON_Flag	Set to 1 if SD_Flag = 0. Set to 0 if SD_Flag = 1. (This flag is used in calculating deductions for accommodation charges for overnight episodes.)
<i>Funding source in scope flag</i>	Fundsc_Flag	<p>Set to 1 if either:</p> <ul style="list-style-type: none"> the hospital is a public hospital and the funding source is either 1, 2, 3, 10 or 11 <p>OR</p> <ul style="list-style-type: none"> the hospital is a private hospital and the funding source is either 1 or 11 OR the funding source is either 10 and the election status is 1. <p>Set to 0 for all other episodes.</p>

The key steps for the data preparation stage are described in Figure 4.

Acute care 1

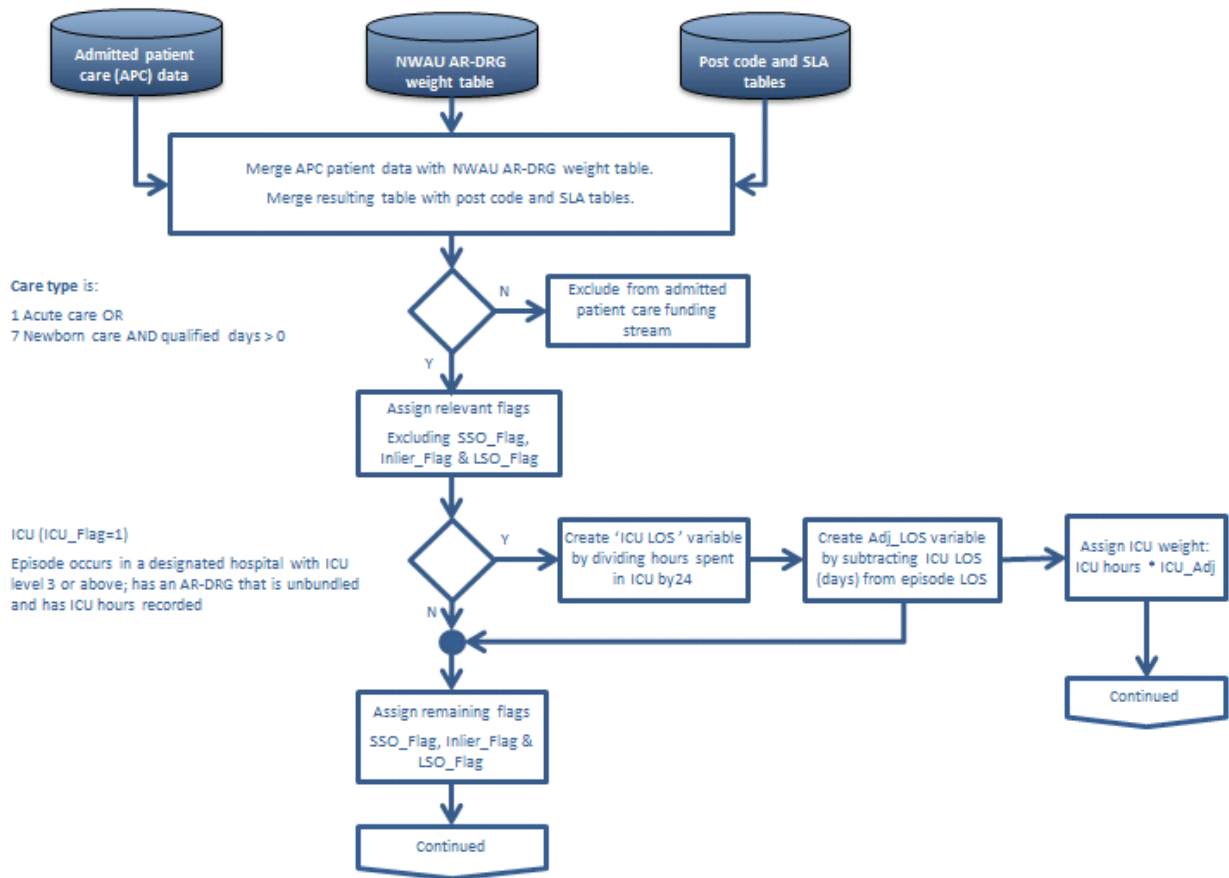


Figure 4 – Assignment of NWAU values to admitted patient episodes: Stage 1 – Data Preparation

2.3.3 Calculating the NWAU Base

The NWAU base weight reflects the allocation of weights for same day payment AR-DRGs, short stay outliers, long stay outliers and inliers. These weights are specified in the table of NWAU parameters which is available from the *Determination* (Appendix C). Table 14 describes the steps required for assigning these weights.

The assignment can be achieved using the following formula and the flags described in Table 13:

$$NWAUBase = SD_DRG_Flag * SD + SSO_Flag * (SSO_F + SSO_PD * Adj_LOS) + LSO_Flag * (Inlier + LSO_PD * (Adj_LOS - Upper)) + Inlier_Flag * Inlier$$

Table 14 – Steps in assigning NWAU Base

Flag	Criteria	Description	NWAU Base assignment
<i>Same day AR-DRG</i>	<i>SD_DRG_Flag = 1</i>	DRG is a designated same day payment AR-DRG (SD_DRG = 1) AND the episodes is a same day episode (SDFlag = 1).	NWAUBase = SD
<i>Short stay outlier</i>	<i>SSO_Flag= 1</i>	The ICU Adjusted length of stay is less than the lower trim point (Adj_LOS < Lower) and the episode does not meet the criteria for a same day AR-DRG weight (SD_DRG_Flag is not equal to 1).	NWAUBase = SSO_F + SSO_PD * Adj_LOS
<i>Long stay outlier</i>	<i>LSO_Flag= 1</i>	The ICU Adjusted length of stay is greater than the upper trim point (Adj_LOS > Upper).	NWAUBase = Inlier + LSO_PD * (Adj_LOS - Upper)
<i>Inlier</i>	<i>Inlier_Flag= 1</i>	The ICU Adjusted length of stay is greater than or equal to the lower trim point and less than or equal to the upper trim point (Lower=<Adj_LOS =< Upper) and the episode does not meet the criteria for a same day AR-DRG weight (SD_DRG_Flag is not equal to 1).	NWAUBase = Inlier

