Development of the   
Australian Refined Diagnosis Related Groups V8.0

# Final Report

# 31 October 2014

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# Glossary of Abbreviations

| **Abbreviation** | **Description** |
| --- | --- |
| ACCD | Australian Consortium for Classification Development |
| ADRG | Adjacent Diagnosis Related Groups |
| APC | Admitted Patient Care |
| AR-DRG | Australian Refined Diagnosis Related Groups |
| CC | Complications and Comorbidities |
| CCAG | Classification Clinical Advisory Group |
| CCL | Complication and Comorbidity Level |
| CDs | Complex Diagnoses |
| DCL | Diagnosis Complexity Level |
| DRG | Diagnosis Related Groups |
| DTG | DRG Technical Group |
| ECC | Episode Clinical Complexity |
| ECCS | Episode Clinical Complexity Score |
| ICD | International Classification of Diseases |
| IHPA | Independent Hospital Pricing Authority |
| LOS | Length of Stay |
| MDC | Major Diagnostic Category |
| NCCH | National Centre for Classification in Health |
| NHCDC | National Hospital Cost Data Collection |
| NMDS | National Minimum Dataset |
| PA | Pricing Authority |
| PCA | Principal Clinical Advisor |
| PCCL | Patient Clinical Complexity Level |
| RID | Reduction in Deviance |
| V | Version |

# Executive Summary

As per the contract for Australian Refined Diagnosis Related Groups (AR-DRG) Classification System Development and Refinement Services between the Commonwealth of Australia as represented by the Independent Hospital Pricing Authority (IHPA) and the University of Sydney as represented by the National Centre for Classification in Health (NCCH), the Australian Consortium for Classification Development (ACCD) led by the NCCH is required to deliver AR-DRG Version (V) 8.0 to IHPA by 31 October 2014.

To date, there have been multiple changes to the existing AR-DRG structure; however AR-DRG V8.0 represents the first systematic review of the structure’s relationship to actual variations in resource use due to case complexity since AR-DRG V4.1 in 1998

## Phase 1: Episode Clinical Complexity Model

Phase one in the development of AR-DRG Version V8.0, included a *Review of the AR-DRG Classification Case Complexity Process* (July 2014).This report proposed a new Episode Clinical Complexity (ECC) Model approved by the Pricing Authority on 21 August 2014.

The ECC Model allows for the assignment of a score, called an Episode Clinical Complexity Score (ECCS), to each episode. These scores quantify relative levels of resource utilisation within each Adjacent Diagnosis Related Group (ADRG) and are used to split ADRGs into Diagnosis Related Groups (DRGs) on the basis of resource homogeneity. The ECC Model is conceptually based, formally derived and data driven.

The process of deriving an ECCS for each episode begins by assigning a Diagnosis Complexity Level (DCL) to each diagnosis appearing against the episode. These DCLs are integers between zero and five that quantify levels of resource utilisation associated with each diagnosis, relative to levels within the ADRG to which the episode belongs.

The DCLs of the episode are then combined using an algorithm to define the episode’s ECCS. The algorithm combines the DCLs in descending order and includes a decay component to adjust for the diminished contribution of multiple diagnoses vis-à-vis their individual contributions.

## Phase 2: Implementing the ECC Model within the AR-DRG Classification

ACCD approached this phase with an underlying objective to adhere to AR-DRG classification structure principles and minimise the use of administrative or non-complexity splitting variables, with a strong preference for ADRG splits based on the ECC Model’s ECCS.

A comprehensive set of ADRG splitting models were evaluated against splitting criteria and in terms of statistical performance and clinical relevance. Through this process, a recommended split was identified for each ADRG.

ACCD’s governance arrangements enabled the consortium to efficiently obtain informed clinical and classification advice on the validity of the proposed splits through the Classifications Clinical Advisory Group (CCAG) and the DRG Technical Group (DTG), with further analysis on specific areas of the classification undertaken at their request prior to finalisation of AR-DRG Version 8.0.

The AR-DRG classification structure itself has not been altered for AR-DRG V8.0 apart from changes required as a result of a review of the surgical hierarchy and minor code movements facilitated by incorporation of DTG approved DRG public submissions. Further refinement of the classification structure has been highlighted for AR-DRG V9.0 and future versions of the classification.

## The results of this development phase

AR-DRG V8.0 has 406 ADRGs (including 3 error ADRGs) with 807 end classes or DRGs (including 3 error DRGs).

AR-DRG V8.0 demonstrates comparable statistical performance to V7.0 in those ADRGs where length of stay has been removed as a splitting variable, and outperforms V7.0 in almost all other ADRGs where splitting has occurred.

Of the 321 ADRGs that have a split, 315 ADRGs use ECCS as the only splitting variable while the remaining 6 ADRGs use splitting variables other than ECCS.

Overall, AR-DRG V8.0 represents a significant refinement to the AR-DRG classification, with major improvement in the measurement of clinical complexity through the use of the ECC Model and simplified splitting logic. The new model will lead to greater transparency in the AR-DRG refinement process and will facilitate consistency and ease of update over time to keep abreast of changes in clinical practice and improvements in data quality. These refinements will provide improved performance and stakeholder support of the AR-DRG classification for many use cases including hospital funding, health system analysis and clinical management.

# Introduction

As per the contract for Australian Refined Diagnosis Related Groups (AR-DRG) Classification System Development and Refinement Services between the Commonwealth of Australia as represented by the Independent Hospital Pricing Authority (IHPA) and the University of Sydney as represented by the National Centre for Classification in Health (NCCH), the Australian Consortium for Classification Development (ACCD) led by the NCCH is required to deliver AR-DRG Version (V) 8.0 to IHPA by 31 October 2014.

Phase one in the development of AR-DRG Version V8.0, included a *Review of the AR-DRG Classification Case Complexity Process* (July 2014).This report proposed a new Episode Clinical Complexity (ECC) Model approved by the Pricing Authority on 21 August 2014. Following this initial phase, ACCD has now incorporated the ECC Model into the splitting phase for development of AR-DRG V8.0 and future versions of the AR-DRG classification.

The ECC Model assigns a Diagnosis Complexity Level (DCL) for each diagnosis (including the principal diagnosis) appearing against an acute admitted episode within each Adjacent Diagnosis Related Group (ADRG). Using the DCLs, a derived Episode Clinical Complexity Score (ECCS) is then allocated to each episode within each ADRG.[[1]](#footnote-1)

ACCD’s approach was to develop a comprehensive set of ADRG splitting models, which were evaluated against splitting criteria and in terms of statistical performance and clinical relevance. Through this process, a recommended split was identified for each ADRG.

Supported by ACCD’s Principal Clinical Advisor (PCA), ACCD’s governance arrangements have enabled the consortium to efficiently obtain informed clinical and classification advice on the validity of the proposed splits through the Classifications Clinical Advisory Group (CCAG) and the Diagnosis Related Groups (DRG) Technical Group (DTG). The process has been undertaken having regard to the *Principles for Construction of AR-DRGs* agreed by DTG and CCAG for AR-DRG classification development, notably the need for stability and statistical robustness, as well as avoidance of inappropriate splitting variables.

