

Independent Hospital Pricing Authority

# National Hospital Cost Data Collection: Private Hospital Report

Round 21 (Financial year 2016-17)

*February 2019*



IHPA

## **National Hospital Cost Data Collection, Private Hospital Report, Round 21 (Financial year 2016-17)**

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# Acronyms/Abbreviations

Acronym/Abbreviation	Description
<b>ABS</b>	Australian Bureau of Statistics
<b>AHPCS</b>	Australian Hospital Patient Costing Standards
<b>AIHW</b>	Australian Institute of Health and Welfare
<b>AR-DRG</b>	Australian Refined - Diagnosis Related Group
<b>DRG</b>	Diagnosis Related Group
<b>EDW</b>	Enterprise Data Warehouse
<b>HCP</b>	Hospital Casemix Protocol
<b>ICD-10-AM</b>	International statistical classification of diseases and related health problems, Tenth Revision, Australian modification
<b>IHPA</b>	Independent Hospital Pricing Authority
<b>NHCDC</b>	National hospital cost data collection
<b>OR</b>	Operating room (theatres)
<b>PHDB</b>	Private Hospital Data Bureau
<b>PwC</b>	PricewaterhouseCoopers Consulting Pty Limited
<b>QA</b>	Quality Assurance
<b>SPS</b>	Specialist procedure suites
<b>WIP</b>	Work in progress

# Disclaimer

## Reliance on this report

This Report has been prepared by PricewaterhouseCoopers Consulting Pty Limited (PwC) at the request of the Independent Hospital Pricing Authority (IHPA). PwC prepared this report solely for IHPA's use in accordance with and for the purpose set out in the contract between IHPA and PwC. PwC acted exclusively for IHPA and considered no-one else's interests and accepts no responsibility, duty or liability to anyone other than IHPA in connection with this report, and for the consequences of using or relying on it for a purpose other than that referred to above.

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## Comparison to Round 20 report

The Round 21 ranking analysis cannot be directly compared to the published Round 20 National Hospital Cost Data Collection (NHCDC) report due to moving from Australian Refined Diagnosis Related Group (AR-DRG) version 8.0 in the Round 20 report to AR-DRG version 9.0 in the Round 21 report. In order to make comparisons between rounds, the data from Round 20 was regrouped to AR-DRG version 9.0, and re-ranked, and these regrouped rankings appear in the tables in this report.

## Public and private sector differences

This report does not seek to compare the average cost per separation between the public and private sectors, as the scope of costs between the two sectors is different. Many of the cost items present in the public sector such as medical specialist costs, including pathology and imaging are not equally represented in Private Hospital general ledgers. These costs are generally not reported for the private sector because the majority of hospitals do not provide these services directly and patients pay for these services separately.

## Confidentiality of data

Due to the commercial nature of the sector, all participating hospitals in Round 21 are requested to sign a confidentiality agreement before any final reports are released.

In this report, where a cost weight reported for a Diagnosis Related Group (DRG) is based on less than five separations, the figures for this cost weight have been replaced by asterisks (\*\*\*\*\*). If the number of contributing hospitals for a particular DRG is less than three, the figures for this cost weight have been replaced by dashes (-----).

# 1. Executive summary

The private sector NHCDC is a voluntary collection that produces a range of hospital cost and activity information by AR-DRG. This report includes the findings from the Round 21 (financial year 2016-17) of the NHCDC for acute admitted care provided by overnight private hospitals.

## Changes in Round 21

As per the Round 20 private sector NHCDC, for Round 21 IHPA facilitated the data collection process, which involved stakeholder engagement, validation, quality assurance and data set consolidation. Consultants (PricewaterhouseCoopers Consulting Pty Limited, PwC) were engaged to undertake the data analysis and reporting.

There have been only minimal changes from Round 20 to Round 21, these were:

- The analysis in this report was updated to AR-DRG version 9.0. This was done to reflect changes in clinical practice and to ensure the classifications remain clinically relevant and robust.
- No market share adjustment has been applied, as the analysis showed that each participating hospital group was appropriately represented based on the data which was submitted.

## Participation

The high level statistics for the Round 21 private sector NHCDC alongside previously reported Rounds (since 2007-08) are provided in Table 1.

In Round 21, the data set includes 105 hospitals and 1,923,310 separations, representing 59 percent of the population. The number of participating hospitals has increased by 14 hospitals or 15 percent. The number of sample separations has increased by 141,611 or 8 percent.

**Table 1. Summary of private hospital participation**

Summary	Round 11 2006-07	Round 12 2007-08	Round 13 2008-09	Round 16 2011-12	Round 17 2012-13	Round 18 2013-14	Round 20 2015-16	Round 21 2016-17
Number of hospitals	82	109	110	105	95	96	91	105
Sample Separations	1,297,147	1,607,678	1,648,989	1,775,059	1,650,816	1,697,311	1,781,699	1,923,310
Participation rate* (%)	59	72	71	66	60	60	58	59
AR-DRG version	4.2	4.2	5.1	6.0x	6.0x	6.0x	8.0	9.0

\*Participation rate refers to the percentage of sample separations compared to the population separations.

## Key findings

The data from the Round 21 private sector NHCDC was analysed to identify the top 20 DRGs by a range of factors. These rankings were compared to the rankings from the Round 20 data. The key findings were as follows:

- Overall there was a high level of consistency between the DRGs appearing in the top 20 in Round 20 and Round 21, apart from the top 20 for Average Length of Stay.
- Highest cost weight: There was 85 percent consistency in the top 20 DRGs between Round 20 and Round 21. The highest ranked DRG was the same in both rounds, and the same DRGs appeared in the top six in both rounds (although in a different order). Three

DRGs which sat close to the top 20 in Round 20 have newly entered the top 20 in Round 21.

- Highest volume of population-adjusted separations: There was 95 percent consistency in the top 20 DRGs between Round 20 and Round 21. The ranking was very similar as well, with the top five DRGs in the same order in both rounds. There was only one new entry to the top 20 in Round 21, and this sat just outside the top 20 in Round 20. This indicates consistency in the high-volume DRGs.
- Highest cost-weighted separations: The analysis showed 90 percent consistency in the top 20 DRGs between Round 20 and Round 21. The top two DRGs were the same in both rounds, and the two new entries to the top 20 sat just outside the top 20 in Round 20.
- Highest Average Length of Stay: There was 70 percent consistency between the top 20 DRGs in Round 20 and Round 21. The top DRG was the same in both rounds, but beyond this there were some difference in the rankings between rounds. There were six new DRGs in the top 20 for Round 21, with some of these being far outside the top 20 in Round 20.

The data was also analysed by cost buckets, examining operating rooms (OR) and specialist procedure suites (SPS) combined, critical care, prosthesis and miscellaneous. Round 20 and Round 21 were compared in terms of overall costs within each cost bucket, in addition to comparing the top 20 DRGs in each cost bucket between rounds. The key findings were:

- The percentage of overall cost in the OR and SPS cost bucket increased by 1.6 percent from Round 20 to Round 21.
- The percentage of overall cost in the miscellaneous cost bucket increased by 0.6 percent between rounds, and now makes up 49 percent of overall costs.
- The percentage of overall costs in the critical care and prosthesis cost buckets decreased by 0.8 and 1.4 percent respectively. These two cost buckets make up the smallest percentage of overall costs.
- The top 20 DRGs within each cost bucket were similar between Round 20 and Round 21, the majority of DRGs in the top 20 in Round 21 also appeared in the top 20 in Round 20.

## Considerations

The following can have a material impact on the reported costs and cost weights and they should be considered when interpreting the information in this report:

- Application of the AHPCS v3.1
- Mapping of general ledger to the appropriate and consistent cost buckets
- Allocation of cost centres to care areas
- Variability in allocating costs using feeder systems (patient level data) versus service weights.



## 2. Introduction

### Purpose of this report

The purpose of this report is to provide an overview of costs reported to the Round 21 private sector NHCDC. The Round 21 private sector NHCDC is a voluntary collection that produces a range of hospital cost and activity information.

The information is grouped by AR-DRG, which is “a patient classification scheme which provides a means of relating the number and types of patients treated in a hospital to the resources required by the hospital, as represented by a code<sup>1</sup>”. The AR-DRG is derived from a range of data collected on admitted patients, including diagnosis and procedure information, classified using ICD-10-AM<sup>2</sup>.

This report documents the data, processes, methodology and results for acute admitted care provided by overnight private hospitals. The results of the collection are expressed as national cost weights by AR-DRG version 9.0. Cost weight tables are provided in AR-DRG versions 9.0, 8.0, 7.0 and 6.0x in the Appendices.

### Format of this report

This report includes AR-DRG aggregated data, cost weights and other cost relativities. The AR-DRG information is displayed for the top 20 AR-DRGs ranked as follows:

- Highest cost weight
- Highest volume of population-adjusted separations
- Highest cost-weighted separations
- Highest Average Length of Stay
- Highest operating room and specialist procedure suites cost bucket cost weight
- Highest critical care cost bucket cost weight
- Highest prostheses cost bucket cost weight
- Highest miscellaneous cost bucket cost weight.

For definitions of the cost buckets please refer to Appendix D: Cost weight tables by AR-DRG version 9.0.

### History of the private sector NHCDC

Round 1 of the private sector NHCDC was conducted in 1996-97 with 23 hospitals and 240,000 episodes being represented. Since then, the collection has grown steadily although no publication was released for Rounds 8, 9, or 14 due to either low participation rates. No collection was carried out for Rounds 10 and 15 as the sector elected to bypass that year and move directly to the following Round. Round 19 was bypassed due to the expectation that achieving a sufficient participation rate would not be met due to competing priorities of

<sup>1</sup> Department of Health, A Users Guide for the Collection of HCP and PHDB (Version 1.2- May 2010 - page 38, [Government Health Website: http://www.health.gov.au/internet/main/publishing.nsf/Content/38E5E5E23C0D4336CA257BF0001E8AC3/\\$File/Data%20Definitions%20Manual.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/38E5E5E23C0D4336CA257BF0001E8AC3/$File/Data%20Definitions%20Manual.pdf), dated viewed 21 January 2019

<sup>2</sup> Department of Health, A Users Guide for the Collection of HCP and PHDB (Version 1.2- May 2010 - page 38, [Government Health Website: http://www.health.gov.au/internet/main/publishing.nsf/Content/38E5E5E23C0D4336CA257BF0001E8AC3/\\$File/Data%20Definitions%20Manual.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/38E5E5E23C0D4336CA257BF0001E8AC3/$File/Data%20Definitions%20Manual.pdf), dated viewed 21 January 2019

participants. Table 2 below shows the participation rate for Round 21 and the last seven published rounds.

**Table 2. Summary of private hospital participation**

Summary	Round 11 2006-07	Round 12 2007-08	Round 13 2008-09	Round 16 2011-12	Round 17 2012-13	Round 18 2013-14	Round 20 2015-16	Round 21 2016-17
Number of hospitals	82	109	110	105	95	96	91	105
Sample Separations	1,297,147	1,607,678	1,648,989	1,775,059	1,650,816	1,697,311	1,781,699	1,923,310
Participation rate* %	59	72	71	66	60	60	58	59
AR-DRG version	4.2	4.2	5.1	6.0x	6.0x	6.0x	8.0	9.0

\* Participation rate refers to the percentage of sample separations compared to the population separations.

## Private hospital statistics for Round 21 (2016-17)

ABS<sup>3</sup> reported that there were 657 private hospitals operating in Australia in 2016-17, a net increase of 27 from Round 20 in 2015-16. There were 11 additional acute and psychiatric hospitals and 16 additional free-standing day hospitals in 2016-17 compared to Round 20.

There were 34,339 beds and chairs available in private hospitals in 2016-17. Acute and psychiatric hospitals accounted for 31,029 or 90 percent of all beds and chairs, with the remaining 3,310 located in free-standing day hospital facilities.

There were 4.9 million patient separations in 2016-17, with 75 percent of those separations reported by acute and psychiatric hospitals. Total patient separations increased by 3.9 percent from 2015-16 to 2016-17.

Private hospitals provided close to 10.8 million patient days of care in 2016-17. Acute and psychiatric hospitals provided 9.6 million, or 89 percent of all patient days. Within acute and psychiatric hospitals, overnight-stay patients accounted for 7.3 million patient days and same-day patients accounted for a further 2.3 million.

## Changes in Round 21

There have been no significant changes made between Round 20 and Round 21 with the exception of those described below.

### Update to AR-DRG version 9.0

IHPA and participants agreed that this report would be in AR-DRG version 9.0, with additional cost weight tables included as appendices in AR-DRG versions 6.0x, 7.0 and 8.0. The Round 20 report was in AR-DRG version 8.0, and as such, direct comparisons between the two reports may be misleading. For the purpose of comparison to Round 20, the Round 20 dataset was re-grouped to AR-DRG version 9.0, and any Round 20 figures in this report can be assumed to be in AR-DRG version 9.0 (where applicable).

