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# ***Review of non-admitted classifications*** Literature Review

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*Final*

*23 August 2013*

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# ***Acronyms and abbreviations***

A&E	Accident and Emergency care
ABF	Activity Based Funding
ACG	Acronym/abbreviation
AIMS	Agency Information Management System
ACCS	Ambulatory Care Classification System
APCs	Ambulatory Patient Classifications
APGs	Ambulatory Patient Groups
CCI	Canadian Classification of Intervention
CIHI	Canadian Institute for Health Information
CMS	Centers for Medicare and Medicaid
CAC	Clinical Advisory Committee
CACS	Comprehensive Ambulatory Care System
CPT	Current Procedural Terminology
DACS	Developmental Ambulatory Classification System
DAD	Discharge Abstract Database
DCG	Diagnostic Cost Groups
DHBs	District Health Boards
HCPCS	Healthcare Common Procedure Coding System
HRGs	Healthcare Resource Groups
HCRS	Home Care Reporting System
HCRS	Home Care Reporting System
HHA	Home Health Agency
HHRGs	Home Health Resource Groups
HITH	Hospital in the Home
HRG4	HRG version 4
IHPA	Independent Hospital Pricing Authority
ICT	Information Communication Technology
ICD-10	International Classification of Diseases tenth revision
ICF	International Classification of Functioning Disability and Health
IR-DRGs	International Refined-DRGs
interRAI-CA	InterRAI–Contact Assessment
MACs	Major Ambulatory Clusters
MMFs	Market Forces Factors
NACRS	National Ambulatory Care Reporting System
NEP	National Efficient Price
NHRA	National Health Reform Agreement
NHS	National Health Service
NHCDC	National Hospital Cost Data Collection
NNPAC	National Non-Admitted Patient Collection
NWAU	National Weighted Activity Units

NACAWG	Non-Admitted Care Advisory Working Group
OPCS-4	Office of Population Censuses and Surveys Classification of
Interventions and Procedures	
OASIS	Outcome and Assessment Information Set
HOPPS	Outpatient Prospective Payment System
OPPS	Outpatient Prospective Payment System
PbR	Payment by Results
PwC	PricewaterhouseCoopers
PPS	Prospective Payment System
RIV	Reduction in Variance (R2)
RAI-HC	Resident Assessment Instrument–Home Care
RIW	Resource Intensity Weights
TFCs	Treatment Function Codes
US	United States of America
VINAH	Victoria Integrated Non-Admitted Health Minimum Dataset
VACS	Victorian Ambulatory Classification and Funding System
WIES	Weighted Inlier Equivalent Separation
WHO	World Health Organisation
WONCA	World Organisation of Family Doctors

# Executive summary

## Introduction

PricewaterhouseCoopers (PwC) has been engaged by the Independent Hospital Pricing Authority (IHPA) to undertake a review of existing non-admitted patient care classifications and recommend a new or revised classification to support Activity Based Funding (ABF) in non-admitted services. The project objectives are to:

- Investigate current local, national and international classifications for non-admitted services;
- Identify and recommend options for the adoption of an existing non-admitted classification system for ABF purposes (either as it stands or with modifications) or the development of a new classification for public hospital non-admitted services; and
- Provide guidance on the most feasible and preferred non-admitted classification of those analysed.

## Approach

The project methodology has a 4 phase approach. In phase 1 of the non-admitted classification review, the key informant interview stage, we met with IHPA key experts, members of the Non-Admitted Care Advisory Working Group (NACAWG), IHPA's Clinical Advisory Committee (CAC) and local and international classification experts. A key objective of phase 1 was to identify classification systems deemed relevant to consider for inclusion in the literature review.

This report is the phase 2 project deliverable, the literature review. The objective of the literature review was to identify relevant non-admitted international classification systems and provide an overview of these systems: the data elements that are collected and the counting and funding rules that apply to each system.

The information gathered from the phase 1 interviews, together with the application of the research questions in a search of the grey literature and peer reviewed journals resulted in identification and inclusion of the following eleven classifications in this literature review:

Location	Classification
3m	<ul style="list-style-type: none"><li>Comprehensive Ambulatory Care System (CACS)</li><li>Home Care Reporting System (HCRS)</li></ul>
United States of America	<ul style="list-style-type: none"><li>Ambulatory Patient Classifications (APCs)</li><li>Adjusted Clinical Groups (ACGs)</li><li>Diagnostic Cost Groups (DCGs)</li><li>Home Health Resource Groups (HHRGs)</li></ul>
England	<ul style="list-style-type: none"><li>Healthcare Resource Groups (HRGs)</li></ul>
Ireland	<ul style="list-style-type: none"><li>Tier 2</li></ul>
New Zealand	<ul style="list-style-type: none"><li>National Non-Admitted Patient Collection (NNPAC)</li></ul>
3M	<ul style="list-style-type: none"><li>Ambulatory Patient Groups (APGs)</li><li>International Refined- DRGs (IR-DRGs).</li></ul>

The report that follows provides an overview of the history of each classification, the scope of care types and settings covered, structure and data elements collected, counting and funding rules.

## Overarching context

In an activity based funding environment there is an important distinction between the role of a classification in differentiating between patient classes and those characteristics of care delivery that are addressed as part of

the funding methodology. A good practice classification system supports clinical categorisation based on patient dependent variables. This enables consistency in categorisation agnostic of the care setting and enables analysis of the elements of cost that are driven by patient characteristics. Whereas funding methodologies support policy objectives and provide incentives for efficiency, effectiveness, quality and innovation.

There are a number of risks associated with Activity Based Funding models which should be considered when developing a classification that is intended to be used for funding purposes. There is interdependence between the counting, the classification, costing and the pricing and funding model. Implementation and development of classifications and ABF funding methodologies are complementary and iterative over time. As better activity and cost definitions are developed and data quality improves, this information informs classification development that better explains variation, and enhanced data leads to refinements in the policy levers and funding methodologies.

Not all of the classifications reviewed are currently used to support funding, and others have progressed along a continuum of maturity from use in reporting of activity to use in supporting funding. This progression includes the collection of required data elements and costing information to refine the classification (as evidenced by improving reduction in variance ( $RIV/R^2$ ) scores) and eventual development of price weights. As part of an ongoing classification development cycle, price weights form the inputs into the funding model, and are continuously reviewed and updated.

There exists high variation in resource use across classifications, where they have been analysed for reduction in variance. A true quantitative assessment of the extent to which different classifications explain resource variation requires application of different classifications to the same patient data-set. Studies on the classifications included in this review find that:

- In Australia a study that showed clinic type explained 24% of cost variation, which provided stronger explanatory power than patient characteristics
- The ACG's support risk-adjusted capitation payment systems. The reported  $R^2$  in ambulatory and primary care is 43% in Canada (Manitoba); 38% in Sweden; 53% in Spain (for GP visits); and 54% in the UK (for GP visits)
- The estimation  $R^2$  of DCGs was 6.2% prior to including outpatient attendances. The  $R^2$  of a demographic model without diagnoses was 1.5% which shows the added strength of the diagnosis. This achieves about two-thirds of the performance compared to models using data from all settings and multiple conditions given that it relies upon the single most predictive diagnosis. In 2000, when outpatient attendances were included, the  $R^2$  score increased to 11.2%<sup>1</sup>. Research has identified that these  $R^2$  results are low in absolute terms (relative to 100 percent) and reflective of prospective risk-adjusted models in general<sup>2</sup>
- In England, HRG analysis shows that there is substantial deviation between reported costs and the national average unit cost of over 50% in many HRGs (30% of reported costs deviated from the national average by 50%) demonstrating high variability between providers and by specialty, particularly for geriatrics and obstetrics. Variation may be accountable to variation in efficiency, patient complexity and differences in approaches to coding and costing. Further investigation will be important to better understand, to improve the confidence in, and reliability of the information collected from providers. However, HRGs have more explanatory power than patient-level costing data, co-morbidities and patient age alone and combined.

1 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000 (a), *Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment Final Report*, Health Economics Research Inc. available < [http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope\\_2000\\_2.pdf](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope_2000_2.pdf)>, viewed 22 August 2013.

2 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000, 'Principal Inpatient Diagnostic Cost Group Model for Medicare Risk Adjustment', *Health Care Financing Review*, 21 (3), pp. 93-118.

## ***Key Lessons and findings***

Lessons learnt and key findings of the literature review are summarised below.

**There are a variety of counting rules in use by the different non-admitted classification systems, from a granular count of procedures through to counting individual visits/attendances or count of all services within a defined time band/episode.**

The unit of count within a classification aims to capture the service that is provided either for reporting purposes or to feed into funding models. There are three main methods used for counting that vary from the 'service event', also known as a 'visit', or 'attendance', which can be understood as intermittent care. This can be compared to an 'episode of care' which captures activity that occurs within a defined period of time (either a specified number of days or the period between recorded admission and discharge dates). The third type of payment is a unit of count aligned to a capitation payment, which is a fixed, pre-determined amount that is paid to health care provider for nominated patients regardless of how often the patient requires service. The variety in the counting rules is linked to the interdependence with the funding rules in each country.

**There are variable approaches to the counting/funding of 'multi-disciplinary' care delivery.**

The treatment of multiple services provided within the same patient visit is variably addressed by the classification's counting rules or the funding model. In the classifications reviewed the variation ranges from systems where only one resource (that deemed most resource intensive) is captured; through to algorithms that weight multiple services during the same visit; and funding rules that dictate separate payments for each or bundled procedures.

This review shows that internationally multidisciplinary services are either addressed at the counting and reporting level or the funding level, where payments are allocated, with the benefit of the latter being that granular data remains available in reporting.

**Non-admitted classification hierarchies use a range of data covering both patient and service characteristics. Those systems that fund a 'service event' prioritise procedures and interventions over patient centric characteristics.**

The researched non-admitted classifications use a variety of dimensions within the structure of their systems including patient characteristics, such as age and diagnosis; however, there is a heavy focus on service descriptions: procedures, interventions and time. The service delivered, or intervention, is deemed the most appropriate indicator of resource use with funding rules designed to discourage perverse incentives, such as providing more services than necessary.<sup>3</sup> Non-admitted classifications tend to lead their hierarchies with procedures and interventions over diagnoses.

**While there is country specific variation in the underlying procedure codes used to build non-admitted classifications, there is generally consistent use of the International Classification of Disease (ICD) coding.**

The literature also implies there may be benefit in the consistent use of underlying coding systems across setting specific classifications to support setting independence, consistent/efficient classification development and clinical meaningfulness. Some countries' classifications have gone so far as to use a single (DRG style) classification across the continuum of care settings; however there is not clear evidence of the performance of these classifications in non-admitted settings.

**Non-admitted classifications are variable in the scope of care settings to which they apply.**

Given the diversity of setting in the non-admitted care delivery, some non-admitted classification systems have a flexible structure to collect the relevant data for different care settings, while others have developed separate classifications based on resource and clinical differences in care delivery by setting. This was especially evident regarding care delivered in the home.

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3 Goldfield N. et al 2008, 'Ambulatory Patient Groups Version 3.0 – A classification System for Payment of Ambulatory Visits', Journal of Ambulatory Care Management, 31(1) pp. 2-16.

**Classifications develop and mature over time, expanding their utility from activity reporting to costing and funding**

This review of non-admitted classifications indicates that some are currently in use to inform trends in care delivery while have evolved over time from a clinical classification through to supporting cost collections and funding methodologies.

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# 1 Introduction

## 1.1 Objective of the report and broader project

PricewaterhouseCoopers (PwC) has been engaged by the Independent Hospital Pricing Authority (IHPA) to undertake a review of existing non-admitted patient care classifications and recommend a new or revised classification for Activity Based Funding (ABF). The project objectives are to:

- 1 Investigate current local, national and international classifications for non-admitted services
- 2 Identify and recommend options for the adoption of an existing non-admitted classification system for ABF purposes (either as it stands or with modifications) or the development of a new classification for public hospital non-admitted services
- 3 Provide guidance on the most feasible and preferred non-admitted classification of those analysed.

There are 4 distinct phases of work within this project which will inform the review and recommendations made, these are:

Phase 1	Phase 2	Phase 3	Phase 4
Key informant interviews	Literature review	Consultation workshop	Analysis and evaluation

This literature review forms the second deliverable and reports on our findings from Phase 2 – Literature review.

With respect to the overarching goal of the project, to identify a classification system that is fit for purpose for funding under ABF, the objective of this phase was to identify international classification systems that should form part of the review and provide an overview of these systems, the data elements that are collected and the counting and funding rules that apply to each system.

## 1.2 Defining non-admitted patient care services

The research framework used for this literature review applied the Australian interpretation of non-admitted services, which is generally understood to encompass public hospital services which could be delivered at a hospital site, in the community or in a patient's home.

Non-admitted patient services are defined in the National Health Reform Agreement<sup>4</sup> (NHRA) as “services of the kind defined in the National Health Data Dictionary, under the data element “Non-Admitted Patient Service Type” which encompass the following services:

- “Allied health and/or clinical nurse specialist, Dental, Imaging, Medical, Obstetrics and gynaecology, Paediatrics, Pathology, Pharmacy, Psychiatric, Surgical and Emergency department<sup>5</sup>”
- A non-admitted patient service event is defined in METeOR as :
  - “An interaction between one or more healthcare provider(s) with one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record<sup>6</sup>”.

It should be noted that the interpretation of non-admitted services in Australia may differ from other countries dependant on the structure of service delivery, clinical models of care, historical/policy considerations,

<sup>4</sup> Council of Australian Governments (COAG), [2011, National Health Reform Agreement](#), accessed 23 July 2013.

<sup>5</sup> Australian Institute of Health and Welfare (AIHW), [2012, National Health Data Dictionary 2012 Version 16](#), accessed 23 July 2013.

<sup>6</sup> Australian Institute of Health and Welfare (AIHW), [METeOR Metadata online registry](#), accessed 23 July 2013.

regulatory and funding models. Where available, we have provided an explanation of the type of services that are included in each of the classification systems included in our research.

### 1.3 Context for non-admitted classification

Non-admitted services play an integral role within the health care continuum, supporting providers to seek alternative methods of providing care outside of the admitted patient hospital setting. Better aligning and integrating community-based programs to support discharge from admitted services and to prevent or substitute hospitalisation is a key focus of policy and program development across Australia.

The NHRA reached at COAG on 13 February 2011 is a reform that, through its significant reorganisation and allocation of health resources, will drive fundamental change in the management and delivery of health services in Australia.

The NHRA commits the Commonwealth to adopt ABF as the method for determining its financial contribution to public hospital services and requires the acceleration of a number of the ABF work areas outlined in the November 2008 National Partnership Agreement (NPA) on Hospital and Health Workforce Reform. This includes collaborative work by the Commonwealth and jurisdictions to develop and implement nationally consistent patient classifications and costing standards.

Under the NHRA, the Commonwealth and jurisdictions agreed to the establishment of a national approach to ABF with public hospital services funded, where possible, on the basis of a national efficient price for each service provided to public patients from 1 July 2012. As part of this agreement, IHPA was tasked with developing and specifying the classification systems and data collection methodologies for public hospital services for ABF purposes including: admitted acute services (including hospital in the home), emergency services, subacute and non-acute services, mental health services, and non-admitted services (including outpatient and community based).

Prior to the introduction of ABF, these services were variously funded around the country, with the phased introduction of ABF for the five patient service categories as follows:

- **Phase 1** – From 1 July 2012 – Admitted acute, emergency care and non-admitted patient services (initially using the Tier 2 outpatient clinics list)
- **Phase 2** – From 1 July 2013 – Remaining non-admitted services, mental health and subacute services.

An explanation of the Tier 2 outpatient clinics list has been included in section 3.

A key driver for the development of a non-admitted classification system that can support ABF funding is the high volume of non-admitted services provided in Australia. Despite the low maturity of Australian hospitals costing and reporting of non-admitted activity, the Round 13 (2008/09) National Hospital Cost Data Collection<sup>7</sup> reported \$11.9 million non-admitted 'occasions of service' totalling a cost of \$3.2 billion. The table below shows a breakdown of this reported data by jurisdiction demonstrating the variability between reported data in each state.

Jurisdiction	Reported Occasions of Service in Round 13 NHCDC (\$)	Reported costs in Round 13 NHCDC (\$ '000)	Percentage of total
NSW	4,592,053	1,257,456	39%
Victoria	1,152,789	322,203	10%
Queensland	2,446,091	683,246	21%
South Australia	1,238,220	369,959	10%
Western Australia	1,595,887	353,409	13%

<sup>7</sup> Department of Health and Ageing (DoHA), National Hospital Cost Data Collection Cost Report Round 13 (2008-2009), available <[http://www.health.gov.au/internet/main/publishing.nsf/Content/EB1A34EB4E8208ECCA25773B00031A09/\\$File/NHCDC%20Report.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/EB1A34EB4E8208ECCA25773B00031A09/$File/NHCDC%20Report.pdf)>, accessed 24 July 2013.

Jurisdiction	Reported Occasions of Service in Round 13 NHCDC (\$)	Reported costs in Round 13 NHCDC (\$ '000)	Percentage of total
Tasmania	420,894	97,555	4%
Northern Territory	171,801	43,150	1%
ACT	287,819	77,138	2%
<b>Total</b>	<b>11,905,554</b>	<b>3,204,117</b>	<b>100%</b>

## 1.4 Approach to the literature review

In Phase 1 of the non-admitted classification review, the key informant interview phase, PwC met with IHPA key experts, members of the Non-Admitted Care Advisory Working Group (NACAWG), IHPA's Clinical Advisory Committee (CAC) and local and international classification experts. The key objective of this phase was to identify classification systems they deemed relevant to consider in phase 2 of the review – The literature review.

The information gathered from these interviews, together with the application of the research questions below resulted in identification and inclusion of the following eleven classifications in this literature review:

<b>Canada</b>	<ul style="list-style-type: none"> <li>• Comprehensive Ambulatory Care System (CACS)</li> <li>• Home Care Reporting System (HCRS).</li> </ul>
<b>United States of America</b>	<ul style="list-style-type: none"> <li>• Ambulatory Patient Classifications (APCs)</li> <li>• Adjusted Clinical Groups (ACGs)</li> <li>• Diagnostic Cost Groups (DCGs)</li> <li>• Home Health Resource Groups (HHRGs).</li> </ul>
<b>England</b>	<ul style="list-style-type: none"> <li>• Healthcare Resource Groups (HRGs).</li> </ul>
<b>Ireland</b>	<ul style="list-style-type: none"> <li>• Tier 2.</li> </ul>
<b>New Zealand</b>	<ul style="list-style-type: none"> <li>• National Non-Admitted Patient Collection (NNPAC).</li> </ul>
<b>3M</b>	<ul style="list-style-type: none"> <li>• Ambulatory Patient Groups (APGs)</li> <li>• International Refined- DRGs (IR-DRGs).</li> </ul>

### **1.4.1 Key research questions**

The following key research questions guided our research and analysis:

- What countries have implemented a classification in the non-admitted care setting?
- What is a practical and robust structure for a non-admitted care classification and what other system elements are required (such as underpinning classifications or data sets)?
- What degree of take up have these international non-admitted classifications had?
- What are the key implementation learnings associated with non-admitted classification?
- Do other non-admitted care classifications perform robustly when linked to funding?

### **1.4.2 Search strategy**

A primary source of specific information regarding non-admitted classifications was the direct experience of the international key informants. Relevant literature was searched using the following methods:

- Articles, reports and policy documents identified by key informants
- Web search of grey literature using Google
- Database searches.

The database searches were conducted to identify recent publications with search terms limited to publication dates ranging from 1996 to present (2013) inclusive.

The search terms used to conduct the review of international classifications were:

**(Outpatient OR non-admitted OR ambulatory care) AND (classification OR class OR category)**

Following this search strategy, all identified citations were reviewed to determine if they were relevant, and where appropriate the abstract was obtained. The abstract was reviewed to determine its relevance, and where required the full article or report was retrieved for inclusion in the literature review (see Appendix C – Bibliography).

### **1.4.3 Search strategy results**

Results were as follows:

- Pubmed Medline 1996 – Results 424 citations, Reviewed for relevance, 17 abstracts reviewed
- PSYCHinfo 2002-present – Results 311 citations, Reviewed for relevance, 10 abstracts reviewed

This literature review retained 15 citations.

### **1.4.4 Research limitations**

- 1 We were unable to identify any published literature for the Irish Tier 2 system, with all information included in this literature review being provided by Luke van Doorn from Laeta Consulting as part of his involvement in developing that outpatient services classification system.
- 2 We were unable to identify current reliable Reduction in Variance (RIV) scores for the classifications that were reviewed.

## 1.5 *Structure of this report*

This literature review report has been structured as follows:

Report section	Details
1 Introduction	This section explains what the literature review is about, why it was required and the approach that was followed. It also includes an explanation of non-admitted care services.
2 Classification systems	This section outlines the purpose of classification in funding models
3 Australian non-admitted classification systems	This section summarises the classification systems in use in Australia for non-admitted care, namely Tier 2 which is the current system in use and provides some history on the Victorian Ambulatory Care Services (VACS) classification system.
4 Findings	This section compares the various classification systems that were reviewed as part of the literature review and summarises the findings.
5 Current non-admitted classifications reviewed	<p>This section summarises the 11 identified classification systems that were deemed relevant for this study and provides the following information for each:</p> <ol style="list-style-type: none"> <li>An overview of the system</li> <li>The structure of the system, other system elements such as datasets and grouping methodology</li> <li>The counting rules</li> <li>Implementation and use in funding.</li> </ol>
Appendix A: Sub-classification elements	Appendix A provides detail regarding the various sub-classifications that form part of the structure of the classification (referred to in section 4 as shown above), for example International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD 10).
Appendix B: Primary Care classifications	Appendix B provides detail around the primary care classification systems that were identified as part of this review as a result of the 'non-admitted care type' where countries including primary care services.
Appendix C: Bibliography	Appendix C contains the bibliography of published literature and other resources used in this literature review.
Appendix D: Discussion on R <sup>2</sup>	Appendix D overviews the R <sup>2</sup> and adjusted R <sup>2</sup> statistics



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## **2    *Classification overview***

A classification is considered as a set of related categories in a meaningful hierarchical structure such that all categories are components of their parent. At each level of the classification, children categories are mutually exclusive and jointly exhaustive of their parent.

Classification system refers to all supporting materials necessary for the implementation and use of the classification including compendiums, indexes, and data specifications. Characteristics of a 'system' include:

- A set of interacting or interdependent components forming an integrated whole
- Structure, defined by their components and composition
- Behaviour, which involves inputs, processing and outputs of material, energy, information, or data
- Interconnectivity: the various parts of a system have functional as well as structural relationships between each other.

In an activity based funding environment there is an important distinction between the role of a classification in differentiating between patient classes and those characteristics of care delivery that are addressed via funding rules.

- A classification system supports clinical categorisation based on patient dependent variables. This enables consistency in categorisation agnostic of the care setting and enables analysis of the elements of cost that are driven by patient characteristics
- Funding approaches support policy objectives and provide incentives for efficiency, effectiveness, quality and innovation.

This distinction between the role of a classification and the role of a funding methodology enables local variation in models of care (independent variables) as well as valid benchmarking of costs and outcomes of care.

### ***2.1    Classification systems as part of a funding system***

As explained above, classification systems are not always used to support funding models, and progress through the following stages as they mature (are developed) for use in funding:

- Initial collection of the data elements required to the classify care delivery at the patient level
- Collection of patient level costing information and cost studies matching classified activity with patient level costs and analysis of the reduction in variance (RIV/R<sup>2</sup>)
- Continued refinement/development of the classification, including grouping of data, based on costing and R<sup>2</sup> analysis
- Once the classification reaches a level of maturity and reliability (usually evidenced by a strong RIV/R<sup>2</sup> score), it is used to inform price weights. Price weights and funding rules form a funding model that can also be continuously reviewed and updated.

Most countries have phased in ABF funding, by progressively increasing the proportions of funding based on activity over time – This approach allows providers to improve data quality, and allows refinements to both the classification and funding methodology.

One criterion to compare classification systems is how well those systems explain resource variation. This is often measured using the 'reduction in variance' summary statistic, ie the ' $R^2$ ' statistic, or sometimes the 'Adjusted  $R^2$ ' statistic. However, in many instances, comparing the  $R^2$  statistics between systems is *not a true comparison between because the patient data sets on which those measures were derived are different in terms of sample size, time period, and patient sub-population*. A true quantitative assessment of the extent to which different classifications explain resource variation in Australia requires applying the different classifications to the same patient data-set.