The key steps for the NWAU Base stage are described in **Error! Reference source not found..**

Acute care 2

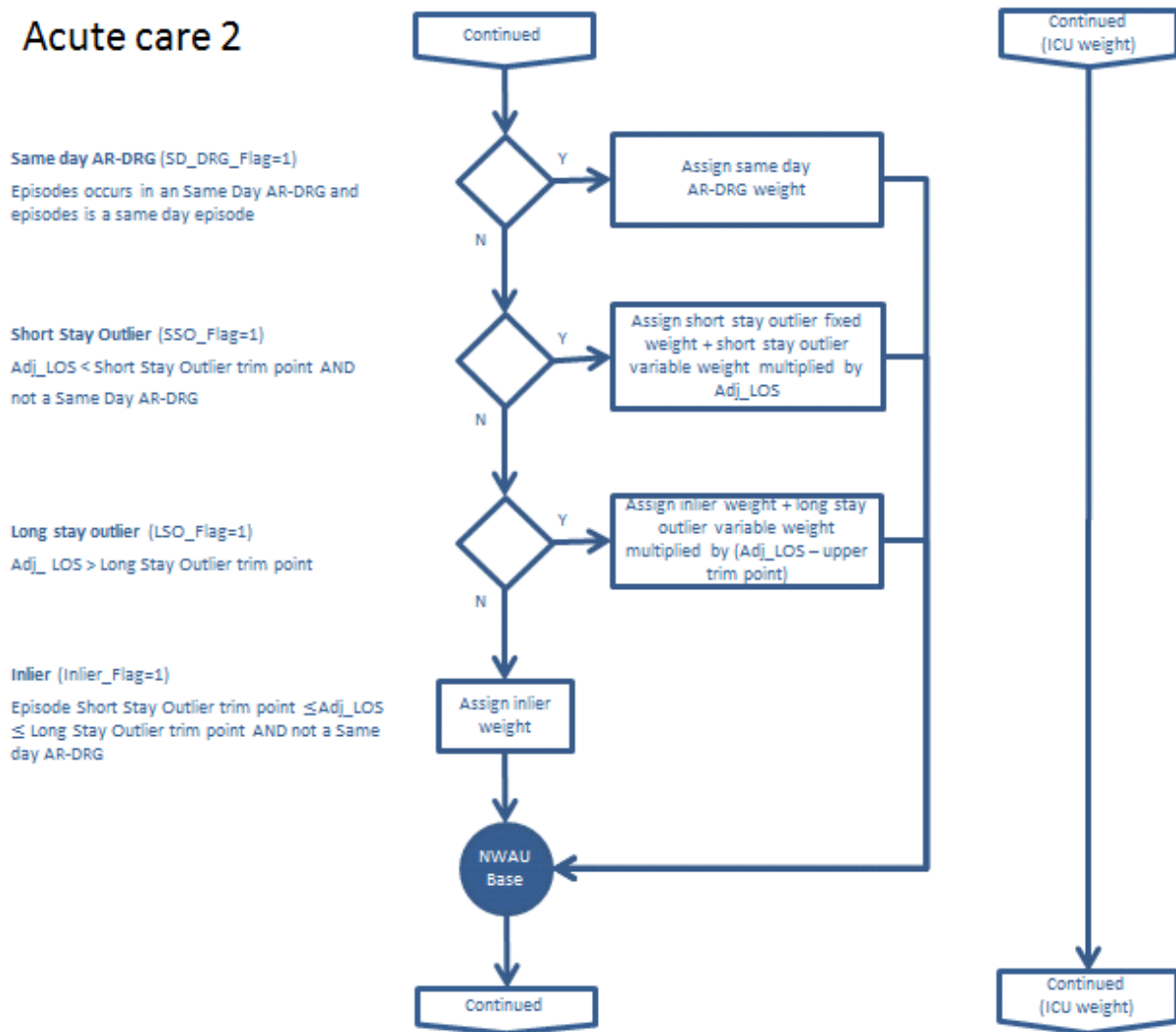


Figure 5 – Assignment of NWAU values to admitted patient episodes: Stage 2 – NWAU Base

2.3.4 Apply Adjustments

Following the calculation of the NWAU Base, various Adjustments are applied. The Adjustment must be applied in the sequence described below (also depicted in **Error! Reference source not found.**):

- a. **Paediatric Adjustments:** Episodes eligible for Paediatric Adjustments (Paed_Flag=1) are those that occur within one of the designated hospitals (Paed_Est = 1) AND The AR-DRG which is not within the Major Diagnostic Category 15 AND the age of the patient at admission in years is less than or equal to 16 years at admission. The Adjustment is applied as follows:

$$NWAU2 = NWAUBase * (1 + Paed_Flag * (Paed_Adj - 1))$$

- b. **Indigenous and Remoteness Area Adjustments:** Indigenous episodes (Indig_Flag = 1) are those where the Indigenous status for the patient is 1, 2 or 3. The Adjustment for Indigenous episodes is specified in the *Determination* (Ind_Adj). The Outer Regional, Remote or Very Remote Adjustments apply where the patient is resident in an outer regional (RA02), remote (RA03) or very remote (RA04) area. The Adjustments for Outer Regional, Remote and Very Remote episodes are specified in the *Determination* (OReg_Adj, Rem_Adj, VRem_Adj, respectively). These Adjustments are applied as follows:

$$NWAU3 = NWAU2 * (1 + Indig_Flag * Indig_Adj + OReg_Flag * OReg_Adj + Rem_Flag * Rem_Adj + VRem_Flag * VRem_Adj)$$