### Market share adjustment changes

The private sector NHCDC has historically been adjusted to reflect market share of participants ensure that large hospital groups are not over-represented in the analysis. In Round 21, the market share adjustment has not been applied either because it was accounted for in the data

<sup>3</sup> ABS, Private Hospital Statistics for 2016-17, <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4390.0~2016-17~Main%20Features~All%20Private%20Hospitals%20-%20summary~2>, date viewed 09<sup>th</sup> January 2019 (this reference is for the whole of section)

submission or there was agreement from the hospital that the potential adjustment was not material.

## Considerations

The following areas can have a material impact on the reported costs and cost weights. These should be considered, in addition to the changes in Round 21, when interpreting the information in this report:

- Application of the AHPCS v3.1
- Mapping of general ledger to the appropriate and consistent cost buckets
- Allocation of cost centres to care areas
- The variability of using feeder systems (patient level data) by participants verses service weights to allocate costs.

# 3. Scope and methodology

## Scope

The scope of the Round 21 private sector NHCDC includes acute patients admitted to overnight private hospitals in Australia who were discharged in the financial year 2016-17. This includes patients that were admitted to a hospital, were classified under the AR-DRG classification and had a care type of acute admitted or qualified newborn<sup>4</sup> (see 'In-scope care types').

For this report an overnight hospital was considered in scope if it performed at least 200 acute admitted separations.

## In-scope care types

Separations associated with acute admitted care and newborn care with qualified care days are in scope, and are included in the calculation of the AR-DRG cost weights. The costs associated with unqualified neonate separations<sup>5</sup> have been included in the costs of care on an adjusted basis (as described below and in Appendix B: for the neonatal adjustment).

Acute admitted care type 1.0 is “care in which the clinical intent or treatment goal is to: manage labour (obstetric); cure illness or provide definitive treatment of injury; perform surgery; relieve symptoms of illness or injury (excluding palliative care); reduce severity of an illness or injury; protect against exacerbation and/or complication of an illness and/or injury which could threaten life or normal function; perform diagnostic or therapeutic procedures.”<sup>6</sup>

Newborn care type 7.0 is “initiated when the patient is born in hospital or is nine days old or less at the time of admission. Newborn care continues until the care type changes or the patient is separated:

- Patients who turn 10 days of age and do not require clinical care are separated and, if they remain in the hospital, are designated as boarders.
- Patients who turn 10 days of age and require clinical care continue in a newborn episode of care until separated.
- Patients aged less than 10 days and not admitted at birth (e.g. transferred from another hospital) are admitted with newborn care type.
- Patients aged greater than 9 days not previously admitted (e.g. transferred from another hospital) are either boarders or admitted with an acute care type.
- Within a newborn episode of care, until the baby turns 10 days of age, each day is either a qualified or unqualified day.
- A newborn is qualified when it meets at least one of the criteria detailed in Newborn qualification status.

Within a newborn episode of care, each day after the baby turns 10 days of age is counted as a qualified patient day. Newborn qualified days are equivalent to acute days and may be denoted as such.”<sup>7</sup>

<sup>4</sup> [Data Dictionary, METeOR ID: 270174](#), AIHW, date viewed 21 January 2019;

<sup>5</sup> These are separations with care type 7.0 (new born care), with zero qualified days in the neonate DRGs (Major Diagnostic Category 15 newborns and other neonates)

<sup>6</sup> [A Users Guide for the Collection of Hospital Casemix Protocol \(HCP\) and Private Hospital Data Bureau \(PHDB\)](#), (Version 1.2- May 2010 page 28), Department of Health, dated viewed 21 January 2019

<sup>7</sup> [A Users Guide for the Collection of Hospital Casemix Protocol \(HCP\) and Private Hospital Data Bureau \(PHDB\)](#), (Version 1.2- May 2010 page 30-31), Department of Health, dated viewed 21 January 2019

## In-scope costs

Participants were requested to submit their costed data in compliance with the AHPCS version 3.1<sup>8</sup> to support consistency in output.

The AHPCS v3.1 defines product costs in scope as “all costs incurred by, or on behalf of the hospital, that are necessarily incurred in the production of patient and non-patient products, subject to the specific exclusion that the costs of time provided by medical specialists to treat private patients that are not directly met by the hospital, are not to be imputed.”<sup>9</sup> This includes non-cash expenditure items such as depreciation.

## Work in Progress Patients

The AHPCS v3.1 requires that all patient activity during the year be costed according to its set of guidelines. For the purposes of the NHCDC, all patients discharged within the reference period are considered in scope. A WIP patient is defined as a patient that is not admitted and discharged within the same financial year, and for the purposes of the NHCDC all patients that are discharged within the reference period, including WIP patients, are considered in-scope.

## Identifying the minimum sample size

This report relied on analysis performed in 2012 to determine the minimum sample size required to proceed. No adjustments have been made during this round to account for any significant sector or market changes since that time.

For Round 21, the participation rate achieved was 59 percent, with 105 hospitals in 10 hospital groups submitting data. This participation rate is similar to Round 20 (58 percent), leading to a confidence level of 85 percent and a margin of error of 3 percent. See Appendix A: Analysis performed to determine the minimum sample size for further details.

## Methodology

There are eight stages of the private sector NHCDC which are outlined below.

### Stage 1: Stakeholder engagement

IHPA sought costed data directly from private hospitals for the private sector NHCDC. Participants were requested to provide a methodology that outlined their costing processes, and all participants demonstrated that they have appropriate costing methodologies.

### Stage 2: Data collection

At the commencement of the data collection phase a Data Request Specification (DRS) was prepared and distributed to all participants. Participants performed their own data collection.

### Stage 3: Data preparation

Participants performed their own QA checks on their data to verify that it was appropriate to use in their costing process.

### Stage 4: Costing

The costing phase involved participants performing episode-level costing using costing software. Programs used by hospitals in Round 21 include but are not limited to CostPro plus, PPM and C++.

<sup>8</sup> IHPA, AHPCS v3.1, July 2014, [Independent Hospital Pricing Authority](#), viewed 21 January 2019

<sup>9</sup> IHPA, AHPCS v3.1, July 2014, page 14, standard SCP 2.003 – Product Costs in Scope, [Independent Hospital Pricing Authority](#), viewed 21 January 2019

### Stage 5: Data submission

IHPA required that the participating hospital groups submit data in accordance with the Round 21 private sector DRS, along with a data quality checklist which provided IHPA with details on the hospital costing process. The various costing methodologies used by private sector hospitals are outlined in Appendix B: Private sector costing approaches.

Participants were informed of the costed data collection timeframes and provided access to the National Health Reform EDW drop box to upload and submit their data. The participating hospitals were provided a Data Transfer Guide to help navigate through the process and to communicate processing timeframes.

### Stage 6: Data validation and Quality Assurance

Participants were required to submit their costed data as csv files which passed data checks documented in the DRS. IHPA only accepted data with zero critical errors and which represented at least 90 percent of the submitted hospital establishment's total in-scope activity.

Where the costed data did not meet the DRS requirements, participants were asked to review the files and make the necessary changes and then re-submit the data.

Once the data was validated, PwC reviewed the data and produced Quality Assurance (QA) reports which helped participants to confirm the accuracy and appropriateness of the data submission. These included checks in areas with potential to have a material impact on results, such as zero or negative cost buckets, extreme high or low cost separations, and DRG flipping<sup>10</sup>. If the QA reports identified uncharacteristic traits, the participant was asked to investigate and either adjust the data or justify the deviation. Once all uncharacteristic traits were justified, the participant confirmed their data was final.

On finalisation of the valid costed data submission, IHPA required participants to submit a data quality statement. The data quality statements informed IHPA of the key matters that may impact each participant's data submission and provided assurance that the data was fit for purpose. IHPA then consolidated the data submission into a national costed data set.

### Stage 7: Data analysis (including adjustments)

PwC checked the national cost data set supplied by IHPA to ensure that the separations were in-scope. PHDB was also used to estimate the number of in-scope private hospitals and the number of in-scope separations Australia-wide in 2016-17.

The data was also examined by hospital group and compared against PHDB, in order to ensure that no hospital group was over-represented in the data set (compared to the Australian population) in a way that would potentially bias the analysis. It was determined that there was no material over-representation. The separations in the submitted data were then scaled up using estimated weights to be reflective of the Australian population.

PwC reviewed the data set for DRG flipping. In Round 21 there were a small number of instances of DRG flipping identified, and after consultation with IHPA and the relevant participant, these separations were removed.

Based on the adjustments described above the cost weight tables were produced, checked for reasonableness, and compared to the Round 20 results.

### Stage 8: Reporting

PwC produced the NHCDC private sector report which outlines the results of the Round 21 private sector NHCDC and draws on the data analysis to provide an interpretation of the results.

<sup>10</sup> DRG flipping occurs when the average cost of a lower complexity DRG within the related adjacent DRG is higher than the one with more complexity.

## Data adjustments

The following adjustments were applied to the dataset during the NHCDC process:

### Neonate adjustment

The costs for newborn infants with zero qualified days, in respect of care type 7 (newborn care) were allocated to the delivery AR-DRGs of mothers at the same hospital.

The definition of unqualified days is provided in the National Health Data Dictionary<sup>11</sup>: “unqualified days” relates to the first 9 days of a newborn’s life, unless the newborn is a second or subsequent live born infant or it requires intensive care. This adjustment has been performed in a fashion consistent with the Round 20 private NHCDC.

### Market share adjustment process

The market share was determined for each hospital group, to ensure they were appropriately represented. This was done by calculating the share of the PHDB separations that belonged to the relevant group, against those of the hospital groups which submitted to the NHCDC. The market share was then compared to the submitted data to see if any hospital groups submitted more separations than their market share would warrant, and if so, whether this would lead to an inappropriate representation. It was concluded that the representation for each hospital group was appropriate, and no adjustments were made to the data due to the market share.

### Population adjustment process

To ensure the results reflect the full range of Australia’s private hospitals, an estimation process was adopted to create representative national costing and activity figures from sample data. The estimation process produces ‘population’ data by estimating weights, on the basis of acute admitted separations, that are applied to the sample data so that the acute admitted separations equal the total population figures. The weights are calculated based on the number of separations in each hospital group in the submitted data and Australia-wide, based on the total population in PHDB.

The total population was determined as the number of acute separations in 2016-17 obtained from PHDB. All private acute hospitals in Australia (excluding private day hospital facilities) with more than 200 acute admitted separations during the financial year were included.

The number of hospitals in the population file for Round 21 is 251.

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<sup>11</sup> Data Dictionary, Meteor ID 327254, <https://meteor.aihw.gov.au/content/index.phtml/itemId/327254>, viewed 22<sup>nd</sup> January 2019



## 4. Results

### Participation

The population of separations in Round 21 is defined as all acute admitted separations performed at 251 in scope overnight private hospitals in 2016-17, which is 3,242,411 separations.

The number of sample separations in Round 21 was 1,923,310 which represents an 8 percent increase in the sample separations compared to Round 20 (shown in Table 4). In Round 21 the participation rate was 59 percent of separations, which is an increase of 1 percentage point compared to Round 20.

The average number of sample separations submitted per participant decreased by 1,262 separations (from 19,579 to 18,317) between Round 20 and Round 21. The average number of separations per population hospital increased by 513 separations (from 12,405 to 12,918) between Round 20 and Round 21.

In the table below, “Change in separations (%)” represents a comparison to the previous Round.

**Table 4. Comparison of separations and hospitals, Round 12 (2007-08) to Round 21 (2016-17)**

Key Statistic	Round 12 2007-08	Round 13 2008-09	Round 16 2011-12	Round 17 2012-13	Round 18 2013-14	Round 20 2015-16	Round 21 2016-17
Sample separations	1,607,678	1,648,989	1,775,059	1,650,816	1,697,311	1,781,699	1,923,310
Change in separations (%)	24	3	8	-7	3	5	8
Population separations	2,248,324	2,328,814	2,703,667	2,753,670	2,827,996	3,051,681	3,242,411
Participation rate (%)	72	71	66	60	60	58	59
Sample hospitals	109	110	105	95	96	91	105
Change in sample hospitals (%)	33	1	-5	-10	1	-5	15
Population hospitals	229	226	248	244	235	246	251
Sample hospitals to population hospitals (%)	48	49	42	39	41	37	42
Average separations per participant	14,749	14,991	16,905	17,377	17,680	19,579	<b>18,317</b>
Average separations per population hospital	9,818	10,304	10,902	11,286	12,034	12,405	<b>12,918</b>
Average Length of Stay	2.62	2.57	2.51	2.53	2.45	2.34	<b>2.26</b>
Change (%)	-9.0	-1.9	-2.2	0.5	-3.1	-4.6	<b>-3.2</b>
Overnight Average Length of Stay	unknown	unknown	unknown	4.42	4.38	4.18	<b>4.10</b>

The Average Length of Stay decreased from 2.34 days in Round 20 to 2.26 days in Round 21 which is a reduction of 3.2 percent (see Table 4), and continued the downward trend visible since Round 12. Contributing to this decline is the reduction in overnight Average Length of Stay from 4.18 to 4.10 (1.9 percent; 0.08 days reduction) and the overall shift in overnight separations towards same-day – in Round 20, 57.8 percent of all separations were same-day, but this increased by 1.5 percent to 59.3 percent of all separations in Round 21.