Further, it is important to note there is limited published research regarding the current RIV/ $R^2$  statistic measures of performance across classifications. Many classifications have high variation in resource use and cost data gaps are an identified limitation to the analysis.  $R^2$  statistics are more readily available for classifications that support capitated payments. Appendix D overviews  $R^2$  statistics.

There are a number of additional considerations associated with classifications suitable for use in Activity Based Funding.

- Engagement with clinicians is important to ensure that the classification development and implementation is clinically meaningful and workable
- Data availability and data quality are essential to implementation of a robust classification (as well as costing and funding)
- Local policy drivers are applicable to funding rule incentives regarding provision of effective and efficient services and minimising perverse incentives, such as negative impacts on patient outcomes
- As explained above, there is interdependence between the grouping/counting of activity, the classification system and the funding model. Implementation and development of classifications and ABF funding methodologies are complementary and iterative over time. As better activity and cost definitions are developed and data quality improves, this information informs classification development that better explains variation, and enhanced data leads to refinements in the policy levers and funding methodologies
- The measurement of the 'reduction in variance' summary statistic, ie the 'R-squared' ( $R^2$ ) statistic, or sometimes the 'adjusted R-squared' statistic (these statistics are defined in Appendix D), is not a reliable comparison between classification systems because the patient data sets on which those measures were derived are different in terms of sample size, time period, and patient sub-population. The sub-population that is selected for a particular study will lead to differences in variance reduction. In order to make a true quantitative assessment of the extent to which different classifications explain resource variation in Australia it would be necessary to apply the different classifications to the same patient data-set. The patient data-set should contain a wide range of demographic and clinical characteristics across a range of care settings. Such analysis is out of scope of this current project.

The literature review that follows overviews classification of non-admitted care within Australia and internationally including an explanation of the scope (care types and settings covered), structure and data elements collected, counting and funding rules. Different terminology may be used by the various countries to describe these terms, and we have included in some places the Australia terminology to enable comparison.

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## 3 *Australian non-admitted classification systems*

Tier 2 Non-Admitted Services (Tier 2) is the current national classification for non-admitted services used for ABF purposes in Australian public hospitals. Prior to the introduction of Tier 2, Victoria used the Victorian Ambulatory Classification and Funding System (VACS), both of which are discussed further in this section.

### 3.1 *Tier 2 Non-Admitted Services*

#### 3.1.1 *History*

In 1997, an Outpatient Costing and Classification Study was commissioned by the Commonwealth on the Developmental Ambulatory Classification System (DACS). The DACS was developed with clinician input to reflect a patient based classification system.

DACS was never implemented as the analysis showed that the best predictor of cost in the ambulatory setting was the clinic type. The 1998 study that showed this identified that clinic type explained 24% of cost variation<sup>8,9</sup> whereas DACS explained only 15% of cost variation when segmented by hospital type and accordingly, was considered inappropriate for use as a classification system (see Appendix D for description on methods to explain variation). In this study, results for age, visit type and the presence/absence of significant procedure variables did not demonstrate as material an explanation of variance in cost.

Following the DACS project, the list of Tier 2 outpatient clinics was formed. Tier 2 classifies 'service events', the base unit of count, by the type of clinic the patient attends. Cost data for these clinics was first collected in the Round 3 (1997-98) National Hospital Cost Data Collection (NHCDC), and has been reported in each subsequent year.

During 2011, the list of Tier 2 clinics was reviewed with the aim of developing the classification system for activity based funding of outpatient services. The outcome of the review was the publication of Version 1.0 of the Tier 2 Outpatient Clinic Definitions, which was released on 1 September 2011. Following some minor revisions, version 1.2 was released on 8 June 2012, and was implemented as the ABF non-admitted classification for 2012-13. Tier 2 Outpatient Clinics version 1.2 had 107 classes.

Tier 2 was refined again during 2012 under the guidance of IHPA's Non-Admitted Care Advisory Working Group (NACAWG), and was renamed Tier 2 Non-Admitted Services to reflect the extension of the updated classification beyond hospital outpatient clinics. The 2012 review particularly focused on home delivered procedures and nurse led clinics. Tier 2 Non-Admitted Services version 2.0 was implemented as the ABF non-admitted classification for 2013-14, and has 133 classes.

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<sup>8</sup> For 1% of Australia's hospitalised ambulatory encounters where data were not adjusted for outliers, untrimmed data. When trimmed, clinic type was an even stronger predictor, explaining 32% of cost variation.

<sup>9</sup> Cleary M., Michael R. & Piper K. 1998, 'Outpatient Costing and classification: are we any closer to a national standard for ambulatory classification systems?', in *Medical Journal of Australia* 169(8) pp. 26-31, available <<https://www.mja.com.au/journal/1998/169/8/outpatient-costing-and-classification-are-we-any-closer-national-standard>>, viewed 28 July 2013.

### 3.1.2 Structure

Tier 2 categorises a hospital's non-admitted services based on the nature of the service provided and the type of clinician providing the service. The structure of the classification firstly categorises the non-admitted service into the following the major categories:

- Procedures
- Medical consultation services
- Stand-alone diagnostic services
- Allied health and/or clinical nurse specialist intervention services.

Secondly, the service is classified by the type of clinician providing the majority of the service (based on the discipline/specialty profession of the clinician).

There are also a number of classes for specialist clinics which treat patients with specific conditions, such as specialist burns clinics, transplant clinics and cystic fibrosis clinics.

Mapping of the local clinic to the Tier 2 classification is completed by the jurisdiction.

Tier 2 is not a patient centric classification system; it assumes the type of clinic where the service is provided is a proxy for the patient clinical condition. Tier 2 differentiates between procedural, diagnostic and consultation clinics and the presence of certain specialist classes, such as multidisciplinary burns clinics.

### 3.1.3 Counting

The unit of count used with Tier 2 is the non-admitted patient 'service event', defined as:

*"An interaction between one or more healthcare provider(s) with one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record".*

The definition counts activity at the patient encounter level. Counting rules include:

- One service event is recorded, regardless of the number of health care providers present
- A service provided by information communication technology (ICT) may be counted if it meets the definition of a service event and is a substitute for a face to face consultation. However, it may only be counted in one location
- Where the definition of a service event is met for all patients attending a group session, each patient attending the session may be counted as a separate service event.

### 3.1.4 Costing

Health services collect and report the following data to IHPA under the following datasets:

- 1 **Patient level** – Report non-admitted patient service events at an individual patient level at each facility, with each non-admitted patient service event classified into a Tier 2 class
- 2 **Aggregate** – Reports non-admitted service events on an aggregate basis, with the total number of non-admitted patient service events for each Tier 2 class reported for each facility.

The extent of patient level reporting is variable within and between hospitals and determined by information technology systems capability. In general patient level data is only reported by larger metropolitan hospitals or selected clinics or services within a hospital.

Some jurisdictions undertake costing of their non-admitted services and report this information to IHPA as part of the annual NHDC. The type of costing (patient level versus cost modelling) varies between and within

jurisdictions with some being able to provide more robust data based on the availability of patient level feeder systems from the various services contributing to the provision of non-admitted care.

### 3.1.5 Implementation and use in funding

Under the National Health Reform Agreement, the Commonwealth and jurisdictions agreed to the establishment of a national approach to ABF with public hospital services funded, where possible, on the basis of a national efficient price (NEP) for each service provided to public patients from 1 July 2012. The phased introduction of ABF for non-admitted patient services is as follows:

- **Phase 1** – From 1 July 2012 – non-admitted patient services (initially using the Tier 2 outpatient clinics list)
- **Phase 2** – From 1 July 2013 – Remaining non-admitted services.

The funding for non-admitted services is calculated by applying a price weight for relevant clinic in the Tier 2 Clinic v 2.0 list to the NEP. The National Efficient Price Determination 2013-14 released by IHPA set the NEP at \$4,993 per National Weighted Activity Unit for 2013-2014.

IHPA has undertaken an initial statistical analysis of 2010-11 cost data to assess classes for cost homogeneity to identify if cost data for classes showed 'multimodality' which would indicate incorrect implementation of a measurement instrument or a non-homogenous sample. This preliminary analysis did identify some classes for which cost distributions featured multi-modality across facilities<sup>10</sup>.

## 3.2 Victoria – Victorian Ambulatory Classification System (VACS)

### 3.2.1 Overview

The Victorian Ambulatory Classification and Funding System (VACS) was introduced by the Victorian Department of Health in 1997 to support casemix funding for outpatient service in major acute hospitals. The VACS was part of a broader activity based funding policy that aimed to provide a more equitable and accountable funding system for Victorian public hospitals. The VACS classification and funding system has run in parallel with historically based block funding of smaller Victorian public hospitals<sup>11</sup>.

On 1 June 2012, as part of the national funding reform the Victorian Department of Health transitioned to the National Tier 2 Classification for counting and reporting non-admitted activity.

### 3.2.2 Structure

At the time that VACS was phased out in 2012 there were 47 VACS classes. The structure is very similar to Tier 2 with the classification definitions on a single axis which were a mix of clinic type and clinical specialty. The classification encompasses medical, surgical, allied health and outpatient clinic classes.

101 -115	Medical outpatient clinics
201-311	Surgical outpatient clinics (including dental 550)
350	Psychiatry and behavioural disorders
401-405	Obstetrics, Gynaecology and related clinics
501-502	Paediatric surgical and Paediatric medical
550	Emergency medicine <sup>12</sup>
601-611	Allied Health

<sup>10</sup> Wulff M. 2013, 2010-11 Non-Admitted Outpatient Cost Data Analysis, Tier 2 Non-Admitted Services Classification, IHPA, Sydney.

<sup>11</sup> Department of Health Victoria 2013, Victorian Ambulatory Classification and Funding System, available <<http://www.health.vic.gov.au/vacs/>>, viewed 25 July 2013

<sup>12</sup> While 550 was listed as a VACS class, it was not funded via VACS.

There were no nurse led classes in VACS Allied Health (601-609). The majority of nurse led clinics were registered in the 'VACS 609 class – Other Allied Health'. In addition, nurse practitioners could lead a medical class and midwives could lead VACS 402 (Obstetrics).

Treatment provided to patients at home was seen as equivalent to inpatient care and patients treated through the Hospital in the Home (HITH) program were funded through the admitted funding system, the Weighted Inlier Equivalent Separation (WIES)<sup>13</sup>.

### **3.2.3 Counting**

There are two different units of count for the VACS, the patient encounter or the occasion of service. Patient encounters are used for all medical outpatient clinics (classes 100 to class 550 inclusive). Occasions of service count is used for the 11 VACS Allied Health categories.

The patient encounter is defined as a visit to a public hospital outpatient clinic and refers to visits within one of the 35 VACS weighted medical/surgical clinic categories. The patient encounter includes all public ancillary services (such as pathology, radiology and pharmacy) associated with the visit. These ancillary services are bundled together and deemed to be a part of the patient encounter. Each patient is expected to have a one-on-one interaction with either a doctor/physician or endorsed registered nurse practitioner at every specialist clinic visit.

Each encounter is counted once for reporting and funding purposes irrespective of the number of clinicians or allied health clinicians the patient may see within the clinic visit.

### **3.2.4 Implementation and use in funding**

The VACS funding model is a weighted casemix model. The Victorian Department of Health routinely calculated the VACS weights for the 35 medical/surgical clinic categories using costing data provided by VACS hospitals. Weights were derived annually from the Victorian Cost Weight Study for each of the 35 VACS specialist run categories. These were then used to set annual budgets and weighted activity targets. Funding for a specialist clinic encounter is based upon the VACS Category weight multiplied by the VACS price per encounter.

Allied Health targets and budgets were calculated at a common flat rate per occasion of service. The VACS model also encompassed non-variable or fixed funding components including a base grant, teaching grant and a range of specified grants paid to selected hospitals.

At 1 July 2011, 23 hospitals or health services reported outpatient clinic activity against the VACS through the Agency Information Management System (AIMS), an online entry system and reporting facility.

Hospitals were required to maintain a VACS clinic schedule which described and mapped clinics to the relevant VACS categories. There was governance of the clinic classifications by the Victorian Department of Health who required hospitals to submit new and revised clinics via formal notification. The Victorian Department of Health continually monitored and updated the schedule of clinics and provided a summary of proposed new clinics to the VACS Clinical Panel (comprising eminent clinicians from the field) for formal approval. This aimed to discourage gaming through reclassification of clinics to those with a higher weight<sup>14</sup>.

## **3.3 Australian National Sub-Acute and Non-Acute Patient (AN-SNAP)**

### **3.3.1 Overview**

AN-SNAP is a national casemix classification system for subacute and non-acute patients, which classifies similar types of patients into care types using specialised criteria. In 1995, the Commonwealth convened the

<sup>13</sup> Department of Health Victoria 2011, Victorian Funding Part three: Technical guidelines Funding and Information, Policy Branch, Department of Health, Melbourne, Victoria.

<sup>14</sup> Department of Health Victoria 2013, Victorian Ambulatory Classification and Funding System, available <<http://www.health.vic.gov.au/vacs/>>, viewed 25 July 2013.

first meeting of the National Sub-Acute and Non-Acute Casemix Committee whose role was to achieve national agreement on the development of a classification for sub-acute and non-acute care. The National Steering Committee resolved to establish an agreed national classification. Its scope was to include rehabilitation, geriatric medicine, palliative care and geriatric psychiatry episodes.

The NSW Health Department was the lead agency and the project was commissioned in 1996 through the Casemix Area Network (CAN) and the Centre for Health Service Development, University of Wollongong, overseen by a National Steering Committee.

The Australian National Sub-Acute and Non-Acute Patient Casemix Study was conducted in 99 hospital and community health sites in all Australian States and Territories and in five sites in New Zealand. Over 30 000 episodes of care were analysed, including overnight, same day, outpatient and community episodes of care. From the 1997 study, a national classification for subacute and non-acute care was developed – The Australian National Sub-Acute and Non-Acute Patient Casemix Classification System, or AN-SNAP classification.

AN-SNAP Version 3 was developed in 2012. The intellectual property associated with AN-SNAP is owned by the University of Wollongong but available in the public domain<sup>15</sup>.

### **3.3.2 Structure**

AN-SNAP version 3 has 150 classes and 6 error classes. AN-SNAP classifies both admitted and non-admitted care in five care types.

- Four are subacute: palliative care, rehabilitation, psycho-geriatric care, geriatric evaluation and management (GEM)
- One non-acute care type: maintenance care.

Each of the care types is defined according to the characteristics of the patient and the goal of care, rather than the care setting in which services are delivered.

The underlying assessment tools and additional factors which have been incorporated into the AN-SNAP system as predictors of cost are:

- Palliative care – Phase, functional dependence as measured by RUG-ADL (resource utilisation groups – Activities of daily living), and age
- Rehabilitation – Impairment groupings, functional status as measured by FIM (Functional Independence Measure), and age
- Psycho-geriatrics – Psychiatric symptom severity and functional status as measured by the HoNOS (Health of the Nation Outcome Scale)
- Geriatric evaluation and management – Cognitive status in addition to motor capacity and age.

### **3.3.3 Counting**

The unit of count is the episode of care rather than the clinical specialty or unit providing the service.

### **3.3.4 Implementation and use in funding**

The AN-SNAP classification was nominated by the Council of Australian Governments' Health Reform Implementation Group as the 'proxy classification' to be used from 1 July 2013 for reporting activity and funding for subacute services. IHPA will further refine the system as the basis for pricing subacute care<sup>16</sup>.

<sup>15</sup> Available at < <http://ahsri.uow.edu.au/chsd/ansnap/index.html>>, viewed 22 August 2013.

<sup>16</sup> Fodero L et al (2011) & IHPA (2012) in The University of Sydney 2013, *Subacute Tools Project Final Report March 2013*, prepared for IHPA, University of Sydney, Sydney.

New South Wales and Queensland have adopted a funding approach based on AN-SNAP. In Queensland, funding is provided on a per diem basis with rates varying according to AN-SNAP class. In New South Wales, a blended episodic/bed day approach is adopted to calculate a cost weight, based on AN-SNAP class.

A Sydney University review in 2013 identified recommendations on the instruments used for both the admitted and non-admitted components. This review also identified that the recording practice and clinical patient management for sub-acute care is not consistent across Australia. Additionally, in regards to funding, subacute episodes are usually bundled in as part of acute episodes which can attract 'outlier payments', but may also result in the subacute element not being funded<sup>17</sup>.

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<sup>17</sup> Fodero L et al (2011) & IHPA (2012) in The University of Sydney 2013, *Subacute Tools Project Final Report March 2013*, prepared for IHPA, University of Sydney, Sydney..



## 4 Key findings from the international experience

This section overviews the international experience of non-admitted or ambulatory patient care classification systems in use and chapter 5 provides details on each identified non-admitted classification.

### 4.1 Classifications systems for non-admitted care

The classifications reviewed that have been reported on in this literature review are:

<b>Canada</b>	<ul style="list-style-type: none"><li>• Comprehensive Ambulatory Care System (CACS)</li><li>• Home Care Reporting System (HCRS).</li></ul>
<b>United States of America</b>	<ul style="list-style-type: none"><li>• Ambulatory Patient Classification (APCs)</li><li>• Adjusted Clinical Groups (ACGs)</li><li>• Diagnostic Costing Groups (DCGs)</li><li>• Home Health Resource Groups (HHRGs).</li></ul>
<b>United Kingdom</b>	<ul style="list-style-type: none"><li>• Healthcare Resource Groups (HRGs).</li></ul>
<b>Ireland</b>	<ul style="list-style-type: none"><li>• Tier 2.</li></ul>
<b>New Zealand</b>	<ul style="list-style-type: none"><li>• National Non-Admitted Patient Collection (NNPAC).</li></ul>
<b>3M</b>	<ul style="list-style-type: none"><li>• Ambulatory Payment Groups (APGs)</li><li>• International Refined- Diagnosis Related Groups (IR-DRGs).</li></ul>

### 4.2 Key findings

We have identified 6 key findings from our review on the international experience of non-admitted classifications:

- **Finding 1** – There are a variety of counting rules in use by the different non-admitted classification systems, from a granular count of procedures through to counting individual visits/attendances or count of all services within a defined time band/episode
- **Finding 2** – There are variable approaches to the counting/funding of ‘multi-disciplinary’ care delivery
- **Finding 3** – Non-admitted classification hierarchies use a range of data covering both patient and service characteristics. Those systems that fund a ‘service event’ prioritise procedures and interventions over patient centric characteristics
- **Finding 4** – While there is country specific variation in the underlying procedure codes used to build non-admitted classifications, there is generally consistent use of the International Classification of Disease (ICD) coding for diagnoses
- **Finding 5** – Non-admitted classifications are variable in the scope of care settings to which they apply
- **Finding 6** – Classifications develop and mature over time, expanding their utility from activity reporting to costing and funding.

Each finding is outlined in more detail below.

#### ***4.2.1 Finding 1 – There are a variety of counting rules in use by the different non-admitted classification systems, from a granular count of procedures through to counting individual visits/attendances or count of all services within a defined time band/episode***

The unit of count within a classification aims to capture the service that is provided either for reporting purposes or to feed into funding models. There are three main methods used for counting that vary from the 'service event', also known as a 'visit', or 'attendance, which can be understood as intermittent care. This can be compared to an 'episode of care' which captures activity that occurs within a defined period of time (either a specified number of days of the period between recorded admission and discharge dates). The third type of payment is a unit of count aligned to a capitation payment, which is a fixed, pre-determined amount that is paid to health care provider for nominated patients regardless of how often the patient requires service.

The three are set out below in more detail:

- 1 The 'service event' classifies one patient visit as the unit of count that is classified. This one visit may contain a number of procedures or interventions that were performed within that are bundled together to form this one counting unit. Conversely, it may be driven by the main procedure conducted. Service event counts are used in:
  - The Canadian CACS, which groups the diagnosis and interventions to form one unit of count
  - The US APC system, which bundles HCPCS and CPT procedures codes to form one unit of count
  - England's HRG system, which bundles procedures and treatment function codes
  - New Zealand's NNPA, which groups service interventions to define one event.

The Australian Tier 2 system counts the patient visit as one service event, however there are no diagnosis or procedures that are grouped to classify this unit of count. The Irish Tier 2 system operates in the same way, although also includes a defined time period as explained below. There are a series of rules to determine which unit of count to follow.

- 2 The second level is where a defined time period is set and all activity within this period forms one unit of count
  - This occurs in both of the classification systems that are dedicated to capturing care delivered in the home, the Canadian HCRS captures all events that occur between the period the patient is admitted and discharged and report s these as one service episode and the US HHRG captures all activity that occurs within a 60 day period as one episode
  - The Irish Tier 2 system has a series of rules, which if met will group all services that fall within a 28 day period following a discharge from hospital. Similarly, England's HRG system count can extend to a year of care for long term conditions.
- 3 The third level is a unit of count based on a capitation payment. ACGs and DCGs are based on a capitated payment to ambulatory/primary care providers based on all diagnoses coded during a year.

The variety in the counting rules is linked to the interdependence with the funding rules in each country.

- CACS, and the Australian and Irish tier 2 only classify on the most resource intensive intervention or service provider (and therefore lose more granular information regarding service provided)
- Both classification systems that are specific to care delivered in the home utilise a period of time as their unit of count rather than individual visits. The US HHRG system, has the flexibility to identify low utilisation outliers (less than 5 visits) and switch to a per visit count

- England's HRG grouper has the flexibility to bundle procedures and consultations that should be grouped together as one HRG and allows other procedures to remain unbundled and become separate HRGs. It is unclear if this enables more gaming
- Classifications that use a capitated payment as their unit of count are driven by diagnosis data over a longer period of time (one year).

This review illustrates a diverse range of rules in unit of count used in non-admitted services. Table 1 shows a comparison of the unit of count across the reviewed classification systems.

**Table 1: Unit of count for non-admitted patient care classifications**

Classification	Service event	Time based (episode of care)	Annual Capitation payment	Associated funding rule
Tier 2	✓			Payment determined by clinic type
Canada – CACS	✓			Not linked to funding at a national level (but is at the provincial level in some provinces)
Canada – HCRS		✓		Not linked to funding
USA – APC	✓			Packaging and discounting rules apply to bundle multiple procedures/diagnoses
USA – ACG			✓	Annual capitation payment
USA – DCG			✓	Annual capitation payment
USA – HHRG		✓		Episode is funded as a 60-day period of care
England – HRG	✓			Multiple procedures/diagnoses are bundled
Ireland	✓	✓		Payments based on service events or in some circumstances, a 28 day episode linked to a discharge from admitted care
NZ – NNPAC	✓			Not linked to funding
3M – EAPGs	✓			Packaging and discounting rules apply to bundle multiple procedures/diagnoses
3M – IR-DRGs	✓			Packaging and discounting rules apply to bundle multiple procedures/diagnoses

### 4.2.2 Finding 2 – There are variable approaches to the counting/funding of ‘multi-disciplinary’ care delivery

The treatment of multiple services provided within the same patient visit is variably addressed by the classification’s counting rules or the funding model. In the classifications reviewed the variation ranges from systems where only one resource (that deemed most resource intensive) is captured; through to algorithms that weight multiple services during the same visit; and funding rules that dictate separate payments for each or bundled procedures.

The Australian Tier 2 system does not differentiate the counting rules of a service event where care is provided by one or multiple healthcare providers. As only one service event is reported, the Tier 2 payment is determined by the reported discipline.

The Canadian CACS system operates much the same as the Australian, if multiple clinical specialists are present, only the one with the highest resource use is captured.

The English HRG system counts each outpatient attendance or procedure performed even if multiple events occur on the same day. The treatment of multidisciplinary care is driven by the funding rules, which may attach a separate payment to each attendance if they are pre-booked and doctor led attendances with a flag for where multiple doctors are present.

The Irish system identifies multidisciplinary care via a ‘Clinic Delivery Mode’ flag with three categories of clinics being identified:

- **Standard clinics** – As those typically comprising a clinician and direct team who provide a clinic in the main service-provider campus
- **Shared clinics** – As those where two or more clinicians see patients from a common waiting list during the same time
- **Joint clinics** – As those that comprise two or more consultants from different specialties that provide care to patients within certain diagnostic categories during the same time period.