During this phase ACCD also acted on recommendations of the DTG to increase the precision of the DCL[[2]](#footnote-2) for two 3-character categories of ICD codes in which significant variation in clinical complexity is captured at the fourth and fifth character level. Again acting on outcomes of the DTG, the consortium also made a minor refinement to the standardisation process used to derive the DCLs to enhance the performance of the ECC Model in the ADRG splitting process.

Public submissions for DRG changes that were brought forward or received during this development cycle were also analysed during this phase, noting that the ECC Model may impact on many of these proposals. The AR-DRG classification structure itself has not been altered for AR-DRG V8.0 apart from changes required as a result of the surgical hierarchy review and some code movements facilitated by incorporation of some DRG public submissions.

## Case Complexity Terminology

As previously reported in the Review of the AR-DRG Classification Case Complexity Report (July 2014) new terminology has been used to describe complexity in AR-DRG V8.0. Episode Clinical Complexity or ECC is the element that recognizes and allows for cost variation within ADRGs. Table 1 provides a comparison of terminology between AR-DRG V7.0 and V8.0.

**Table 1: Case Complexity Terminology Comparison between AR-DRG V7.0 and V8.0**

| **AR-DRG V7.0** | **AR-DRG V8.0** |
| --- | --- |
| **N/A** | **Episode Clinical Complexity (ECC) Model** assigns a score to each episode. These scores quantify relative levels of resource utilisation within each ADRG and are used to split ADRGs into DRGs on the basis of resource homogeneity. |
| **Complication and/or Comorbidity (CC)** codes are the 2,439 diagnosis codes that may contribute to the calculation of PCCL (i.e. the diagnoses that may affect the calculation of episodes level complexity). | **Complex Diagnoses (CDs)** in a particular ADRG are the set (or list) of diagnoses that may affect the calculation of episode clinical complexity in that ADRG. CDs differ across ADRGs. |
| **Complication and Comorbidity Levels (CCLs)** are integer values between 0 and 4 assigned to diagnosis codes as complexity weights, specific to the ADRG of the episode. Only CC codes receive nonzero CCLs. | **Diagnosis Complexity Levels (DCLs)** are **i**nteger values between 0 and 5 assigned to diagnosis codes as complexity weights, specific to the ADRG of the episode. The CDs of an ADRG are precisely those diagnoses assigned a nonzero DCL. |
| **Patient Clinical Complexity Level (PCCL)** is an integer between 0 and 4 assigned to episodes as measure of the cumulative effect of a patient’s CCs. | **Episode Clinical Complexity Score (ECCS)** is a value between 0 and 31.25 assigned the measure of the cumulative effect of DCLs for a specific episode**.**[[3]](#footnote-3) |
| **Mild, moderate, severe and catastrophic CCs** are descriptive terms used in the naming of DRGs where PCCL has been used as a splitting variable. | **Minor, Intermediate, Major and Extreme** Complexity are descriptive terms used in the naming of DRGs where ECCS has been used as a splitting variable.[[4]](#footnote-4) |

The following report summarises the development of clinically relevant ECC splits for each Adjacent Diagnosis Related Group (ADRG) to replace the existing case complexity system. With an ECC Model that better explains cost variations due to episode clinical complexity; the resulting AR-DRG classification has been simplified by a reduced dependence on non-clinical variables such as length of stay (LOS).

## Background

### The AR-DRG Classification[[5]](#footnote-5)

DRGs have a long history of development in Australia. In 1985 the first research in this area was undertaken to investigate whether the DRG classification system developed at Yale University in the United States of America (USA) was relevant to Australian clinical practice. The first release of the Australian National Diagnosis Related Groups (AN-DRG) classification occurred in July 1992.

Although not publicly released, AR-DRG V4.0 was a major update to previous AN-DRG versions involving a new base classification(s) as well as a further developed case complexity structure. It was produced using ICD-9-CM Second Edition codes as an interim step in the move towards the introduction of the International Statistical Classification of Diseases, Tenth Revision, Australian Modification (ICD-10-AM). AR-DRG V4.0, which incorporated the use of the newly developed Australian Classification of Health Interventions (ACHI) provided the foundation necessary for ICD-10-AM/ACHI First Edition codes to be used as the base within AR-DRG V4.1.

Building on the original Yale Complication and Comorbidity (CC) structure, AR-DRG V4.0 (and the implemented AR-DRG V4.1), introduced new CCs and incorporated Complication and Comorbidity Levels (CCLs) appropriate for Australian clinical practice. In addition, research was conducted on the effects of multiple CCs on resource use and an algorithm developed to measure Patient Clinical Complexity Level (PCCL).

Coinciding with the introduction of ICD-10-AM/ACHI/ACS in July 1998, AR-DRG V4.1 replaced the AN-DRGs in December 1998. The process of updating the AR-DRGs has generally occurred biennially to incorporate code changes made in each edition of ICD-10-AM/ACHI to date. AR-DRGs are used by public and private hospitals, and state and territory health authorities to provide better management, measurement and payment of high quality and efficient health care services.

AR-DRGs classify units of hospital output. The classification groups acute admitted episodes into clinically coherent categories (outputs) that consume similar amounts of resources (inputs). All of the Australian DRG versions include a case complexity matrix. Each cell in the matrix represents the complexity added by a specific diagnosis within each ADRG.

### The Episode Clinical Complexity Model

To date, there have been multiple changes to the existing AR-DRG structure; however AR-DRG V8.0 represents the first systematic review of the structure’s relationship to actual variations in resource use due to case complexity since AR-DRG V4.1 in 1998.

AR-DRG Version 8.0 implements a new episode-level clinical complexity model, called the ECC Model, which assigns a score, called an ECCS, to each episode. These scores quantify relative levels of resource utilisation within each ADRG and are used to split ADRGs into DRGs on the basis of resource homogeneity. The ECC Model is conceptually based, formally derived and data driven.[[6]](#footnote-6)

The process of deriving an ECCS for each episode begins by assigning a Diagnosis Complexity Level (DCL) to each diagnosis appearing against the episode. These DCLs are integers between zero and five that quantify levels of resource utilisation associated with each diagnosis, relative to levels within the ADRG to which the episode belongs.

The DCLs of the episode are then combined using an algorithm to define the episode’s ECCS. The algorithm combines the DCLs in descending order and includes a decay component to adjust for the diminished contribution of multiple diagnoses vis-à-vis their individual contributions.

# Method

## Data preparation

This phase of the project used data drawn from three years of acute admitted episodes for public hospitals from 2009-10 to 2011-12, as reported in the Admitted Patient Care (APC) National Minimum Dataset (NMDS) and the National Hospital Cost Data Collection (NHCDC). The ADRG splitting models were derived using data from patient-costed public establishments reporting in the NHCDC over this period.

Episodes were first grouped to their proposed AR-DRG V8.0 ADRG and their Episode Clinical Complexity Score (ECCS) values were then calculated. Episodes having the potential to be overly influential in the derivation of ADRG splitting models were identified and excluded. Overly influential episodes are those with highly unusual combinations of ECCS and cost that work together to exert undue influence in determining the ECCS thresholds that define optimal ADRG splitting models.

The process of identifying overly influential episodes, or observations, was done by first repeatedly splitting each ADRG into up to five categories using all possible ECCS thresholds. Episode costs were then modelled against these five (or less) category splits using generalised linear modelling techniques. Finally, case deletion statistics[[7]](#footnote-7) were used to identify influential observations.