Literature in the public domain supports a reduction in Average Length of Stay as hospitals focus on increasing efficiency through improving patient pathways and discharge planning, and using new technologies and medical devices which enable certain procedures to be performed faster and/or with shorter recovery times.

## Analysis of Top 20 DRGs

Analysing the top 20 DRGs provides insight into the consistency between rounds, the identification of any trends, and highlights the DRGs that are driving costs. This section of the report provides an analysis of the top 20 DRGs by the following categories:

- Highest cost weight
- Highest number of population-adjusted separations
- Highest cost-weighted separations
- Highest Average Length of Stay including minimum and maximum range.

Additional analysis of the cost buckets (operating room/specialist procedure suites, critical care, prostheses and miscellaneous) has been undertaken to identify the top 20 DRGs for each of these buckets.

*Please note: The Round 21 ranking analysis cannot be directly compared to the published Round 20 NHCDC report due to moving from AR-DRG version 8.0 to version 9.0. Therefore the Round 20 data has been regrouped in version 9.0 to provide a more accurate comparison.*

### Top 20 DRGs ranked by highest cost weight

#### Key findings

As shown in Figure 1 the highest cost weight DRG was A13A (Ventilation  $\geq 336$  hours, Major Complexity). As illustrated in Table 5, this was ranked number one in Round 20 and was ranked among the highest cost weight DRGs due to its complexity. The five highest cost weight DRGs were all closely related to A13A, reflecting the resource-intensive nature of these groups. A13A has increased by 6.08 cost weights between rounds, which may be due to the small number of sample separations.

The DRGs in Table 5 were high cost low volume DRGs, that represented only 0.2 percent (or 6,067 population-adjusted separations) of the total population-adjusted separations (3,242,411). They also represented only 3.1 percent of the total population cost-weighted separations.

#### Consistencies between Round 21 and Round 20

85 percent (17 out of 20) of the top 20 DRGs for Round 21 were also in the Round 20 results with the top six being the same DRGs (although in a different order). A14A (Ventilation  $\geq 96$  hours &  $< 336$  hours, Major Complexity) ranked number two was ranked number three in Round 20, and A14B (Ventilation  $\geq 96$  hours &  $< 336$  hours, Intermediate Complexity) ranked number three was ranked number six Round 20.

Overall these top 20 DRGs were anticipated to be represented in the top 20 list given their high patient complexity and resource utilisation.

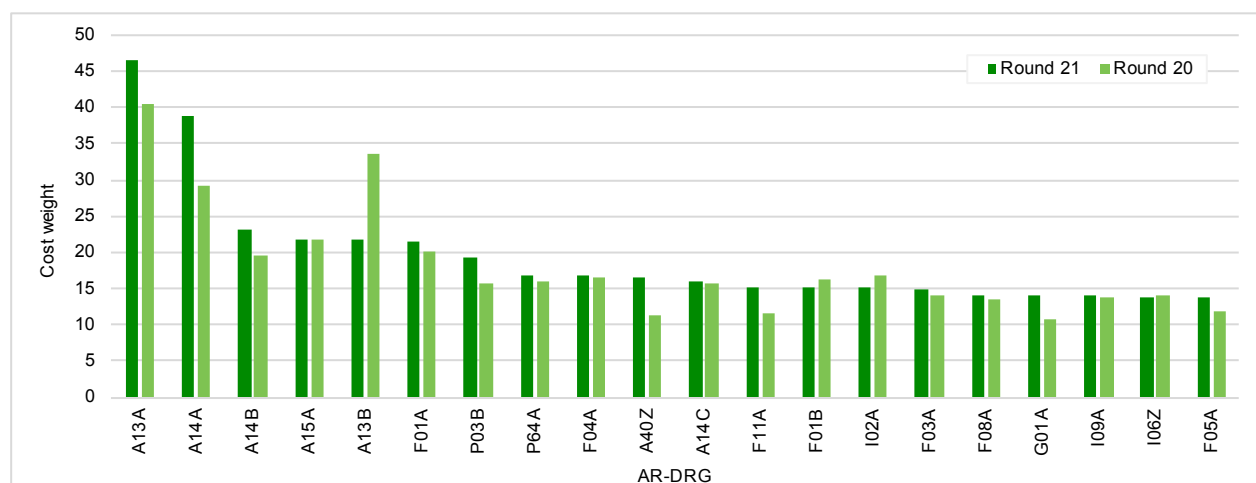
### Differences between Round 21 and Round 20

There were three DRGs which were new to the top 20 in Round 21:

- A40Z (ECMO)
- F11A (Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp)
- G01A (Rectal Resection, Major Complexity).

These DRGs were all just outside the top 20 in Round 20, sitting at ranks 26, 24 and 31 respectively, indicating that they were consistently high cost weight DRGs.

**Figure 1. Top 20 DRGs ranked by highest cost weight**



**Table 5. Top 20 DRGs ranked by highest cost weight**

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Cost weight (a)	No. of weighted seps (b)	Cost-weighted seps (c)=(a)x(b)	Number of days (d)	ALoS (days) (e)=(d)/(b)	Std error	% of total seps	% of CW seps	Cost weight Round 20	Rank Round 20	No. of weighted seps Round 20
Yes	1	A13A	Ventilation >=336hours, Major Complexity	46.60	98	4,567	5,575	56.7	4.85	0.0%	0.1%	40.52	1	141
Yes	2	A14A	Ventilation >=96hours & <336hours, Major Complexity	38.79	165	6,400	8,460	51.2	2.96	0.0%	0.2%	29.17	3	241
Yes	3	A14B	Ventilation >=96hours & <336hours, Intermediate Complexity	23.16	288	6,670	8,022	27.8	1.12	0.0%	0.2%	19.60	6	468
Yes	4	A15A	Tracheostomy, Major Complexity	21.86	11	240	255	24.2	2.39	0.0%	0.0%	21.64	4	32
Yes	5	A13B	Ventilation >=336hours, Minor Complexity	21.63	8	173	256	30.6	1.94	0.0%	0.0%	33.70	2	37
Yes	6	F01A	Implantation and Replacement of AICD, Total System, Major Complexity	21.58	278	5,999	3,410	12.3	0.66	0.0%	0.2%	19.98	5	369
Yes	7	P03B	Neonate, AdmWt 1000-1499g W Significant GI/Vent>=96hrs, Minor Complexity	19.34	46	890	1,654	35.6	2.34	0.0%	0.0%	15.74	12	54
Yes	8	P64A	Neonate, AdmWt 1250-1499g W/O Significant GI/Vent>=96hrs, Major Complexity	16.93	16	271	553	35.3	3.32	0.0%	0.0%	15.90	10	26
Yes	9	F04A	Cardiac Valve Procedures W CPB Pump W/O Invasive Cardiac Invest, Major Comp	16.69	177	2,954	3,901	22.0	0.85	0.0%	0.1%	16.42	8	318
No	10	A40Z	ECMO	16.45	13	214	224	17.9	9.69	0.0%	0.0%	11.27	26	32
Yes	11	A14C	Ventilation >=96hours & <336hours, Minor Complexity	15.87	172	2,730	3,163	18.4	0.99	0.0%	0.1%	15.78	11	174
No	12	F11A	Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp	15.16	62	940	2,884	46.5	1.64	0.0%	0.0%	11.48	24	60
Yes	13	F01B	Implantation and Replacement of AICD, Total System, Minor Complexity	15.11	2,179	32,925	4,454	2.0	0.18	0.1%	1.0%	16.26	9	2,291
Yes	14	I02A	Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity	15.04	59	887	2,016	34.3	1.31	0.0%	0.0%	16.82	7	70
Yes	15	F03A	Cardiac Valve Procedures W CPB Pump W Invasive Cardiac Investigation, Major Comp	14.82	257	3,809	5,452	21.2	0.65	0.0%	0.1%	14.16	13	292
Yes	16	F08A	Major Reconstructive Vascular Procedures W/O CPB Pump, Major Complexity	14.00	150	2,100	3,658	24.5	0.74	0.0%	0.1%	13.45	16	219
No	17	G01A	Rectal Resection, Major Complexity	14.00	285	3,990	9,161	32.1	0.66	0.0%	0.1%	10.75	31	346
Yes	18	I09A	Spinal Fusion, Major Complexity	14.00	547	7,658	9,501	17.4	0.44	0.0%	0.2%	13.80	15	666
Yes	19	I06Z	Spinal Fusion for Deformity	13.78	988	13,615	9,141	9.3	0.36	0.0%	0.4%	14.12	14	1,212
Yes	20	F05A	Coronary Bypass W Invasive Cardiac Investigation, Major Complexity	13.74	269	3,696	5,290	19.7	0.63	0.0%	0.1%	11.87	20	454
17 in Top 20	<b>Sub-total, top 20 highest cost weight All DRGs</b>			16.60	6,067	100,728	87,030	14.3		0.2%	3.1%			
	<b>Top 20, % of all DRGs</b>			1.00	3,242,411	3,242,411	7,331,450	2.3		100%	100%			
					0.2%	3.1%	1.2%							

**Notes**

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(e) ALoS means Average Length of Stay

## Top 20 DRGs ranked by highest volume of population-adjusted separations

### Key findings

Table 6 and Figure 2 show the DRGs with the highest population-adjusted separations for Round 21. This is a measure of the volume of separations in the entire Australian overnight private hospital population (i.e. the separations in the Round 21 sample, adjusted using weights to reflect the whole population).

Table 6 shows that for Round 21, R63Z (Chemotherapy) was ranked number one which is consistent with its Round 20 ranking. Table 6 also shows that the top 20 DRGs represented 45 percent (1,461,226 population-adjusted separations) of the total population-adjusted separations (3,242,411 population-adjusted separations). However, these DRGs represented only 19 percent (631,757) of the total population cost-weighted separations. This indicates that these DRGs were high volume and low cost.

The Average Length of Stay for these top 20 DRGs is 1.2 days compared to the population average of 2.3 days. The reason for this is that the majority of these DRGs were same-day procedures.

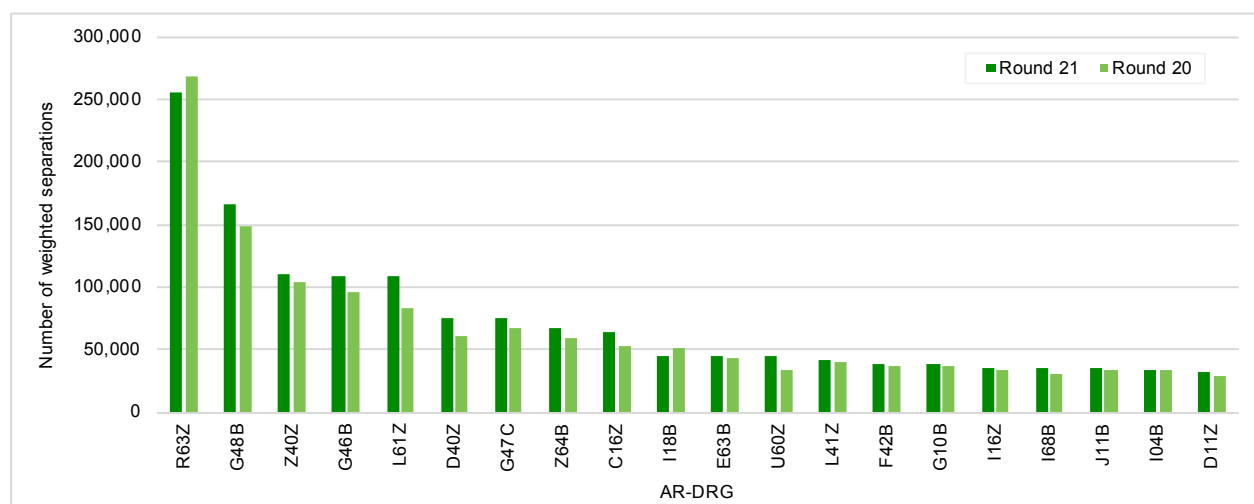
### Consistencies between Round 21 and Round 20

95 percent (19 out of 20) of the current round's top 20 DRGs were included in Round 20's top 20 (see Table 6) with the top five being ranked in the same order as the top five from Round 20. This was expected given the high frequency of treatments required for R63Z (Chemotherapy) and the demand for colonoscopies endoscopies as day procedures.

### Differences between Round 21 and Round 20

The only difference in the top 20 between Round 20 and Round 21 was D11Z Tonsillectomy and Adenoidectomy which was ranked 21 in Round 20 and has moved up to rank 20 in Round 21. This very small movement between the rounds indicated that there is a high level of consistency in the number of high-volume DRGs.