This review shows that internationally multidisciplinary services are either addressed at the counting and reporting level or the funding level, where payments are allocated, with the benefit of the latter being that granular data remains available in reporting.

### 4.2.3 Finding 3 – Non-admitted classification hierarchies use a range of data covering both patient and service characteristics. Those systems that fund a ‘service event’ prioritise procedures and interventions over patient centric characteristics.

The researched non-admitted classifications use a variety of dimensions within the structure of their systems including patient characteristics, such as age and diagnosis; however, there is a heavy focus on service descriptions: procedures, interventions and time. The service delivered, or intervention, is deemed the most appropriate indicator of resource use with funding rules designed to discourage perverse incentives, such as providing more services than necessary<sup>18</sup>. Non-admitted classifications tend to lead their hierarchies with procedures and interventions over diagnoses.

- Within the CACS, diagnosis and intervention codes are used to derive mutually exclusive classes. The addition of age, anaesthetic technique and investigative technologies was added and reported to deliver good prediction of resource use
- England’s HRGs use patient demographics like age and gender, procedures and includes flags for first attendance as a surrogate for time

<sup>18</sup> Goldfield N. et al 2008, ‘Ambulatory Patient Groups Version 3.0 – A classification System for Payment of Ambulatory Visits’, Journal of Ambulatory Care Management, 31(1) pp. 2-16.

## Key findings

- 3M EAPGs use procedure as the initial classification variable. Significant procedures then disaggregate to groups based on the body system. They aim to group together patients with similar clinical characteristics and those requiring similar resource uses. The grouper considers three levels procedures – The primary one (being the main purpose of the visit), the ancillary tests/procedures (which are usually used to diagnose) and incidental procedures
- The Irish adaptation of Tier 2 classification mapped clinic type to main diagnostic Categories (MDCs) to formalise the clinic type to diagnostic category link however it is noted that this is not a patient level characteristic but a clinic centric classification based on the assumption that the clinic a patient attends is reflective of their MDC
- The ACGs use patient diagnoses over a period of time, usually a year, to assign patients to clinically and resource similar groups.

Many classifications in non-admitted care use procedure as the driver for the classification hierarchy because diagnosis data is both limited and deemed not indicative of resource use within a single encounter.

- In Australia, a 1998 study identified that clinic type overrode patient characteristics in terms of explanatory power, where clinic type explained 24% of cost variation whereas patient characteristics explained only 15% of cost variation when segmented by hospital type. This led to the development of a clinic based system
- However, classification systems that support capitation payments, which in this review include the John Hopkins ACG System and the DCG system use diagnoses as the lead variable to classify patients according to clinical and resource similar groups with high validity demonstrated in many countries based on collecting all diagnoses (including those related to hospitalisations) over a year.

The literature findings regarding the structure of the non-admitted classification and dimensions used to build the classification suggest that while patient characteristics including age and diagnosis were commonly used they were more likely to be a secondary axis after procedure, intervention or other service descriptors. Time or time surrogate is also used in some classifications. Table 2 below sets out the key inputs into the classifications reviewed.

**Table 2: Key inputs to the classification**

Classification	Diagnosis codes	Procedure codes	Key patient characteristics
Tier 2		T2 1 series	
Canada – CACS	ICD	CCI Investigative technology	eg Age
Canada – HCRS			eg Functionality
USA – APC	ICD	HCPCS/CPTs	
USA – ACG	ICD		
USA – DCG	ICD		eg Age, gender and Medicaid status
USA – HHRG	ICD		eg Functionality and available caregiver
England – HRG	ICD	OCSP4.6	
Ireland		T2 1 series	

Classification	Diagnosis codes	Procedure codes	Key patient characteristics
NZ – NNPAC			eg Age
3M – EAPGs	ICD	HCPs/CPTs	
3M – IR-DRGs	ICD	Accommodates country specific modifications and procedure coding systems	

#### *4.2.4 Finding 4 – While there is country specific variation in the underlying procedure codes used to build non-admitted classifications, there is generally consistent use of the International Classification of Disease (ICD) coding for diagnoses*

A range of underlying code sets were used in the researched non-admitted classification systems.

- Where diagnosis is used in classifications, ICD was the underlying diagnosis code set used
- Each of these countries also has its own national procedure coding system.

The literature also implies there may be benefit in the consistent use of underlying coding systems across setting specific classifications to support setting independence, consistent/efficient classification development and clinical meaningfulness. Some countries' classifications have gone so far as to use a single (DRG style) classification across the continuum of care settings; however there is not clear evidence of the performance of these classifications in non-admitted settings.

- Both HRGs and IRDRGs are based on the admitted DRG system. HRGs use casemix combinations of both diagnoses and procedures that support setting independent service delivery. If a procedure or intervention can be performed across different care settings, the same HRG will be derived regardless of setting. In IRDRGs, non-procedural (medical) ambulatory DRGs include an optional complexity level based on the length of the medical consultation. Both of these classifications are complex and diagnosis reliant.

#### *4.2.5 Finding 5 – Non-admitted classifications are variable in the scope of care settings to which they apply*

Given the diversity of care settings in the non-admitted care delivery, some non-admitted classification systems have a flexible structure to collect the relevant data for different care settings, while others have developed separate classifications based on resource and clinical differences in care delivery by setting. This was especially evident regarding care delivered in the home.

- In Canada and the US outpatient and home delivered services are classified by separate classifications, whereas England and 3M (as discussed above) have developed a broad classification across multiple care settings
- US HHRG classify services provided in the home based on patient characteristics that reflect clinical need (including diagnosis) and rationale for in home (rather than ambulatory) care. It combines clinical need and functional status scores to identify severity as well as service utilisation
- Home visits are not currently included within scope for existing HRGs and PbR payments, they are planned for HRG development in the future
- In Canada the CACS system is used to classify emergency, day surgery and outpatient clinic patient care. Though not a classification in its own right, the Home Care Reporting System (HCRS) is used to report on government-funded home care services.

**Table 3: Scope of care settings included**

Classification	Outpatient/ ambulatory hospital	Care delivered at home	Day procedures	Emergency	Admitted care
Tier 2	✓	✓	✓		
Canada – CACS	✓		✓	✓	
Canada – HCRS		✓			
USA – APC	✓		✓		
USA – ACG	✓	✓	✓		
USA – DCG	✓		✓	✓	✓
USA – HHRG		✓			
UK – HRG	✓	✓	✓	✓	✓
Ireland	✓	✓	✓		
NZ – NNPAC	✓	✓	✓	✓	
3M – EAPGs	✓			✓	
3M – IR-DRGs	✓			✓	✓

#### 4.2.6 Finding 6 – Classifications develop and mature over time, expanding their utility from activity reporting to costing and funding

This review of non-admitted classifications indicates variation in the extent they are used for funding and other policy purposes. Some are currently in use to research trends in care delivery while others have evolved over time to support cost collections and funding methodologies. Findings from the review show that:

- US classifications have the longest history in supporting funding and vary from procedure based outpatient systems (Medicare APC and 3M Medicaid APGs) to specific home based classification (HHRG) and a time based capitated system (ACGs and DCGs) based on diagnoses. ACGs and DCGs demonstrate the enhanced explanatory power of risk-adjustment where the count is based on a longer period of time than a single encounter
- England's HRGs evolved from providing input to reference costs and subsequently moved to supporting the PbR funding methodology. This classification began with admitted care and has more recently included non-admitted
- CACS have a long history of development and are taken up to support variable funding methodologies across Canada
- In their development phase, DCGs required a large sample size to ensure stability and reliability and patients with very high or very low costs are excluded from these samples.

**Table 4: Extent of classification system use**

Classification	Use in funding	Ongoing costing studies	Regular classification development cycle	Use in reporting and data analysis
Tier 2	✓			✓



Classification	Use in funding	Ongoing costing studies	Regular classification development cycle	Use in reporting and data analysis
Canada – CACS		✓	✓	✓
Canada – HCRS				✓
USA – APC	✓	✓		✓
USA – ACG	✓	✓	✓	✓
USA – DCG	✓	✓	✓	✓
USA – HHRG	✓			✓
UK – HRG	✓	✓	✓	✓
Ireland	✓	✓		✓
NZ – NNPAC				✓
3M – EAPGs	✓			✓
3M – IR-DRGs				✓

### 4.3 Performance of non-admitted classifications

It is important to note there is not a lot of published research regarding the current RIV/R<sup>2</sup> measures of performance across these classifications (with most published studies being outdated). Many of the studies found identify the high variation in resource use across classifications and identify gaps in cost data as a limitation to the analysis. As previously discussed, in order to make a true quantitative assessment of the extent to which different classifications explain resource variation in Australia it would be necessary to apply the different classifications to the same patient data-set. R<sup>2</sup> are more readily available for classifications that support capitated payments and report that inclusion of diagnosis is an important factor to raise the predictive power of a risk-adjusted model.

- In Australia, a study identified that clinic type explained 24% of cost variation, which provided stronger explanatory power than patient characteristics
- The ACGs support risk-adjusted capitation payment systems. The reported R<sup>2</sup> in ambulatory and primary care is 43% in Canada (Manitoba); 38% in Sweden; 53% in Spain (for GP visits); and 54% in the UK (for GP visits).
- The estimated R<sup>2</sup> of DCGs was 6.2% prior to including outpatient attendances. The R<sup>2</sup> of a demographic model without diagnoses was 1.5% which shows the added strength of the diagnosis. This achieves about two-thirds of the performance compared to models using data from all settings and multiple conditions given that it relies upon the single most predictive diagnosis. In 2000, when outpatient attendances were included, the R<sup>2</sup> score increased to 11.2%<sup>19</sup>. Research has identified that these R<sup>2</sup> results are low in absolute terms (relative to 100 percent) and reflective of prospective risk-adjusted models in general<sup>20</sup>
- In England, HRG analysis shows that there is substantial deviation between reported costs and the national average unit cost of over 50% in many HRGs (30% of reported costs deviated from the national average by 50%) demonstrating high variability between providers and by specialty, particularly for

19 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000 (a), *Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment Final Report*, Health Economics Research Inc. available < [http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope\\_2000\\_2.pdf](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope_2000_2.pdf)>, viewed 22 August 2013.

20 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000, 'Principal Inpatient Diagnostic Cost Group Model for Medicare Risk Adjustment', *Health Care Financing Review*, 21 (3), pp. 93-118.



geriatrics and obstetrics. Variation may be accountable to variation in efficiency, patient complexity and differences in approaches to coding and costing. However, HRCs have more explanatory power than patient-level costing data, co-morbidities and patient age alone and combined

- A 2005 analysis of HHRGs investigated the relationship between casemix and profit or loss margin at a provider level finding that there is a statistically significant but small ability for casemix to inform margin. It concluded limited practical use of this finding at a policy level<sup>21</sup>. The cost data that underpins margins was also identified as potentially being weak.

R<sup>2</sup> statistics are overviewed in Appendix D.

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<sup>21</sup> Medicare Payment Advisory Commission (Medpac) 2005, *Home Health Agency Case Mix and Financial Performance*, report to Congress, December 2005, Medpac, Washington DC.

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## 5 *The international experience in non-admitted classifications*

### 5.1 *Canada*

Canada has two key classification systems in use for patients receiving emergency, day surgery, outpatient and home care. These are:

- The Comprehensive Ambulatory Care System (CACS) – Covering emergency, day surgery and outpatient clinic patients
- The Home Care Reporting System (HCRS) – Covering publically funded home care programs.

The Canadian Institute for Health Information (CIHI) is an independent not-for-profit organisation, funded through a combination of federal and jurisdiction monies, whose role is to provide information on Canadian health data. CIHI owns the CACS grouping methodology and which it makes available for purchase. CIHI collects and reports on the clinical, administrative and financial data for hospitals in Canada as well as the data collected through HCRS.

Canada does not have a nationally consistent approach to funding health services. Uptake of classifications and funding methodologies for health services is decided by each Province or Territory.

#### 5.1.1 *Comprehensive Ambulatory Care System (CACS)*

##### **Overview**

The Comprehensive Ambulatory Care Classification System (CACS) is a grouping methodology for ambulatory care patient data in Canada that covers emergency, day surgery and outpatient clinic patient care.

Classification development and a grouping methodology began in 1995 alongside the establishment of the National Ambulatory Care Reporting System (NACRS) dataset (overviewed further in Appendix A). In 2001, the CACS grouper was released supported by the data within NACRS. In 2010, a second data collection was implemented, the Discharge Abstract Database (DAD), which includes an expanded day surgery dataset.

NACRS data can be submitted by hospitals in three 'levels' of granularity. Level 3 submissions, the highest submission level, include the full set of mandatory and optional NACRS data elements including coded diagnostic and intervention information required to group according to CACS. Adoption of CACS has been dependent on the collection of the data required for the two data sets (NACRS and DAD) that underpin the CACS.

CACS uptake in Canada includes select facilities in Nova Scotia, single facilities in Manitoba, Prince Edward Island, Yukon and Saskatchewan, and pilot projects in British Columbia<sup>22</sup>. In 2010, Alberta implemented the CACS, relinquishing their previous non-admitted patient classification system, the Ambulatory Care Classification System (ACCS) in use since 1997. The key differentiating feature between ACCS and CACS is the unit of count in ACCS was based on number of staff rather than visit.

##### **Structure**

The CACS structure is based on patient specific data including diagnosis coded in ICD-10-CA and interventions coded based on Canadian Classification of Intervention (CCI) codes (refer to Appendix A for further information). The required data collected by hospitals for the NACRS and DAD data sets are grouped into:

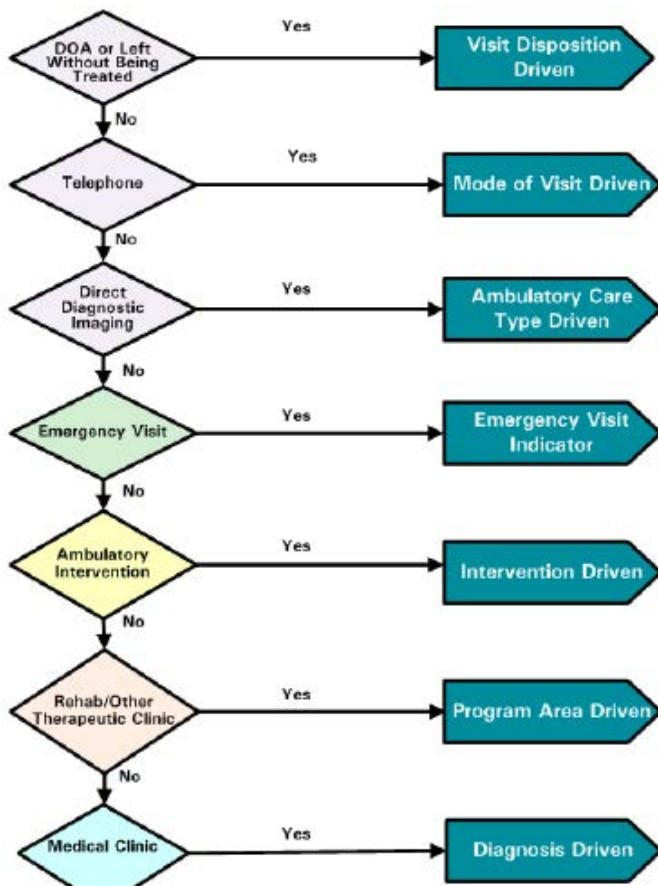
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<sup>22</sup> Canadian Institute for Health Information (CIHI) 2011, Data Quality Documentation for External Users: National Ambulatory Care Reporting System 2010-11, available <[http://www.cihi.ca/cihi-ext-portal/pdf/internet/nacrs\\_exec\\_summ\\_2010\\_2011\\_en](http://www.cihi.ca/cihi-ext-portal/pdf/internet/nacrs_exec_summ_2010_2011_en)>, accessed 23 July 2013.

- One of 242 CACS classes based on diagnosis and intervention codes<sup>23</sup>
- One of the 21 Major Ambulatory Clusters (MACs).

Data are grouped into mutually exclusivity classes based on defined grouper logic. This logic is included in Figure 1.

**Figure 1: CACS grouper logic overview<sup>24</sup>**



The hierarchy in the grouper logic assigns firstly to an 'intervention driven' class based on cost and clinical profile. Where more interventions are undertaken, the one with the highest rank in the hierarchy drives the classification.

The 'program area' class that applies to rehabilitation defines the type of rehabilitation service received (eg physiotherapy or occupational therapy).

If no other category is appropriate, patients are assigned to a CACS class based on diagnosis.

<sup>23</sup> Both code sets are from ICD-10-CA and CCI classification systems version, 2012

<sup>24</sup> Canada's Institute for Health Information (CIHI) 2013, Comprehensive Ambulatory Classification System (CACS) Directory, CIHI, Canada.

As MACs are assigned subsequent to CACS class classification, each MAC will contain both diagnoses and intervention codes where as individual CACS classes will contain procedures or diagnoses. As such, it is the intention of the classification that MACs are used for higher level analysis than CACS cells, for reporting purposes and trend analysis, for example. The 21 MACs are provided in Table 5.

**Table 5: CACS major ambulatory clusters**

MAC code	MAC name/description	MAC code	MAC name/description
<b>AA</b>	Exception Logic	<b>09</b>	Diseases and Disorders of the Subcutaneous Tissues and Breast
<b>EV</b>	Emergency Visit	<b>10</b>	Endocrine, Nutritional and Metabolic Diseases and Disorders
<b>RE</b>	Rehabilitation	<b>11</b>	Diseases and Disorders of Kidney and Genitourinary System
<b>01</b>	Diseases and Disorders of the Nervous System	<b>13</b>	Maternal Care
<b>02</b>	Diseases and Disorders of the Eye	<b>14</b>	Neonates, Infants and Non-specific Paediatric Conditions
<b>03</b>	Diseases and Disorders of the Ear, Nose, Mouth and Throat	<b>15</b>	Diseases and Disorders of the Blood and Lymphatic System
<b>04</b>	Diseases and Disorders of the Respiratory System	<b>16</b>	Multisystemic or Unspecified site Infections
<b>05</b>	Diseases and Disorders of the Circulatory System	<b>17</b>	Mental Diseases and Disorders
<b>06</b>	Diseases and Disorders of the Digestive System	<b>20</b>	Examinations and Other Health Factors
<b>07</b>	Diseases and Disorders of the Hepatobiliary System and Pancreas	<b>21</b>	Oncological Diseases and Disorders
<b>08</b>	Diseases and Disorders of the Musculoskeletal System and Connective Tissue	<b>ZZ</b>	Miscellaneous Ungroupable

Using statistical regression, each CACS class is assigned a unique Resource Intensity Weight based on:

- Patient age (in four age brackets)
- Anaesthetic technique
- Investigative technology (comprising 21 categories that span CT, x-ray, nuclear imaging and ultrasound variants).

Resource Intensity Weights are determined through separate costing exercises.

## Counting

One patient 'visit' forms the base unit of activity counted in CACS.

Where multiple procedures or interventions are undertaken during one visit, or where a patient is seen by multiple clinical specialists, only the one considered to be of highest resource use that is submitted to the dataset<sup>25</sup>. This approach incentivises documentation and coding of the clinical specialty that drives the most time spent, or requires a further referral.

<sup>25</sup> Canada's Institute for Health Information (CIHI) 2013, Comprehensive Ambulatory Classification System (CACS) Directory, CIHI, Canada.

For rehabilitation services, it is acknowledged that a patient may see more than one clinical specialty during a visit, however, the counting rule is such that only one clinical specialty can be submitted to NACRS. Similarly only one intervention is included for CACS cell assignment even if multiple are provided.

Assignment of clinical specialty is a clinical judgement based on guidance contained within the CACS directory that notes consideration should be given to:

- Length of time spent with specialty
- Whether the visit is crisis or follow-up
- Mode of visit, whether direct or indirect
- Group or individual session<sup>26</sup>.

Examples in the 2013 CACS introduction intended to provide further assistance to clinicians are reproduced in Table 6. Note that 'Main extent' in the example refers to whether the service is a group or individual service.

**Table 6: Guidance for CACS cell assignment**

Example 1	Main intervention	6RA60RDSD Training, Voice, Speech Articulation
	Program Area	SP
	CACS D141	Speech and Language Pathology
Example 2	Main intervention	6RA60RDSD Training, Voice, Speech Articulation
	Program Area	OT
	CACS D999	Other/Unspecified Rehabilitation without Valid Intervention
Example 3	Main intervention	6AA10GA Counselling, Mental Health and Addictions, gambling
	Main extent	GR Group of clients with one health care provider
	Program Area	PR
	CACS D061	Psychology

Specific counting rules apply to “cross over” CACS classes for some diagnostic imaging diagnoses, to ensure mutual exclusivity and correct assignment of resources. The “cross over” classes are four types of diagnostic imaging interventions that are identified through the grouping methodology at the “Direct Diagnostic Imaging” step but are re-routed to the “Ambulatory Intervention” step (see Figure 1). The reason for “cross over” classes is to change the classification of a number of diagnostic imaging service based on an analysis that their resource use is better aligned to ambulatory interventions<sup>27</sup>.

Interventions that are not generally considered to be typical ambulatory care are grouped to a class named “Not Generally Ambulatory”<sup>28</sup>. This logic regarding models of care is reviewed on an annual basis.

<sup>26</sup> Canada's Institute for Health Information (CIHI) 2013, Comprehensive Ambulatory Classification System (CACS) Directory, CIHI, Canada.

<sup>27</sup> The four cross over cells are for Coronary Angiogram, Other Cardiac Study, Anigraphy Except Coronary, and Other Hepatobiliary Intervention.

<sup>28</sup> Canada's Institute for Health Information (CIHI) 2013, Comprehensive Ambulatory Classification System (CACS) Directory, CIHI, Canada

The key difference between the CACS and Alberta's previous classification system, the ACCS is the base unit of count as it was the number of unique service provider staff that drove the counting in the ACCS. That is, if one patient sees two different provider types (eg a physical therapist and an occupational therapist), two visits are recorded. However, if one patient sees two of the same provider type at the same time (eg two physical therapists), one visit only is recorded.

### **Implementation and use in funding**

CIHI revises CACS based on an annual development cycle and case costing is performed annually to calculate cost weights. The latest significant revision was in 2011, when the CACS methodology was redeveloped to include age, anaesthetic technique and investigative technology to enhance the Resource Intensity Weights (RIW). The criteria adhered to when redeveloping the CAC methodology included:

- Clinical relevance
- Resource-homogeneity
- Focus on client/patient characteristics
- User friendly
- Multiple uses
- Minimise opportunity for gaming
- Dynamic
- Build on current knowledge
- Modifiable.

Further cost data collection concerning rehabilitation and other therapeutic clinics is intended to support further development of the CACS classification. CIHI reports a 'strong' Reduction in Variance (RIV) score associated with the CACS<sup>29</sup>.

### **5.1.2 Home care reporting system**

#### **Overview**

The Home Care Reporting System (HCRS) is used in Canada to report on government-funded home care services and longitudinal trends on patients using home care services including their characteristics and service use. There is no classification grouper/hierarchy associated with HCRS.

The HCRS was launched in 2006–07 and by 2011–12, and has been taken up by the following Provinces/Territories submitting data (either in part or completely):

- Yukon
- British Columbia
- Manitoba
- Ontario
- Nova Scotia.

Implementation is also under way in Alberta, Saskatchewan and Newfoundland and Labrador.

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<sup>29</sup> As identified during the key informant interview

HCRS contains demographic, clinical, functional and resource utilisation information on patients. The assessment tools that support the data inputs to the HCRS are the Resident Assessment Instrument–Home Care (RAI-HC) and interRAI-CA, which were developed by interRAI, a not-for-profit organisation comprising international researchers. These tools aim to assess and measure outcomes and resource use across the continuum of care. With permission, CIHI modified the interRAI tools for use in the HCRS.

The scope of publicly funded home care programs in Canada includes:

- Short-term care to those recovering from surgery or acute medical conditions
- Long-term care and support to allow people with chronic conditions to continue living in the community
- Other specialised programs, such as end-of-life care and rehabilitation<sup>30</sup>.

Home care is delivered in the community in private homes and residential care settings, as well as in hospitals and ambulatory clinics.