Episodes identified as being overly influential in at least half of the splits in which they occurred were classified as overly influential and were excluded from the ADRG splitting models. Approximately 12 thousand episodes, representing 0.10 per cent of the 12.4 million episode total, were excluded in this way.

## Process for Splitting Adjacent DRGs

ACCD has used the *Principles for construction of AR-DRGs* (see Section 2.2.1 below) as the underlying foundation for splitting model selection having regard to clinical coherence in the first instance (see Appendix 1: DTG and CCAG approved Paper on the *Principles for construction of AR-DRGs*). Through DCL assignment, the ECC Model encompasses the use of the principal diagnosis along with additional diagnoses in the calculation of the ECCS, thus enhancing the ability of the AR-DRG classification to capture episode complexity.

Clinical coherence has also been enhanced by utilising the ECCS to ensure that clinical factors have been taken into account, minimising the reliance on administrative (or non-complexity) variables such as LOS.

Statistical splitting criteria and thresholds (see Section 2.2.2 below) have been used in conjunction with the *Principles for construction of AR-DRGs* to ensure both resource homogeneity and classification soundness. Wherever possible ACCD has adhered to the criteria and thresholds in selecting a splitting model (see Section 2.2.3 below)based solely on ECCS. In some instances however, this resulted in fewer splits than in AR-DRG V7.0 and clinical and jurisdictional advice was sought in relaxing specific criteria so that the same number of end classes or DRGs were maintained as in V7.0.

In relation to the principle regarding operational soundness, ACCD has developed the ECC Model in consultation with CCAG and DTG to ensure acceptability. In using the ECC Model, ACCD has minimized the use of administrative (non-complexity) variables therefore reducing the possibility of the classification being adversely affected by patient treatment and management practices within the health system.

### Principles for Construction of AR-DRGs

AR-DRG V8.0 has been developed with maximum regard to the clinical attributes of the patient, and with minimum regard to who is providing the service or the setting in which it is provided. To achieve this balance, the following principles were applied in the ADRG splitting model selection process for AR-DRG V8.0:

* Clinically coherent
  + patient demographics
  + diagnoses (principal and additional)
  + interventions
* Reasonably homogeneous in resource use
  + episodes within a DRG have relatively similar (not necessarily identical) level of resource utilisation
  + ADRGs, and DRGs within an ADRG, are as distinctive as possible from each other, reflecting genuine and material differences
* Classification soundness
  + statistically robust
  + reasonably balanced branches
  + sufficient volume and cost variances in new splitting
  + stable over time, with changes only made in response to significant clinical changes (often caused by technology advancement) or cost variations.
* Operationally acceptable and robust
  + understandable by and acceptable to a wide range of users involved in the planning and delivery of care
  + reasonably robust with respect to changes in management and organisational arrangements of the health system
  + not encouraging inappropriate behaviours in patient treatment and management practices within the health system.

### Splitting Criteria

For each splitting model, statistical criteria were required. Criteria used for previous AR-DRG versions have evolved over time. For AR-DRG V8.0, the criteria used for AR-DRG Version 7.0 have been maintained. Reduction in Deviation (RID) has been used as the dispersion measure rather than R squared. Also the dispersion measure is for cost distribution, rather than length of stay (LOS).

The criteria and thresholds are shown in Table 2 below:

**Table 2: Splitting Criteria and Thresholds**

| **Criterion\*** | **Description** | **Threshold** |
| --- | --- | --- |
| 1a | Minimum episodes per category | 200 per year |
| 1b | Minimum cost per category | $1M per year |
| 1c | Minimum percentage of ADRG episodes per category | 10% |
| 1e | Minimum percentage of ADRG episodes in category 1 for splits based on LOS | 25% |
| 2a | Minimum absolute change in mean cost between consecutive categories | $3,700 |
| 2b | Minimum relative change in mean cost between consecutive categories | 2.0 |
| 3a | Maximum relative increase in CV of categories compared to ADRG | 1.3 |
| 4a | Minimum increase in RID from best performing partition with one less category (Note: The best performing partition within one less category must also satisfy criteria 1 to 3. | 5% |

**\*** Each criterion must be satisfied (except where either 2a or 2b apply)

These criteria have not been observed in all cases of splitting within previous AR-DRG versions and have been relaxed on a case by case basis. This has usually been in response to clinical issues or other specific considerations. For example AR-DRG V6.0 is an example of where adherence of criteria was more stringent. This resulted in some AR-DRG V5.2 splits being re-instated (e.g. ADRG O60 *Vaginal delivery*) within AR-DRG V6x.

ACCD has generally followed the splitting criteria, and allowed the number of splits to change when it is the outcome of the modelling process. However, if the number of splits differs to the current AR-DRG version, a comparison has been made based on RID, clinical coherence and any special factors that have applied to that ADRG in previous AR-DRG versions.

A full review of the splitting criteria and thresholds has been highlighted as work to be undertaken for AR-DRG V9.0. This is desirable as the criteria have failed in the past and in some instances continue to fail for AR-DRG V8.0.

### Splitting Models

The splitting models used to derive AR-DRG V8.0 were selected from a comprehensive collection of splitting models derived using all possible ECCS splitting thresholds together with non-complexity splitting variables used in AR-DRG Version 7.0. Specifically, all possible ECCS-only splitting models were derived for each ADRG, and these were combined with splitting models using a combination of all possible ECCS thresholds together with non-complexity splitting variables (e.g. length of stay, procedure code lists) for those ADRGs in which non-complexity splitting variables were used in Version 7.0.

All splitting models from this comprehensive collection were then evaluated against splitting criteria and also had their statistical performance tested in terms of RID. A short list of four best performing splitting models was then selected for each ADRG and compared to each other and against AR-DRG Version 7.0. These four ADRG splitting models were selected to carry the following properties:

**Model 1:**

* Always has the same number of splits as in AR-DRG V7.0
* Uses non-ECCS (i.e. non complexity) splitting variables wherever AR-DRG V7.0 does
* Best efforts to satisfy splitting criteria but may not always satisfy criteria

**Model 2:**

* May or may not have the same number of splits as in AR-DRG V7.0
* May use non-ECCS splitting variables wherever AR-DRG V7.0 does but is able to use ECCS alone if performance is improved
* Always satisfies splitting criteria

**Model 3:**

* Always has the same number of splits as in AR-DRG V7.0
* Uses ECCS alone as a splitting variable
* Best efforts to satisfy splitting criteria but may not always satisfy criteria

**Model 4:**

* May or may not have the same number of splits as AR-DRG V7.0
* Uses ECCS alone as a splitting variable
* Always satisfies splitting criteria

### Splitting Model Selection

ACCD has observed the *Principles for Construction of AR-DRGs* and wherever possible has adhered to splitting criteria and thresholds in proposing ADRG splits to CCAG and DTG.

Broadly speaking, Model 4 (ECCS only) has generally been selected as the preferred splitting model for each ADRG. However, after clinical and jurisdictional input, Model 1, 3 or a modification of 3 were selected where non-complexity splitting variables were required to be maintained or a set number of splits preserved. DTG and CCAG input was sought to determine final model selection (see Table 3).