**Figure 2. Comparison of top 20 DRGs by highest volume of population adjusted separations**



**Table 6. Top 20 DRGs ranked by highest volume of population adjusted separations**

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Cost weight (a)	No. of weighted seps (b)	Cost-weighted seps (c)=(a)x(b)	Number of days (d)	ALoS (days) (e)=(d)/(b)	Std error	% of total seps	% of CW seps	No. of weighted seps Round 20	Rank Round 20	Cost weight Round 20
Yes	1	R63Z	Chemotherapy	0.15	<b>256,062</b>	38,409	256,216	1.0	0.000	7.9%	1.2%	268,018	1	0.15
Yes	2	G48B	Colonoscopy, Minor Complexity	0.29	<b>166,005</b>	48,141	172,047	1.0	0.001	5.1%	1.5%	148,776	2	0.26
Yes	3	Z40Z	Other Contacts W Health Services W Endoscopy	0.24	<b>110,439</b>	26,505	111,990	1.0	0.001	3.4%	0.8%	104,543	3	0.21
Yes	4	G46B	Complex Endoscopy, Minor Complexity	0.35	<b>109,420</b>	38,297	115,684	1.1	0.001	3.4%	1.2%	95,336	4	0.31
Yes	5	L61Z	Haemodialysis	0.10	<b>108,871</b>	10,887	108,905	1.0	0.000	3.4%	0.3%	83,214	5	0.11
Yes	6	D40Z	Dental Extractions and Restorations	0.45	<b>76,067</b>	34,230	76,353	1.0	0.001	2.3%	1.1%	61,622	7	0.38
Yes	7	G47C	Gastroscopy, Minor Complexity	0.22	<b>75,952</b>	16,709	80,125	1.1	0.001	2.3%	0.5%	67,493	6	0.21
Yes	8	Z64B	Other Factors Influencing Health Status, Minor Complexity	0.18	<b>66,815</b>	12,027	69,369	1.0	0.002	2.1%	0.4%	58,932	8	0.17
Yes	9	C16Z	Lens Procedures	0.59	<b>64,268</b>	37,918	64,465	1.0	0.002	2.0%	1.2%	52,810	9	0.47
Yes	10	I18B	Other Knee Procedures, Minor Complexity	0.54	<b>45,662</b>	24,657	47,354	1.0	0.002	1.4%	0.8%	50,703	10	0.48
Yes	11	E63B	Sleep Apnoea, Minor Complexity	0.20	<b>45,117</b>	9,023	45,259	1.0	0.003	1.4%	0.3%	42,886	11	0.18
Yes	12	U60Z	Mental Health Treatment W/O ECT, Sameday	0.07	<b>44,630</b>	3,124	44,630	1.0	0.000	1.4%	0.1%	33,266	18	0.11
Yes	13	L41Z	Cystourethroscopy for Urinary Disorder, Sameday	0.23	<b>41,369</b>	9,515	41,369	1.0	0.001	1.3%	0.3%	40,511	12	0.20
Yes	14	F42B	Circulatory Dsrds, Not Adm for AMI W Invasive Cardiac Inves Proc. Minor Comp	0.92	<b>38,621</b>	35,531	54,856	1.4	0.005	1.2%	1.1%	37,095	13	0.88
Yes	15	G10B	Hernia Procedures, Minor Complexity	0.98	<b>38,455</b>	37,686	47,188	1.2	0.003	1.2%	1.2%	36,484	14	0.86
Yes	16	I16Z	Other Shoulder Procedures	1.39	<b>35,616</b>	49,506	42,500	1.2	0.004	1.1%	1.5%	34,255	16	1.26
Yes	17	I68B	Non-surgical Spinal Disorders, Minor Complexity	0.46	<b>35,278</b>	16,228	61,297	1.7	0.003	1.1%	0.5%	30,648	19	0.45
Yes	18	J11B	Other Skin, Subcutaneous Tissue and Breast Procedures, Minor Complexity	0.41	<b>35,256</b>	14,455	36,143	1.0	0.002	1.1%	0.4%	34,595	15	0.36
Yes	19	I04B	Knee Replacement, Minor Complexity	4.35	<b>34,532</b>	150,214	174,770	5.1	0.007	1.1%	4.6%	33,693	17	4.25
No	20	D11Z	Tonsillectomy and Adenoidectomy	0.57	<b>32,793</b>	18,692	33,437	1.0	0.002	1.0%	0.6%	28,384	21	0.50
19 in Top 20	<b>Sub-total, 20 highest separation count All DRGs</b>			<b>0.43</b>	<b>1,461,226</b>	<b>631,757</b>	<b>1,683,957</b>	<b>1.2</b>		45%	19%			
				<b>1.00</b>	<b>3,242,411</b>	<b>3,242,411</b>	<b>7,331,450</b>	<b>2.3</b>		100%	100%			
			<b>Top 20 separation count, % of all DRGs</b>		<b>45%</b>	<b>19%</b>	<b>23%</b>							

**Notes**

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(e) ALoS means Average Length of Stay

## Top 20 DRGs ranked by highest cost-weighted separations

### Key findings

Table 7 and Figure 3 present the top 20 DRGs ranked by highest cost weight separations. A cost-weighted separation refers to the number of population-adjusted separations multiplied by the cost weight for that DRG, and measures the total cost, or resource utilisation, associated with that DRG.

Figure 3 shows that the highest cost weight DRG was I04B (Knee Replacement, Minor Complexity). This procedure is a common procedure within the private sector and it is frequently ranked amongst the highest cost-weighted DRGs. As can be seen in Table 7, the number of cost-weighted separations for this DRG has increased by 6,871 or 4.8 percent (from 143,343 to 150,214 separations) between Rounds.

The DRGs listed in the top 20 (Table 7) were anticipated to be within this ranking given that 80 percent (16 out of 20) are either within orthopaedic, neurology or cardiac procedures which require high cost prostheses or high volume treatments like colonoscopy/endoscopy or chemotherapy.

The top 20 DRGs by cost-weighted separations represented 31 percent (1,006,245 cost-weighted separations) of the total population cost-weighted separations of 3,242,411. Additionally, these DRGs represented 22 percent of the total population-adjusted separations. This indicated that these were a mixture of high volume and high cost DRGs.

### Consistencies between Round 21 and Round 20

As shown in Table 7 the top two DRGs by cost-weighted separations; I04B (Knee Replacement, Minor Complexity) and I33B (Hip Replacement for Non-Trauma, Minor Complexity) were ranked in the same order as Round 20 which is influenced by the high volume of separations, length of stay above average and high cost prostheses being used in these orthopaedic procedures.

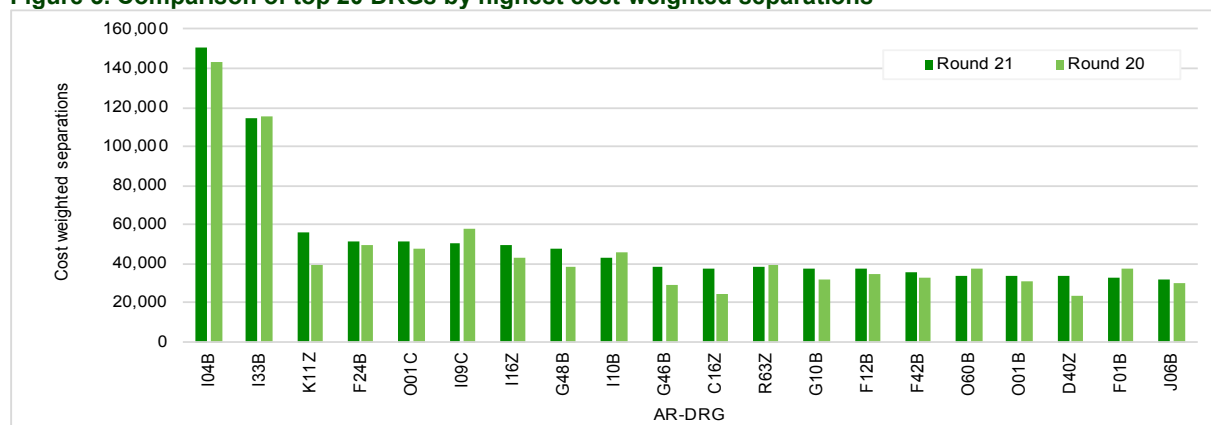
### Differences between Round 21 and Round 20

There were two new DRGs in the top 20 as can be seen in Table 7. These are; C16Z (Lens Procedures) ranked 11 in Round 21 and 21 in the previous round, and D40Z (Dental Extractions and Restorations) ranked 18 in Round 21 and 23 in Round 20.

These DRGs have incurred a significant increase in the number of cost-weighted separations between rounds, with an increase of 13,045 cost-weighted separations (or 52%) for C16Z and 10,721 cost-weighted separations (or 46%) for D40Z.

K11Z (Major Laparoscopic Bariatric Procedures) has moved from rank 9 in Round 20 to rank 3 in Round 21. This was due to a large increase in the number of cost-weighted separations, from 14,681 in Round 20 to 21,042 in Round 21 (an increase of 6,361 weighted separations, or 43%).

**Figure 3. Comparison of top 20 DRGs by highest cost-weighted separations**



**Table 7. Top 20 DRGs ranked by highest cost-weighted separations**

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Cost weight (a)	No. of weighted seps (b)	Cost-weighted seps (c)= (a)x(b)	Number of days (d)	ALoS (days) (e)=(d)/(b)	Std error	% of total seps	% of CW seps	Cost-weighted seps Round 20	Rank Round 20	No. of weighted seps Round 20	Cost weight Round 20
Yes	1	I04B	Knee Replacement, Minor Complexity	4.35	34,532	<b>150,214</b>	174,770	5.1	0.01	1.1%	4.6%	143,343	1	33,693	4.25
Yes	2	I33B	Hip Replacement for Non-Trauma, Minor Complexity	5.02	22,720	<b>114,054</b>	106,142	4.7	0.01	0.7%	3.5%	115,411	2	23,629	4.88
Yes	3	K11Z	Major Laparoscopic Bariatric Procedures	2.65	21,042	<b>55,761</b>	53,384	2.5	0.01	0.6%	1.7%	39,367	9	14,681	2.68
Yes	4	F24B	Interventional Coronary Procs, Not Adm for AMI, Minor Comp	2.44	20,973	<b>51,174</b>	34,070	1.6	0.01	0.6%	1.6%	49,955	4	18,661	2.68
Yes	5	O01C	Caesarean Delivery, Minor Complexity	2.01	25,426	<b>51,106</b>	115,675	4.5	0.01	0.8%	1.6%	47,952	5	26,496	1.81
Yes	6	I09C	Spinal Fusion, Minor Complexity	6.43	7,864	<b>50,566</b>	39,221	5.0	0.05	0.2%	1.6%	58,050	3	9,564	6.07
Yes	7	I16Z	Other Shoulder Procedures	1.39	35,616	<b>49,506</b>	42,500	1.2	0.00	1.1%	1.5%	43,288	7	34,255	1.26
Yes	8	G48B	Colonoscopy, Minor Complexity	0.29	166,005	<b>48,141</b>	172,047	1.0	0.00	5.1%	1.5%	38,771	10	148,776	0.26
Yes	9	I10B	Other Back and Neck Procedures, Minor Complexity	2.33	18,423	<b>42,926</b>	58,645	3.2	0.02	0.6%	1.3%	45,636	6	20,753	2.20
Yes	10	G46B	Complex Endoscopy, Minor Complexity	0.35	109,420	<b>38,297</b>	115,684	1.1	0.00	3.4%	1.2%	29,182	19	95,336	0.31
No	11	C16Z	Lens Procedures	0.59	64,268	<b>37,918</b>	64,465	1.0	0.00	2.0%	1.2%	24,874	21	52,810	0.47
Yes	12	R63Z	Chemotherapy	0.15	256,062	<b>38,409</b>	256,216	1.0	0.00	7.9%	1.2%	39,452	8	268,018	0.15
Yes	13	G10B	Hernia Procedures, Minor Complexity	0.98	38,455	<b>37,686</b>	47,188	1.2	0.00	1.2%	1.2%	31,540	16	36,484	0.86
Yes	14	F12B	Implantation and Replacement of Pacemaker, Total System, Minor Complexity	5.15	7,298	<b>37,585</b>	16,707	2.3	0.03	0.2%	1.2%	34,584	14	6,587	5.25
Yes	15	F42B	Circulatory Dsrds, Not Adm for AMI W Invasive Cardiac Inves Proc, Minor Comp	0.92	38,621	<b>35,531</b>	54,856	1.4	0.01	1.2%	1.1%	32,696	15	37,095	0.88
Yes	16	O60B	Vaginal Delivery, Intermediate Complexity	1.51	22,626	<b>34,165</b>	92,671	4.1	0.00	0.7%	1.1%	37,284	11	25,382	1.47
Yes	17	O01B	Caesarean Delivery, Intermediate Complexity	2.37	14,355	<b>34,021</b>	80,872	5.6	0.01	0.4%	1.0%	31,332	17	14,611	2.14
No	18	D40Z	Dental Extractions and Restorations	0.45	76,067	<b>34,230</b>	76,353	1.0	0.00	2.3%	1.1%	23,509	23	61,622	0.38
Yes	19	F01B	Implantation and Replacement of AICD, Total System, Minor Complexity	15.11	2,179	<b>32,925</b>	4,454	2.0	0.18	0.1%	1.0%	37,249	12	2,291	16.26
Yes	20	J06B	Major Procedures for Breast Disorders, Minor Complexity	1.75	18,302	<b>32,029</b>	41,259	2.3	0.01	0.6%	1.0%	30,065	18	18,403	1.63
18 in Top 20	<b>Sub-total, top 20 highest cost-weighted separations</b>			<b>1.01</b>	<b>1,000,254</b>	<b>1,006,245</b>	<b>1,647,179</b>	<b>1.6</b>		31%	31%				
	<b>All DRGs</b>			<b>1.00</b>	<b>3,242,411</b>	<b>3,242,411</b>	<b>7,331,450</b>	<b>2.3</b>		100%	100%				
	<b>Top 20 cost-weighted separations, % of all DRGs</b>				<b>31%</b>	<b>31%</b>	<b>22%</b>								