- c. **ICU Adjustment:** ICU weights for eligible episodes are then added. These weights are calculated at the rate specified in the *Determination* (ICU_Adj). The formula for adding these weights is:

$$NWAU4 = NWAU3 + ICU_Flag * ICUhours * ICU_Adj$$

- d. **Private Patient Adjustments:** The resulting cost weight is adjusted for private episodes to take account of medical and prostheses costs met from other sources, by applying the *Private Patient Service Adjustment* specified in the *Determination* (Pri_Srv_Adj). In addition, a further adjustment is made for the accommodation charges made in relation to these episodes. This is the *Private Patient Accommodation Adjustment*. This Adjustment is calculated separately for same day and overnight episodes. Different rates apply across each state and territory. Note that the episodes original length of stay is used in this step, not the ICU adjusted length of stay (ie LOS is used, not Adj_LOS) The Private Patient Accommodation Adjustment should not result in a negative NWAU, so a floor of zero is applied to the calculation. The formula for applying the private patient Adjustments is:

$$NWAU = \text{Max}(0, NWAU4 * (1 - Private_Flag * (1 - Pri_Ser_Adj)) - (Private_flag * SD_Flag * Pri_Acc_Adj_SD) - (Private_flag * ON_Flag * LOS * Pri_Acc_Adj_ON))$$

The key steps for this stage are described in Figure 6 **Error! Reference source not found.**

Acute care 3

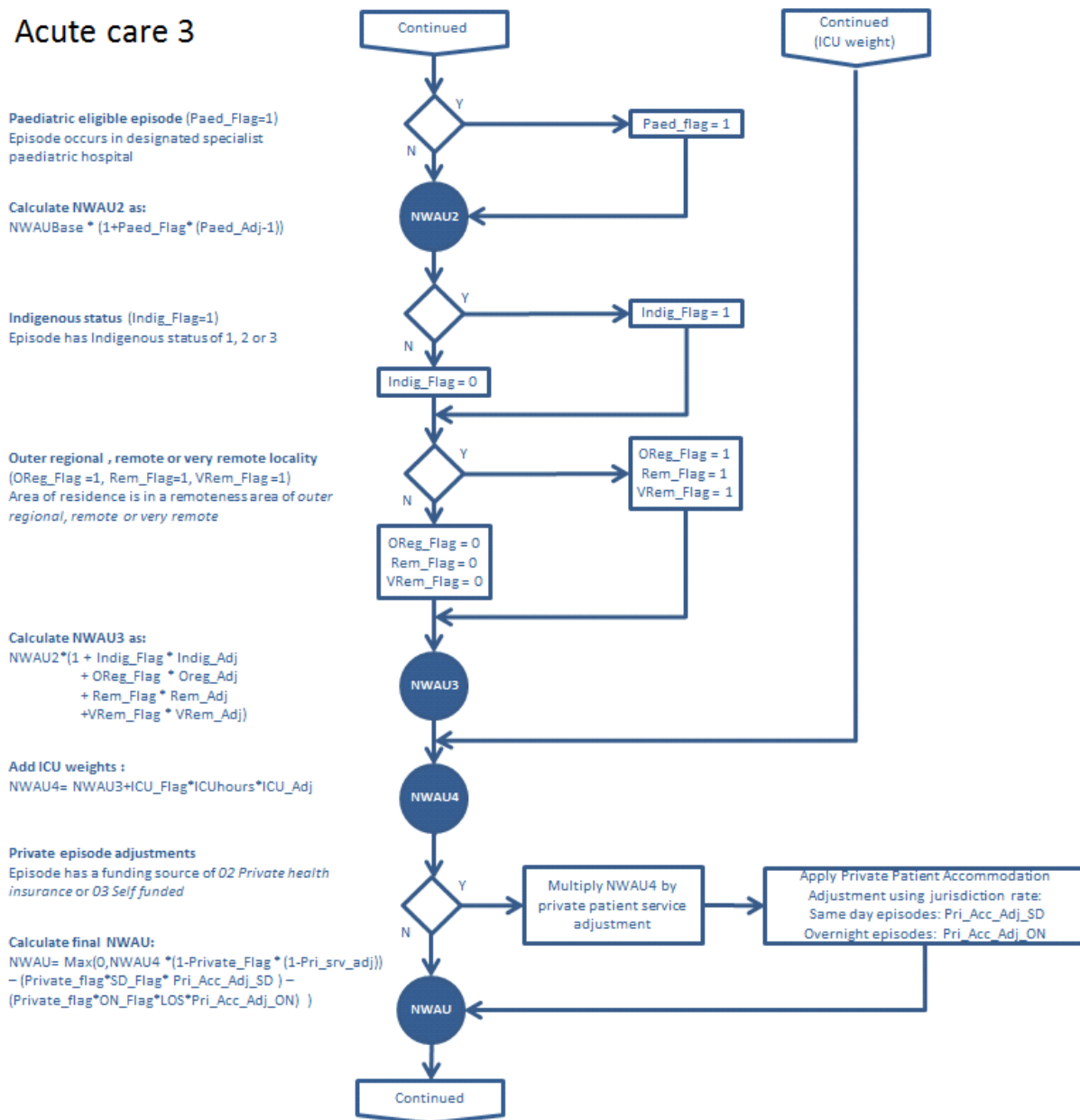


Figure 6 – Assignment of NWAU values to admitted patient episodes: Stage 3 – Additional Adjustments

2.3.5 Identifying episodes in-scope for ABF

Not all acute episodes will be in-scope for national ABF. In the final stage of calculating the NWAU, episodes are classified by funding source/election status and the type of hospital to identify the subset of acute episodes for which ABF will apply from July 2012. The key steps are:

- a. **Funding source/election status:** Identify episodes that are in-scope for ABF based on the funding source/election status. Episodes that do not meet these criteria will be excluded from national ABF.
- b. **Hospitals in scope for ABF:** Identify episodes that relate to hospitals that are in-scope for ABF from July 2012 (ABF_Status = 1) or occur in private hospitals. Other episodes will be funded on a block basis and are therefore excluded from the ABF arrangements.
- c. **Private hospital episodes:** Some episodes are reported for private hospitals (e.g. public episodes provided under contract with private hospitals). These episodes are potentially in-scope for ABF arrangements, but may need to be considered separately.