## Governance and Consultation Process

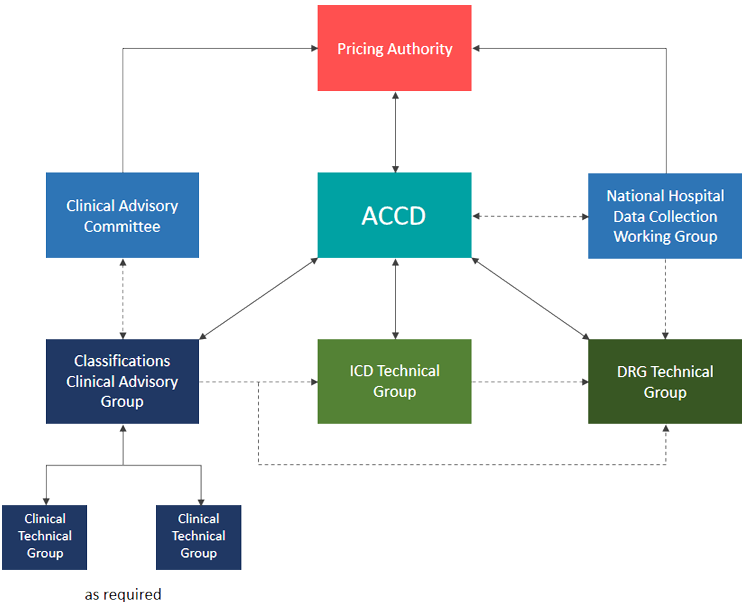
The Pricing Authority (PA) has the overall governance role and is responsible for the proper and efficient performance of IHPA's functions. The final decision on the AR-DRG Classification System rests with the PA.

ACCD’s governance arrangements, endorsed by IHPA include the establishment and management of the following technical groups to ensure appropriate communication channels:

* International Classification of Diseases (ICD) technical group (ITG): classification advice in regard to ICD-10-AM/ACHI/ACS.
* Diagnosis Related Groups (DRG) technical group (DTG): advice in regard to the refinement and development of AR-DRGs in Australia.
* Classifications Clinical Advisory Group (CCAG): to facilitate broad canvassing of clinicians to ensure that there is likely to be general acceptance of the developed proposals.
* Clinical technical groups: as required to provide specialty related clinical advice.

Figure 1 below depicts the AR-DRG Classification System Development and Refinement Services Governance Structure.

**Figure 1: The AR-DRG Classification System Development and Refinement Services Governance Structure**



During Phase 1 of the project,the *Principles for Construction of AR-DRGs* (see Section 2.2.1) were discussed and agreed to at both the DTG and CCAG with general consensus that wherever possible, administrative (non-complexity) variables such as LOS should not be used to split ADRGs and in most circumstances were introduced as a proxy for cost or complexity to improve the performance of the AR-DRG classification.

During this phase, ACCD once again worked closely with both the DTG and CCAG in developing the ADRG splitting approach and proposed ADRG splits for AR-DRG V8.0.

ACCD in consultation with DTG determined an approach which would involve clinical review of particular ADRG proposed splits by exception. The preferred approach was to use ECCS to split ADRGs where appropriate and highlight those ADRGs where CCAG input would be required.

Chaired by Dr Amanda Ling (a member of IHPA’s Clinical Advisory Committee (CAC)) and supported by Dr Philip Hoyle (ACCD’s Principal Clinical Advisor and a member of CAC), CCAG is comprised of four other clinicians with a broad knowledge range and interest/expertise in classifications.

CCAG’s role was to provide initial input to minimise the use of non-complexity splitting variables within 108 ADRGs. This process was performed after an internal review of the 108 ADRGs was undertaken by the ACCD team including the Principal Clinical Advisor, DRG and classification experts.

A face to face CCAG meeting was held on 29 September 2014 to endorse:

* the removal of *same day* and *<2 day* length of stay ADRG splits from the AR-DRG classification (59 ADRGs)
* ACCD’s preferred position of using the ECC Model’s ECCS to split 26 out of the remaining 49 ADRGs that have previously used the following non-complexity splitting variables:
  + Died or transferred within 5 days (8 ADRGs)
  + Age (2/5 ADRGs)
  + Diagnosis and procedure code splits (3/23 ADRGs)
  + Neonatal major problem list splits (10 ADRGs)
  + Mental health legal status (2 ADRGs)
  + Urgency of admission (1 ADRG)
* the removal of splits in general for particular low volume ADRGs where the split is not acceptable based on the current statistical splitting criteria and thresholds used in the ECC Model

CCAG’s input was presented at DTG on 1 October 2014 for discussion.

The DTG meeting held on 1 October 2014 primarily focused on discussion related to CCAG input and finalising ADRG splitting decisions for AR-DRG V8.0 (see Table 3).

Prior to the meeting, DTG also received the proposed splits for all 403 ADRGs for their review. The meeting primarily focused on ADRGs that resulted in less number of splits using ECCS alone when compared to AR-DRG V.7.0.