Notes



(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0  
(b) Separations shown are strata weighted (e) ALoS means Average Length of Stay

## Top 20 DRGs ranked by Average Length of Stay

### Key findings

Table 8 shows that the DRG with the highest Average Length of Stay is A13A (Ventilation  $\geq 336$  hours, Major Complexity) with an Average Length of Stay of 56.7 days. This DRG was also ranked number one in Round 20, and was also ranked as the DRG with the highest cost weight. DRGs with a high cost weight are expected to have a high Average Length of Stay, and vice versa.

The DRGs listed in the top 20 for Round 21 are expected to be within this ranking given their complex nature. With the exception of A13B (Ventilation  $\geq 336$  hours, Minor Complexity) all DRGs within the top 20 are either intermediate or major complexity DRGs which have long length of stays.

As shown in Table 8, these DRGs represent 0.1 percent (3,328 population-adjusted separations) of the total 3,242,411 population-adjusted separations. They also represented 1.3 percent (40,717 cost-weighted separations) of the total population cost-weighted separations.

### Consistencies between Round 21 and Round 20

70 percent (14 out of 20) of this Round's top 20 DRGs were in the top 20 in Round 20. The top DRG in Round 20 has remained the top DRG in Round 21, with the Average Length of Stay for this DRG remaining largely the same between rounds (54.8 in Round 20 vs 56.7 in Round 21).

### Differences between Round 21 and Round 20

There were a number of differences between the top 20 rankings in Round 20 and Round 21. This was largely due to the nature of the DRGs with a high Average Length of Stay – the length of stay tends to have a very broad range for these DRGs, and can vary from very short (including same-day separations) to very long (several months). These DRGs also tend to be low in volume, which leads to more volatile results.

DRG B83A (Acute Paraplegia and Quadriplegia and Spinal Cord Conditions, Major Complexity) was a new entry to the top 20. Now ranked number 8, it was ranked 121 in Round 20. It had an Average Length of Stay of 34.1 days in Round 21 compared to only 13.8 days in Round 20. The range of length of stay was the widest of all DRGs in the top 20 (in Round 21), with the smallest being a same-day separation, and the longest being a stay of over one year (383 days).

DRGs I02A (Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity) and P64A (Neonate, AdmWt 1250-1499g W/O Significant GI/Vent $\geq 96$  hrs, Major Complexity) were ranked 2 and 3 respectively in Round 20, and have fallen to ranks 7 and 6 in Round 21. This was most likely due to the small number of population-weighted separations (59 and 16, respectively) leading to volatility.

**Figure 4. Comparison of top 20 DRGs by Average Length of Stay**

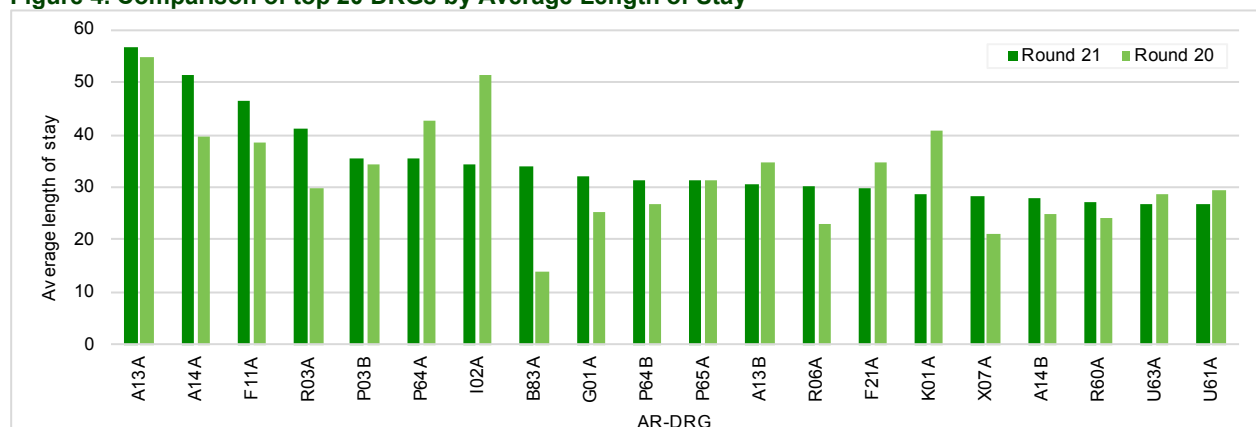


Table 8. Top 20 DRGs ranked by Average Length of Stay

Top 20 Round 20	Rank Round 21	DRG	DRG Description	ALoS (days) (a)	Min LoS	Max LoS	Cost weight	No. of weighted seps (b)	Cost-weighted seps	Std error	% of total seps	% of CW seps	ALoS Round 20	Rank Round 20	Number of days
Yes	1	A13A	Ventilation >=336hours, Major Complexity	56.7	17	171	46.60	98	4,567	4.85	0.0%	0.1%	54.8	1	5,575
Yes	2	A14A	Ventilation >=96hours & <336hours, Major Complexity	51.2	11	163	38.79	165	6,400	2.96	0.0%	0.2%	39.5	5	8,460
Yes	3	F11A	Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp	46.5	2	129	15.16	62	940	1.64	0.0%	0.0%	38.5	6	2,884
Yes	4	R03A	Lymphoma and Leukaemia W Other GIs, Major Complexity	41.1	1	201	12.86	78	1,003	1.36	0.0%	0.0%	29.9	15	3,211
Yes	5	P03B	Neonate, AdmWt 1000-1499g W Significant GI/Vent>=96hrs, Minor Complexity	35.6	1	57	19.34	46	890	2.34	0.0%	0.0%	34.5	10	1,654
Yes	6	P64A	Neonate, AdmWt 1250-1499g W/O Significant GI/Vent>=96hrs, Major Complexity	35.3	16	58	16.93	16	271	3.32	0.0%	0.0%	42.5	3	553
Yes	7	I02A	Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity	34.3	4	99	15.04	59	887	1.31	0.0%	0.0%	51.5	2	2,016
No	8	B83A	Acute Paraplegia and Quadriplegia and Spinal Cord Conditions, Major Complexity	34.1	1	383	8.62	54	465	2.51	0.0%	0.0%	13.8	121	1,827
No	9	G01A	Rectal Resection, Major Complexity	32.1	7	112	14.00	285	3,990	0.66	0.0%	0.1%	25.3	25	9,161
Yes	10	P64B	Neonate, AdmWt 1250-1499g W/O Significant GI/Vent>=96hrs, Minor Complexity	31.3	15	56	9.03	50	452	0.48	0.0%	0.0%	26.9	19	1,555
Yes	11	P65A	Neonate, AdmWt 1500-1999g W/O Significant GI/Vent>=96hrs, Extreme Comp	31.2	10	65	10.10	91	919	0.58	0.0%	0.0%	31.3	12	2,855
Yes	12	A13B	Ventilation >=336hours, Minor Complexity	30.6	16	39	21.63	8	173	1.94	0.0%	0.0%	34.6	9	256
No	13	R06A	Autologous Bone Marrow Transplant, Major Complexity	30.1	1	68	11.65	148	1,724	0.85	0.0%	0.1%	22.9	36	4,450
Yes	14	F21A	Other Circulatory System GIs, Major Complexity	29.7	5	77	8.57	83	711	0.73	0.0%	0.0%	34.7	8	2,462
Yes	15	K01A	GIs for Diabetic Complications, Major Complexity	28.6	3	72	10.09	71	716	0.91	0.0%	0.0%	40.6	4	2,027
No	16	X07A	Skin Grafts for Injuries Excluding Hand, Major Complexity	28.1	1	138	8.38	123	1,031	0.91	0.0%	0.0%	21.2	46	3,456
No	17	A14B	Ventilation >=96hours & <336hours, Intermediate Complexity	27.8	5	114	23.16	288	6,670	1.12	0.0%	0.2%	24.9	27	8,022
No	18	R60A	Acute Leukaemia, Major Complexity	27.0	1	206	8.42	323	2,720	0.57	0.0%	0.1%	24.2	29	8,730
Yes	19	U63A	Major Affective Disorders, Major Complexity	26.8	1	179	4.90	1,087	5,326	0.15	0.0%	0.2%	28.8	18	29,136
Yes	20	U61A	Schizophrenia Disorders, Major Complexity	26.6	1	110	4.46	193	861	0.30	0.0%	0.0%	29.6	17	5,131
14	Sub-total, top 20 longest ALoS separations			31.1			12.23	3,328	40,717		0.1%	1.3%			103,421
in	All DRGs			2.3			1.00	3,242,411	3,242,411		100%	100%			7,331,450
Top 20	Top 20 longest ALoS separations, % of all DRGs							0.1%	1.3%						1.4%

## Notes

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(c) ALoS means Average Length of Stay

## Analysis of cost buckets

The private sector NHCDC has analysed and reported on the following cost buckets since Round 17 (2012-13). The same cost buckets have been reported in Round 21, these are:

- Operating room/Specialist Procedure Suites (OR/SPS)
- Critical care
- Prostheses
- Miscellaneous (representing the remainder of the cost buckets – see Appendix B: Private sector costing approaches for the list of cost buckets).

This section contains the analysis of the differences between cost buckets in Round 20 and Round 21 as well as the top 20 DRGs by these cost buckets.

### Differences between Round 21 and Round 20

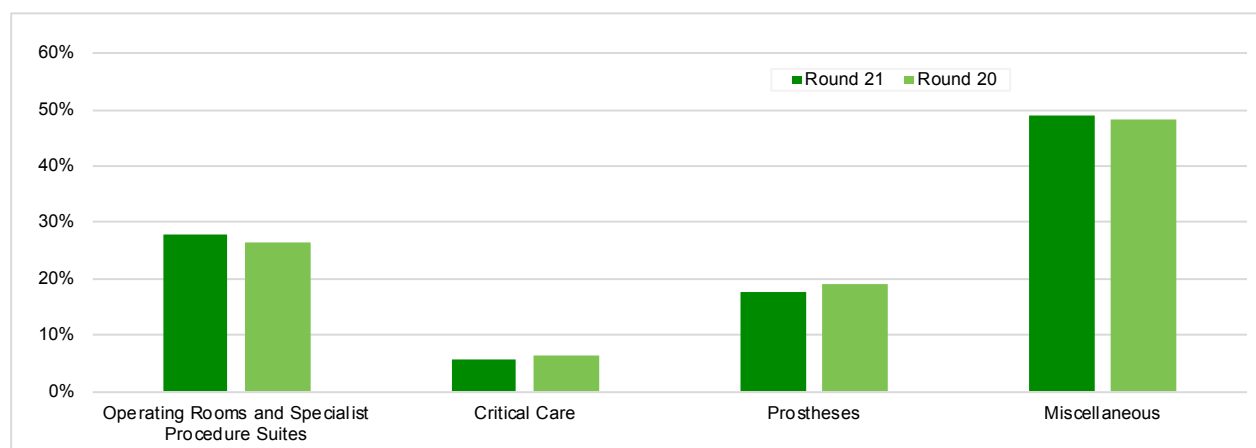
Table 9 and Figure 5 illustrate the differences between the cost buckets in Round 20 and Round 21. The movements between the rounds are relatively small which is to be expected given that participants undertook their own costing in Round 20 and continued to do so in Round 21.

Figure 5 shows that OR/SPS had the largest movement between Rounds with an increase of 1.6 percent and there was a decrease of 1.4 percent in prostheses.