Acute care 4

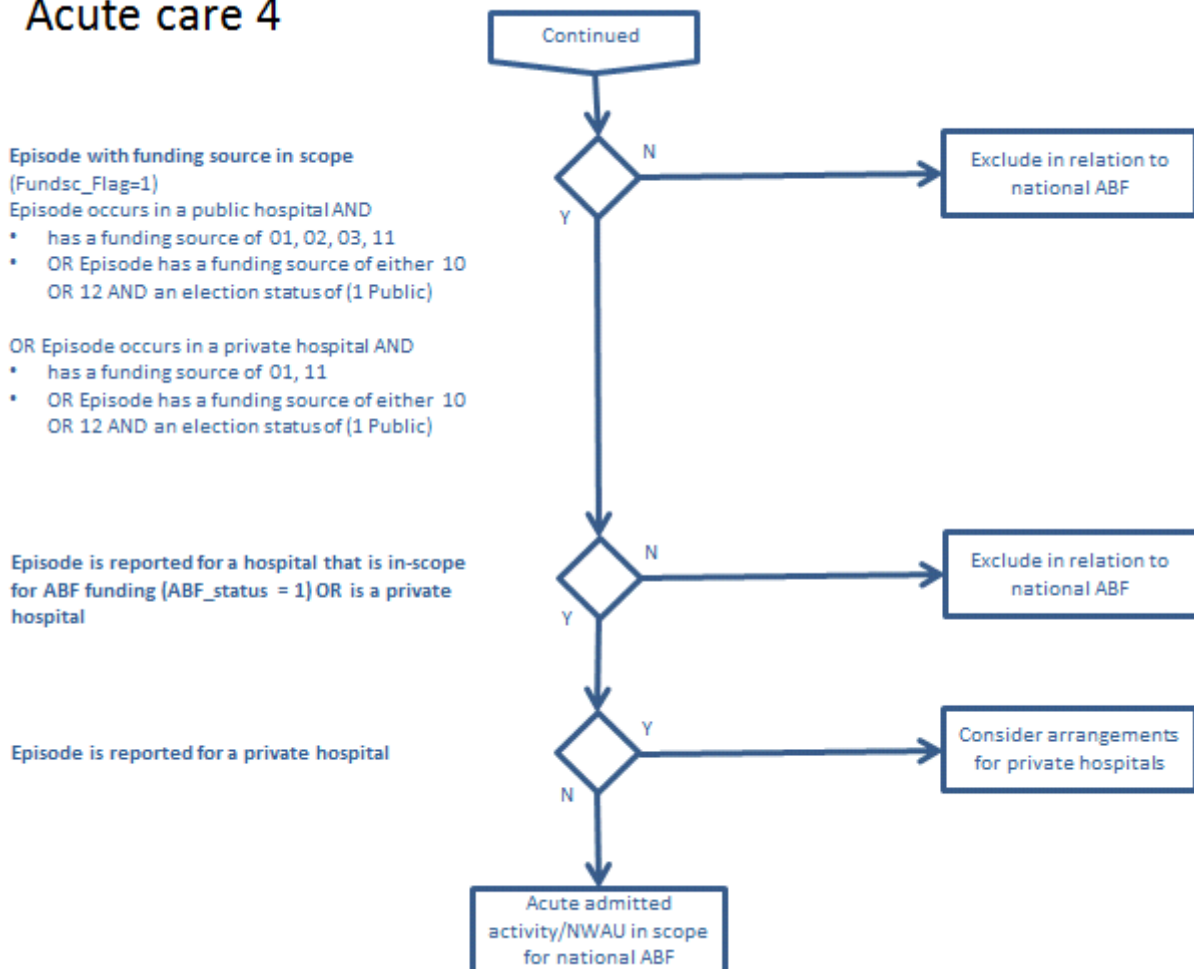


Figure 7 – Assignment of NWAU values to admitted patient episodes: Stage 4 – Episodes in scope for ABF

3 Emergency care cost model

3.1 General issues

3.1.1 Funding unit

The unit for ABF for emergency care is an 'emergency department stay'¹⁵ or presentation. It includes stays for patients who are treated and go home, and ones that are subsequently admitted to hospital or transferred to another facility for further care.

3.1.2 Scope

Emergency care is that provided to patients registered for care in an emergency department in selected public hospitals. Patients who were dead on arrival are in scope if an emergency department clinician certified the death of the patient. Patients who leave the emergency department after being triaged and then advised of alternative treatment options are also in scope.

The scope includes only physical presentations to emergency departments. Advice provided by telephone or videoconferencing is not in scope, although it is recognised that advice received by telehealth may form part of the care provided to patients physically receiving care in the emergency department.

Patients being treated in emergency departments may subsequently become 'admitted' (including admission to a short stay unit, admission to elsewhere in the emergency department, admission to another hospital ward, or admission to hospital-in-the-home). All patients remain in scope for ABF for emergency care until they are recorded as having physically departed the emergency department, regardless of whether they have been admitted.

Within this scope, Department of Veterans' Affairs¹⁶ and compensable patients¹⁷ are excluded.

3.1.3 Classification

Two systems are used to classify emergency care for the purposes of ABF of these services from 1 July 2012: Urgency Related Groups (URGs) Version 1.2 and Urgency Disposition Groups (UDGs) version 1.2. These are available from the *Determination* (Table 2 and Table 3). The former applies to level 3B to 6 emergency departments, and the latter to all others (i.e. levels 1 to 3A). The levels are defined in the *Determination* (Glossary).