**Table 3: Summary of CCAG and DTG Consultation – Splitting Decisions**

| **ACCD Proposal** | **CCAG Consultation** | **DTG Consultation** | **Outcome** |
| --- | --- | --- | --- |
| ***1. Same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs)** | ***1. Same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs)** | ***1. Same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs)** | ***1. Same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs)** |
| Removal of *same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs) as splitting variables | CCAG endorsed removal of *same day* and *< 2 day LOS* splits to allow splitting to be determined using ECCS | DTG agreed with CCAG endorsement | Remove *Same day* (57 ADRGs) and *<2 day LOS* (2 ADRGs) as splitting variables  ***Comment:*** *Both CCAG and DTG agreed that these issues are better dealt with by funding models rather than within the DRG classification* |
| ***2. Died or transferred within 5 days* splits (8 ADRGs)** | ***2. Died or transferred within 5 days* splits (8 ADRGs)** | ***2. Died or transferred within 5 days* splits (8 ADRGs)** | ***2. Died or transferred within 5 days* splits (8 ADRGs)** |
| Removal of *Died* as a splitting variable as it is accounted for within the ECCS | CCAG endorsed the removal of *Died* as a splitting variable and agreed that patients who died should be accounted for in the ECCS | DTG agreed with CCAG endorsement | Remove *Died* as a splitting variable  ***Comment:*** *Patients who die can reasonably be regarded as part of the complexity spectrum and swept into the ECCS.* |
| ACCD requested CCAG’s advice as to whether:   * Patients in these 8 ADRGs, who have early transfer, are clinically distinctive * An administrative variable of early transfer should be retained as a proxy for the relative resource use of those patients | CCAG endorsed the removal of the *<5 day transfer* split for the following ADRGS:   * *E40 Respiratory system disorders w ventilator support* * *E64 Pulmonary Oedema and Respiratory Failure* * *F09 Other cardiothoracic procedures w/o CPB pump* * *F40 Circulatory disorders w ventilator support* | DTG agreed with CCAG endorsement | Remove the *<5 day transfer as a splitting variable* for ADRGs E40, E64, F09, F40 |
| n/a | CCAG endorsed retaining a transfer split for the following ADRGs:   * *B70 Stroke and other cerebrovascular disorders* * *B78 Intracranial injuries* * *F60 Circulatory disorders, admitted for AMI w/o invasive cardiac investigation procedures* * *F62 Heart failure and shock* | DTG agreed with CCAG endorsement | Maintain a transfer splitting variable for ADRGs B70, B78, F60, F62 with analysis undertaken to determine whether the transfer split can be shortened |
| n/a | CCAG requested ACCD look at additional cost by day data for these four ADRGs to determine if the *< 5 day transfer* split could be shortened. Otherwise, CCAG endorses to retain the 5 day split. | DTG agreed with CCAG endorsement. Analysis to be undertaken by ACCD to look for transfer patterns across jurisdictions. If variance across the jurisdictions is found the <5 day transfer split should be retained | Following analysis, ACCD will maintain a *<5 day transfer* splitting variable for ADRGs B70, B78, F60, F62 due to variation in transfer patterns across jurisdictions. Further work to be undertaken for AR-DRG V9.0 (see Section 2.4.1) |
| ***3. Age splits (5 ADRGs)*** |  |  |  |
| ACCD requested CCAG’s advice as to whether *Age* as a splitting variable should be maintained within 2 ADRGs involving children (A07, and I13) | CCAG endorsed:   * retaining the age split in A07 *Allogeneic bone* *marrow transplant* recognising that clinically, these patients are different and also taking into account that Pre-MDCs are an area flagged for review in a future version of the classification * removing the age split for I13 *Humerus, tibia, fibula and ankle procedures* | DTG agreed with CCAG endorsements and requested that *Age* as a splitting variable be retained for A07 and A09  DTG endorsed the removal of *Age* as a splitting variable in all other instances (F19, I13 and U63) | Retain *Age* as a splitting variable in A07 and A09 |
| ***4. Diagnosis and procedure code splits (23 ADRGs)*** | ***4. Diagnosis and procedure code splits (23 ADRGs)*** | ***4. Diagnosis and procedure code splits (23 ADRGs)*** | ***4. Diagnosis and procedure code splits (23 ADRGs)*** |
| ACCD requested CCAG’s advice on ADRGs J06 and J07 in relation to the need to maintain a malignancy split | CCAG endorsed removing the split on malignancy in J06 *Major procedures for breast disorders* and *J07 Minor procedures for breast disorders* as the split provided no useful information and the costs were similar and not reflective of the types of patients in the DRGs | DTG agreed with CCAG endorsement to remove *malignancy* as a splitting variable | Remove diagnosis and procedure code splitting variables |
| In addition, CCAGs advice was also sought as to whether a departure from ECCS (no split) is justified for ADRG O60, and if so whether to adopt 2 or 3 splits | CCAG endorsed using ECCS but retaining 3 complexity splits for O60 *Vaginal delivery* | DTG agreed with CCAG recommendation to use ECCS but retain 3 splits in O60. The same number of splits as in V7.0 to be maintained for ADRG O01 *Caesarean delivery* | Use ECCS but maintain 3 splits in ADRG O60 and O01 |
| ***5. Major problem splits (neonates)(10 DRGs)*** | ***5. Major problem splits (neonates)(10 DRGs)*** | ***5. Major problem splits (neonates)(10 DRGs)*** | ***5. Major problem splits (neonates)(10 DRGs)*** |
| ACCD seeks endorsement from CCAG in relation to removal of the *major problem list, other problem list* and *complicating procedures list* from the neonatal ADRGs | CCAG endorsed the removal of the *major problem list, other problem list* and *complicating procedures list* and the use of ECCS with no splits required for:   * *P03 Neonate, AdmWt 1000-1499g w significant OR procedures* * *P04 Neonate, AdmWt 1500-1999g w significant OR procedures* * *P05 Neonate, AdmWt 2000-2499g w significant OR procedures* * *P63 Neonate, AdmWt 1000-1249g w/o significant OR procedures*   CCAG endorsed using ECCS with proposed splits for:   * *P06 Neonate, AdmWt >=2500g w significant OR procedures* * *P64 Neonate, AdmWt 1250-1499g w/o significant OR procedures* * *P65 Neonate, AdmWt 1500-1999g w/o significant OR procedures* * *P66 Neonate, AdmWt 2000-2499g w/o significant OR procedures* * *P67 Neonate, AdmWt >=2500g w/o significant OR procedures <37 completed weeks gestation* * *P68 Neonate, AdmWt >=2500g w/o significant OR procedures >=37 completed weeks gestation*   CCAG recognised that clinical confirmation should be sought from appropriate neonatology representatives where ADRGs result in fewer splits when compared to AR-DRG V7.0 | * DTG requested to retain splits for all 10 ADRGs. * DTG agreed with CCAG endorsement to remove *major problem list, other problem list* and *complicating procedures list*   DTG agreed that neonatal clinical consultation through CCAG should be arranged in the future. This would be in the form of advice and education around the change to MDC 15 following the replacement of the major problem list with ECCS. It is anticipated that this consultation would note the outcome of the review of the ECC methodology which may yield the same number of ADRG splits as in AR-DRG V7.0 | *Major problem list*, *other problem list* and *complicating procedures list* removed as splitting variables  Same number of splits is maintained in all Neonatal ADRGs with the exception of P62 where there is now a split (V7.0 had no split) |
| ***6. Mental Health Legal Status (2 ADRGs)*** | ***6. Mental Health Legal Status (2 ADRGs)*** | ***6. Mental Health Legal Status (2 ADRGs)*** | ***6. Mental Health Legal Status (2 ADRGs)*** |
| CCAG advice was sought as to whether there is another purpose to be gained by retention of mental health legal status as a splitting variable within the AR-DRG classification | CCAG endorsed:   * using ECCS for *U61 Schizophrenia disorders* * using ECCS but maintaining the number of splits (as in V7.0) for U62 *Paranoia and acute psychotic disorders* (2 splits) | DTG agreed with CCAG endorsement to remove *mental health legal status as a splitting variable* from U61 and U62 | Mental Health Legal Status as a splitting variable removed. |
| ***7. Urgency of admission:*** | ***7. Urgency of admission:*** | ***7. Urgency of admission:*** | ***7. Urgency of admission:*** |
| ACCD sought CCAG advice as to whether there is a clinical reason for maintaining *Urgency of admission* as a splitting variable within the AR-DRG classification. | CCAG endorsedthe removal of *Urgency of admission* as a splitting variable and using ECCS for Y02 Skin graft for other burns as a better reflector of complexity. | DTG agreed with CCAG endorsement to remove *Urgency of admission* from Y02 | *Urgency of admission* as a splitting variable removed |
| ***8. Low volume ADRGs*** | ***8. Low volume ADRGs*** | ***8. Low volume ADRGs*** | ***8. Low volume ADRGs*** |
| ACCD sought CCAG advice as to whether there is any overwhelming clinical rationale to continue the practice of having a split in general for particular low volume ADRGs | CCAG endorsed using the ECCS (adhering to criteria) and not splitting low volume ADRGs | * DTG requested where there was a split in V7.0 but no split using ECCS, the split should be retained (e.g. A08, E76, J01, K10) * DTG discussed K11 as there is no split in the ECC Model; the split would need to be forced (ACCD to review) * Discussion about these low volume ADRGs generalized to situations where no split was being proposed and there was a split in V7.0. In these cases, DTG agreed that the number of splits as in V7.0 should be maintained | A minimum number of splits have been maintained when compared to V7.0 (i.e. if an ADRG had a split in V7.0 then a split was maintained in V8.0) |
| ***9.* O*ther issues*** | ***9.* O*ther issues*** | ***9.* O*ther issues*** | ***9.* O*ther issues*** |
| ***DCL Precision***  After investigation of initial candidate codes identified for enhanced DCL precision in the *Review of the AR-DRG Case Complexity Process* Report, ACCD proposed that DCLs be recalculated at the fourth and 5th character level for N18.- *Chronic Kidney Disease* and T31.- *Burns classified according to extent of body surface area involved* | N/A | DCL precision in relation to N18.- and T31.- was discussed at DTG. It was agreed that the DCLs should be recalculated with enhanced precision (4th and 5th character level) for these two conditions. | The DCL matrix has been recalculated with enhanced precision for N18.-.  The low occurrence of episodes with *T31.-* diagnosis codes meant that DCLs calculated at the 4th and 5th character level were no different from those calculated at the 3 character level. Consequently, no enhanced DCL precision was possible for the *T31.-* (see Section 2.4.2) |
| ***DCL Standardisation***  ACCD to investigate ways of increasing the ability of ECCS to be used as a splitting variable. | N/A | DTG discussed examples in which the ECCS values were too clustered to allow splitting on the basis of ECCS | A minor modification to the standardisation factor used in the DCL formula was implemented allowing viable ECCS splitting models to be derived for all ADRGs. (see Section 2.4.3) |
| ***Surgical Hierarchy***  Following a surgical hierarchy review ACCD proposes the swapping of 2 ADRGs (I30 *Hand procedures* and I27 *(Soft tissue procedures).* | N/A | The full review of the surgical hierarchy was presented to DTG for discussion and endorsement. DTG supported the proposal for swapping the positions of 2 ADRGs (I30 *Hand procedures* and I27 *(Soft tissue procedures)* | ADRG I27 was moved above I30 within the surgical hierarchy |
| ***Public submissions***  ACCD proposed that out of 29 DRG public submissions brought forward or received during this development cycle, that:   * 6 be approved for inclusion in AR-DRG V8.0 * 12 be held over pending implementation of the ECC Model in AR-DRG V8.0 * 11 be not approved | N/A | DTG endorsed ACCD’s proposals in relation to the public submissions received. Specifically that 6 be implemented for AR-DRG V8.0 | A small number of episodes resulted in an ADRG change due to the adoption of the 6 DRG Public Submissions |