### Structure

The HCRS classification is based on two standardised and validated clinical assessment tools that are used to screen and assess clients:

- The Resident Assessment Instrument–Home Care (RAI-HC) – To inform admission to home care from community or hospital and to screen vulnerable populations in hospital emergency departments
- The interRAI–Contact Assessment (interRAI-CA) – To assess long-stay home care clients in community settings<sup>31</sup>.

The RAI-HC collects the clinical data set for long-term supportive care and maintenance home care clients. This standardised instrument enables a common language to assess the health status and care needs of individuals. It also provides a data source for planning and quality improvement, which includes information on:

- Health, functional and cognitive status
- Environmental assessment
- Treatments
- Medications.

The interRAI-CA captures a brief profile of all people served through screening or home care intake processes. Its data inputs are captured in Table 7.

In addition to the capturing specific data elements, the RAI-HC assessment instrument automatically populates a number of measures, including:

- Clinical Assessment Protocols used by clinicians to identify risk and support care planning
- Outcome scales that summarise function in areas such as cognition, physical function and frailty
- The RUG-III casemix methodology
- Risk-adjusted quality indicators.

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30 Canada's Institute for Health Information (CIHI) 2013, Home Care Reporting System – metadata, available <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types-of-care/community+care/home+care/hcrs\\_metadata](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types-of-care/community+care/home+care/hcrs_metadata)>, accessed 22 July 2013.

31 Canada's Institute for Health Information (CIHI) 2012, Home and Continuing Care, Home Care Reporting System, available <[http://www.cihi.ca/CIHI-ext-portal/pdf/internet/HCRS\\_INFO2012\\_PDF\\_EN](http://www.cihi.ca/CIHI-ext-portal/pdf/internet/HCRS_INFO2012_PDF_EN)>, accessed 22 July 2013.

**Table 7: HCRS data records and descriptions<sup>32</sup>**

Record name	Code	Summary of data collected
Admission	<b>AD</b>	Personal identifiers, demographic and administrative information collected through referral, intake and acceptance processes (may include data from the initial RAI-HC assessment or the first service visit)
Update client profile	<b>UC</b>	A change in client's demographic or administrative information
RAI-HC assessment	<b>RH</b>	Data captured during the RAI-HC assessment, excluding demographic information already collected
Medication	<b>MD</b>	Data captured during RAI-HC assessment
Service Start	<b>SS</b>	Captures beginning of individual stream of home care service. Type of service, discipline of service provider and date service started are recorded
Service Details	<b>SD</b>	The amount and delivery settings of service received during the reporting period
Service end	<b>SE</b>	Captures information about the end of an individual stream of home care services. Date stream of service finished
ER Visits	<b>ER</b>	Records ED visits a home care client may have during reporting period
Organisational Client transfer	<b>OT</b>	Used when organisations undergo restructure that impacts on client unique identifiers
Discharge	<b>DC</b>	Captures information when an individual is discharged, marking the completion of an episode

## Counting

The information submitted reflects the different events that occur throughout a client's home care service episode<sup>33</sup> and links between service events provided through different organisations using a unique client identifier. A 'service episode' is not bound by a set period (eg 60- or 90-days) but by the date of admission and discharge as captured in the client record.

Information is entered into a computer at the point of care and is driven by an event-level reporting system.

## Implementation and use in funding

Clinicians use the information to support front-line care planning and quality improvement at the point of care as well as to support planning, quality improvement, funding and accountability at the management and policy-making levels<sup>34</sup>.

The HCRS is not used to inform funding.

## 5.2 United States of America

The United States of America (US) provides government funded health care nationally through Medicare for those over the age of 65 and the long term disabled; and on a state by state basis through Medicaid for those who are indigent or targeted for defined public health programs, such as dialysis or HIV treatment. Medicaid cover is defined by each state and financed through a combination of federal and state funds. The key distinction between Australian and these US payment systems is that Medicare and Medicaid are output based

<sup>32</sup> Canada's Institute for Health Information (CIHI) 2012, Data Quality Documentation, Home Care Reporting System, 2011-12, available <[https://secure.cihi.ca/free\\_products/HCRS\\_External\\_Data\\_Quality\\_Report%202011\\_EN.pdf](https://secure.cihi.ca/free_products/HCRS_External_Data_Quality_Report%202011_EN.pdf)>, accessed 23 July 2013.

<sup>33</sup> *ibid*.

<sup>34</sup> CIHI 2013, Home Care Reporting System – metadata, available <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types-of-care/community+care/home+care/hcrs\\_metadata](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types-of-care/community+care/home+care/hcrs_metadata)>, accessed 22 July 2013.



funding systems (the provider is paid for each unit of service). Together Medicare and Medicaid fund approximately half of all health care service in the US.

There are two classification systems that are nationally consistent/underpin the Medicare funding methodology for patients receiving non-admitted care. These are:

- Ambulatory Patient Classifications (APCs) – The classification used for outpatient hospital services<sup>35</sup>
- Home Health Resource Groups (HHRGs) – For classification of hospital in the home type services<sup>36</sup>.

Adjusted Clinical Groups (ACGs) are based on evidence that clustering of morbidity over time is a better predictor of health service resource use than the presence of specific diseases<sup>37</sup>. They are suitable for a capitation funding model and as such the patient is usually assigned to the provider who receives the payment. This approach is particularly relevant in managing chronic conditions.

Medicaid funding methodologies are variable and defined by each state. Many states use the same two classification systems as Medicare for outpatient and home care services (APCs and HHRGs). The other key classification used by state Medicaid programs is Ambulatory Patient Groups (APGs). APGs and APCs are often compared and contrasted in classification literature as well as in guidance material designed for providers. As APGs are a product developed and owned by the private sector, 3M's, they are discussed separately in section 5.7.

### 5.2.1 Ambulatory Patient Classifications (APCs)

#### Overview

APCs were developed by the Centers for Medicare and Medicaid (CMS) and implemented in 2000 to support Medicare reimbursement to hospitals for outpatient services via outpatient prospective payment system (HOPPS). APCs have also been adopted by a number of other US outpatient care payers including state Medicaid programs and private insurers. Primary care clinicians are not reimbursed through APCs; however the procedure codes that underpin APCs (CPTs and HCPCSs) are used in other payment methodologies including the Medicare primary care payment system.

APCs were developed as a companion classification to the Diagnosis Related Group (DRG) classification of Medicare admitted hospital service. The Medicare Prospective Payment System (PPS), what Australia calls Activity Based Funding, was implemented for admitted hospital care in 1983.

As outpatient services were funded separately, there was an upward trend in this type of activity following implementation of DRG reimbursement. This shift toward increased outpatient activity drove the development of APCs<sup>38</sup> and the implementation of the hospital outpatient prospective payment system (HOPPS) as a cost control mechanism. Introduction of APCs replaced a number of fragmented systems in previously in place in hospitals across the country<sup>39</sup>.

#### Structure

APCs are based on procedure and intervention codes, for example *outpatient evaluation and management, outpatient surgery and outpatient ancillary services including radiology services, pathology and laboratory*

35 Outpatient hospital services are considered to be those covered by Medicare Part B, which are medically necessary diagnostic and treatment services received as an outpatient from a Medicare-participating hospital. Covered outpatient hospital services include emergency or observation services, Services in an outpatient clinic, Laboratory tests, Mental health care in a partial hospitalisation program, x-rays and other radiology services billed by the hospital, medical supplies, preventative and screening services and some drugs (Medicare n.d. *Outpatient hospital services*, available < <http://www.medicaregov/coverage/outpatient-hospital-services.html>>, accessed 25 July 2013.

36 Home health is defined as 'skilled' nursing, physical therapy, occupational therapy, speech pathology, social work, and supporting home health aide services under specific coverage guidelines.

37 Starfield et al 1985 as in The John Hopkins ACG System 2011, *Technical Reference Guide Version 10.0*, available <[http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb\\_035024.pdf](http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb_035024.pdf)>, viewed 28 July 2013.

38 Anumula N. & Sanelli P.C. 2012, 'Hospital Outpatient Prospective Payment System', *Health Care Reform Vignette AJNR* 33, April 2012 pp. 615-616.

39 Matson T. & Georgoulakis J. 2000, 'Market memo: Complying with outpatient PPS implementation', *Health Care Strategic Management*; May 2000; 18(5): pp. 19-23

*services, medical testing and injections*<sup>40</sup>. Diagnoses are used in limited circumstance only where they assist to identify medical justification for service provision or dispensing of items<sup>41</sup>, ie as part of funding rules.

The procedure codes that underpin APCs are Healthcare Common Procedure Coding System (HCPCS) and Current Procedural Terminology (CPT) codes (these are further detailed in Appendix A).

APCs are bundles of HCPCSs and CPTs based on expected care delivery patterns, ie CPT and HCPCS codes as well as the modifiers are grouped via grouping software into APC classes<sup>42</sup>. While CMS is responsible for the ongoing development of APCs based on similar characteristics and costs<sup>43</sup>, it is the hospitals that classify services to APCs via grouping software. The appropriate procedure codes are extracted from the medical record and encoding software helps with bundling issues and assignment of APCs.

Each APC has its own allocated relative weight to reflect its common resource intensity level. Relative weights are statistically calculated based on the cost of services, similar to the approach that is used to calculate DRG weights<sup>44</sup>.

## Counting

The APC bundle is the unit of count for the outpatient prospective payment system<sup>45</sup>, however, each patient may have several APC codes assigned to their encounter<sup>46</sup>.

## Implementation and use in funding

Each CPT or HCPCS code is assigned a payment rate. Data which inform the costs that are used to refine APCs comes from annual Medicare cost reports filed by providers and individual patient hospital claims. The scaled relative weight for an APC measures the resource requirements and is based on the median cost of services in that APC group weighted against the total cost of all services. Following this, the ratio of individual APC to total cost of all services will inform the calculated relative weight.

The APC payment rate is calculated by multiplying the scaled relative weight for the APC of the service by a 'clinical factor' to determine the national unadjusted payment rate for the APC<sup>47</sup>. The labour portion of the national unadjusted payment rate (60%) is adjusted by a geographic factor<sup>48</sup>. Payment rates also take into consideration the APC's number of counting rules and funding rules such as:

- **Payments for New Technologies** – To embed innovation into the system. Payments for New Technologies are set at a mid-point range until cost data are available to assign a more permanent clinical APC
- **Separately paid services** – That include a number of surgical procedures, diagnostic and non-surgical therapeutic procedures, blood and associated products, clinic and ED visits, some drugs
- **Partial hospitalisation** – Paid on a daily basis where the rate is based upon the number of individual service provides and their expected cost
- **Packaging** – Intended for services that are generally bundled so that dependent, ancillary, supportive and adjunctive items are included in the payment for the main independent service provided. Examples of usually packaged services include:

40 University of Nebraska Clinical Centre, n.d., [Ambulatory Payment Classifications \(APCs\)](#), available.>, accessed 22 July 2013.

41 Abbey D. 2009, *Healthcare Payment Systems, An Introduction*, CRC Press, Taylor & Francis Group, New York

42 Ibid.

43 Medicare Learning Network, *Hospital Outpatient Prospective Payment System, Payment System Fact Sheet Series*, Department of Health and Human Services, Centres for Medicare and Medicaid Services, available <<http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/HospitalOutpaysysfctshsht.pdf>>, viewed 23 July 2013.

44 Abbey D. 2009, *Healthcare Payment Systems, An Introduction*, CRC Press, Taylor & Francis Group, New York

45 Medicare Learning Network, *Hospital Outpatient Prospective Payment System, Payment System Fact Sheet Series*, Department of Health and Human Services, Centres for Medicare and Medicaid Services, available <<http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/HospitalOutpaysysfctshsht.pdf>>, viewed 23 July 2013.

46 Abbey D. 2009, *Healthcare Payment Systems, An Introduction*, CRC Press, Taylor & Francis Group, New York.

47 Anumula N. & Sanelli P.C. 2012, 'Hospital Outpatient Prospective Payment System', *Health Care Reform Vignette AJNR* 33, April 2012 pp. 615-616.

48 Calculated by multiplying by the hospital wage index for the hospital location.

- Routine supplies
  - Anaesthesia
  - Operating and recovery room use
  - Implantable medical devices such as pacemakers
  - Guidance services
  - Image processing services, and
  - Intraoperative services<sup>49</sup>.
- **An outlier policy** – To cover atypical cases that encounter costs above the APC payment amount where total service costs exceed the assigned APC payment by a factor of 2.5 times
  - **Discounting** – When multiple significant procedures are performed or when the same ancillary procedure is performed multiple times. For example, surgical rates are subject to discounting when multiple procedures are performed concurrently, with the most expensive APC group paid in full and all others are paid at half of their APC rate.

The APC system includes a number of inbuilt incentives. For example, where associated CPT or HCPCS codes are not provided, items are not paid, thus incentivising hospitals submit complete data, and the bundling and counting rules work to decrease the risk of upcoding.

## 5.2.2 The Adjusted Clinical Groups (ACG) System

### Overview

Adjusted Clinical Groups (ACG) actuarial cells were developed in the late 1970s based on studies of the relationship between morbidity or illness burden and healthcare services utilisation among children in managed care settings. They were developed from evidence that clustering of morbidity is a better predictor of health service resource use than the presence of specific diseases<sup>50</sup>.

The ACG system was developed during the 1980s at the Johns Hopkins University in order to incorporate each patient's cluster of diagnoses into a measure of casemix that could be used in the study of primary care populations<sup>51</sup>. The original ACG system was released in 1990<sup>52</sup>. It was initially developed specifically for primary care use, but has been expanded to include hospital inpatient information.

The ACG System is widely used by researchers and analysts to compare various patient populations' prior health resource use, while taking into account morbidity or illness burden.

The ACG casemix System is reported to be a statistically valid, diagnosis-based, casemix methodology that describes or predicts a population's resource utilisation and costs. ACGs are a person-focused method of classifying illnesses whereby individuals are assigned to a single ACG category as they develop conditions. ACGs are a series of mutually exclusive, health status categories defined by morbidity, age, and sex. They assume the resource level to deliver healthcare is correlated with the illness burden.

49 Medicare Learning Network, *Hospital Outpatient Prospective Payment System, Payment System Fact Sheet Series*, Department of Health and Human Services, Centres for Medicare and Medicaid Services, available <<http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/HospitalOutpaysysfctsht.pdf>>, viewed 23 July 2013.

50 Starfield et al 1985 as in The John Hopkins ACG System 2011, *Technical Reference Guide Version 10.0*, available <[http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb\\_035024.pdf](http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb_035024.pdf)>, viewed 28 July 2013.

51 Starfield et al 1991 as in The John Hopkins ACG System 2011, *Technical Reference Guide Version 10.0*, available <[http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb\\_035024.pdf](http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb_035024.pdf)>, viewed 28 July 2013.

52 Weiner et al 1991 as in The John Hopkins ACG System 2011, *Technical Reference Guide Version 10.0*, available <[http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb\\_035024.pdf](http://www.healthpartners.com/ucm/groups/public/@hp/@public/documents/documents/cntrb_035024.pdf)>, viewed 28 July 2013.

## Structure

Individuals within a given ACG have experienced a similar pattern of morbidity and resource consumption over the course of a given year. The ACG System assigns all ICD (-9,-9-CM,-10) codes to one of 32 diagnosis clusters known as Aggregated Diagnosis Codes (ADG). Individual diseases or conditions are placed into a single ADG cluster based on five clinical dimensions:

- Duration (acute, recurrent, or chronic)
- Severity (eg minor and stable versus major and unstable)
- Diagnostic certainty (symptoms versus documented disease)
- Etiology (infectious, injury, or other)
- Specialty care involvement (eg medical, surgical, obstetric, hematology).

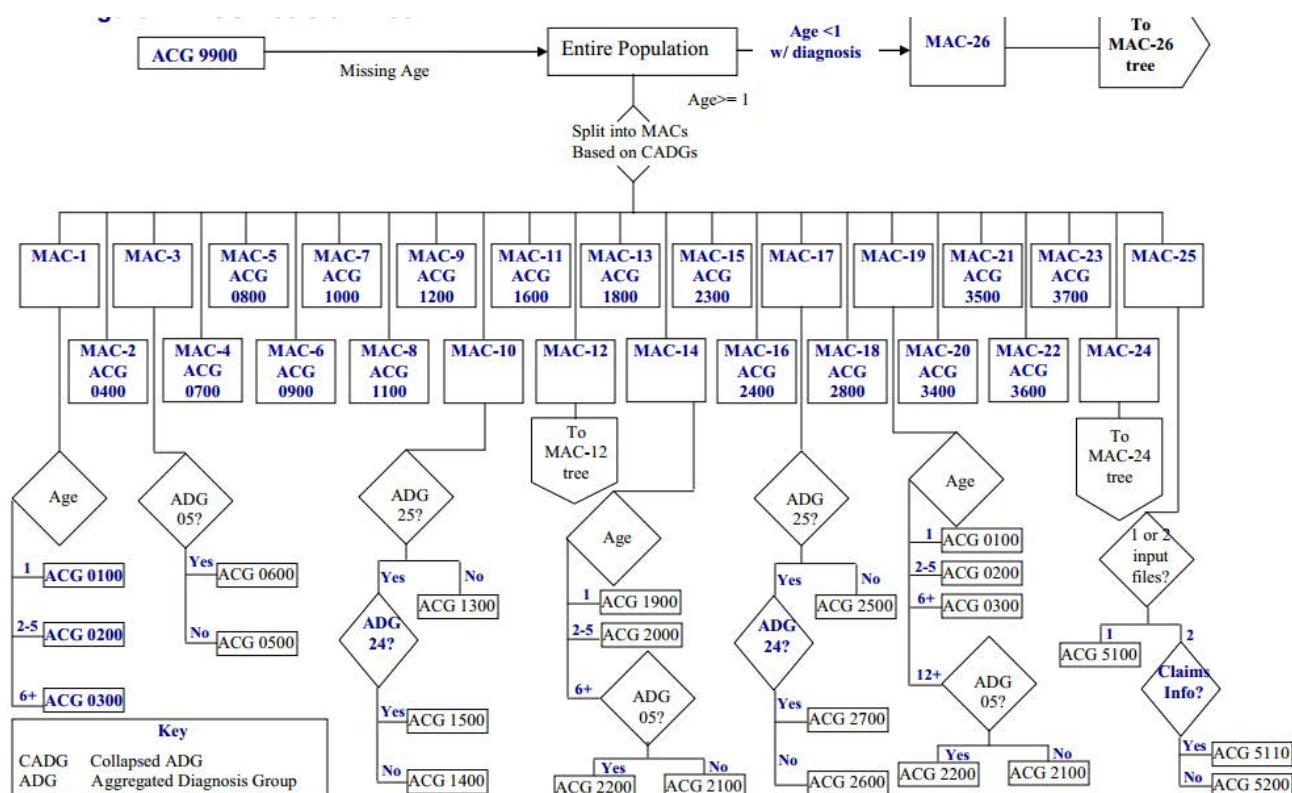
The ACG methodology uses a branching algorithm to place people into mutually exclusive categories using diagnosis, age and gender data.

The first step of the ACG grouping logic is to assign diagnosis codes to one of 32 ADGs. Each ADG contains diagnosis codes that are similar in terms of severity and likelihood of persistence of the health condition treated over a relevant period of time, ADGs are distinguished by several clinical characteristics (time limited or not, medical/specialty/pregnancy, physical health/psycho-social), and degree of refinement of the problem (diagnosis or symptom/sign).

Some ADGs have very high expected resource use and are labelled “Major ADGs”. ADGs are not mutually exclusive – A patient may have up to 32 assigned ADGs (similar to the fact that patients may have several diagnoses).

Second, ADGs are collapsed in to ‘Collapsed ADGs’ (CADGs) which again are not mutually exclusive. That is, an individual can be assigned as many as 12 CADGs. Third, patient CADGs form mutually exclusive categories that occur frequently which become the branches of the ACG hierarchy.

Major Ambulatory Clusters (MACs) form the major branches of the ACG decision tree. The final step in the grouping algorithm divides the MAC branches into terminal groups, the actuarial cells known as ACGs. The logic used to split MACs into ACGs includes a combination of statistical considerations and clinical insight. During the ACG development process, the overarching goal for ACG assignment was to identify groups of individuals with similar needs for healthcare resources who also share similar clinical characteristics. Figure 2 shows the ACG decision tree.

**Figure 2: ACG Decision tree**

Relative resource use weights and broader resource use bands are applied upon assignment of ACG cells.

## Counting

The unit of count for the ACG System is a one year period. The ACGs classify all diagnoses for each individual over a year.

ACGs can be assigned to individuals using available from diagnostic information derived from outpatient or ambulatory physician visit claims records, encounter records, inpatient hospital claims or discharge abstracts. A patient is assigned to a single ACG based on the diagnoses assigned by all clinicians seeing them during all contacts, regardless of setting. Thus ACGs are person-oriented and are not based on visits or episodes.

## Implementation and use in funding

The ACG system is licensed in fourteen countries internationally, and in use in the United States, Canada (Manitoba), Spain, UK for outpatient/primary care. The John Hopkins ACG System bibliography contains over 100 citations from 1990 to 2013<sup>53</sup> in regards to outpatient care; studies investigate resource utilisation, service use and compare providers. Since 2003, international versions have grown in use from a single project in Canada to on-going use in 14 European, Asian, Middle Eastern, and African countries. In addition, numerous pilot and academic projects are underway in other countries.

A key feature of the ACG system is that it supports risk-adjusted capitation payment systems. The reported  $R^2$  in ambulatory and primary care is 0.43 in Canada (Manitoba); 0.38 in Sweden; 0.53 in Spain for GP visits); and 0.54 in the UK (for GP visits).

<sup>53</sup> ACG John Hopkins 2013, *The John Hopkins ACG System Bibliography*, available <<http://acg.jhsph.org/public-docs/AcgBibliography.pdf>>, viewed 28 July 2013.

### 5.2.3 Diagnostic Cost Groups (DCGs)

#### Overview

The Diagnostic Cost Groups (DCGs) were developed in the United States as part of the Principal Inpatient Diagnostic Cost Group (PIPDCG) model for implementation in 2000 to form a health-status based risk adjustment for Medicare capitation payments for managed care plans<sup>54</sup>. Development of this model began in 1989 and in 2000 was used to determine a patient's relative risk factor via DCGs. Diagnosis drives the DCGs, and treatments or procedures are generally excluded.

Originally, the DCG model focused on inpatients with serious illnesses and longer hospital stays<sup>55</sup>. In 2000 it was broadened to include outpatient attendances which significantly improved its ability to predict patient expense. It was renamed the Diagnostic Cost Group, Hierarchical Condition Category (DCG/HCC) model. Since then it has been developed to also include prescription drugs, emergency care, laboratory and radiology services as well as outpatient surgery<sup>56</sup>.

DCGs are owned by DxCG, a division of Urix, Inc. which is a worldwide provider of predictive modelling software for health care.

#### Structure

The patient level risk factor is determined using demographic factors (age, gender, disability status and Medicaid status), principal medical problem (diagnosis). Diagnoses are coded using the ICD; the 15,000 codes were collapsed into 172 Diagnostic Groups (DxGs) in 2000 and by 2007 included 781 groups and 184 broader categories (see Figure 3).

Demographic factors are cited as important predictors of subsequent-year spending, explaining a significant amount of variation of spending unrelated to hospital diagnoses<sup>57</sup>.

ICD diagnosis codes map directly to each DxG. That is, each ICD code has a one-to-one relationship with each DxG. Most patients will have multiple DxGs. Condition Categories are grouped to DxGs of similar resource use. Each DxG maps to only one Condition Category. These are further aggregated to 31 Hierarchical Condition Categories which identify the most costly manifestation of each condition. Patients only have one Condition Code but are likely to have multiple Hierarchical Condition Categories. Figure 3 shows the structure of these components.