3.2 Analysis of costs to derive NWAU for emergency care

3.2.1. Data preparation

Preparing the data involved the following steps:

- a. *Restrict the sample to hospitals in scope for ABF:* Activity data for emergency care were drawn from the *Non-admitted Patient Emergency Department Care NMDS*, enhanced to capture ICD-10-AM diagnosis, URG and Major Diagnostic Block (for grouping to URG classes).

¹⁵ See data set specification *Non-admitted patient emergency department care DSS 1 January 2012-30 June 2012* [METeOR identifier: 471595].

¹⁶ See data element *Episode of care—funding eligibility indicator (Department of Veterans Affairs)*, [METeOR identifier: 270092], value of 1 Yes.

¹⁷ See data element *Patient—compensable status*, [METeOR identifier: 270100], value 1 Compensable.

- b. *Merge the NHCDC patient costing data with the Non-admitted Patient Emergency Department Care NMDS:* Although costing of emergency department care has been in scope of the NHCDC for a number of years, the costing was not on the basis of patients' emergency department diagnoses. Therefore, the 2009-10 data were re-costed by hospitals and resubmitted in late 2011. These data included ancillary costs (pathology, imaging, pharmacy), bundled into the nearest emergency department attendance for each patient (as per NHCDC guidelines).

IHPA undertook analysis of these data, and found that, of the 290 ABF hospitals from the APC data set:

- 263 provided activity and/or cost data for emergency services.
- 145 provided cost data with 100 providing it at the URG level and 45 at the UDG level.
- A further 25 nominally block funded hospitals also provided cost data.

After removing hospitals with large numbers of cases grouped to error URGs and lack of non-admitted emergency data, 125 hospitals remained in the analysis. Of these:

- 84 of these hospitals reported URG costs and 41 only at the UDG level.
- Of the 45 reporting at the UDG level only four were level 3A emergency services and below.

- c. *Trim extreme cases that were clearly errors:* Overall, there was a significant amount of statistical cleansing of these data. Table 15 provides details of emergency care stays removed from the NHCDC costing data for emergency care.

Table 15 – Emergency care stays removed from analysis of NHCDC

Step	ED stays
Total reported ED stays with cost data	3,597,611
Remove stays not related to hospitals with level 3B to 6 EDs	173,636
Remove stays grouped to error URGs	194,253
Remove stays with reported costs of \$0	11,982
Remove stays with reported costs of less than \$5 or greater than \$10,000	8,751
Remove stays with unreasonably high or low costs	24,789
Stays included in analysis	3,184,200

3.2.2 Sample weights

The NHCDC provides a sample of emergency care activity in public hospitals. To ensure the resulting calculations for the NWAU were appropriate for the full population of emergency care activity as reflected in the *Non-admitted Patient Emergency Department Care NMDS*, observations from the NHCDC were weighted up to reflect the entire population of emergency care activity by state/territory.

3.2.3 Calculation of average costs

For patient costing sites with URG costing data the mean cost for each class was calculated. Mean costs for UDG class were also calculated using all patient level cost sites (including those that had supplied URG level data) and a number of hospitals that had supplied costing data aggregated to the UDG level. (All WA hospitals supplying ED costing data supplied summary costs at the UDG level as did several hospitals from NSW). Using a similar process to that adopted for incorporating cost modelled hospitals' acute admitted care data, the UDG data mean costs for patient costed and cost

modelled sites were combined to derive an adjustment factor to be applied to the mean costs for URG and UDG classes, so that total costs reflected all hospitals that had submitted costing data.

3.2.4 Calculation of NWAU

NWAU were calculated by dividing the estimated mean costs for each URG and UDG class by the mean modelled cost for all in-scope acute admitted episodes. The resulting weights are presented in Table 2 (URG) and Table 3 (UDG) of the *Determination*.

3.3 Assigning NWAU for emergency care

Assignment of a NWAU for emergency care is on the basis of a URG or a UDG. The former is applied to level 3B to 6 emergency departments, and the latter to Level 1 to 3A emergency services. The steps involved in assigning NWAU to emergency department stays is described in Figure below. The key steps are:

- a. *Data preparation* – This involves:
 - Grouping data to URG Version 1.2 where diagnosis is available and UDG Version 1.2
 - Join the Emergency Care Stay level data with the URG Weight File (Table 2 from the *Determination*) where URG variable is available
 - Join the Emergency Care Stay level data with the UDG Weight File (Table 3 from the *Determination*) using the UDG variable is available.
- b. *Assign URG and UDG cost weights* – This involves:
 - For emergency departments with a role of level 3B to 6, assigning the URG Version 1.2 weight from Table 2 from the *Determination*
 - For emergency departments with a role of level 1 to 3A, assigning the UDG Version 1.2 weight from Table 2 from the *Determination*
- c. *Apply Indigenous and Remoteness Area Adjustments* – This involves:
 - Indigenous episodes (Indig_Flag =1) are those where the Indigenous status for the patient is 1, 2 or 3. The Adjustment for Indigenous episodes is specified in the *Determination* (Ind_Adj).
 - The Outer Regional, Remote or Very Remote Adjustments apply where the patient is resident in an outer regional (RA02), remote (RA03) or very remote (RA04) area. The Adjustments for Outer Regional, Remote and Very Remote episodes are specified in the *Determination* (OReg_Adj, Rem_Adj, VRem_Adj, respectively). These Adjustments are applied as follows:
$$NWAU = Base\ NWAU * (1 + Indig_Flag * Indig_Adj + OReg_Flag * OReg_Adj + Rem_Flag * Rem_Adj + VRem_Flag * VRem_Adj)$$
- d. *Identifying emergency department stay in scope for ABF* – This involves:
 - Excluding stays reported for hospitals which have been identified as being block funded
 - Excluding stays related to eligible veterans and their dependents and compensable patients.