## Investigations following CCAG and DTG consultations

### Transfer as a splitting variable

Under the previously CCAG and DTG agreed *Principles for construction of AR-DRGs* summarised in Section 2.2 of this report, the ADRG splitting process for AR-DRG V8.0 is seeking to minimise the use of administrative variables, with a strong preference for splits based on relative complexity (i.e. ECCS). AR-DRG V7.0 splits based on *transfer within 5 days* have therefore been subjected to scrutiny through the clinical and technical review processes.

At its 29 September 2014 meeting, CCAG and subsequently the DTG on 1 October 2014 resolved that three ADRGs should continue to have a split based on transfer, possibly at a lesser number of days, with the possible addition of a fourth ADRG (B78)[[8]](#footnote-8).

Both CCAG and DTG asked that further analysis be undertaken to guide a decision on what day, if any, was most suited for splitting purposes, with an underlying position that unless there was good evidence in favour of a transfer split other than at *<5 days*, the *transfer in <5 day* split should be maintained.

The ADRGs for further evaluation are:

* B70 *Stroke and other cerebrovascular disorders*
* B78 *Intracranial injuries*
* F60 *Circulatory disorders, admitted for AMI w/o invasive cardiac investigation procedures*
* F62 *Heart failure and shock*

ACCD undertook an analysis using the dataset created for purposes of developing AR- DRG V8.0 (consisting of both the Admitted Patient Collection and the National Hospital Cost Data Collection) and examined on what day of admission transfers occurred, relative cost, whether the transfer was from a less complex or a more complex hospital, as well as long term trends.

The analysis raised doubts as to whether there is sufficient evidence to justify changing from a five day split to a shorter timeframe. ACCD found that clinical practice has indeed changed with more transfers occurring now in less than 2 Days. However, the patterns of transfer differ over establishments and jurisdictions.

The cut-off values for transfer splits could be shortened to optimise RID. However, it is unclear as to whether this may result in an incentive to keep a patient requiring a transfer in hospital longer, resulting in the episode grouping to a higher cost DRG.

ACCD’s decision therefore is to maintain the *transfer in < 5 Days* for the four ADRGs in question for AR-DRG V8.0 with a view to more thoroughly investigating the issue for AR-DRG V9.0.

### Enhanced DCL precision

The DTG identified two 3-character categories of ICD codes in which significant variation in clinical complexity is captured at the fourth and fifth character level, namely *N18.- Chronic kidney disease* and *T31.- Burns classified according to extent of body surface involved*. DTG requested that ACCD investigate the possibility of enhancing the precision of DCLs beyond their calculation at the 3-character level to capture this variation in complexity.

This was undertaken for *N18.-* by grouping the codes contained within it into three categories and assigning common DCLs within each category:

* *N18.1*, *N18.2* and *N18.9* were combined and assigned common DCLs;
* *N18.3* and *N18.4* were combined and assigned common DCLs; and
* *N18.5* was individually assigned DCLs.

A hierarchy of DCLs across the three groups was also maintained within each ADRG according to disease complexity. Specifically, for each ADRG, DCLs of group 1 never exceeded those of group 2, and DCLs of group 2 never exceeded those of group 3.

The low occurrence of episodes with *T31.-* diagnosis codes meant that DCLs calculated at the fourth and fifth character were no different from those calculated at the three character level. Consequently, no enhanced DCL precision was possible for the *T31.-* ICD code category.

### DCL standardisation

Approximately 10 ADRGs exhibited highly clustered distribution of low ECCS values across their episodes, which prevented the derivation of viable splitting models. Consequently, DTG requested ACCD review the DCL standardisation process detailed in the *Review of the AR-DRG Classification Case Complexity Process Final Report (2014)* with a view to refining it in a way that increases the performance of ECCS as an ADRG splitting variable.

A minor modification to the standardisation factor used in the DCL formula was implemented, resulting in a widened distribution of ECCS values across episodes in those ADRGs where ECCS values were previously clustered, thus allowing viable ECCS splitting models to be derived for all ADRGs.

## Work highlighted for AR-DRG Version 9.0 and future AR-DRG Versions

As part of the continual review of the classification, ACCD will continue to consult with DTG and CCAG in relation to AR-DRG public submissions. Discussion at the last DTG meeting for this development cycle held on 1 October 2014 highlighted future work including a review of:

* Splitting criteria and thresholds as detailed in Section 2.2.2
* Pre-MDCs
* Remaining non-complexity variables (e.g. transfer)
* Other highlighted ADRGs

The next meeting of the DTG will be scheduled for the second half of 2015 where work will continue on the abovementioned areas.

# Results

## AR-DRG V8.0

With the exception of changes resulting from the surgical hierarchy (swap of I30 and I27) review and the minor code changes associated with six public submissions implemented, the AR-DRG structure has remained the same as in AR-DRG V7.0.