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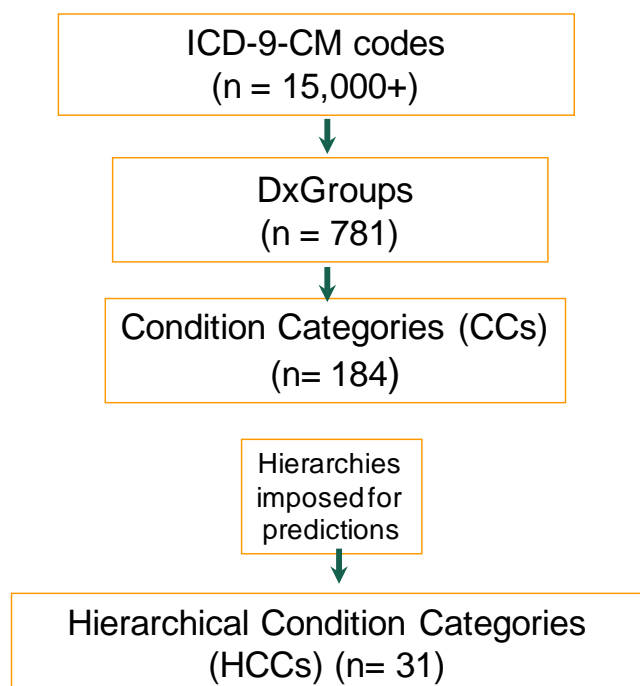
54 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000, 'Principal Inpatient Diagnostic Cost Group Model for Medicare Risk Adjustment', *Health Care Financing Review*, 21 (3), pp. 93-118.

55 *ibid.*

56 Schutt D.C. (MD) & Kelley B. 2007, 'Efficiency Methodology'. Thomson Healthcare.

57 Pope et al. 2000.



**Figure 3: DCG Model**

Assigned Hierarchical Condition Categories are collated to generate a relative risk score for each patient.

### Counting

The patient is the unit of analysis. One year's worth of claims are collated to identify patient-level complexity and co morbidities.

### Implementation and use in funding

The PIP-DCG model is used to risk-adjust a portion of Medicare and Choice capitation payments<sup>58</sup> in the United States. Many other health organisations (over 350) use DCGs for health based payments including in Germany, where the government uses DCGs as the basis for their classification that distributes funding<sup>59</sup>.

A linear multiple regression model predicts future Medicare expenditures. The estimation  $R^2$  of the early PIPDCG model was 6.2% prior to including outpatient attendances. The  $R^2$  of a demographic model without diagnoses was 1.5% which shows the added strength of the diagnosis. Given that the DCG model relies upon the single most predictive diagnosis, it achieves about two-thirds of the performance compared to models using data from all settings and multiple conditions. In 2000, when conditions experienced by patients in their outpatient attendances were included, the  $R^2$  score increased to 11.2%<sup>60</sup>.

Even so, these  $R^2$  results are low in absolute terms (relative to 100 percent) and reflective of prospective risk-adjusted models in general<sup>61</sup>. This indicates that there is considerable variability in medical expenses.

58 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000 (a), *Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment Final Report*, Health Economics Research Inc. available < [http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope\\_2000\\_2.pdf](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope_2000_2.pdf)>, viewed 22 August 2013.

59 Verisk Health 2009, Verisk Health to Present on Predictive Modeling at the 5th Annual World Health Care Congress, available <<http://www.veriskhealth.com/press-releases/verisk-health-present-predictive-modeling-5th-annual-world-health-care-congress>>, viewed 22 August 2013.

60 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000 (a), *Diagnostic Cost Group Hierarchical Condition Category Models for Medicare Risk Adjustment Final Report*, Health Economics Research Inc. available < [http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope\\_2000\\_2.pdf](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/pope_2000_2.pdf)>, viewed 22 August 2013.

61 Pope G.C., Ellis R.P., Ash A.S., Liu C.F., Ayanlan J., Bates D., Burstin H., Iezzoni L. & Ingber M.J. 2000, 'Principal Inpatient Diagnostic Cost Group Model for Medicare Risk Adjustment', *Health Care Financing Review*, 21 (3), pp. 93-118.

Confirming the desirability of broader data, a Dutch study showed that including diagnostic information from prior hospitalisations improves the demographic capitation payment formula to predict future costs<sup>62</sup>.

In their development phase, DCGs require a large sample size to ensure stability and reliability and patients with very high or very low costs are excluded from these samples<sup>63</sup>.

### 5.2.4 Home Health Resource Groups (HHRGs)

#### Overview

Home Health Resource Groups (HHRGs) are used nationally by Medicare to classify 'home health' care, a defined Medicare product. Further, a number of State Medicaid programs and private insurance payers use HHRGs.

HHRGs were developed by the University of Colorado and Abt Associates under multi-year pilot projects and phased in by CMS over 3 years beginning in 1997 with full funding implementation as of 2000 to support Medicare home health reimbursement under prospective payment system (PPS), the equivalent of AFB. The implementation of PPS in home health followed the 1983 DRG implementation for admitted care and a trend of increasing out of hospital care delivery.

The Medicare home health benefit pays for 'skilled' home health care provided by a Medicare certified Home Health Agency (HHA). To be eligible for the home health benefit, the patient must meet three different eligibility criteria:

- Be homebound
- Require intermittent skilled nursing care and/or skilled rehabilitation services
- Be under a physician plan of care that establishes the home health visits are medically necessary.

Where these conditions are met, a patient may first receive a 60-day episode of Medicare coverage for home health visits, and then may be entitled to unlimited 60-day episodes thereafter (so long as the eligibility requirements continue to be satisfied).

Services included in the home care arrangements include:

- Skilled nursing care (such as administering injections, wound care)
- Physical therapy (such as range of motion exercises)
- Occupational therapy (such as activities to restore range of motion loss)
- Speech and language pathology services (such as tasks to restore speech/voice production)
- Medical social work services (such as assessment of the beneficiary's social and emotional factors related to the illness) if part of a plan including nursing or rehabilitation ; and
- Aide services (such as bathing, dressing) if part of a plan including nursing or rehabilitation
- Equipment and resources as provided on a regular outpatient basis<sup>64</sup>.

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62 Lamers LM 1999, 'Risk-adjusted capitation based on the Diagnostic Cost Group Model: an empirical evaluation with health survey information', *Health Serv Res* 33(6), pp. 1727-1744.

63 Schutt D.C. (MD) & Kelley B. 2007, 'Efficiency Methodology'. Thomson Healthcare.

64 Talaga S. 2013, *Medicare Home Health Benefit Primer: Benefit Basics and Issues*, available <<http://www.fas.org/sgp/crs/misc/R42998.pdf>>, viewed 22 July 2013.



## Structure

There are 153 HHRGs available for patient classification<sup>65</sup>. Each HHRG has a unique casemix weight which is used to adjust the base rate reimbursement for an episode of care.

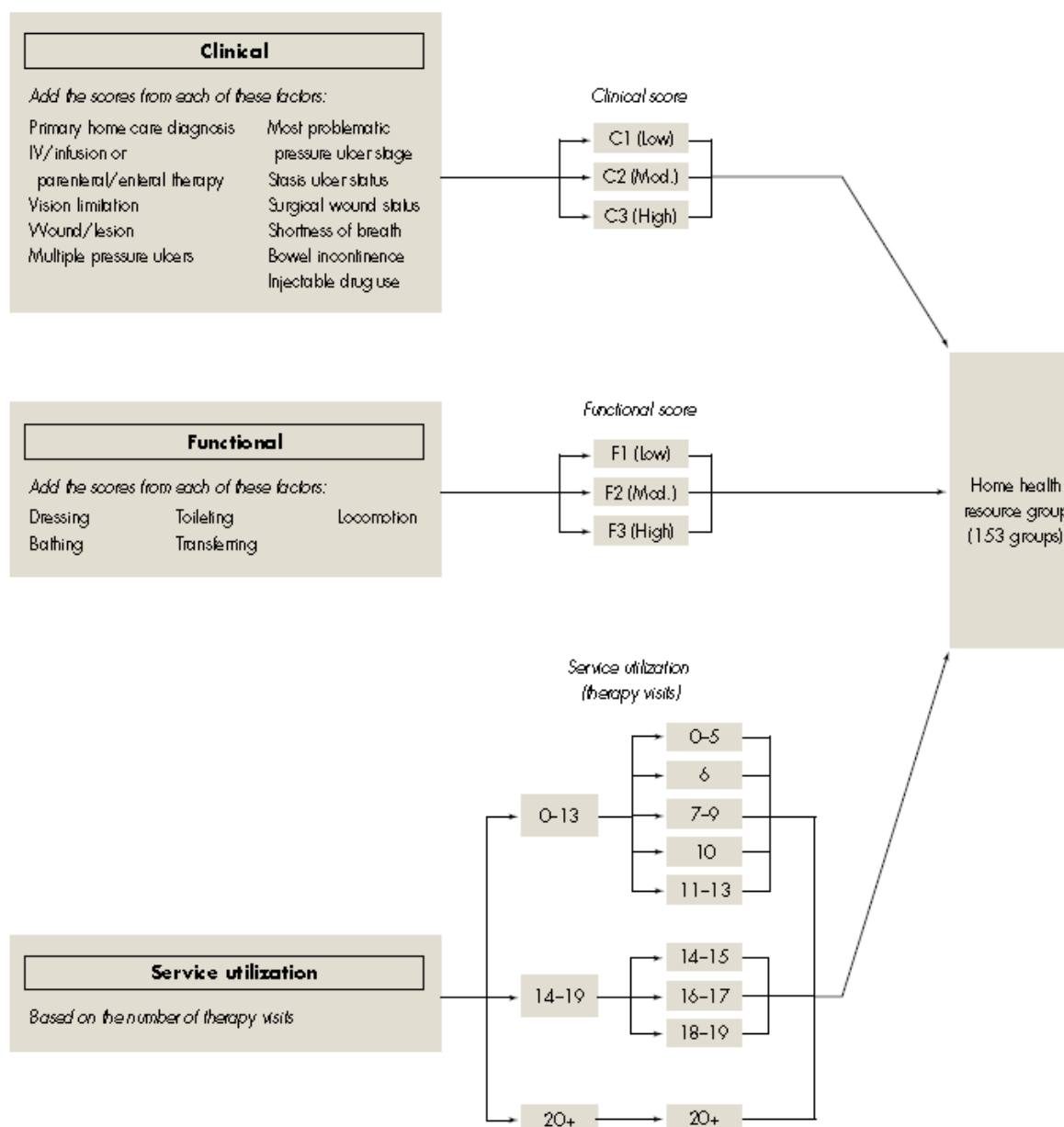
HHRGs are grouped based on three factors measured by the Outcome and Assessment Information Set (OASIS). The OASIS is a mandated clinical assessment tool that establishes eligibility to receive Medicare paid home health services. OASIS data elements encompass a wide range of socio-demographic, environmental, health status, health service utilisation, and functional status characteristics of adult patients:

- **Clinical status**, such as primary home care diagnosis, vision limitations, existence of wounds or lesions, shortness of breath, and use of drugs
- **Functional status**, such as including dressing, bathing, toileting, transferring, and locomotion
- **Service use** as measured by previous number of services.

The OASIS data elements are grouped based on grouper software into an HHRG class. Figure 4 shows this grouper logic for information gathered through OASIS.

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<sup>65</sup> Centres for Medicare and Medicaid Services (CMS) 2013, *Home Health PPS*, available <<http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HomeHealthPPS/index.html?redirect=/homehealthpps/>>, viewed 22 July 2013.

**Figure 4: HHRG classification logic<sup>66</sup>**

## Counting

The unit of count that forms the basis of HHRGs is the 60-day 'episode'.

## Implementation and use in funding

As noted, all Medicare-certified HHAs are required to collect and submit OASIS data to CMS (through designated financial intermediaries). In practice, a nurse or therapist is responsible for collecting the required data element for grouping.

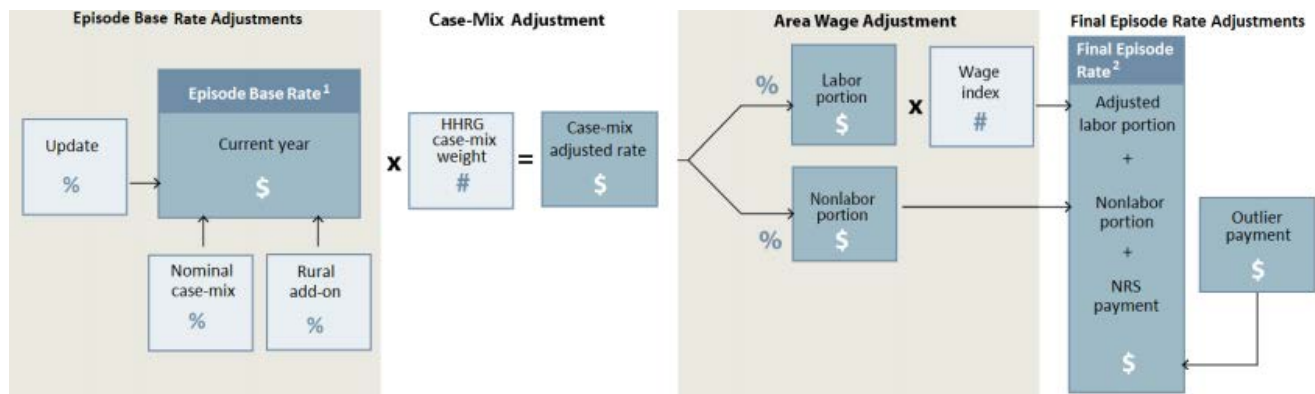
The HHRG funding for 60-day episodes relies on specific funding rules regarding service utilisation and reclassifying for changes in condition, for example for short stay episodes; significant changes in condition within the 60 day episode; or number of rehabilitation visits.

<sup>66</sup> Medpac, Home Health Care Services Payment System, October 2010

Each HHRG has a national relative weight reflecting the average relative costs of patients within each group compared with the average Medicare home health payment. The per-episode payment rate is disaggregated to labour and non-labour portions so as to account for geographical differences in labour costs, judged by the patient's address (rather than the location of the provider, as per the APC system). HHRG payments are adjusted to reflect geographical area differences where services are delivered. Other adjustments for special circumstances, such as high-cost outliers, can also modify the payment. Further, where fewer than 5 visits are delivered during a 60-day episode, the HHA is paid per visit by visit type, rather than by the episode payment method.

The figure below illustrates how HHRGs are used in the funding model for HHAs:

**Figure 5: Home Health prospective payment system, including HHRG casemix weight<sup>67</sup>**



HHRGs provide a way in which to identify severity as they incorporate both clinical and functional characteristics. However, there is concern that casemix under the payment system may be subject to gaming and HHRGs do not adequately capture all the costs of care, some researchers lean towards other severity measures, including risk scores, number of episodes of care, measures of number of chronic conditions<sup>68</sup>.

CMS reports that the national average HHRG casemix index increased by around 13% from 2000 to 2005. The increase suggests that patients are progressively more resource-intensive, and thus more costly services were billed to Medicare. However, while CMS noted that patient characteristics had changed, other studies indicate most of the increase (approximately 12%) in the national average HHRG casemix index was not related to treating more resource-intensive patients<sup>69</sup>. Instead it was more likely related to changes in coding behaviour.

To offset the nominal growth, the episode base rate was reduced by 2.75% for 2008, 2009, and 2010 payments with an additional 2.71% reduction in 2011. In analysing further data, CMS reduced the episode base rate by 1.32% to offset the nominal casemix growth that had increased to 19% between September 2000 and the end of December 2009<sup>70</sup>.

An analysis was commissioned in 2005 to investigate the relationship between casemix and profit or loss margin at a provider agency level. This study found that there is a statistically significant but small ability for casemix to inform margin and concluded that there was limited practical use of this finding at a policy level<sup>71</sup>. The cost data that underpins margins was also identified as potentially being weak because cost reporting is not linked to Medicare payments for Home Health Agencies. It was recommended that a study focusing on the relationship between cost at an episode level and casemix would be a valuable next step and better identify the explanatory power of the classification in relation to associated cost, but no subsequent studies were found during this review.

<sup>67</sup> Talaga S. 2013, *Medicare Home Health Benefit Primer: Benefit Basics and Issues*, available <<http://www.fas.org/sgp/crs/misc/R42998.pdf>>, viewed 22 July 2013.

<sup>68</sup> Goldberg et al. 2011, *Home Health Study Report, Literature review*, Centres for Medicare and Medicaid Services (CMS), available <[http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HomeHealthPPS/downloads/HHPPS\\_LiteratureReview.pdf](http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HomeHealthPPS/downloads/HHPPS_LiteratureReview.pdf)>, viewed 22 July 2013.

<sup>69</sup> Talaga S. 2013, *Medicare Home Health Benefit Primer: Benefit Basics and Issues*, available <<http://www.fas.org/sgp/crs/misc/R42998.pdf>>, viewed 22 July 2013.

<sup>70</sup> Talaga S. 2013, *Medicare Home Health Benefit Primer: Benefit Basics and Issues*, available <<http://www.fas.org/sgp/crs/misc/R42998.pdf>>, viewed 22 July 2013.

<sup>71</sup> Medicare Payment Advisory Commission (Medpac) 2005, *Home Health Agency Case Mix and Financial Performance*, report to Congress, December 2005, Medpac, Washington DC.

## 5.3 England

England's National Health Service (NHS) provides government funded healthcare nationally across the continuum of care. The NHS has developed and implemented a classification system, Healthcare Resource Groups (HRGs).

HRGs<sup>72</sup> classify inpatient and outpatient hospital care and underpin a funding method called Payment by Results (PbR) (what Australia calls Activity Based Funding). As its name indicates, this system intends to pay providers the cost to deliver agreed volumes of care where the cost for service is nationally determined. PbR aims to support a transparent payment methodology and performance management.

Since its beginnings in 2003-04 PbR has evolved in stages. The first local and national prices were developed in 2003-4 and a national cost for all of admitted care in 2005-06. A transition period extending to 2007-08 assisted providers in managing the implementation and impact on services. Services delivered in the outpatient setting were added to the system in 2007. By 2011, PbR represented 60% of all acute care funding. A February 2012 study by PwC indicated a poor explanation of variation in costs between providers.<sup>73</sup>

PbR also funds approximately one third of primary care with the remaining care being funded through separate national contracts and arrangements. 'Read Codes' are a standardised coded thesaurus of primary care focused clinical terms that document the patient pathway in the primary care setting. Read codes have been in use in the NHS since 1985 and are still widely used in the primary care sector. The UK Terminology Centre continues to maintain and distribute Read Code-based products which are updated every three months. Read codes are cross-mapped to the UK mandated procedure codes, the Office of Population Censuses and Surveys Classification of Interventions and Procedures (OPCS-4) and an ICD-10 variant, the ICD -10 Pathology Bounded Code List. As Read Codes are primary care focused, they are overviewed in Appendix B.

### 5.3.1 Healthcare Resource Groups (HRGs)

#### Overview

Healthcare Resource Groups (HRGs) are the classification of healthcare in England that underpin the PbR payment system. The HRG classification comprises standard groupings of clinically similar treatments which use common levels of healthcare resource, forming the main casemix classification used within England's NHS. The National Casemix Office designs and refines classifications as well as associated software that are used by the NHS to classify healthcare activity.<sup>74</sup>

HRGs have evolved since the 1990s. The most recent revision, which was completed in 2007, resulted in HRG version 4 (HRG4). HRG4 groups have been used as the units to derive costing (known as 'reference costs') since April 2007 (for financial year 2006-07 onwards) and for PbR since April 2009 (for financial year 2009 onwards). There was a major revision the HRGs in 2007, HRG4, which incorporates a wider group of clinical professions and services and applies to new care settings, including outpatient care, increasing the number of groups from 650 to over 1,400.<sup>75</sup>

HRGs enable activity comparisons for care within and between different provider organisations, provide an opportunity to benchmark treatments and services to support trend analysis over time and are used to determine payments to providers. Providers use the HRG Grouper to plan, benchmark and communicate results to commissioners as part of their request for payment. Commissioners use the Grouper to assess and validate provider payment claims.

HRGs were developed first for admitted patient care in 2003-04. In 2005-06, 39 outpatient attendance tariffs were established and as of 2007 outpatient care procedures and emergency department care (termed Accident and Emergency care, or A&E) began to be incorporated, beginning with nine tariffs for outpatient procedures and 3 A&E Tariffs in 2013.<sup>76</sup>

<sup>72</sup> HRG's are used in England where as the PbR system and the underpinning OPCS codes are used in the United Kingdom.

<sup>73</sup> An evaluation of the reimbursement system for NHS-funded care: Report for Monitor, PwC, February 2012.

<sup>74</sup> Health & Social Care Information Centre, *National Casemix Office*, available: <<http://www.hscic.gov.uk/casemix>>, accessed 17 July, 2013.

<sup>75</sup> Health & Social Care Information Centre, *Healthcare Resource Groups (HRG4)*, available: <<http://www.hscic.gov.uk/hrg4>>, accessed 17 July, 2013.

<sup>76</sup> National Health Service (NHS) 2011, *A simple guide to Payment by Results*, available <[http://www.ncvo-vol.org.uk/sites/default/files/DH\\_PBR.pdf](http://www.ncvo-vol.org.uk/sites/default/files/DH_PBR.pdf)>, viewed 23 July 2013

Home visits are not included within scope for PbR payments and are considered in the same group as community services which are in scope for planned HRG development in future.

## Structure

HRGs for outpatient attendances draw from patient level data retrieved from NHS patient records. Data elements required for non-admitted consultations at a patient level include age, gender, professional specialty, activity treatment, a flag for first attendance and procedure codes (both primary and other procedures)<sup>77</sup>. HRGs are based on diagnosis and procedure codes (only the procedure codes are used to classify non-admitted patient care):

- International Classification of Diseases tenth revision (ICD-10) for diagnoses – Applicable to both inpatient and non-admitted care
- Office of Population Censuses and Surveys 4 (OPCS-4) for operations, procedures and interventions for which the latest upgrade for OPCS-4, OPCS-4.6, was implemented in April 2011 – Applicable to both inpatient and non-admitted care<sup>78</sup>
- Treatment Function Codes (TFCs) – Described as a ‘sub-specialisation which applies to non-admitted outpatient *attendances* only. TFCs are defined as codes for ‘a division of clinical work based on main specialty, but incorporating approved sub-specialties and treatment’<sup>79</sup> and are mapped to HRGs. In 2011-12 there were 56 TFCs for outpatient attendances that included general surgery, a range of paediatric services, pain management, and imaging. TFCs are not applicable to outpatient *procedures*, which are mapped from OPCS-4 codes to HRGs directly.

This data is submitted by a hospital to the Secondary Uses Service whose role is to group the data to the HRGs (or TFCs, for outpatient attendances).

HRG4 design is governed by the Casemix Design Framework<sup>80</sup>. HRGs are casemix combinations of both diagnoses and procedures that support setting independent service delivery such that a procedure or intervention can be performed across different care settings and the same HRG will be derived regardless of setting<sup>81</sup>.

Current data collection methods for non-admitted care dictate that diagnosis data is not used for classification to HRG outpatient attendances even where recorded by clinicians. This is because diagnosis data collection is not mandated for outpatient care<sup>82</sup> meaning that it cannot be used in this system.

<sup>77</sup> National Health Service (NHS) National Casemix Office, *HRG4 Grouper Reference Manual*, available <<http://www.hscic.gov.uk/CHttpHandler.ashx?id=11481&p=0>>, viewed 24 July 2013.

<sup>78</sup> National Health Service (NHS) 2013, *Payment by Results, Guidance for 2013-14*, available <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/214902/PbR-Guidance-2013-14.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214902/PbR-Guidance-2013-14.pdf)>, viewed 24 July 2013.

<sup>79</sup> Defined by the NHS Data Model and Dictionary as in NHS 2013, *Payment by Results, Guidance for 2013-14*, available <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/214902/PbR-Guidance-2013-14.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214902/PbR-Guidance-2013-14.pdf)>, viewed 24 July 2013.

<sup>80</sup> National Casemix Office 2013, *HRG4 Companion*, available: <[http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4\\_Companion\\_v3.pdf](http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4_Companion_v3.pdf)>, accessed 18 July, 2013.

<sup>81</sup> However, the setting agnostic rule applies for procedure based HRGs only (including outpatient services) and does not apply to diagnosis HRGs.

<sup>82</sup> National Casemix Office 2013, *HRG4 Companion*, available: <[http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4\\_Companion\\_v3.pdf](http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4_Companion_v3.pdf)>, accessed 18 July, 2013.

The HRG4 structure is comprised of clinically meaningful sections called 'chapters' and 'subchapters'. These are based on body systems following variable logic<sup>83</sup>. Non-admitted *attendances* sit in sub-chapter, 'WF'. In turn, this sub-chapter sits within 'W – Immunology, infectious diseases and other contacts with health services' which contains interventions not covered in earlier chapters. Because HRG4 is designed to be setting-independent, where a *procedure* occurs in an outpatient setting, it receives the same HRG for inpatient care and would not receive a 'WF' HRG classification.