Some of the reasons why we may see a change in the cost buckets include:

- Improvement in the accuracy of cost allocations through quality improvement of the participant's feeder data and/or allocation statistics
- Changes in service weights between Rounds
- Increase in same-day theatre related separations.

**Figure 5. Breakdown of cost by cost-bucket group (Round 21 compared to Round 20)**



**Table 9. Breakdown of cost by cost-bucket group (Round 21 compared to Round 20)**

Cost Bucket	Round 20 2015-16	Round 21 2016-17	Movement
Operating Rooms and Specialist Procedure Suites	26.4%	<b>27.9%</b>	1.6%
Critical Care	6.4%	<b>5.6%</b>	-0.8%
Prostheses	18.9%	<b>17.5%</b>	-1.4%
Miscellaneous	48.3%	<b>49.0%</b>	0.6%

Total	100.0%	100.0%	0.0%
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## Operating room/specialist procedure suites cost bucket

### Key findings

Table 10 shows that the highest operating room/specialist procedure suites cost weight DRG was A15A (Tracheostomy, Major Complexity). This DRG was ranked number 2 in Round 20, and was expected to rank highly given the large amount of theatre time utilised by this procedure. This DRG only had 11 population-weighted separations in Round 21, which may be the reason for the movement from Round 20.

The top operating room/specialist procedure suites DRGs presented in Table 10 have a lower percentage of their total cost belonging to the operating room and specialist procedure suites buckets (19%) than the average DRG (28%). This indicated that most of the DRGs in this table were overall high cost DRGs with only a small share of their cost coming from the operating room/specialist procedure suites bucket (but due to the high overall cost, this is still enough to be a top-ranking DRG).

There were a few DRGs which are lower cost overall, but have a high share of their costs allocated to the operating room/specialist procedure suites cost buckets. These were:

- J01B (Microvas Tiss Transf for Skin, Subcut Tiss & Breast Dsrds, Minor Complexity) which had 45% of its total cost belonging to the operating room/specialist procedure suites cost bucket
- J01A (Microvas Tiss Transf for Skin, Subcut Tiss & Breast Dsrds, Major Complexity) which had 37% of its total cost belonging to the operating room/specialist procedure suites cost bucket
- A15C (Tracheostomy, Minor Complexity) and A15B (Tracheostomy, Intermediate Complexity) which had 34% and 27%, respectively, of their total costs belonging to the operating room/specialist procedure suites cost bucket.

### Consistencies between Round 21 and Round 20

80 percent (16 of 20) of the top 20 DRGs by operating room/specialist procedure suites costs in Round 20 were present in the top 20 of round 21. The top three DRGs were the same between Round 20 and Round 21, although in a different order.

### Differences between Round 21 and Round 20

There were four new entrants to the top 20 in Round 21. These were:

- G01A (Rectal Resection, Major Complexity)
- F11A (Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp)
- I09A (Spinal Fusion, Major Complexity)
- L03A (Kidney, Ureter and Major Bladder Procedures for Neoplasm, Major Complexity)

These DRGs were all highly ranked in Round 20, with ranks between 22 and 38.

**Table 10. Top 20 DRGs for operating room/specialist procedure suites cost bucket**

Top 20 Round 20	Rank Round 21	DRG	DRG Description	OR and SPS cost weight (a)	No. of weighted seps (b)	Overall cost weight (c)	ALoS (days) (d)	% of DRG total cost				OR and SPS cost weight Round 20	Rank Round 20
								OR and SPS	Critical care	Prosthesis	Miscellaneous		
Yes	1	A15A	Tracheostomy, Major Complexity	4.17	11	21.86	24.2	19%	41%	9%	31%	3.39	2
Yes	2	A15B	Tracheostomy, Intermediate Complexity	3.58	63	13.16	16.3	27%	31%	7%	35%	3.16	3
Yes	3	J01A	Microvas Tiss Transf for Skin, Subcut Tiss & Breast Dsrds, Major Complexity	3.54	55	9.60	16.8	37%	13%	5%	46%	3.48	1
Yes	4	A14A	Ventilation >=96hours & <336hours, Major Complexity	3.36	165	38.79	51.2	9%	54%	5%	32%	2.90	5
Yes	5	A13A	Ventilation >=336hours, Major Complexity	3.15	98	46.60	56.7	7%	64%	3%	26%	2.05	18
Yes	6	F03A	Cardiac Valve Procedures W CPB Pump W Invasive Cardiac Investigation, Major	2.90	257	14.82	21.2	20%	32%	18%	31%	2.67	7
Yes	7	J01B	Microvas Tiss Transf for Skin, Subcut Tiss & Breast Dsrds, Minor Complexity	2.90	381	6.44	8.2	45%	7%	7%	41%	2.84	6
Yes	8	A40Z	ECMO	2.88	13	16.45	17.9	18%	54%	8%	21%	3.15	4
Yes	9	A15C	Tracheostomy, Minor Complexity	2.58	57	7.56	9.2	34%	28%	6%	32%	2.65	8
Yes	10	F05A	Coronary Bypass W Invasive Cardiac Investigation, Major Complexity	2.49	269	13.74	19.7	18%	41%	6%	34%	2.57	9
Yes	11	I02A	Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity	2.46	59	15.04	34.3	16%	10%	15%	59%	2.33	11
Yes	12	F08A	Major Reconstructive Vascular Procedures W/O CPB Pump, Major Complexity	2.44	150	14.00	24.5	17%	23%	19%	40%	2.33	12
No	13	G01A	Rectal Resection, Major Complexity	2.38	285	14.00	32.1	17%	25%	4%	54%	1.82	25
Yes	14	F03B	Cardiac Valve Procedures W CPB Pump W Invasive Cardiac Investigation, Minor	2.24	351	9.96	12.5	22%	27%	19%	32%	2.32	13
No	15	F11A	Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp	2.22	62	15.16	46.5	15%	11%	3%	72%	1.58	38
Yes	16	F04A	Cardiac Valve Procedures W CPB Pump W/O Invasive Cardiac Invest, Major	2.22	177	16.69	22.0	13%	37%	14%	36%	2.35	10
Yes	17	F05B	Coronary Bypass W Invasive Cardiac Investigation, Minor Complexity	2.20	761	9.17	12.3	24%	36%	6%	35%	2.21	14
No	18	I09A	Spinal Fusion, Major Complexity	2.16	547	14.00	17.4	15%	9%	46%	29%	1.96	22
No	19	L03A	Kidney, Ureter and Major Bladder Procedures for Neoplasm, Major Complexity	2.14	427	8.17	15.0	26%	20%	6%	48%	1.71	29
Yes	20	H01A	Pancreas, Liver and Shunt Procedures, Major Complexity	2.12	283	11.22	22.4	19%	22%	7%	52%	2.02	20
16	<b>Sub-total, top 20 highest ORSPS cost weight DRGs</b>			<b>2.44</b>	<b>4,470</b>	<b>13.16</b>	<b>19.8</b>	19%	31%	13%	37%		
in	<b>All DRGs</b>			<b>0.28</b>	<b>3,242,411</b>	<b>1.00</b>	<b>2.3</b>	28%	6%	18%	49%		
Top 20	<b>Top 20 OR and SPS cost weight DRGs, % of all DRGs</b>				<b>0.1%</b>								

**Notes**

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(d) ALoS means Average Length of Stay

## Critical care cost bucket

### Key findings

Table 11 demonstrates that the highest critical care cost weight DRG was A13A (Ventilation  $\geq 336$  hours, Major Complexity). This was ranked number one in Round 20 and is expected to be highly ranked given its complex and resource intensive nature.

As seen in Table 11 the DRGs listed in the top 20 were expected to be within this ranking given that they include either mechanical ventilation or neonatal DRGs.

The DRGs with the highest critical care costs were low-volume, high complexity DRGs.

### Consistencies between Round 21 and Round 20

The top 8 DRGs were the same as in Round 20, although in a slightly different order. A13B (Ventilation  $\geq 336$  hours, Minor Complexity) had the largest movement in critical care cost weight, moving from 21.56 in Round 20 to 14.28 in Round 21, which was a drop of 7.28 (or 34%). This was likely due to volatility from the small separation count, with only 8 population-weighted separations in Round 21.

### Differences between Round 21 and Round 20

There were five new DRGs entering the top 20 critical care cost weights (see Table 11) in Round 21. These were:

- A40Z (ECMO)
- B42B (Nervous System Disorders W Ventilator Support, Intermediate Complexity)
- E40B (Respiratory System Disorders W Ventilator Support, Minor Complexity)
- P64B (Neonate, AdmWt 1250-1499g W/O Significant GI/Vent  $\geq 96$  hrs, Minor Complexity)
- F03A (Cardiac Valve Procedures W CPB Pump W Invasive Cardiac Investigation, Major Comp).

These DRGs were all highly ranked in Round 20 (ranging from rank 21 to 34), and the reason for their movement into the top 20 in Round 21 was most likely the low separation counts leading to volatility.



Table 11. Top 20 DRGs for critical care cost bucket

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Critical care cost weight (a)	No. of weighted seps (b)	Overall cost weight (c)	ALoS (days) (d)	% of DRG total cost				Critical care cost weight Round 20	Rank Round 20
								OR and SPS	Critical care	Prosthesis	Miscellaneous		
Yes	1	A13A	Ventilation >=336hours, Major Complexity	29.90	98	46.60	56.7	7%	64%	3%	26%	26.58	1
Yes	2	A14A	Ventilation >=96hours & <336hours, Major Complexity	20.93	165	38.79	51.2	9%	54%	5%	32%	15.37	3
Yes	3	P03B	Neonate, AdmWt 1000-1499g W Significant GI/Vent>=96hrs, Minor Complexity	15.87	46	19.34	35.6	0%	82%	0%	18%	12.40	4
Yes	4	A13B	Ventilation >=336hours, Minor Complexity	14.28	8	21.63	30.6	3%	66%	1%	29%	21.56	2
Yes	5	P64A	Neonate, AdmWt 1250-1499g W/O Significant GI/Vent>=96hrs, Major Complexity	13.55	16	16.93	35.3	0%	80%	0%	20%	10.59	6
Yes	6	A14B	Ventilation >=96hours & <336hours, Intermediate Complexity	12.99	288	23.16	27.8	8%	56%	6%	30%	10.87	5
Yes	7	A14C	Ventilation >=96hours & <336hours, Minor Complexity	9.85	172	15.87	18.4	5%	62%	3%	30%	9.86	8
Yes	8	A15A	Tracheostomy, Major Complexity	8.95	11	21.86	24.2	19%	41%	9%	31%	10.50	7
No	9	A40Z	ECMO	8.83	13	16.45	17.9	18%	54%	8%	21%	3.59	28
Yes	10	P65A	Neonate, AdmWt 1500-1999g W/O Significant GI/Vent>=96hrs, Extreme Comp	6.41	91	10.10	31.2	0%	63%	0%	37%	7.82	11
Yes	11	E40A	Respiratory System Disorders W Ventilator Support, Major Complexity	6.25	21	9.97	15.7	1%	63%	8%	29%	4.56	20
Yes	12	F04A	Cardiac Valve Procedures W CPB Pump W/O Invasive Cardiac Invest, Major Comp	6.24	177	16.69	22.0	13%	37%	14%	36%	5.88	14
No	13	B42B	Nervous System Disorders W Ventilator Support, Intermediate Complexity	6.04	11	9.94	12.2	1%	61%	0%	38%	4.30	22
Yes	14	F05A	Coronary Bypass W Invasive Cardiac Investigation, Major Complexity	5.68	269	13.74	19.7	18%	41%	6%	34%	4.80	19
No	15	E40B	Respiratory System Disorders W Ventilator Support, Minor Complexity	5.66	61	8.48	9.5	1%	67%	2%	30%	4.53	21
Yes	16	F06A	Coronary Bypass W/O Invasive Cardiac Investigation, Major Complexity	5.47	182	13.16	19.6	16%	42%	9%	34%	5.79	15
Yes	17	P05B	Neonate, AdmWt 2000-2499g W Significant GI/Vent>=96hrs, Minor Complexity	5.12	27	8.43	21.7	0%	61%	0%	39%	7.76	12
Yes	18	E41A	Respiratory System Disorders W Non-Invasive Ventilation, Major Complexity	4.98	212	9.28	18.9	1%	54%	2%	44%	5.32	18
No	19	P64B	Neonate, AdmWt 1250-1499g W/O Significant GI/Vent>=96hrs, Minor Complexity	4.88	50	9.03	31.3	0%	54%	0%	46%	3.24	34
No	20	F03A	Cardiac Valve Procedures W CPB Pump W Invasive Cardiac Investigation, Major Comp	4.71	257	14.82	21.2	20%	32%	18%	31%	4.15	25
15	Sub-total, top 20 highest critical care cost weight DRGs			9.43	2,175	18.13	25.9	10%	52%	7%	32%		
In	All DRGs			0.06	3,242,411	1.00	2.3	28%	6%	18%	49%		
Top 20	Top 20 Critical Care cost weight DRGs, % of all DRGs				0.1%								

## Notes

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(d) ALoS means Average Length of Stay

## Prostheses cost bucket

### Key findings

The highest cost weight DRG is F01A (Implantation and Replacement of AICD, Total System, Major Complexity) as shown in Table 12. This was ranked number one in Round 20 due to the high cost of the defibrillator prostheses and increased activity. The prostheses cost weight for this DRG has remained similar between rounds, increasing from 14.95 in Round 20 to 15.91 in Round 21, a change of 0.96 cost weights (or 6.5%).