Emergency care patient level data

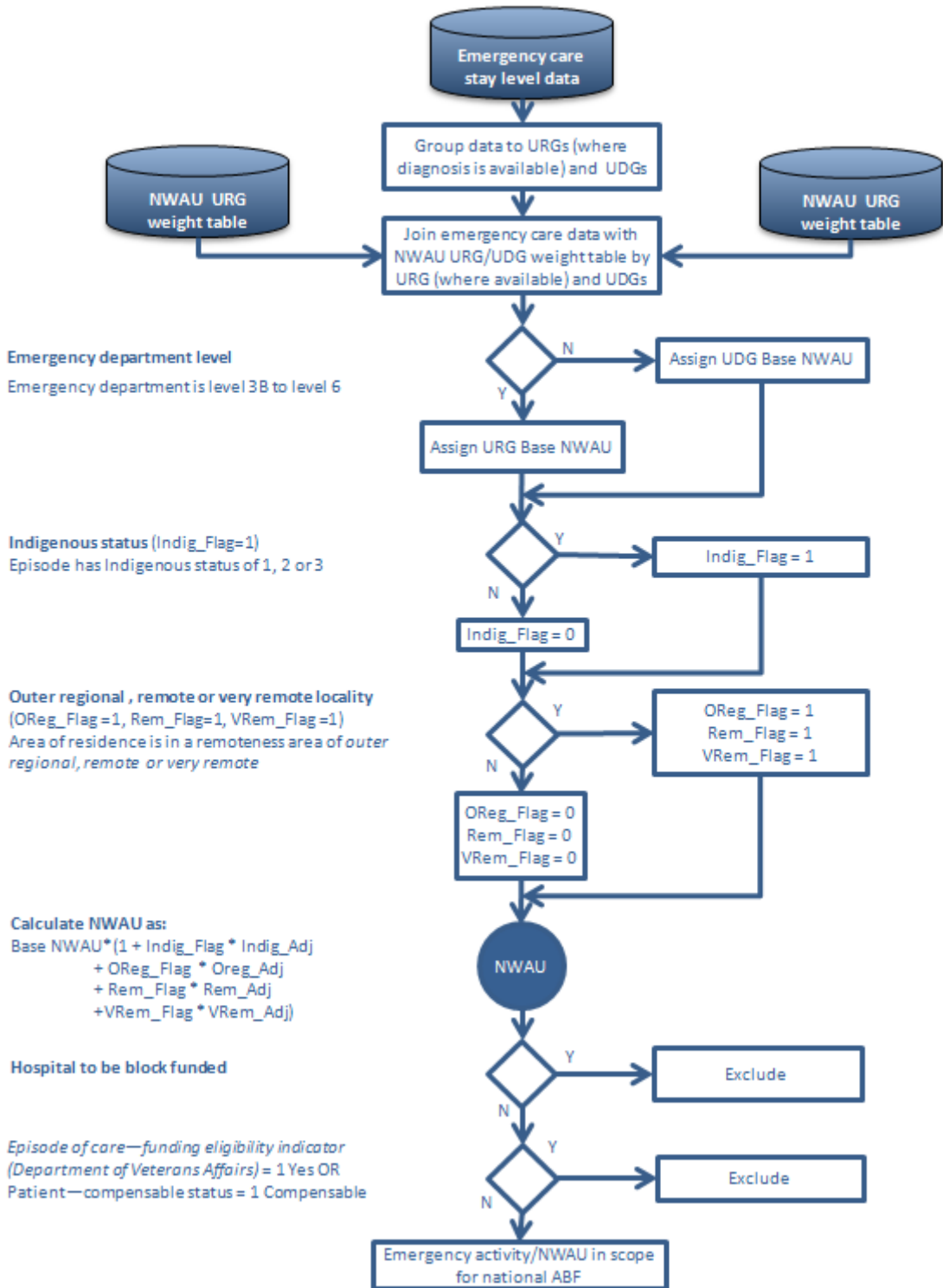


Figure 8 – Assignment of NWAU values to emergency stays

4 Non-admitted outpatient care cost model

4.1 General issues

4.1.1 Funding unit

The unit for funding non-admitted outpatient care is a Non-Admitted Patient Service Event. This is “An interaction between one or more healthcare provider(s) with one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record”¹⁸.

4.1.2 Scope

The scope of non-admitted outpatient care includes service events occurring in outpatient clinics in ABF hospitals. An outpatient clinic is a specialty unit or organisational arrangement under which a hospital provides outpatient clinic services¹⁹. The nature of the service provided by the clinic is classified by Tier 2 clinic types which are described in the *Determination*. The *Determination* also describes the Tier 2 clinic class that are in-scope for ABF from 1 July 2012.

4.1.3 Classification

The NHCDC Tier 2 clinics are used to classify non-admitted outpatient care for the purposes of ABF. The classification is comprised of 107 clinics. These are listed in the *Determination*.

4.2 Analysis of costs to derive NWAU for non-admitted outpatient care

4.2.1 Data preparation

The NWAU cost weights for non-admitted outpatient care were derived from costing and activity data submitted by states and territories related to 2009-10.

Cost data relating to non-admitted outpatient care for 2009-10 were provided by 76 hospitals. No cost data was provided by NSW, SA or WA, and the limitations of this have been recognised and accounted for to the extent possible statistically.

Data related to out of scope clinics were removed first.

The patient level data was cleansed by trimming extreme episode costs (under \$10 and over \$10,000) and testing with z-scores by clinic group by jurisdiction. The inner 70% of service events from each clinic was then used for analysis; this step was used to mitigate the effects of the large cost variation that existed within hospital and clinic (over two-thirds of cost variation in the data was at the level of clinic within hospital). After cleansing, 2.7 million service events were available for analysis.