The HRG4 Grouper performs validation checks, based on an algorithm and assigns an HRG based on data from the patient medical record and produces output files which contain the original input data along with the assigned HRGs<sup>84</sup>.

The HRG grouping logic classifies patient data based on the complexity of procedure, following a cascading set of procedure hierarchies, ie if there is no significant procedure performed; patients are then assigned to a HRG based on diagnosis. Procedure hierarchies provide the procedure complexity *across* all HRG4 chapters and sub-chapters.

- Procedures are assigned a value between 0 and 15 and where a single procedure for a patient is equal to or greater than 5, it will be used for grouping
- If more than one procedure is recorded the grouper selects the dominant procedure based on the hierarchy value
- If equal, the earliest recorded of the highest ranking procedures drives grouping
- Non-admitted consultations sit in a distinct category within the hierarchy and procedures assigned a 0-2 value are either not within grouping scope because of their low resource intensity, or are unbundled components that can be added to an HRG4 for a payment later in the PbR process
- Where data describing underlying procedure is not recorded for non-admitted patients and where procedures are not carried out, the associated HRG4 classification is to one of two 'global' Non-Admitted HRGs. This is unique in HRG classification to non-admitted care.

Procedure hierarchies are described in Table 8.

**Table 8: Procedures hierarchy for considering the relative resource use across HRG Chapters<sup>85</sup>**

Value	Procedures Hierarchy	Description
0	Procedures that cannot be used for grouping	OPCS codes not valid for grouping (eg approach codes)
1	Procedures that cannot be used for grouping	Non-operative procedures with minimal resource (eg administering an injection)
2	Procedures that cannot be used for grouping	Procedures that will generate unbundled HRG(s). Procedure hierarchies are not used to determine unbundled HRGs so every instance of a procedure generates an unbundled HRG. This hierarchy value is used only for completeness
3-4	Non-admitted consultations	Procedures relating to subchapter WF, Non-admitted Consultations
5-15	Scale of relative resource use	Within this range, 5 represents least relative resource use and

<sup>83</sup> National Health Service (NHS) 2011, *A simple guide to Payment by Results*, available <[http://www.ncvo-vol.org.uk/sites/default/files/DH\\_PBR.pdf](http://www.ncvo-vol.org.uk/sites/default/files/DH_PBR.pdf)>, viewed 23 July 2013.

<sup>84</sup> Health & Social Care Information Centre, *Healthcare Resource Groups (HRG4)*, available: <<http://www.hscic.gov.uk/hrg4>>, accessed 17 July, 2013.

<sup>85</sup> National Casemix Office, *HRG4 Companion*, available: <[http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4\\_Companion\\_v3.pdf](http://www.hscic.gov.uk/media/11488/HRG4-Companion/pdf/HRG4_Companion_v3.pdf)>, accessed 18 July, 2013.

Note: In the absence of procedures, or where the only procedure(s) has a hierarchy value of 1, the grouper will switch to using diagnosis to determine the HRG (through diagnosis hierarchies), noting that this step is not taken for non-admitted care classification. This also means that complication and co morbidity splits in the grouper do not apply to non-admitted care. The diagnosis hierarchies have not been included in this review as they are not relevant to HRGs for non-admitted care.

Value	Procedures Hierarchy	Description
		15 represents most resource intensive procedures

Patient data can be grouped at both a local and national level for some procedures however the national Secondary Uses Service serves to benchmark and report results to commissioners.

As groups contain clinically similar treatments that use common levels of resource, HRGs represent bundled care, however, the recent HRG4 includes the ability to 'unbundle'. Where previous HRG versions derived a single HRG per episode, HRG4 incorporates the ability to add other unbundled components of care as separate HRGs.

This unbundling was in response from providers concerns regarding costs of existing care delivery patterns (and therefore raises questions regarding HRGs use in driving efficiency). This development was based on the generally high cost unbundled elements representing activity and costs by:

- Identifying specialist services to ensure funding for priority areas
- Supporting service redesign (eg locally commissioned rehabilitation)
- Supporting separate elements of the care pathway to be delivered by different providers.

The grouper ignores unbundled components when deriving the core HRG. The impact of unbundling is that a record will be assigned more than one HRG if it includes unbundled elements. The 'Unbundled components' become an HRG in their own right as additions to a core HRG. Unbundled elements are available for:

- Chemotherapy – Procurement and delivery
- Radiotherapy – Planning and delivery
- Diagnostic Imaging
- Rehabilitation
- Renal Dialysis
- Critical Care
- Specialist Palliative Care
- High cost drugs<sup>86</sup>.

If the case arises that all procedures are unbundled, all procedures are allocated one of the eight unbundled elements in HRG classifications.

Multidisciplinary care is defined as multiple providers present with the patient, providing care simultaneously. Multidisciplinary care does not include meetings about the patient (without their presence) nor does it include sequential appointments, which are intended to be counted as unique attendances. Multidisciplinary care must be evidenced in clinical notes, or other documentation to be grouped and costed accordingly.

## Counting

For non-admitted care, the unit of count is the outpatient 'attendance', noting that an attendance may include multiple outpatient procedures. Unbundled service components are counted and classified as HRGs at a procedure level<sup>87</sup>.

<sup>86</sup> National Health Service (NHS) 2009, *Guide to unbundling*, available <http://www.mstrust.org.uk/competencies/downloads/guide%20to%20unbundling.pdf>, viewed 24 July 2013.



One of the fundamental features of the PbR is its unit of count, termed a 'currency'. Units of count take a number of forms to suit the care to which they are aligned. HRGs set the unit of count depending on the care type – As such, they are not consistent between admitted, or emergency care. Units of count include:

- An 'attendance', for non-admitted care in a clinic
- An 'episode', (termed a 'spell') of care in admitted patient care which is based on the period between admission to discharge (or death)
- A 'per diem', unit for specialist rehabilitation <sup>88</sup>
- A 'year of care', for long term conditions <sup>89</sup>.

For payment purposes, where a patient has multiple distinct outpatient attendances (and/or procedures) on the same day then each attendance is counted and classified separately and may subsequently attract a separate payment. Payments are applicable only to pre-booked, consultant (doctor) led attendances.

If multiple outpatient procedures are undertaken in a single outpatient attendance, the HRG will be based on the same logic as used in admitted patient care (that is, based on the procedure that is ranked highest in the grouping hierarchy), and only one HRG will be payable.

### Implementation and use in funding

HRG4 has been used to inform reference costs from the 2006 financial year and for PbR since April from the 2009 financial year. The components used to determine costs and prices are:

- **Reference costs**, which are the average costs of services that are reported by a sample of 400 NHS providers on an annual basis. HRGs form the units for *reference costs*
- **Tariffs (price)**. *Reference costs* form the basis of *tariff* prices, but the actual relationship between these two components is determined by government bodies (the NH S Commissioning Board and Monitor)
- **Various adjustments**. National *tariffs* are also published on an annual basis. Adjustments include Market Forces Factors (MMFs). *MMFs* are unique to each provider and reflect the fact the cost differential for service provision across England.

The process to assign a reference cost and following that, a payment is that, subsequent to the grouper classifying patient data to a HRG (and a TFC for outpatient attendances), non-admitted care is assigned a payment according to the flow charts contained in Figure 7 and Figure 8 below depending on whether the care provided is an outpatient procedure or attendance where there can be multiple procedures conducted in one attendance.

These figures show that assigned payments are based on national tariffs but also incorporate various adjustment factors that are unique to local circumstances. The national tariff associated to a HRG is multiplied by a nationally determined MFF. There may also be other adjustments to the tariff for long or short stays, for specialised services, or to support particular policy goals<sup>90</sup>. For the small portion of non-admitted care where classified outpatient attendances are not linked to a national tariff, the price is negotiated locally between commissioners and providers.

There is no national tariff for non-consultant led outpatient clinics. The NHS Data Model and Dictionary states that 'all non-consultant led activity is identified in the admitted patient care by a pseudo main speciality code for midwives, nurses and allied health professionals'. Prices for these services are encouraged to be set locally.

87 National Health Service (NHS) 2009, *Guide to unbundling*, available <<http://www.mstrust.org.uk/competencies/downloads/guide%20to%20unbundling.pdf>>, viewed 24 July 2013.

88 National Health Service (NHS) 2013, *Payment by Results, Guidance for 2013-14*, available <[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/214902/PbR-Guidance-2013-14.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214902/PbR-Guidance-2013-14.pdf)>, viewed 24 July 2013.

89 National Health Service (NHS) 2011, *A simple guide to Payment by Results*, available <[http://www.ncvo-vol.org.uk/sites/default/files/DH\\_PBR.pdf](http://www.ncvo-vol.org.uk/sites/default/files/DH_PBR.pdf)>, viewed 23 July 2013.

90 National Health Service (NHS) 2011, *A simple guide to Payment by Results*, available <[http://www.ncvo-vol.org.uk/sites/default/files/DH\\_PBR.pdf](http://www.ncvo-vol.org.uk/sites/default/files/DH_PBR.pdf)>, viewed 23 July 2013.

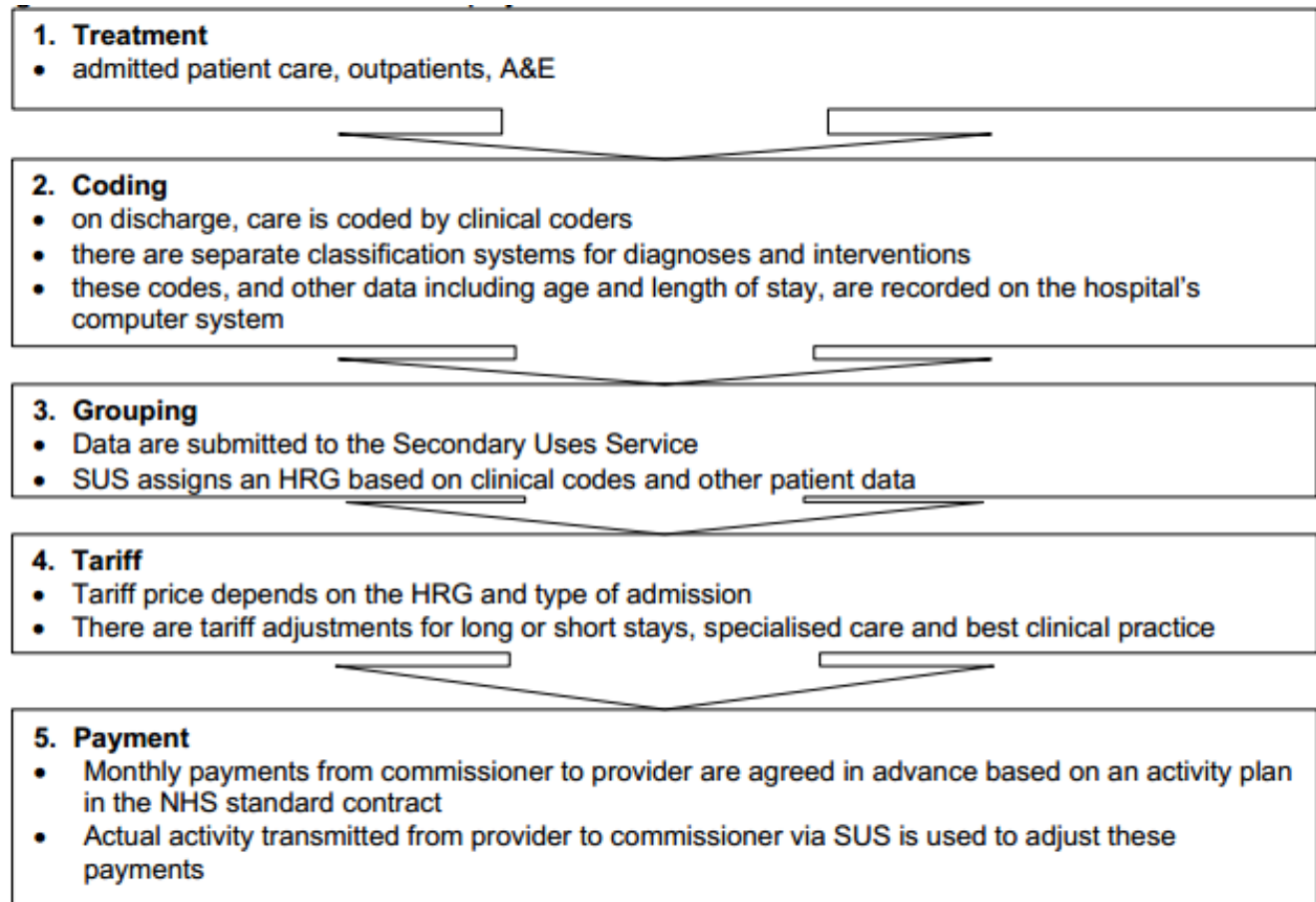


The exception to this approach is for maternity services in an outpatient setting, where all maternity activity (both consultant led care and midwife led care) is included in the tariff.

Final payments are made to providers on a monthly basis according to an agreed level of care determined through advanced planning in contracts with the NHS.

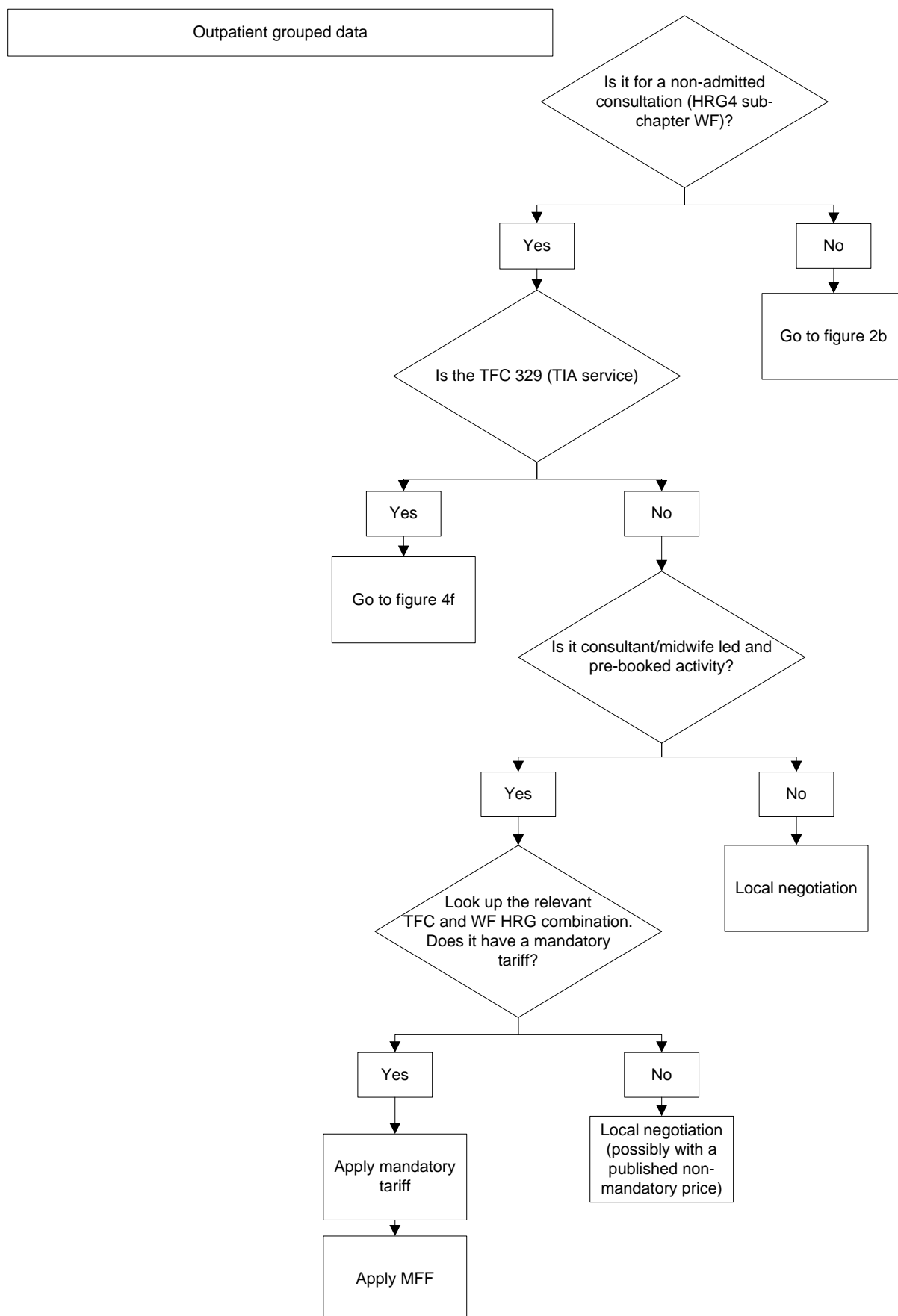
The figure below identifies where the HRG classification sits amongst the broader PbR lifecycle.

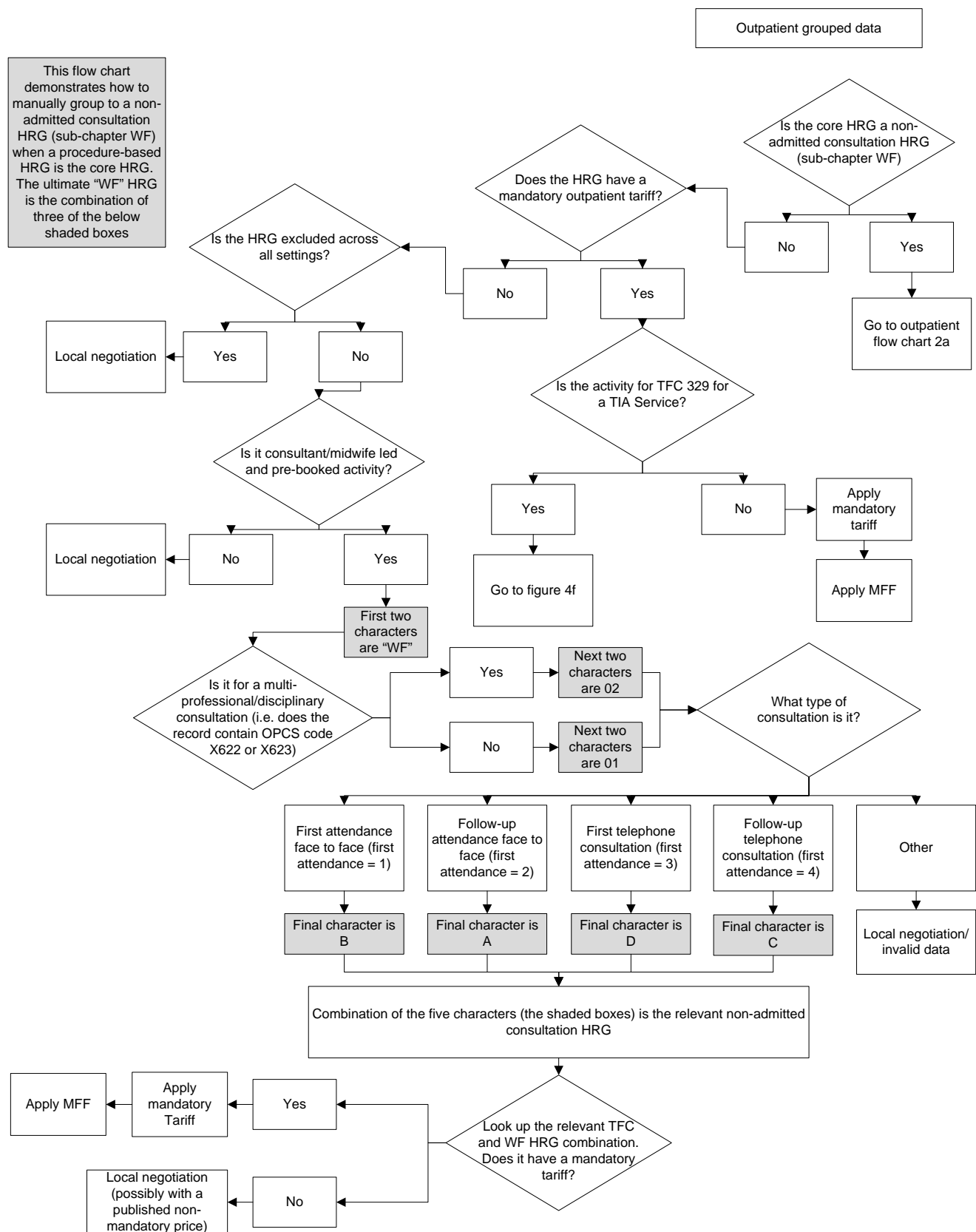
**Figure 6: The PbR lifecycle** <sup>91</sup>



<sup>91</sup> National Health Service (NHS) 2011, A simple guide to Payment by Results, available <[http://www.ncvo-vol.org.uk/sites/default/files/DH\\_PBR.pdf](http://www.ncvo-vol.org.uk/sites/default/files/DH_PBR.pdf)>, viewed 23 July 2013.

**Figure 7: Outpatient attendances (outpatient flow chart 2a)**



**Figure 8: Outpatient procedures (and determining appropriate attendance) (outpatient patient flowchart 2b)**

A broad analysis of the factors that explain HRG cost variation shows that there is substantial deviation between reported costs and the national average unit cost of over 50% in many HRGs. In all, 30% of reported

costs deviated from the national average by 50%<sup>92</sup>. Variation compared to locally reported costs may be due to differences in efficiency, complexity of patient treatments (casemix), other external cost factors, and differences in approaches to coding and costing. Investigating these reasons will be important to better understand, to improve the confidence in, and reliability of the information collected from providers. This study demonstrated high variability between providers and by specialty (from 0.12 for Geriatrics to 0.510 for Obstetrics).

If local costs informed by local patient-level costing systems are aggregated, they are higher than the national Reference Costs. Whilst this analysis does not draw out non-admitted patient care specifically, it shows that that key factors impacting cost variation include:

- Average length of stay, which explains around 25% of cost variation in HRGs
- When considering patient-level costing data, co-morbidities and patient age drive cost variation, but HRGs have more explanatory power than either of these alone and combined
- That MFF, combined with the HRGs contributes to explaining cost variation but is far less powerful than explaining cost variation on its own.

This study also identified that DRGs have good explanatory power but that variation in results is driven by patient characteristics, which is contrary to the findings based on patient level data using HRGs that show HRG to be a more powerful explanatory tool than patient characteristics (such as age and co-morbidities) to explain cost variation.

## 5.4 Ireland

### 5.4.1 Tier 2 Adaptation

The Irish adaptation of Tier 2 is used across hospitals providing non-admitted care. In 2007, the Australian Tier 2 list of clinics was adopted and adjusted to classify non-admitted care in Ireland. Currently the Tier 2 adaptation includes part of the original Tier 2 clinic list combined with specialty clinics specific to the Irish context, totalling 108 clinics. Definitions of data elements and service count measures were finalised in 2013.

The Irish adaptation of Tier 2 is used to classify non-admitted services, and social care provided in acute hospitals, community hospitals, district hospitals, health centres, dental clinics, GP surgeries and home care. Inclusions and exclusions are provided in Table 9.

**Table 9: Inclusions and exclusions for outpatient services and clinics<sup>93</sup>**

Inclusions	Exclusions
<ul style="list-style-type: none"> <li>• Consultant-led clinics</li> <li>• Nurse and allied health-led clinics</li> <li>• Diagnostic clinics</li> <li>• Procedure clinics</li> <li>• Acute Medical Assessment review clinics</li> <li>• Specified day centres (eg diabetic)</li> </ul>	<ul style="list-style-type: none"> <li>• ED first attendance</li> <li>• ED review</li> <li>• Acute Medical Assessment Unit first visit</li> <li>• Inpatient admissions</li> <li>• Day case admissions</li> <li>• Day hospitals.</li> </ul>

### Structure

The classification is structured as a list of clinics that are assigned based on the clinic which the patient attends. Outpatient clinics are split into four main categories:

- Procedure clinics

<sup>92</sup> PricewaterhouseCoopers (PwC) 2012, *An evaluation of the reimbursement system for NHS-funded care Appendices*, report for Monitor, PwC, United Kingdom.