All DRGs in the top 20 by prostheses cost have a higher percentage of the total cost belonging to the prostheses bucket than the average for all DRGs. The average percentage of costs belonging to the prosthesis bucket for all DRGs is 18%, whereas it is 60% for the DRGs in the top 20 table, ranging from 25% for B02A (Cranial Procedures, Major Complexity) to 90% for F01B (Implantation and Replacement of AICD, Total System, Minor Complexity). This indicates that the majority of the cost of these DRGs comes from the cost of the prostheses.

These high cost prostheses procedures only represented 1.8 percent (57,143 population-adjusted separations) of the total 3,242,411 population-adjusted separations.

### Consistencies between Round 21 and Round 20

95 percent (19 out of 20) of the top 20 DRGs were included in the Round 20 results with the top five being ranked in the same order between rounds. This indicated that these DRGs were consuming a relatively stable amount of prostheses costs. The prostheses cost weights between rounds for the top 20 DRGs had also remained relatively stable.

### Differences between Round 21 and Round 20

The only new DRG was B02A (Cranial Procedures, Major Complexity). This DRG was ranked number 32 for prosthesis cost in Round 20, and has increased to rank 16 in Round 21. This DRG also had the largest increase in prostheses cost weight of all DRGs in the top 20, increasing from 2.16 to 3.33 (an increase of 1.17, or 54%). The changes in this DRG were likely due to a different set of hospitals in the sample or an introduction of new high cost prostheses compared to the previous round.

Table 12. Top 20 DRGs for prostheses cost bucket

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Prosthesis cost weight (a)	No. of weighted seps (b)	Overall cost weight (c)	ALoS (days) (d)	% of DRG total cost				Prosthesis cost weight Round 20	Rank Round 20
								OR and SPS	Critical care	Prosthesis	Miscellaneous		
Yes	1	F01A	Implantation and Replacement of AICD, Total System, Major	15.91	278	21.58	12.3	6%	8%	74%	12%	14.95	1
Yes	2	F01B	Implantation and Replacement of AICD, Total System, Minor	13.65	2,179	15.11	2.0	5%	1%	90%	3%	14.43	2
Yes	3	I06Z	Spinal Fusion for Deformity	8.11	988	13.78	9.3	14%	6%	59%	20%	8.39	3
Yes	4	D01Z	Cochlear Implant	6.96	729	8.35	1.5	10%	0%	83%	6%	6.94	4
Yes	5	I09A	Spinal Fusion, Major Complexity	6.49	547	14.00	17.4	15%	9%	46%	29%	6.38	5
Yes	6	I09B	Spinal Fusion, Intermediate Complexity	4.94	3,324	9.07	8.1	18%	5%	54%	23%	4.56	7
Yes	7	I01A	Bilateral and Multiple Major Joint Procedures of Lower Limb, Major	4.51	545	10.89	15.5	15%	7%	41%	37%	4.73	6
Yes	8	I01B	Bilateral and Multiple Major Joint Procedures of Lower Limb, Minor	4.50	2,452	7.72	6.2	17%	3%	58%	22%	4.39	8
Yes	9	F17A	Insertion and Replacement of Pacemaker Generator, Major Complexity	4.12	169	5.67	3.7	10%	4%	73%	13%	3.35	14
Yes	10	F12A	Implantation and Replacement of Pacemaker, Total System, Major	3.88	1,419	7.11	8.2	12%	11%	55%	22%	3.75	10
Yes	11	F12B	Implantation and Replacement of Pacemaker, Total System, Minor	3.69	7,298	5.15	2.3	13%	5%	72%	10%	3.68	11
Yes	12	I32A	Revision of Knee Replacement, Major Complexity	3.62	444	8.91	14.9	15%	5%	41%	39%	3.76	9
Yes	13	I09C	Spinal Fusion, Minor Complexity	3.58	7,864	6.43	5.0	21%	3%	56%	20%	3.38	13
Yes	14	F17B	Insertion and Replacement of Pacemaker Generator, Minor Complexity	3.40	1,853	4.24	1.2	12%	1%	80%	7%	3.26	15
Yes	15	I31A	Revision of Hip Replacement, Major Complexity	3.39	225	12.27	23.5	14%	13%	28%	46%	3.41	12
No	16	B02A	Cranial Procedures, Major Complexity	3.33	322	13.46	20.0	15%	24%	25%	36%	2.16	32
Yes	17	I33B	Hip Replacement for Non-Trauma, Minor Complexity	2.89	22,720	5.02	4.7	17%	1%	58%	24%	2.83	20
Yes	18	I33A	Hip Replacement for Non-Trauma, Major Complexity	2.84	2,290	6.16	8.1	16%	6%	46%	32%	2.86	18
Yes	19	I05A	Other Joint Replacement, Major Complexity	2.82	652	6.17	7.4	19%	6%	46%	29%	2.92	17
Yes	20	I31B	Revision of Hip Replacement, Intermediate Complexity	2.78	844	7.18	10.0	19%	8%	39%	34%	2.85	19
19	Sub-total, top 20 highest prosthesis cost weight DRGs			3.99	57,143	6.61	5.3	15%	4%	60%	20%		
In	All DRGs			0.18	3,242,411	1.00	2.3	28%	6%	18%	49%		
Top 20	Top 20 Prosthesis cost weight DRGs, % of all DRGs				1.8%								

## Notes

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(d) ALoS means Average Length of Stay

## Miscellaneous cost bucket

### Key findings

As in previous rounds, the miscellaneous cost bucket was the most volatile in rankings of all the cost buckets. The volatility may be driven by; the sample size, different hospitals participating and a different approach to costing being used by the participating hospitals.

Table 13 shows that the highest cost weight DRG in this cost bucket was A14A (Ventilation  $\geq 96$  hours &  $< 336$  hours, Major Complexity). This was ranked number three in Round 20.

The DRGs listed in the top 20 were to be expected given that they are high cost, low volume treatments and have appeared in the top 20 of previous tables throughout this report.

These DRGs represented only 0.1 percent (3,647 population-adjusted separations) of the total 3,242,411 population-adjusted separations.

### Consistencies between Round 21 and Round 20

75 percent (15 out of 20) of the top 20 DRGs were included in the Round 20 results, which is a relatively high level of consistency given the volatility in miscellaneous costs between years.

I01A (Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity) was ranked number one in Round 20, but has fallen to rank 6 in Round 21. Its miscellaneous cost weight has decreased from 11.87 to 8.93, which is a decrease of 2.94 cost weights, or 25%.

### Differences between Round 21 and Round 20

There were five new DRGs in the top 20 in Round 21:

- B83A (Acute Paraplegia and Quadriplegia and Spinal Cord Conditions, Major Complexity)
- X07A (Skin Grafts for Injuries Excluding Hand, Major Complexity)
- L09A (Other Procedures for Kidney and Urinary Tract Disorders, Major Complexity)
- F04A (Cardiac Valve Procedures W CPB Pump W/O Invasive Cardiac Invest, Major Comp)
- H01A (Pancreas, Liver and Shunt Procedures, Major Complexity).

Of the DRGs above, the biggest movement was B83A, which moved from a rank of 98 in Round 20, with a miscellaneous cost weight of 3.19 to a rank of 7 in Round 21, with a miscellaneous cost weight of 8.44. The movement was likely due to the low number of population-adjusted separations in this DRG (54 in Round 21) leading to volatility.

**Table 13. Top 20 DRGs for miscellaneous (Misc.) cost bucket**

Top 20 Round 20	Rank Round 21	DRG	DRG Description	Miscellaneous cost weight (a)	No. of weighted seps (b)	Overall cost weight (c)	ALoS (days) (d)	% of DRG total cost				Miscellaneous cost weight Round 20	Rank Round 20
								OR and SPS	Critical care	Prosthesis	Miscellaneous		
Yes	1	A14A	Ventilation >=96hours & <336hours, Major Complexity	12.50	165	38.79	51.2	9%	54%	5%	32%	8.94	3
Yes	2	A13A	Ventilation >=336hours, Major Complexity	12.22	98	46.60	56.7	7%	64%	3%	26%	10.09	2
Yes	3	R03A	Lymphoma and Leukaemia W Other GIs, Major Complexity	11.10	78	12.86	41.1	4%	7%	4%	86%	6.96	9
Yes	4	F11A	Amputation, Except Upper Limb and Toe, for Circulatory Disorders, Major Comp	10.88	62	15.16	46.5	15%	11%	3%	72%	7.93	7
Yes	5	R06A	Autologous Bone Marrow Transplant, Major Complexity	9.99	148	11.65	30.1	3%	10%	1%	86%	7.99	6
Yes	6	I02A	Microvascular Tissue Transfers or Skin Grafts, Excluding Hand, Major Complexity	8.93	59	15.04	34.3	16%	10%	15%	59%	11.87	1
No	7	B83A	Acute Paraplegia and Quadriplegia and Spinal Cord Conditions, Major Complexity	8.44	54	8.62	34.1	0%	1%	0%	98%	3.19	98
Yes	8	R60A	Acute Leukaemia, Major Complexity	7.77	323	8.42	27.0	1%	6%	0%	92%	7.26	8
Yes	9	G01A	Rectal Resection, Major Complexity	7.57	285	14.00	32.1	17%	25%	4%	54%	5.63	17
Yes	10	A14B	Ventilation >=96hours & <336hours, Intermediate Complexity	6.86	288	23.16	27.8	8%	56%	6%	30%	5.94	13
Yes	11	A15A	Tracheostomy, Major Complexity	6.83	11	21.86	24.2	19%	41%	9%	31%	6.69	10
No	12	X07A	Skin Grafts for Injuries Excluding Hand, Major Complexity	6.80	123	8.38	28.1	13%	4%	1%	81%	4.38	43
Yes	13	K01A	GIs for Diabetic Complications, Major Complexity	6.53	71	10.09	28.6	16%	11%	8%	65%	8.14	5
Yes	14	F21A	Other Circulatory System GIs, Major Complexity	6.33	83	8.57	29.7	8%	16%	2%	74%	6.22	11
Yes	15	T01A	Infectious and Parasitic Diseases W GIs, Major Complexity	6.33	523	8.72	25.8	11%	12%	4%	73%	5.67	16
Yes	16	A13B	Ventilation >=336hours, Minor Complexity	6.32	8	21.63	30.6	3%	66%	1%	29%	8.42	4
Yes	17	G02A	Major Small and Large Bowel Procedures, Major Complexity	6.19	704	11.82	26.0	14%	31%	3%	52%	5.82	15
No	18	L09A	Other Procedures for Kidney and Urinary Tract Disorders, Major Complexity	6.16	103	8.82	25.9	9%	18%	2%	70%	4.92	29
No	19	F04A	Cardiac Valve Procedures W CPB Pump W/O Invasive Cardiac Invest, Major Comp	5.95	177	16.69	22.0	13%	37%	14%	36%	5.11	26
No	20	H01A	Pancreas, Liver and Shunt Procedures, Major Complexity	5.85	283	11.22	22.4	19%	22%	7%	52%	4.53	40
15 in Top 20	<b>Sub-total, top 20 highest miscellaneous cost weight DRGs</b>			<b>7.37</b>	<b>3,647</b>	<b>14.31</b>	<b>29.5</b>	11%	33%	5%	51%		
	<b>All DRGs</b>			<b>0.49</b>	<b>3,242,411</b>	<b>1.00</b>	<b>2.3</b>	28%	6%	18%	49%		
	<b>Top 20 Miscellaneous cost weight DRGs, % of all DRGs</b>				<b>0.1%</b>								

**Notes**

(a) For cost weight (cost bucket specific) calculations please refer to Appendix D: Cost weight tables by AR-DRG Version 9.0

(b) Separations shown are strata weighted

(d) ALoS means Average Length of Stay

# Appendix A: Analysis performed to determine the minimum sample size

## Background

In September 2012 IHPA engaged PwC to review the methodology for calculating the minimum sample size to have a valid and reliable private sector NHCDC collection. This review was requested by the private sector to ensure the validity and reliability of the collection.

The calculations were based on data received from IHPA, the Department of Health and the PHDB to determine the number of separations, number of hospitals and number of hospital groups required to participate.

## The outcome

The conclusion of this review based on 2012 data was:

- Approximately 60 percent of all separations are required in order to achieve a 95 percent confidence level and 4.0 percent acceptable margin of error.
- The 95 percent confidence level and 4.0 percent margin of error parameters have been informed by considering participation levels in historic publications.
- The collection should include approximately 90 hospitals and 10 hospitals 'groups' (of 2 or more hospitals) to be representative.