¹⁸ See object class *Non-admitted patient service event* [METeOR identifier: 400604].

¹⁹ See data set specification *Non-admitted patient DSS 2011-12* [METeOR identifier: 399390].

Table 16 – Non-admitted care service events removed from analysis

Step	Service events '000
Total Service Events with cost data	4,726
Removal of out of scope service events	664
Removal of service events with costs <\$10 or >\$10,000	65
Removal of service events with unreasonably high or low costs	203
Restriction to inner 70% of service events	1,079
Service Events included in analysis	2,714

4.2.2 Sample weights

No weighting of the sample was possible.

4.2.3 Calculation of average costs

Cost data for non-admitted outpatient care were provided by a sample of hospitals. Mean costs were calculated for each Tier 2 clinic. Where there was no data for a clinic, similar clinics were used to identify an appropriate estimated mean cost.

4.2.4 Calculation of NWAU

NWAU were calculated by dividing the estimated mean costs for each Tier 2 clinic by the by the mean modelled cost for all acute admitted episodes. The resulting weights are presented in the *Determination*.

4.3 Assigning NWAU for non-admitted outpatient care

Assignment of a NWAU to Non-Admitted Patient Service Events is by clinic type using the Tier 2 clinic classification. The steps involved in assigning NWAU to service events are described in Figure below. The key steps involved include:

- a. *Data preparation, which entails:*
 - Grouping non-admitted patient data to the Tier 2 Clinic classification
 - Joining data with the Tier 2 Clinic weights data (derived from the *Determination*).
- b. *Assign Tier 2 clinic cost weights to service events/aggregated counts of service events.*
- c. *Apply Indigenous and Remoteness Area Adjustments – This involves:*
 - Indigenous episodes (Indig_Flag =1) are those where the Indigenous status for the patient is 1, 2 or 3. The Adjustment for Indigenous episodes is specified in the *Determination* (Ind_Adj).
 - The Outer Regional, Remote or Very Remote Adjustments apply where the patient is resident in an outer regional (RA02), remote (RA03) or very remote (RA04) area. The Adjustments for Outer Regional, Remote and Very Remote episodes are specified in the *Determination* (OReg_Adj, Rem_Adj, VRem_Adj, respectively). These Adjustments are applied as follows:

$$NWAU = Base\ NWAU * (1 + Indig_Flag * Indig_Adj + OReg_Flag * OReg_Adj + Rem_Flag * Rem_Adj + VRem_Flag * VRem_Adj)$$

- d. *Identifying service events in scope for ABF.* This involves excluding service events reported for clinic types, funding sources and hospitals that will not be in-scope for ABF.