<sup>93</sup> Outpatient Services Performance Improvement Programme 2013, *Definitions for Use in the Management of Outpatient Services*, received during personal communication with Luke van Doorn, Laeta Consulting.

- Medical consultation clinics
- Standalone diagnostic clinics
- Allied health/clinical nurse specialist clinics.

Services are split by the type of health professional 'leading' the service:

- Consultant-led outpatient services which includes,
  - Consultant-led medical delivered
  - Consultant-led nurse delivered
  - Consultant led-allied health delivered.
- Allied health-led outpatient services
- Nurse-led outpatient services.

### Counting

Units of count include both:

- 1 Service events
- 2 Outpatient episodes of care, defined as 'a period of care for a specific healthcare problem or condition' that may:
  - Be continuous
  - May consist of a series of intervals marked by one or more brief separations. An episode of care is initiated with an initial assessment and acceptance by the organisation and is usually completed with discharge or appropriate referral. Where the requirement for care occurs in 28 days or less, the previous episode of care may continue at the clinician's discretion<sup>94</sup>.

Episodes of care are commenced with an initial assessment and acceptance by the organisation and are usually completed with discharge or appropriate referral<sup>95</sup>.

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<sup>94</sup> Outpatient Services Performance Improvement Programme 2013, *Definitions for Use in the Management of Outpatient Services*, received during personal communication with Luke van Doorn, Laeta Consulting

<sup>95</sup> Outpatient Services Performance Improvement Programme 2013, *Definitions for Use in the Management of Outpatient Services*, received during personal communication with Luke van Doorn, Laeta Consulting.

Multidisciplinary care is identified via a 'Clinic Delivery Mode' flag. The descriptors and rules regarding multidisciplinary are:

- **Standard clinics** – As those typically comprising a clinician and direct team who provide a clinic in the main service-provider campus
- **Shared clinics** – As those where two or more clinicians see patients from a common waiting list during the same time
- **Joint clinics** – As those that comprise two or more consultants from different specialties that provide care to patients within certain diagnostic categories during the same time period.

### Implementation and use in funding

Patient level costing is being conducted across Ireland to inform development of service weights. Currently costing data is reported at both patient level and aggregate level.

## 5.5 New Zealand

### 5.5.1 National Non-Admitted Patient Collection (NNPAC)

#### Overview

New Zealand's National Non-Admitted Patient Collection (NNPAC) is a dataset that stores information about non-admitted secondary care events, including outpatient and emergency department visits in public hospitals. NNPAC was implemented in July 2006 and contains data from 2005. It allows regional government health funders (the New Zealand Ministry of Health and District Health Boards (DHBs)) to monitor outpatient activity and ensure that appropriate remuneration for service is provided to DHBs.

As well as informing funding allocations and policy, the main purposes of the NNPAC are to monitor non-admitted patient events, analyse service flows between regions and monitor policy impacts<sup>96</sup>.

NZ's national approach to outpatient data collection provides consistent information about outpatient activity, however there is no information on associated costs, diagnoses or procedures or relative weights. Data collection is compulsory for local DHBs and is subsequently aggregated and coded centrally.

Services taking place outside hospital relevant to scope may include:

- Public/private/psychiatric hospital
- Private Residence
- Residential Care
- Marae (provides culturally appropriate out of hospital health and social services to the indigenous community)
- Primary or other community care
- Other Institution.

#### Structure

All records are required to have a valid National Health Index number. The NNPAC data model includes 16 dimensions that relate to patient characteristics, clinician health specialty and service interventions<sup>97</sup>. However,

<sup>96</sup> Statistics New Zealand 2013, *Measuring government sector productivity in New Zealand a feasibility study*, available <[http://www.stats.govt.nz/browse\\_for\\_stats/economic\\_indicators/productivity/measuring-govt-productivity/8-data-availability-health-care.aspx](http://www.stats.govt.nz/browse_for_stats/economic_indicators/productivity/measuring-govt-productivity/8-data-availability-health-care.aspx)>, viewed 24 July 2013.

<sup>97</sup> National Health Board Business Unit 2012, *Non-admitted Patients Collection File Specification*. Wellington: Ministry of Health.

dimensions do not include procedure or diagnosis information at this point in time. Table 10 shows all NNPAC data model dimensions.

**Table 10: NNPAC data model dimensions**

Dimension type	Dimension
Patient characteristic	<ul style="list-style-type: none"> <li>• Health care user details</li> <li>• Age band</li> <li>• Affiliation.</li> </ul>
Clinician	<ul style="list-style-type: none"> <li>• Health speciality.</li> </ul>
Service/procedure/intervention	<ul style="list-style-type: none"> <li>• Triage level</li> <li>• Purchaser code</li> <li>• Purchase unit (type of contract under which the event is funded, assists to associate a price to the event)</li> <li>• Service facility</li> <li>• Location</li> <li>• Geography.</li> <li>• Geography sent</li> <li>• Time of service</li> <li>• Date of service</li> <li>• Event date</li> <li>• Event end</li> <li>• Funding agency</li> </ul>

The NNPAC data is sourced from various DHB management systems and is processed by NZ's National Collections and Reporting. In the case where one provider has multiple source systems, multiple files can be accepted at one time with each source system having a unique identifier.

### Counting

The NNPAC's unit of count is an 'event-based' unit that relate s to medical and surgical outpatient events and emergency department events collected by DHB s. Data is limited to event data only as described in Table 10 and does not include information on diagnosis or procedure.

### Implementation and use in funding

In New Zealand, outpatient and emergency department activity is funded through contracts, District Annual Plans, between districts and the Ministry of Health. Each district negotiates its own District Annual Plans with the Ministry of Health. Activity volume, along with the price, is set out in the District Annual Plans within the Price Volume Schedule. This schedule includes adjusters designed to modify the turnout prices in the case of less or more activity being carried out.

Activities are not priced at a national level; price negotiation takes place on a local basis. Services are funded on their negotiated planned activity.

The Ministry of Health reports there are some problems with NNPAC data comprehensiveness. Planned NNPAC development includes adding diagnostic and procedure details to the dataset and design rules to better enable cross-validation between data elements to signal errors.

## 5.6 3M

3M, a multinational diversified technology company, has developed a number of proprietary health system classifications over the past 20 years. 3M delivers solutions in over 20 countries for coding, classification, grouping and performance management software and associated consulting services

In 1990 3M was commissioned by the US Centers for Medicare and Medicaid Services (CMS) to develop an outpatient classification system for Medicare, the Ambulatory Patient Groups (APGs). As previously discussed, Medicare further developed APGs into the APC classification currently in use. However, APGs and their subsequent revision to Enhanced Ambulatory Patient Groups (EAPGs) have been purchased by and are in current use by a number of state-based Medicaid programs across the US.

The two 3M classifications relevant to non-admitted care are:

- Enhanced Ambulatory Patient Groups (EAPGs) – Focus on the outpatient hospital setting, covering day surgery units, emergency care and outpatient clinics
- International Refined DRGs (IR-DRGs) – Which classify patients across the continuum of care, including inpatient, outpatient, ED, clinics and rehabilitation.

### 5.6.1 *Enhanced Ambulatory Patient Groups (EAPGs)*

#### **Overview**

As described above, APGs, EAPGs and associated payment systems are linked by historical developments. The APGs were originally designed by 3M to support a US Medicare Outpatient Prospective Payment System (OPPS). APGs cover same day surgery units, emergency care and outpatient clinics. They include telehealth, home visits and physician visits, but are not inclusive of nursing home services. The latest version (version 3.0) incorporates visits at home, conducted through the internet, face to face or in a hospital outpatient clinic. It also accounts for the increasing interest in short-term episodes of illness defined as episodes of illness that last fewer than three months<sup>98</sup>.

Following development of EAPGs in 2007 with the purpose to better describe a patient group that is broader than the Medicare (over 65 years old) population, both the New York State Department of Health and the State of Maryland have adopted EAPGs into their payment methodologies and weights for their state-wide Medicaid programs.

The APG classification system for outpatients aims to explain the resources used in an outpatient visit, focusing on differentiating between facility costs and professional costs. APGs group patients with similar clinical characteristics and requiring similar resource use, ie the costs for provision of services under each group will have similar costs, which are based on the cost averages by APG. It allows for homogeneity for comparable services across ambulatory care settings, such as outpatient departments, ambulatory surgery, emergency departments and diagnostic and treatment centres.

Current EAPG uptake across the USA outside of New York state includes:

- Maryland state hospitals
- Oklahoma in 2009
- Virginia Medicaid in 2010
- Iowa in 2010
- South Dakota in 2010.

Further announcements of uptake in 2013 have been:

- Virginia Medicaid – Hospitals
- Illinois Medicaid

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<sup>98</sup> Goldfield N. et al 2008, 'Ambulatory Patient Groups Version 3.0 – A classification System for Payment of Ambulatory Visits', *Journal of Ambulatory Care Management*, 31(1) pp. 2-16.



- Wisconsin Medicaid<sup>99</sup>.

### Structure

EAPGs are underpinned by ICD-9-CM diagnosis codes and CPT/HCPCS codes (levels 1 and 2). CPT/HCPCS codes are detailed further in Appendix A.

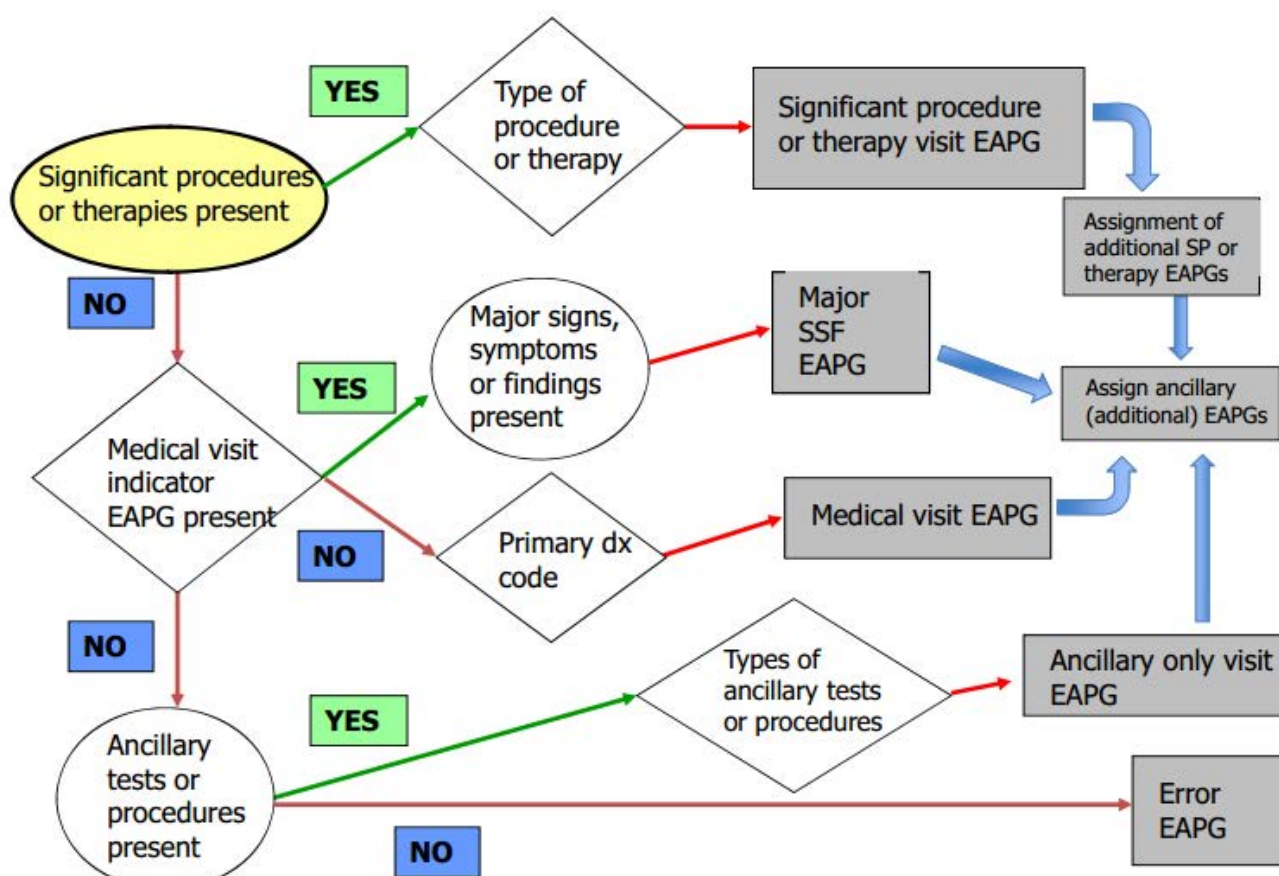
The EAPG classification structure comprises:

- Three levels of procedure
  - **Significant procedures** – Usually scheduled and constituted as the main reason of the visit, if one of multiple, the procedure that consumes the majority of time and resources
  - **Ancillary tests and procedures** – Generally ordered by the primary physician to assist in patient diagnosis or treatment
  - **Incidental procedures** – Part of a medical visit, associated with professional services.
- **Medical EAPGs** – Patients who receive medical treatment but do not have a significant procedure performed during the visit
- **Per diems/partial hospitalisation** – Applying to half day or full day mental health or substance abuse treatment.

The logic that the Grouper follows to classify patient data to procedure EAPGs is provided in Figure 9.

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<sup>99</sup> Washington State Hospital Association, *Medicaid Inpatient and Outpatient Rebased for Prospective Payment Hospitals*, available <[http://www.wsha.org/files/64/WSHA\\_Rebasing\\_Task\\_Force\\_-\\_12.19.pdf](http://www.wsha.org/files/64/WSHA_Rebasing_Task_Force_-_12.19.pdf)>. viewed 24 July 2013.

Figure 9: EAPG logic<sup>100</sup>

## Counting

The EAPG counts each procedure being assigned a code (and associated weights). EAPGs form the building blocks to a 'visit'. There may be multiple APGs associated with a visit, depending on the services provided<sup>101</sup>.

## Implementation and use in funding

The EAPG grouper collates the multiple APG s associated with patient visit and assigns them to payment units. The following diagram summarises how this operates in a practical sense.

Figure 10: Logical functions within EAPG products<sup>102</sup>

Three grouping/funding rule techniques are used with APG payment systems (together these aim to minimise the risk of perverse incentives). These are:

- **Packaging** – For **ancillary services**. Only relatively inexpensive and low cost ancillaries are packaged so as not to expose providers to risk where multiple high cost ancillary services are required for a patient. Basic ancillary tests are often packaged

100 Fee D, 3M Health Information Systems inc. 2008, *3M Enhanced Ambulatory Patient Groups (EAPGs)*, 3M Health Information Systems inc., available: <[http://solutions.3m.com/3MContentRetrievalAPI/BlobServlet?locale=en\\_US&lmd=1235751572000&assetId=1180610409415&assetType=MMM\\_Image&blobAttribute=ImageFile](http://solutions.3m.com/3MContentRetrievalAPI/BlobServlet?locale=en_US&lmd=1235751572000&assetId=1180610409415&assetType=MMM_Image&blobAttribute=ImageFile)>, accessed 17 July 2013.

101 State of New York Department of Health 2012, *Policy and Billing Guidance Ambulatory Patient Groups (APGs) Provider Manual Revision 2.1 August 2012*, Department of Health, New York

102 Goldfield N. et al 2008, 'Ambulatory Patient Groups Version 3.0 – A classification System for Payment of Ambulatory Visits', *Journal of Ambulatory Care Management*, 31(1) pp. 2-16.

- **Consolidating** – For **significant procedures**. Multiple related significant procedure EAPGs are collapsed into a single EAPG for the purpose of payment. This incentivises care providers to deliver patients the most efficient care possible. In some instances efficiencies are gained by providing a package of services at once. It also minimises the incentive to split services in order to classify a higher volume of service counts. Multiple unrelated significant procedures performed during one visit are not packaged together
- **Discounting** – For **multiple unrelated significant procedures or multiple of the same ancillary services**. This aims to provide a financial incentive to avoid providing the same service multiple times and is applied in the absence of consolidation.

The APG grouping technique is flexible to variable applications of funding rules around the unit of count (visit), eg in the New York state Medicaid Program, two policies are used for payment purposes and the Grouper recognises both. Payments made on a 'visit' or an 'episode' basis. As already defined, a 'visit' is the unit of service which comprises all APG services for a patient, sharing a common date of service and any packaging, consolidation or discounting must occur on the same date of service.

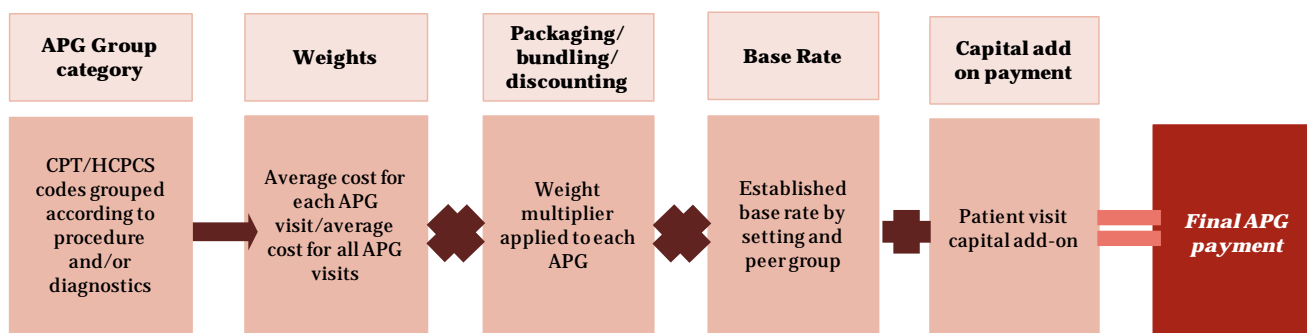
From 2011, the EAPG grouper was updated to enable the ability to pay by an 'episode', where the grouping elements of packaging, consolidation and discounting are applied one claim irrespective of dates conducted. Under episode billing an episode shall consist of all medical visits and or procedures that are provided by a clinic to a patient on a single date of service plus any associated non -carved out ancillary laboratory radiology services, regardless of the date.

**Table 11: Primary differences between visit and episode payment groupings<sup>103</sup>**

Visit grouping	Episode grouping
<ul style="list-style-type: none"> <li>• Multiple visit (ie medical visits and/or significant procedures with different dates of service, plus associated ancillaries) may be reported on a claim</li> <li>• Providers must reassign dates of ancillary lab and radiology services at the line level to correspond to date of medical visit or significant procedure visit that generated the order for the ancillary service</li> <li>• Grouper/pricer applies APG logic to all services and procedures with the same date of service.</li> </ul>	<ul style="list-style-type: none"> <li>• Only one episode of care may be reported on a claim</li> <li>• Providers must include a 'from' and 'to' date in the claim header to reflect the episode of care</li> <li>• Providers report the actual dates of service for all procedures which are part of the episode of care at the line level (any medical visit/significant procedures on the same date of service and associated lab and radiology services on or after that date service)</li> <li>• Grouper/pricer applies APG logic to all services and procedures included on the claim, irrespective of service dates.</li> </ul>

The specific New York payment methodology dictates that the APG code, with other relevant values and rates to establish a final APG payment as per Figure 11.

**Figure 11: APG Payment Calculation Overview<sup>104</sup>**



<sup>103</sup>State of New York Department of Health 2012, *Policy and Billing Guidance Ambulatory Patient Groups (APGs) Provider Manual Revision 2.1*  
August 2012, Department of Health, New York

<sup>104</sup>ibid.

Where EAPGs have been implemented, issues identified have included:

- How to deal with outliers within the principle of averages used in the APG system
- The requirement to monitor and control the number of visits that should be implemented so as to minimise the incentive to over-provide services
- The requirement to monitor the potential to upcode and fragment coding
- Clarity regarding the definition of a visit <sup>105</sup>.

The phased implementation approach spans three years to comprise 25% portions of payment based on APGs, increasing to 50%, 75% and finally 100% by the end of the three year period.

## 5.6.2 International Refined-DRGs (IR-DRGs)

### Overview

International Refined-DRGs (IR-DRGs) classify patients across the continuum of care, including inpatient, outpatient, ED, clinics and rehabilitation. This classification was developed by 3M Health Information Systems in 2004 revised to version 2.5 in 2013. The purpose of IR-DRGs is to provide a classification that can compare across geographic regions, with classification groups being informed by an international database. IR-DRGs include a set of procedural codes to support international benchmarking. They are used by countries or health systems/providers within countries for funding, budgeting and outcomes measurements<sup>106</sup>.

### Structure

IR-DRGs are based on a set of patient attributes which include principal diagnosis, specific secondary diagnoses, procedures performed, age and sex<sup>107</sup>. They contain internationally comparable procedural and medical DRGs that, with a 'native grouper' that can be adapted to a range of national inpatient and ambulatory encounter coding systems. The 'native grouper' can assign an IR-DRG to an inpatient or ambulatory encounter, following coding. This forgoes the need to map between procedure codes. Whilst the IR-DRGs designed to be internationally comparable and to operate without needing to map between international code systems, they can also be tailored to national coding systems.

IR-DRGs are procedure-driven, consisting of:

- 263 base inpatient DRGs (109 procedural/intervention DRGs and 154 medical DRGs) with each base inpatient DRG containing three sub-class severity levels
- 237 procedural/intervention ambulatory IR-DRGs (51 base DRGs and up to 135 medical ambulatory DRGs) with many being a part of a co morbidity subdivision<sup>108</sup>
- 14 error DRGs for non-appropriate grouping.

IR-DRG also conforms to multiple versions of ICD: ICD-10, ICD-9-CM and ICD-9.

The IR-DRG system uses the same logic and structure as the AP-DRG and APR-DRG systems. It incorporates the same severity of illness adjustment using secondary diagnoses, but only uses three subgroups:

- Without Complications and Co morbidities

<sup>105</sup>Fee D, 3M Health Information Systems inc. 2008, *3M Enhanced Ambulatory Patient Groups (EAPGs)*, 3M Health Information Systems inc., available: <[http://solutions.3m.com/3MContentRetrievalAPI/BlobServlet?locale=en\\_US&lmd=1235751572000&assetId=1180610409415&assetType=MMM\\_Image&blobAttribute=ImageFile](http://solutions.3m.com/3MContentRetrievalAPI/BlobServlet?locale=en_US&lmd=1235751572000&assetId=1180610409415&assetType=MMM_Image&blobAttribute=ImageFile)>, accessed 17 July 2013.

<sup>106</sup>Berlinguet M. et al. 2006, *Case-Mix Analysis Across Patient Populations and Boundaries: A refined classification system Designed Specifically for International Use, a White Paper*, 3M, USA.