These minimum targets were used as criteria for the Round 21 collection. It should be noted that these criteria are based on analysis conducted in 2012 and no adjustments have been made to account for any significant sector or market changes for this Round 21 collection and associated reports. The analysis to determine minimum sample size will be reviewed before the next round to allow for any changes that have occurred since the previous analysis.

These minimum targets were used as the condition on which the previous rounds would go ahead. Since Round 20, IHPA has targeted a select group of participants to provide self-costed data, changing the expectation that the minimum participation rate of 60 percent will be met.

## Minimum participation levels based on 2012 analysis

### *Historical data analysis used in determining the minimum participation levels*

The following datasets were received and reviewed:

1. The published cost weight tables for Round 13 (2008-09)
2. A summary of the NHCDC sample for Round 13 and Round 14, by hospital and DRG, for the overnight sector
3. From the PHDB dataset: a summary of the population levels of activity, showing the total number of separations by hospital in-scope for the collection (at least 200 separations), for Round 13 and Round 14, for the overnight sector
4. From the PHDB dataset: a summary of the population levels of activity, Average Length of Stay, and standard deviation of the length of stay, by hospital and DRG, for all private hospitals, that is, for private overnight hospitals and private day hospitals.

Item 1 above was obtained from the Department of Health website<sup>12</sup>. Items 2 and 3 above were provided by IHPA. Item 4 above was provided by Department of Health.

In order for the NHCDC sample to be representative of the patient population and the population of private hospitals, minimum participation levels have been specified in terms of:

1. Separation sample size expressed as a percentage of the population levels of activity, where “population” is defined as the total number of separations for hospitals in-scope for the collection. The minimum separation sample size considered to provide sufficient reliability consistent with common statistical practice and historical publication practices was based on the following parameters:
  - a. Standard deviation of costs per DRG;
  - b. Margin of error in the estimated average cost per DRG; and
  - c. Statistical confidence that the estimates fall within the specified margin of error.

Parameters (b) and (c) above were informed by reviewing the minimum sample size considered robust enough for publication in the Round 7 to 13 collections and parameter (a) was derived from the Round 13 cost weights.

2. The minimum number of hospitals that are required to participate, in aggregate and by hospital characteristic, to ensure that the collection is representative of the population of private hospitals; and
3. The minimum number of hospital groups that are required to participate, to ensure that the results represent the population of private hospitals.

### Percentage of population separations

A key objective of the collection is to produce estimated costs and cost weights by classified activity. The percentage of population separations that is required in a sample depends upon the tolerable “margin of error”, statistical confidence<sup>13</sup> required, and the standard deviation of costs. To obtain an estimate of the average episode cost of a given DRG, say “k”, within a margin of error  $m$  and with  $x$  percent confidence, the required sample size for DRG(k) is:

*sample size of AR – DRG(k)*

$$= \left( \frac{(Z - \text{score of } x) \times (\text{standard deviation of episode cost for DRG}(k))}{(\text{margin of error } m)} \right)^2$$

A dataset with a lower margin of error, higher statistical confidence, and higher standard deviation, will require a larger sample size. The standard deviation of each DRG varies, and so the sample size required for each DRG (given the same parameters for error and confidence) will vary. However, given that the NHCDC collection is a voluntary one, it will be impossible to achieve target samples for each DRG. Hence, the sample sizes across all DRGs were aggregated. In performing this aggregation, two weighting methods were investigated:

1. Number of separations by DRG;
2. Total cost by DRG (number of separations per DRG multiplied by the average cost per DRG).

<sup>12</sup>Published cost weight tables for Round 13 on the Commonwealth Department of Health website [Government Health Website: http://www.health.gov.au/internet/main/publishing.nsf/Content/Round\\_13-cost-reports](http://www.health.gov.au/internet/main/publishing.nsf/Content/Round_13-cost-reports), accessed 3 April 2012

<sup>13</sup> In this context: the probability that an estimate falls within the margin of error of the true mean.



## Outcome of analysis

Based on the above analysis, historically IHPA agreed that for the private overnight NHCDC the minimum target participation rate would be 60 percent in order to achieve a robust sample<sup>14</sup>. For Round 21, the participation rate achieved was 59 percent, 105 hospitals and 10 groups. This participation rate is similar to Round 20 (58 percent), leading to a confidence level of 85 percent and a margin of error of 3 percent as per Table 14 below. This participation rate is not expected to significantly impact the validity of the results.

**Table 14. Round 21 participation rate confidence level and margin of error**

		Confidence level			
		85%	90%	95%	99%
<b>Margin of error per DRG class (%)</b>	1%	87%	88%	90%	92%
	2%	72%	75%	80%	85%
	3%	59%	63%	69%	77%
	4%	49%	53%	60%	69%
	5%	40%	45%	52%	61%
	6%	34%	39%	45%	55%
	7%	29%	33%	39%	49%
	8%	25%	29%	35%	44%
	9%	21%	25%	31%	40%
	10%	19%	22%	27%	36%

## Minimum number of hospitals required

The formula that is used to produce cost weights is provided below:

$$\text{Cost – weight of DRG}(k) = \left( \frac{\text{Average cost of DRG}(k)}{\text{Average costs across all DRGs}} \right)$$

Where the average costs are weighted by population levels of activity across all DRGs and by other hospital characteristics (e.g. hospital size and for-profit / not-for-profit status).

The above formula shows that the cost weight is influenced by both the average cost of an individual DRG, as well as the overall average cost across all DRGs. The average costs within a given DRG, and across all DRGs, are in turn influenced by the underlying distribution of separations by hospital attribute by which average costs can vary. Therefore, to ensure that the national cost weights are representative of the Australian population of hospitals, it is important to have a sample that reflects the distribution of separations, and the average costs, across the hospital attributes by which costs can vary.

The study found that there are statistically significant variations in cost between the following hospital attributes; state variations in average costs, status (for profit/non-profit), hospital size (+8,000 separations or under 8,000 separations); and region (metropolitan verses non-metropolitan).

To ensure that the average cost per DRG represents a national average, the attributes of the participating hospitals must be such that they represent the hospital attributes by which costs can vary. Weighting factors can then be applied to re-balance the sample to the population by DRG and hospital attribute. Therefore, the attributes listed above can be used to formulate a sampling frame against which hospitals can be recruited to participate.

<sup>14</sup> Defined as 95 percent confidence level and 4.0 percent acceptable margin of error for the overall average cost. The 95 percent confidence level and 4.0 percent margin of error parameters were informed by considering participation levels in historic publications that were considered acceptable for publication.



### Outcome of analysis

Based on the above analysis and to achieve a separation sample size of 60 percent IHPA agreed that for the previous rounds of the private overnight NHCDC the target minimum number of 10 hospitals will be required. With the caveat that the participants would submit at least 90 percent of the submitting hospital establishment's total in-scope activity, which is evaluated as a ratio of total in-scope activity data submitted for the PHDB collection in that reference period.

For Round 21 the participation rate was 59 percent, with 105 hospitals and 10 hospital groups.

# Appendix B: Private sector costing approaches

## Costing methodologies

Hospital costing is the process of identifying the resources and inputs used during an episode and applying the costs of those inputs to the different types of clinical procedures and treatments provided to each patient in a hospital.

From Round 20, the participating hospitals have been required to undertake their own costing and during Round 20 they were asked to provide a summary of their costing methodology process as well as the process they used to submit the costing data. During Round 21, participating hospitals have been asked to indicate which of the costing methodologies (outlined below) they have used.

There are two main methodologies that are adopted by participants for hospital cost allocations: cost modelling or patient costing.

**Cost modelling:** Cost modelling (also known as top down costing) takes the total admitted acute costs for patient areas (such as Wards) and allocates costs to encounters based on an assumed level of consumption using service weights. Service weights are the relative costs of a service for each type of patient care product. Service weights are applied to apportion costs to patient groups defined by their DRG (in the case of acute admitted care).

**Patient costing:** Patient costing (also known as bottom-up costing) uses activity feeder systems to provide actual resource consumption. For example, a prostheses system within a hospital will record what type of prostheses has been implanted into a patient and the cost of the implant. This data is used to allocate costs to patients from the Prostheses patient care area. Patient level costing yields results that are closer to the true cost of an encounter within a hospital, however due to the dependency on feeder systems, perfect patient level costing can be difficult to achieve.

## Data sources

The following categories of patient level data components are utilised during the costing process:

**Financial data:** This includes the general ledger cost centres and account codes, along with mapping of those cost centres to patient care areas and standardised line items. This data set excludes revenue cost centres and/or account codes.

**Activity data:** This includes the encounter level data (such as patient ID, encounter ID, date of birth etc.) and transfer information identifying the patient's pathway through the hospital via transfers between areas such as operating rooms and wards.

**Feeder data:** This includes data that identifies patient consumption of hospital products or services within a patient care area. For example, a prostheses feeder might list the prosthetic items received by a patient and the cost of each. This feeder data is used to allocate costs in the general ledger as it identifies how much of the prostheses products each encounter consume.

Where no feeder data is available, patient care area costs are allocated using service weights.

### Cost bucket or cost components

The cost of a separation of acute admitted care is reported by allocating patient level costs to a set of pre-defined cost buckets/cost components. The cost buckets are listed as follows:

- |                          |                    |                                 |
|--------------------------|--------------------|---------------------------------|
| 1. Ward Medical          | 6. Allied Health   | 11. Specialist Procedure Suites |
| 2. Ward Nursing          | 7. Pharmacy        | 12. On-costs                    |
| 3. Non-clinical Salaries | 8. Critical Care   | 13. Prostheses                  |
| 4. Pathology             | 9. Operating Rooms | 14. Hotel                       |
| 5. Imaging               | 10. Supplies       | 15. Depreciation                |

Please note that Emergency Department cost bucket is excluded for the private sector NHCDC cost buckets as this collection is for acute admitted only.

Once each of the cost buckets were calculated for an individual patient, the patient's total cost of care is derived as the sum of the above components.

### AR-DRG grouping

All 105 hospitals submitted data costed in AR-DRG version 9.0.

### Cost weights

A cost weight for a selected AR-DRG is calculated as the average cost for that DRG, expressed as a weight relative to the overall average cost across all AR-DRGs. The national cost weight across all AR-DRGs is equal to 1.00, with higher cost AR-DRGs having a cost weight higher than 1.00. The weight is an indicator of the complexity of the care of the patient and thus the resourcing intensity required. This is often referred to as the casemix of a patient or hospital.

### Costing standards

Costing was performed in compliance with AHPCS version 3.1.

# Appendix C: Standard error range for the Round 21 private sector NHCDC

Standard errors, reported against DRG cost weights included in 0 Analysis of Top 20 DRGs and Appendix D: Cost weight tables by AR-DRG Version 9.0, give an indication of the reliability of cost weights. A large standard error indicates a high level of variation in the underlying sample data for that particular DRG, and therefore the cost weight presented is a less reliable estimate of the true underlying cost of a separation in that DRG.

Table 15 summarises the reliability of DRG cost weights by grouping the standard errors into a number of ranges. Numbers of DRGs and separations falling into standard error ranges provide insight into the global impact of estimation error on cost weights.

**Table 15. Number of DRGs by standard error range**

Standard error range	Number of DRGs	Separations	Percentage of DRGs (%)	Percentage of total separations (%)
0.000 - 0.039	259	2,910,040	34%	90%
0.040 - 0.099	188	235,469	24%	7%
0.100 - 0.149	73	42,727	10%	1%
0.150 - 0.199	52	20,761	7%	1%
0.200 - 0.399	93	20,992	12%	1%
0.400 +	103	12,315	13%	0%
<b>Total*</b>	<b>768</b>	<b>3,242,304*</b>	<b>100%</b>	<b>100%</b>

\* The standard error for some DRGs cannot be estimated due to low separation counts in the sample.

The results above show that 58 percent (34 percent + 24 percent) of DRGs have cost weight estimates with a standard error range of less than 0.1. Around 97 percent (90 percent + 7 percent) of separations are within the subset of DRGs that have a standard error of less than 0.1.

# Appendix D: Cost weight tables by AR-DRG Version 9.0

Table 16. Round 21 (2016-17) national consolidation cost weight tables – V9.0

Please refer to Excel file for details

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# Appendix E: Cost weight tables by AR-DRG Version 8.0

Table 17. Round 21 (2016-17) national consolidation cost weight tables – V8.0

Please refer to Excel file for details

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# Appendix F: Cost weight tables by AR-DRG Version 7.0

Table 18. Round 21 (2016-17) national consolidation cost weight tables – V7.0

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# Appendix G: Cost weight tables by AR-DRG Version 6.0x

Table 19. Round 21 (2016-17) national consolidation cost weight tables – V6.0x

Please refer to Excel file for details

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