Non-admitted outpatient care

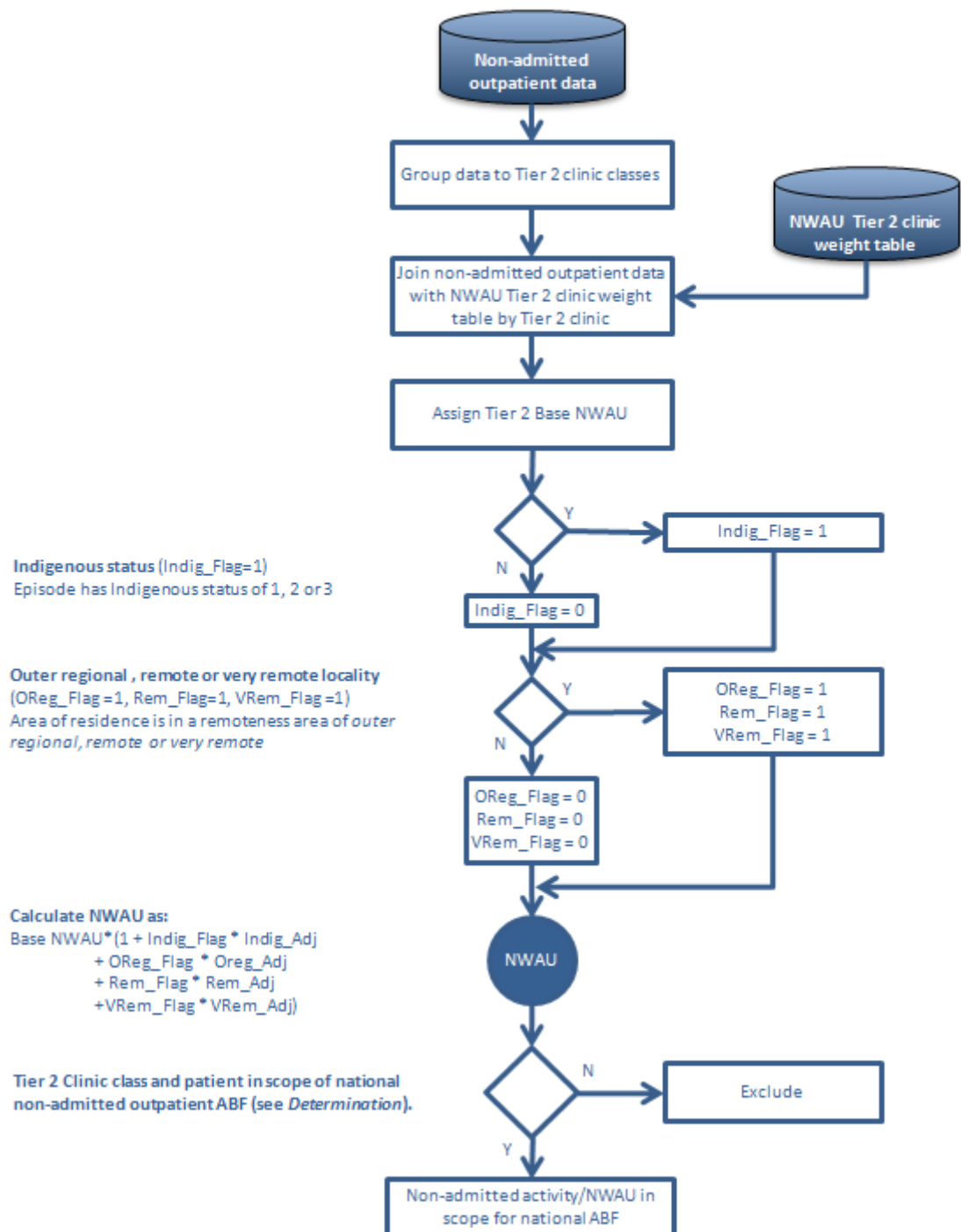


Figure 9 – Assignment of NWAU values to Non-Admitted Patient Service Events

Attachment A – Source data tables for assignment of acute admitted care NWAU

Admitted patient care file – data elements required

Variable	Description	METeOR Identifier
EstID	Establishment number	269975
Age	Age (years) at admission	Derived from <i>Date of birth</i> (287007) and <i>Admission date</i> (269967)
Indig	Indigenous status	291036
PC	Postcode of usual residence	Not an NMDS item
SLA	Area of usual residence (SLA of patient's residence under ASGC 2009/2010)	386783
Care	Care Type	270174
Qdays	Number of qualified days for newborns	270033
Fundsc	Funding source for hospital patient	339080
Electst	Admitted patient election status	326619
DRG60x	Diagnosis related group	AR-DRG Version 6.x is required
SDFlag	Same day patient flag	Based on <i>Admission date</i> (269967) = <i>Separation date</i> (270025)
LOS	Length of stay	Derived from <i>Separation date</i> (270025) - <i>Admission date</i> (269967), with value = 1 for same day episodes
ICUhours	ICU hours	Not an NMDS item

NWAU_parameters file (derived from the *Determination* - Appendix C)

Variable	Description
DRG6x	AR-DRG Version 6.x
DRG6x_Description	AR-DRG Version 6.x short name
SD_DRG_flag	Flags an AR-DRG as a designated same day payment AR-DRG (=1)
ICU_Bundled_flag	Flags an AR-DRG as one in which ICU costs are either bundled (=1) or unbundled (=0)
Lower	The length of stay trim point for defining short stay outliers
Upper	The length of stay trim point for defining long stay outliers
SD	The cost weight for designated same day payment AR-DRGs
SSO_F	The fixed cost weight component for short stay outliers
SSO_PD	The per day cost weight component for short stay outliers
Inlier	The inlier cost weight
LSO_PD	The per day cost weight component for long stay outliers
Paed_Adj	The Paediatric Adjustment
Indig_Adj	The Indigenous Adjustment
OReg_Adj	The Outer Regional Adjustment
Rem_Adj	The Remote Adjustment
VRem_Adj	The Very Remote Adjustment
ICU_Adj	The ICU Adjustment per hour for ICU eligible episodes
Pri_Srv_Adj	The Private Patient Service Adjustment for medical and prostheses costs
Pri_Acc_Adj_SD	The Private Patient Accommodation Adjustment for same day episodes
Pri_Acc_Adj_ON	The Private Patient Accommodation Adjustment for overnight episodes

PC_to_RA file (see Supplementary Table 1)

Variable	Description
Postcode	Australian postcodes
RA06	Remoteness Area coded as 0-4
RA06_Code	Remoteness Area coded as RA0-RA4
RA06_Description	The name of each Remoteness Area

SLA_to_RA file (see Supplementary Table 2)

Variable	Description
SLA_5DIGITCODE	SLA 2009/2010 code using five digits
RA06	Remoteness Area coded as 0-4
RA06_Code	Remoteness Area coded as RA0-RA4
RA06_Description	The name of each Remoteness Area

Attachment B – Funding source and election status values in-scope for ABF

Funding source ²⁰	Election status ²¹	Public hospitals (Establishment Sector ²² 1)	Private hospitals (Establishment Sector ²³ 2)
01 Australian Health Care Agreements	All values	Public	Public
02 Private health insurance	All values	Private	Out of scope
03 Self-funded	All values	Private	Out of scope
04 Worker's compensation	All values	Out of scope	Out of scope
05 Motor vehicle third party personal claim	All values	Out of scope	Out of scope
06 Other compensation	All values	Out of scope	Out of scope
07 Department of Veterans' Affairs	All values	Out of scope	Out of scope
08 Department of Defence	All values	Out of scope	Out of scope
09 Correctional facility	All values	Out of scope	Out of scope
10 Other hospital or public authority (contracted care)	1 Public	Public	Public
	2 Private	Public	Out of scope
	9 Not stated	Public	Out of scope
11 Reciprocal health care agreements (with other countries)	All values	Public	Public
12 Other	All values	Out of scope	Out of scope
13 No charge raised	All values	Out of scope	Out of scope
99 Not stated	All values	Out of scope	Out of scope

²⁰ See data element *Funding source for hospital patient* [METeOR identifier: 339080].

²¹ See data element *Admitted patient election status* [METeOR identifier: 326619].

²² See data element *Establishment sector* [METeOR identifier: 269977], value of 1 (Public).

²³ See data element *Establishment sector* [METeOR identifier: 269977], value of 2 (Private).

References

- Commonwealth of Australia 2010, *Australian Hospital Patient Costing Standards Version 1.1*, Department of Health and Ageing, Canberra, <[http://www.health.gov.au/internet/main/publishing.nsf/Content/0FABA9D6DB24D7E8CA257712000C5D3C/\\$File/HospitalPatientCostingStandards_v1.1.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/0FABA9D6DB24D7E8CA257712000C5D3C/$File/HospitalPatientCostingStandards_v1.1.pdf)>.
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- Independent Hospital Pricing Authority 2012, *Three year data plan v1.0*, IHPA, Canberra.