AR-DRG V8.0 comprises 403 non-error ADRGs (with 3 error ADRGs: 960, 961 and 963) which in turn are made up of 804 non error DRGs (with 3 error DRGs: 960Z *Ungroupable*, 961Z *Unacceptable Principal diagnosis* and 963Z *Neonatal Diagnosis Not Consistent W Age/Weight).*

In total AR-DRG V8.0 has 807 DRGs. Of the 406 (including 3 error ADRGs) ADRGs:

* 85 have no split (Z) (including 3 error ADRGs)
* 246 have one split (A, B)
* 70 have 2 splits (A, B, C)
* 5 have 3 splits (A, B, C, D)

Of the 321 ADRGs that have a split, 315 ADRGs use ECCS as the only splitting variable while the remaining 6 ADRGs use splitting variables other than ECCS, specifically:

* A07 and A09 use ECCS and age
* B70, B78, F62 use ECCS and transfer
* F60 uses transfer only

The ECCS of each episode is the cumulative effect of all the DCLs however this value is rounded to the nearest multiple of 0.5 before being evaluated against the splitting thresholds.

Appendix 1 provides DTG and CCAG approved Paper on the Principles for constructions of AR-DRGs

Appendix 2 specifies splitting logic for all 406 ADRGs

Appendix 3 details the long and short descriptions for all 807 DRGs within AR-DRG V8.0.

Appendix 4 provides detail of the statistical performance and breakdown of episodes and costs within each ADRG for V8.0. This appendix also provides detail on the comparison of V8.0 to V7.0 (see also section 3.2).

## Comparison between AR-DRG V7.0 and V8.0

The following sections illustrate the differences in ADRG structure between AR-DRG V7.0 and V8.0 in relation to the number of end classes or DRGs and the reduced need to use non-complexity splitting variables in AR-DRG V8.0.

The new classification demonstrates a simplified approach to explaining case complexity. With the exception of ADRGs split using LOS in AR-DRG Version 7.0, the performance of AR-DRG Version 8.0 is equal to or exceeds that of Version 7.0 in almost all ADRGs, and is comparable in those ADRGs where LOS has been removed as a splitting variable.

### Change in the DRG structure

***Number of DRGs in AR-DRG V8.0***

The total number of DRGs in AR-DRG V8.0 is 807 (including 3 error DRGs), which represents a net increase of 36 DRGs from the V7.0 total of 771 (similarly including 3 error DRGs). There are 112 ADRGs that have changed their number of splits from V7.0 to V8.0. However, the main factor influencing the net increase of 36 DRGs is a reduction in the number of ADRGs with no split.

In comparison to AR-DRG V7.0, the number of ADRGs without a split has decreased by 45, leaving 82 ADRGs with one DRG in AR-DRG V8.0. That is, 45 ADRGs with no split in AR-DRG V7.0 are each split into two DRGs in V8.0.

A similar increase in the number of splits has occurred among ADRGs split into two DRGs in V7.0, with 29 of these ADRGs increasing to being split into three DRGs in V8.0.However, this change is countered by 37 ADRGs split into three DRGs in V7.0 that have reduced to being split into two DRGs in V8.0.

Finally, there has been a decrease of one ADRG in the number of ADRGs split into four DRGs, from six ADRGs in V7.0 to five in V8.0.

These changes are summarised in Table 4.

**Table 4: Summary of the change in the number of splits by ADRG from AR-DRG V7.0 to 8.0**

| NA | N/A | **Number ADRGs by constituent DRG count, V7.0** | **Number ADRGs by constituent DRG count, V7.0** | **Number ADRGs by constituent DRG count, V7.0** | **Number ADRGs by constituent DRG count, V7.0** | **TOTAL** |
| --- | --- | --- | --- | --- | --- | --- |
| N/A | N/A | **1 DRG**  **/ no split** | **2 DRGs**  **/ 1 split** | **3 DRGs**  **/ 2 splits** | **4 DRGs**  **/ 3 splits** | **TOTAL** |
| **Number ADRGs by constituent DRG count, V8.0** | **1 DRG /**  **no split** | 82 | N/A | N/A | N/A | **82** |
| **Number ADRGs by constituent DRG count, V8.0** | **2 DRGs /**  **1 split** | 45 | 164 | 37 | N/A | **246** |
| **Number ADRGs by constituent DRG count, V8.0** | **3 DRGs /**  **2 splits** | N/A | 29 | 40 | 1 | **70** |
| **Number ADRGs by constituent DRG count, V8.0** | **4 DRGs /**  **3 splits** | N/A | N/A | N/A | N/A5 | **5** |
| **TOTAL** | **TOTAL** | **127** | **193** | **77** | **6** | **403** |

***Note:*** *3 error ADRGs and DRGs not included*

***Number of ADRGs by splitting variables***

**Table 5** compares the variables used to split ADRGs into DRGs between AR-DRG V7.0 and V8.0. It demonstrates that the new methodology has substantially increased the power of complexity as a splitting variable and reduced the reliance on non-complexity splitting variables within the AR-DRG classification.

* The number of ADRGs split by complexity alone (i.e. ECCS or PCCL) has increased from 167 ADRGs (42%) in AR-DRG V7.0 to 315 ADRGs (78%) in V8.0.
* The number of ADRGs split by using non-complexity variables (sometimes in combination with complexity) has decreased from 108 ADRGs in AR-DRG V7.0 to six ADRGs in V8.0.
* The number of non-complexity splitting variables used has decreased from seven variables in AR-DRG V7.0 to two variables in V8.0.

**Table 5: Number of ADRGs by splitting variables**

| **Splitting variables** | **ADRG v7.0** | **ADRG v7.0** | **ADRG v8.0** | **ADRG v8.0** |
| --- | --- | --- | --- | --- |
| Nil – no split | 127 | 32% | 82 | 20% |
| PCCL/ECCS only | 168 | 42% | 315 | 78% |
| PCCL/ECCS with other/s | 74\* | 18% | 5\*\* | 1% |
| Other/s only | 34\* | 8% | 1\*\* | 0% |
| Total | **403** | 100% | **403** | 100% |

***Notes: (1)*** *3 error ADRGs and DRGs not included*

***(2)*** \* Other variables under AR-DRG V7.0 include:

* Length of Stay (same day, <2 days, <5days),
* Diagnosis,
* Procedure,
* Age,
* Mental Health Legal Status,
* Separation mode (Died, Transferred), and
* Urgency of Admission.

\*\* Other variables under AR-DRG V8.0 include:

* Age, and
* Separation mode (Transferred[[9]](#footnote-9)).

### Performance of classification: Reduction in Deviance

***Overall performance***

Overall performance of the classification has been assessed using RID under the assumption of gamma distribution of the episode cost. This measure is used for generalised linear models and is similar to the Reduction of Variance for ordinary least squared models applied to normal distribution. RID is expressed as a percentage and varies from 0% (no fit) to a theoretical 100% (perfect fit).

Table 6 shows the overall performance of the classifications at the ADRG and DRG levels. To isolate the impact of removing LOS as a splitting variable, these performance statistics are first evaluated across all ADRGs and secondly evaluated across all ADRGs that did not include LOS as a splitting variable in AR-DRG Version 7.0. This distinction is important as all same day and <2 Days LOS splits, 59 in total, are removed in AR-DRG V8.0. LOS is highly correlated with cost and therefore leads to higher RID scores but it is not a valid variable as per the *Principles for construction of AR-DRGs* (see section 2.2.1).

The overall RID performance of the classification at the DRG level decreases from 71.6% in V7.0 to 69.7% in V8.0, however, this net increase is a consequence of the same day and <2 Days LOS splits being removed. Excluding the 59 affected ADRGs, the overall RID performance of the AR-DRG classification increases from 74.3% in V7.0 to 75.2% in V8.0

**Table 6: Overall performance of AR-DRG V7.0 and V8.0: RID**

| **Level of assessment** | **AR-DRG V7.0** | **AR-DRG V8.0** |
| --- | --- | --- |
| All episodes (n = 12,419,880) | All episodes (n = 12,419,880) | All episodes (n = 12,419,880) |
| RID, ADRG level | 61.8074 | 61.8072 |
| RID, DRG level | 71.6027 | 69.6824 |
| Excluding episodes from ADRGs with same-day and <2 Days splits removed  (n = 9,655,865) | Excluding episodes from ADRGs with same-day and <2 Days splits removed  (n = 9,655,865) | Excluding episodes from ADRGs with same-day and <2 Days splits removed  (n = 9,655,865) |
| RID, ADRG level | 70.6778 | 70.6801 |
| RID, DRG level | 74.2831 | 75.1731 |

***Performance by ADRG***

The following compares the performance of AR-DRG Version 8.0 to Version 7.0 by ADRG.

Three groups of ADRGs were identified. The first group consists of 82 ADRGs without a split in V7.0 and V.8.0. These ADRGs both have RID=0, thus zero change occurred with the transition to V8.0.

The second group consists of 59 ADRGs that have same day or <2 Days LOS split in V7.0. As expected, performance in all of these ADRGs decreased.

In the last group, consisting of all other ADRGs, the performance improved in 91% of 262 ADRGs. In 22 ADRGs performance decreased by a small amount, and in one (K11 with only 2 episodes) it remained at zero.

Thus, the introduction of the ECC Model’s ECCS has achieved increased performance in the AR-DRG classification.

Table 7 summarises these changes and

Figure ***2*** presents the distribution of absolute changes in RID, demonstrating the superiority of AR-DRG V8.0 when compared to AR-DRG V7.0.

**Table 7: Change in performance (RID) at ADRG level after the transition to AR-DRG V8.0**

| **Groups** | **N ADRGs** | **Change in RID** | **Change in RID** | **Change in RID** |
| --- | --- | --- | --- | --- |
| **Groups** | **N ADRGs** | **Negative** | **Zero** | **Positive** |
| Both V7.0 and V8.0 have no split in ADRG | 82 | - | 82 | - |
| ADRGs that have same day or <2 Days split in V7.0 | 59 | 59 | - | - |
| Other | 262 | 22 | 1\* | 239 |
| **Total** | **403** | **81** | **83** | **239** |

**\*** K11 with only 2 episodes remains at zero

**Figure 2: Change in performance (RID) at ADRG level after the transition to AR-DRG V8.0**

Figure 2 presents the distribution of absolute changes in RID.  The vertical axis measures the number of ADRGs and the horizontal axis is the absolute difference between the RID in Version 8.0 and Version 7.0. Positive differences in RID, represented by blue and cross-patterned bars on the right side of Figure 2 indicate an improved performance.  There are 239 ADRGs with an improved performance.  On the left side of Figure 2 the red and dotted bars indicate the negative differences in RID when comparing Version 8.0 to Version 7.0. A total of 81 ADRGs in Version 8.0 have had a diminished performance when compared to Version 7.0.  In Version 7.0, 59 of these 81 ADRGs use same day or less than 2 days length of stay as a splitting variable. In other words, the diminished performance in Version 8.0 is primarily due to the removal of length of stay as a splitting variable.  Overall Figure 2 demonstrates a the superior performance of AR-DRG V8.0 when compared to AR-DRG V7.0.  



# Conclusion

The development of AR-DRG V8.0 had at its core the implementation of the ECC Model within the AR-DRG classification. A comprehensive set of ADRG splitting models were evaluated against classification structure principles, splitting criteria and in terms of statistical performance and clinical relevance. ACCD’s objective has been to minimise the use of non-complexity splitting variables, with a strong preference for ADRG splits based on relative complexity (i.e. ECCS). This has been achieved with only 6 of the 403 (non-error) ADRGs requiring the use of a non-complexity splitting variable.

AR-DRG V8.0 has 807 end classes or DRGs (including 3 error DRGs). V8.0 of the classification demonstrates comparable statistical performance to V7.0 in those ADRGs where LOS has been removed as a splitting variable, and outperforms V7.0 in almost all other ADRGs where splitting has occurred.

The conceptually based, theoretically derived and data driven characteristics of the ECC Model implemented within the classification provide a strong basis for ongoing refinement of the classification as changes in clinical care and improvements in data quality occur over time.

Overall, AR-DRG V8.0 represents a significant refinement to the AR-DRG classification, with major improvement in the measurement of clinical complexity through the use of the ECC Model, and simplified splitting logic leading to greater transparency. These refinements will provide improved performance and support of the AR-DRG classification in its many roles including those within hospital funding, health system analysis and clinical management.

1. The role of Diagnosis Complexity Levels and the Episode Clinical Complexity Score within the Episode Clinical Complexity Model are described in further detail in Section 1.1.2. [↑](#footnote-ref-1)
2. The role of Diagnosis Complexity Levels and the Episode Clinical Complexity Score within the Episode Clinical Complexity Model are described in further detail in Section 1.1.2. [↑](#footnote-ref-2)
3. Although the maximum ECCS value is 31.25, less than 0.5 per cent of episodes have an ECCS above 10. This is an overall percentage estimate, which differs by ADRG. [↑](#footnote-ref-3)
4. The descriptors *Minor* and *Major* are used where an ADRG has been split into two DRGs using ECCS; *Minor*, *Intermediate* and *Major* are used where the ADRG has been split into three DRGs; and *Minor*, *Intermediate*, *Major* and *Extreme* are used where the ADRG has been split into four DRGs. [↑](#footnote-ref-4)
5. Section 1.1.1 briefly summarises work undertaken in the development of AR-DRG V4.0 which is further described in *Volume 3, AR-DRG Classification Version 4.0* (Commonwealth Department of Health and Aged Care, 2000). [↑](#footnote-ref-5)
6. Section 1.1.2 is a summary of the Episode Clinical Complexity Model which is further described in the *Review of the AR-DRG Classification Case Complexity Process Final Report* approved by the Pricing Authority on 21 August 2014 [↑](#footnote-ref-6)
7. Case deletion statistics measure the influence of each observation by quantifying the change in the model parameters caused by deleting the observation. [↑](#footnote-ref-7)
8. Whether a patient died or not within the period was regarded as adequately covered by ECCS and removed as a splitting variable. [↑](#footnote-ref-8)
9. Separation mode in AR-DRG V8.0 no longer includes ‘Died’ as a splitting variable [↑](#footnote-ref-9)