<sup>107</sup>Aisbett C. et al 2007, 'Measuring hospital case mix: Evaluation of alternative approaches for the Irish hospital system, working paper, The Economic and Social Research Institute (ESRI), Dublin, No. 192, available <<http://www.econstor.eu/bitstream/10419/68019/1/52982227X.pdf>>, accessed 24 July 2013

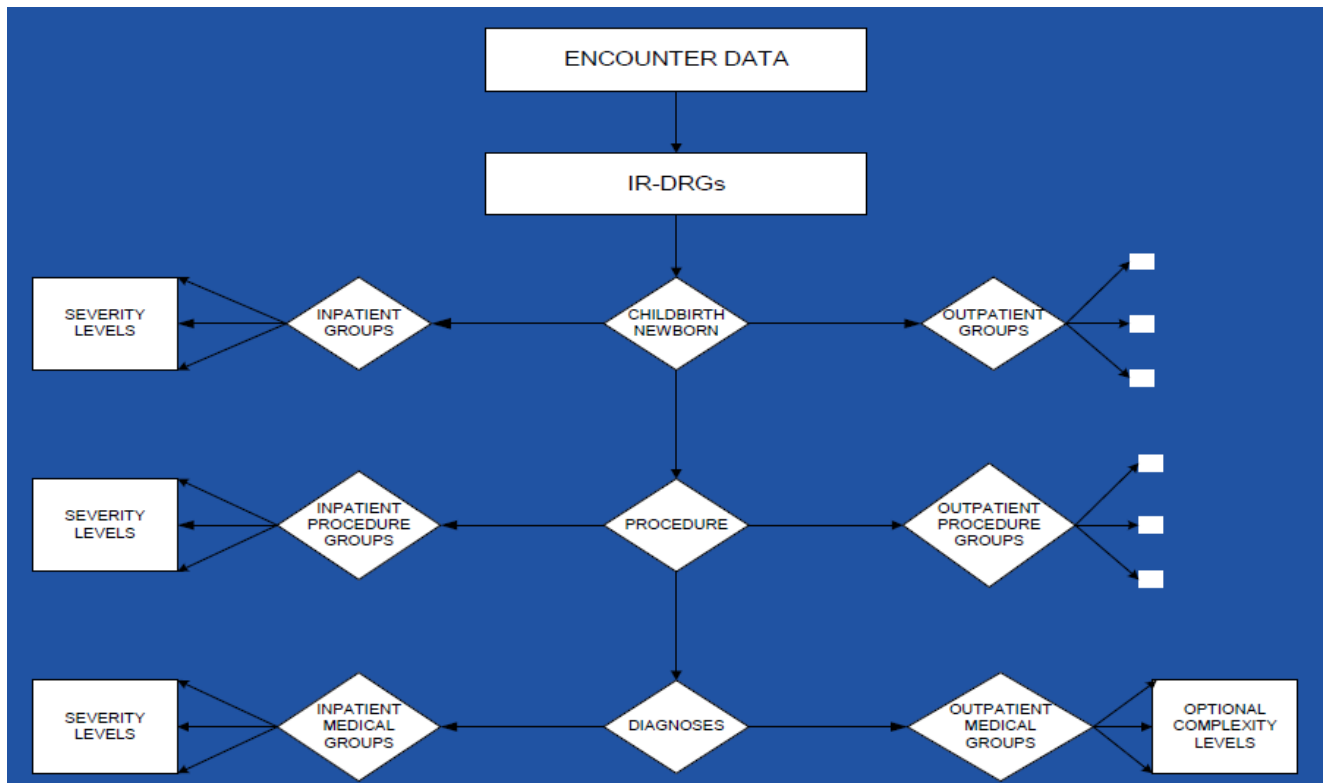
<sup>108</sup>Berlinguet M. et al. 2006, *Case-Mix Analysis Across Patient Populations and Boundaries: A refined classification system Designed Specifically for International Use, a White Paper*, 3M, USA.

- With Complications and Co morbidities and
- With major-Complications and Co morbidities.

The IR-DRG does not include multiple Complications and Co morbidities because 3M identified most international datasets do not contain more than two secondary diagnoses.

A key feature of the IR-DRG Grouper is that it incorporates severity adjustments, based on complications and co morbidities that are applied to base patient groups. Figure 12 shows the Grouper logic.

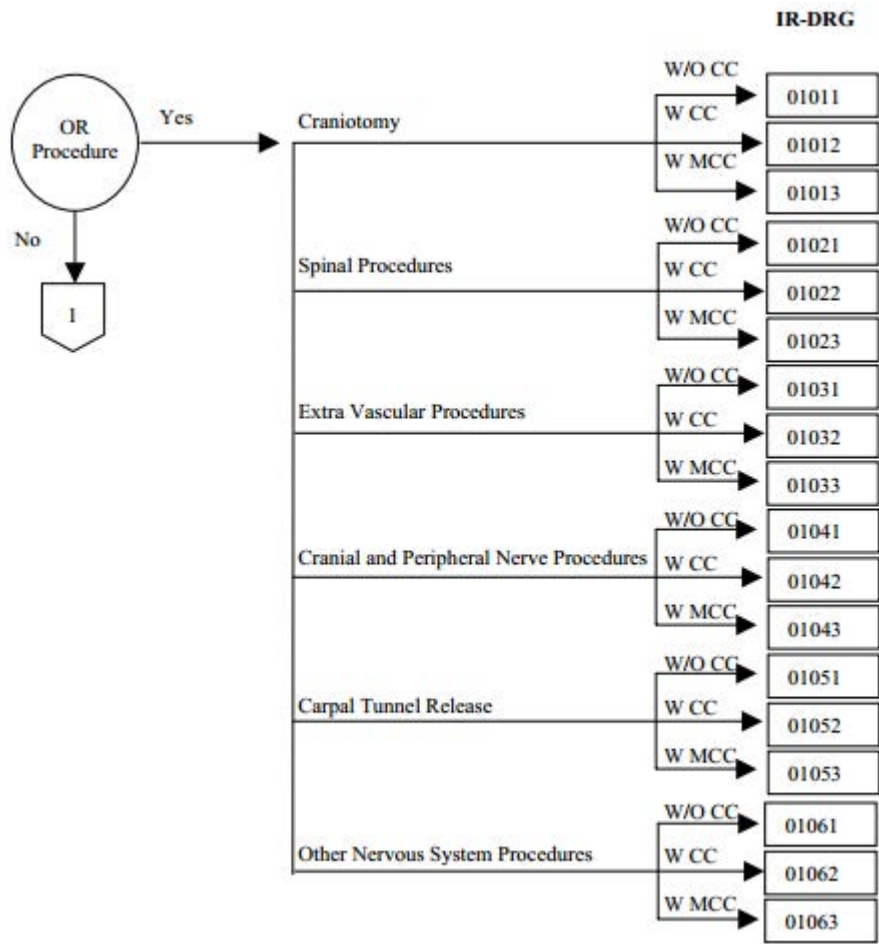
**Figure 12: IR-DRG 2.0 conceptual framework<sup>109</sup>**



A more granular representation, of one component of the classification is provided in Figure 13.

<sup>109</sup>Mazevska D. 2005, Comparison of 3M International Refined (IR)-DRG and Australian Refined (AR)-DRG. Proceedings, WHO Family of International Classifications, Tokyo Meeting. <http://www3.who.int/icd/tokyomeeting/documentlist> (June), pp.2-8.

Figure 13: Major diagnostic category 1 – Diseases and disorders of the nervous system<sup>110</sup>



Carpal

### Counting

A patient procedure or diagnosis forms the base unit of count for the IR-DRG classification.

### Implementation and use in funding

IR-DRGs are used in Bulgaria and Romania for classification but not funding purposes<sup>111</sup>. In Spain, a project is under way, which aims to estimate national Spanish cost weights for IR-DRGs, using detailed patient-level cost data from a sample of hospitals following a common bottom-up cost-accounting methodology<sup>112</sup>.

<sup>110</sup> IR-DRG Definitions Manual Version 1.2 as in Aisbett C. et al 2007, 'Measuring hospital case mix: Evaluation of alternative approaches for the Irish hospital system, working paper, The Economic and Social Research Institute (ESRI), Dublin, No. 192, available <<http://www.econstor.eu/bitstream/10419/68019/1/52982227X.pdf>>, accessed 24 July 2013.

<sup>111</sup> Canadian Institute for Health Information (CIHI) 2004, *Acute Care Grouping Methodologies: From Diagnosis Related Groups to Case Mix Groups Redevelopment, background paper for the Redevelopment of the Acute Care Inpatient Grouping Methodology Using ICD-10-CA/CCI Classification Systems*, available <[https://secure.cihi.ca/free\\_products/Acute\\_Care\\_Grouping\\_Methodologies2004\\_e.pdf](https://secure.cihi.ca/free_products/Acute_Care_Grouping_Methodologies2004_e.pdf)>, viewed 24 July 2013.

<sup>112</sup> Busse R. et al (eds) 2011, *Diagnosis-Related Groups in Europe, moving towards transparency, efficiency and quality in hospitals*, European Observatory on Health Systems and Policies Series, available <[http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0004/162265/e96538.pdf](http://www.euro.who.int/__data/assets/pdf_file/0004/162265/e96538.pdf)>, viewed 24 July 2013



# Appendix A Other classifications

Non-admitted and ambulatory classification systems are underpinned in some cases by sub-classifications/defined code sets. For example, the US APCs, Canada's CACs and HRGs are underpinned by ICD (or national variants) to code diagnosis. Each of these countries also has its own respective coding system to describe and classify procedure. These sub-classifications are overviewed in this appendix.

The following were identified for this review of international classifications related to non-admitted care:

<b>Supporting classifications to existing international non-admitted classifications</b>	A1. WHO – International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD10) A2. Canada – Canadian Classification of Health Interventions (CCI) A3. United States of America – Healthcare Common Procedure Coding System and Current Procedural Terminology (HCPCS/CPT) A4. United Kingdom – Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision) (OPCS-4)
<b>Other relevant classification areas</b>	A5. WHO – International Classification of Functioning Disability and Health (ICF)
<b>Supporting datasets</b>	A6. Victoria – Victoria Integrated Non-Admitted Health Minimum Dataset (VINAH) A7. Canada – National Ambulatory Care Reporting System (NACRS) A8. Canada – Discharge Abstract Database (DAD)
<b>Rescinded classification systems</b>	A9. Canada – Ambulatory Care Classification System (ACCS), Alberta

## A1. World Health Organisation

### *International Statistical Classification of Diseases and Health Related Problems 10th Revision (ICD-10)*

#### Overview

The International Classification of Diseases (ICD) is the global health information standard for mortality and morbidity statistics. The ICD is the standard diagnostic tool for epidemiology, health management and clinical purposes, including the analysis of the general health situation of population groups. It is used to monitor the incidence and prevalence of diseases and other health problems. ICD-10 was endorsed by the Forty-third World Health Assembly in May 1990 and came into use in WHO Member States as from 1994, however the classification itself has been in existence since 1893. ICD-10 is cited in more than 20,000 scientific articles and used by 117 countries around the world.

The ICD defines the universe of diseases, disorders, injuries and other related health conditions. It is used to classify and report on diseases and other health problems in many types of health and vital records including death certificates and health records. In addition to enabling the storage and retrieval of diagnostic information for clinical, epidemiological and quality purposes, these records also provide the basis for the compilation of national mortality and morbidity statistics by WHO Member States. ICD is used to share and compare health information between hospitals, regions, settings and countries and data comparisons in the same location across different time periods.

All Member States of the World Health Organisation use the ICD and it has been translated into 43 languages. Most countries use the system to report mortality data, a primary indicator of health status. Within countries,

users include physicians, nurses, other providers, researchers, health information managers and coders, health information technology workers, policy-makers, insurers and patient organisations.

The ICD has been revised and published in a series of editions to reflect advances in health and medical science over time. The 11th revision process is underway and the final ICD-11 will be released in 2015<sup>113</sup>. For the first time, through advances in information technology, users will be able to provide input to the beta version of ICD-11 using an online revision process. When finalised, ICD-11 will be ready to use with electronic health records and information systems<sup>114</sup>.

## Structure

The ICD enables reporting on:

- Diseases
- Injuries
- Symptoms
- Reason for encounter
- Factors that influence health status
- External causes of disease.

The ICD is a variable-axis classification divided into 21 components called 'chapters'. The first character of the ICD code is a letter, where each letter is associated with a particular chapter.

- Chapters I to XVII relate to diseases and other morbid conditions
- Chapter XIX to injuries, poisoning and certain other consequences of external causes.

The remaining chapters are content which is included in diagnostic data.

- Chapter XVIII covers symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
- Chapter XX relates to external causes of morbidity and mortality
- Chapter XXI relates to factors influencing health status and contact with health services.

Chapters are subdivided into homogenous 'blocks' of three-character categories. While most are classified into three character categories for single conditions, selected because of their frequency, severity or susceptibility to public health intervention. Others are classified into these characters for diseases with some common characteristics.

While not mandatory at an international level, most three-character categories can be sub-divided by means of a fourth, numeric character after a decimal point, allowing up to ten subcategories.

## Counting

A three-character category is used for counting conditions, diseases and mortalities.

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<sup>113</sup> World Health Organisation, International Classification of Diseases (ICD) Information Sheet, available < <http://www.who.int/classifications/icd/factsheet/en/index.html> >, accessed on 19 July, 2013.

<sup>114</sup> *ibid*.



## Implementation and use in funding

The ICD is used in reimbursement and resource allocation decision-making by countries. About 70% of the world's health expenditures (USD \$3.5 billion) are allocated using the ICD.<sup>115</sup>

## A2. Canada

### Canadian Classification of Health Interventions (CCI)

#### Overview

The Canadian Classification of Health Interventions (CCI) is a list of codes for diagnostic, therapeutic and support interventions developed by the Canadian Institute of Health Information (CIHI). These codes support the CACS non-admitted methodology as well as admitted care.

The CCI is the companion classification system to the ICD-10-CA, replacing the Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP) and the intervention portion of the ICD-9-CM in Canada<sup>116</sup> from 2001. CCI classifies a broad range of interventions. The number of intervention codes increased to 18,000 in the CCI from just fewer than 3,500 in the CCP and Volume 3 of ICD-9-CM<sup>117</sup>.

The implementation timing for the ICD-10-CA/ CCI varied on a Province/ Territory basis.

**Table 12: CCI Implementation Schedule<sup>118</sup>**

Province/Territory	Year of Implementation
British Columbia, Newfoundland, Nova Scotia, Prince Edward Island, Saskatchewan (partial), Yukon	2001
Alberta, Northwest Territories, Nunavut, Ontario, Saskatchewan (complete)	2002
New Brunswick	2003
Manitoba	2004
Quebec	2006

#### Structure

The structure of the CCI is 'axial' in that there are six distinct fields that link to form the code. As well as being axial, it can be described as having a hierarchical structure<sup>119</sup>. The code length is of 10 characters and has an alpha-numeric structure<sup>120</sup>.

The first section of the code is the broad category (type of intervention) for which options are:

- 1 Therapeutic interventions (physical and physiological)
- 2 Diagnostic interventions (assessments and tests)

<sup>115</sup> *ibid*.

<sup>116</sup> Canadian Institute for Health Information, *Canadian Classification of Health Interventions*, available < [http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_cci](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_cci) >, accessed 24 July, 2013.

<sup>117</sup> Canadian Institute for Health Information, *CCI Coding Structure*, available < [http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_ccistruct](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_ccistruct) > accessed 24 July, 2013.

<sup>118</sup> Canadian Institute for Health Information, *ICD-10-CA/ CCI Implementation Schedule*, available < [http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_icd10status](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_icd10status) >, accessed 24 July, 2013.

<sup>119</sup> Canadian Institute for Health Information, *Comparison of CCI with CCP and ICD-9-CM*, available < [http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_ccicompare1](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_ccicompare1) >, accessed 24 July, 2013.

<sup>120</sup> Canadian Institute for Health Information, *CCI Coding Structure*, available < [http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_ccistruct](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_ccistruct) > accessed 24 July, 2013.

- 3 Diagnostic imaging interventions
- 4 Therapeutic (cognitive, psychosocial and sensory)
- 5 Other (including healthcare services and support) <sup>121</sup>.

The second and third section codes refer to 'groups' which either indicate the body part affected or for cognitive, psychosocial, sensory interventions and other health service indicate the specific skill, sense or activity involved in the intervention. Sections four and five are applied to indicate what was done and a unique set of intervention codes that exist for each section. Finally, the technique or reason code indicates how or why the intervention was conducted.

**Table 13: CCI Code components<sup>122</sup>**

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Section	Group	Intervention	Approach, technique, reason	Device, agent, method used	Tissue used
1 digit	2 digits	2 digits	2 digits	2 digits	1 digit

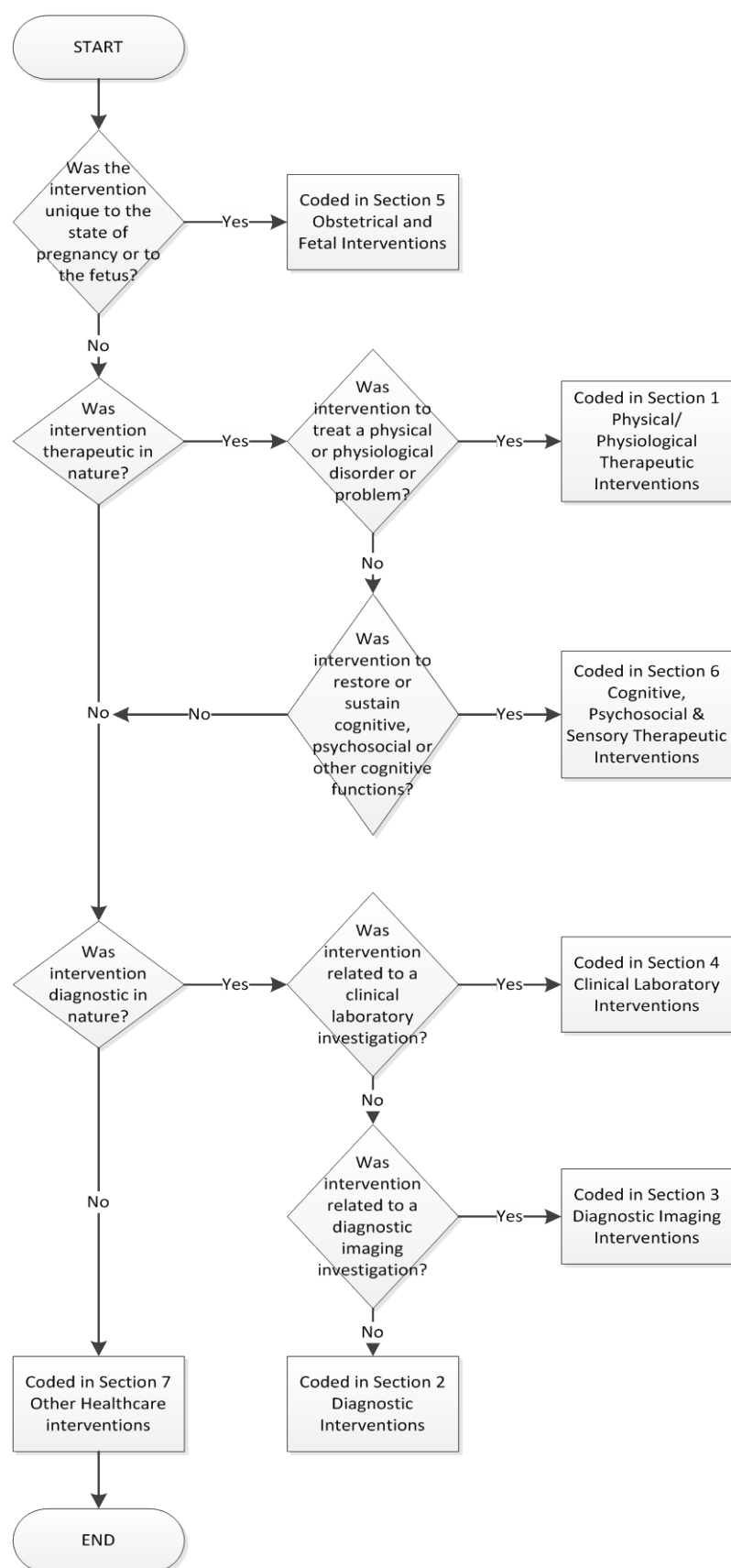
In addition to the CCI code, there is an optional 'attributes' capability, which describe additional service characteristics:

- **Status attribute** – Identifies interventions which are “Repeats or revisions”, “Abandoned after Onset” or part of a “Staged” process
- **Location attribute** – Identifies the anatomical side/location involved in the intervention. Examples of valid entries will include: (L)eft, (R)ight, (B)ilateral
- **Extent attribute** – Indicates a quantitative measure related to the intervention. Examples include ‘Number’ of lesions removed, ‘Length’ of laceration repaired, etc.
- **Mode of delivery** – Identifies, where required, information related to the method of delivery of a particular intervention (eg direct, indirect, self-directed). These attributes are applied in the same field as the Location attribute.

<sup>121</sup> Canadian Institute for Health Information (CIHI) 2006, Appendix B – Health Related Services and Intervention Codes (CCI), available <[http://www.hcaiinfo.ca/Health\\_Care\\_Facility\\_Provider/documents/appendices/AppendixB-CCI-CIHI.pdf](http://www.hcaiinfo.ca/Health_Care_Facility_Provider/documents/appendices/AppendixB-CCI-CIHI.pdf)>, accessed 26 July 2013.

<sup>122</sup> Canadian Institute for Health Information (CIHI) n.d, *CCI Coding Structure*, available <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass\\_ccistruct](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_ccistruct)> accessed 24 July, 2013.

**Figure 14: Intervention tree to assign interventions to sections**



## A3. United States of America

### *Healthcare Common Procedure Coding System and Current Procedural Terminology (HCPCS/CPT)*

#### Overview

The Healthcare Common Procedure Coding System (HCPCS), produced by the Centres for Medicare and Medicaid Services (CMS), is a standardised coding system that serves to support nationally consistent Medicare billing/funding (five billion Medicare and other insurance program claims).<sup>123</sup>

In 2013, there were approximately 9,500 separate HCPCS codes to describe procedures.

#### Structure

Two principle subsystems sit within the HCPCS set which are:

- **Level I**, comprising Current Procedural Terminology (CPT), a numeric coding system maintained by the American Medical Association (AMA). The CPT is a uniform coding system consisting of descriptive terms and identifying codes that are used primarily to identify medical services and procedures furnished by physicians and other health care professionals. These health care professionals use the CPT to identify services and procedures for which they bill public or private health insurance programs. Decisions regarding the addition, deletion, or revision of CPT codes are made by the AMA. The CPT codes are republished and updated annually by the AMA.<sup>124</sup>
- **Level II**, a standardised coding system used primarily to identify products, supplies, and services not included in the CPT codes, such as ambulance services and durable medical equipment, prosthetics, orthotics and supplies. It is also used as an official code set for outpatient hospital care, chemotherapy drugs, Medicaid and other services. The Blue Cross Blue Shield Association and the American Dental Association post their procedure codes as part of HCPCS Level II. The CMS often uses HCPCS Level II to post codes for the tracking of demonstration projects and new technologies.<sup>125</sup>

The CPT code consists of five numeric digits, divided into three categories:

- **Category I** – CPT Codes, including codes for Evaluation and Management, Anaesthesia, Surgery, Radiology, Pathology and Laboratory and Medicine
- **Category II** – Performance Measurement
- **Category III** – Emerging Technology.

The HCPCS codes are alpha-numeric, consist of a letter followed by four numeric digits. Full codes can be located through the Centers for Medicare and Medicaid Services.<sup>126</sup>

Development and use of level II of the HCPCS began in the 1980s. In 2003, the Secretary of Health and Human Services delegated authority to CMS to maintain and distribute HCPCS Level II codes. The code set is updated quarterly based on public input, which includes feedback from providers, manufacturers, vendors, specialty societies and others.

Previously, there was also a level III code called local codes however these were discontinued in December 2013

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<sup>123</sup>Centres for Medicare & Medicaid Services 2013, *HCPCS – General Information*, available: <<http://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/index.html>>, accessed on 24 July, 2013.

<sup>124</sup>Centres for Medicare & Medicaid services 2013, *HCPCS Coding Questions*, available <[http://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/HCPCS\\_Coding\\_Questions.html](http://www.cms.gov/Medicare/Coding/MedHCPCSGenInfo/HCPCS_Coding_Questions.html)>, accessed 24 July, 2013.

<sup>125</sup>AAPC Advancing the Business of Healthcare 2013, *What is HCPCS?*, available <<http://www.aapc.com/resources/medical-coding/hcps.aspx>>, accessed 24 July 2013.

<sup>126</sup>Centers for Medicare & Medicaid Services (CMS), 2013 Alpha- Numeric HCPCS File Updated, available <<http://www.cms.gov/Medicare/Coding/HCPCSReleaseCodeSets/Alpha-Numeric-HCPCS-Items/2013-Alpha-Numeric-HCPCS.html?DLPage=1&DLSort=0&DLSortDir=descending>>, viewed 24 July, 2013.

## **A4. United Kingdom**

### ***Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures***

#### **Overview**

The Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (OPCS) is the United Kingdom's statistical classification that translates operations and surgical procedures into codes<sup>127</sup>. The NHS Classifications Service supports, maintains and develops the OPCS which is governed by Crown Copyright<sup>128</sup>. The classification is updated annually and the latest version is the OPCS Classification of Interventions and Procedures is the OPCS-4.6 for NHS implementation on 1 April 2011<sup>129</sup>.

The OPCS-4.6 is comparable to the Current Procedural Terminology in the US.

#### **Structure**

The OPCS-4.6 is an alphanumeric nomenclature, with a 4 character code system similar to the ICD-10. The OPCS-4.6 classifies procedures and interventions rather than diagnoses. There are 24 sections (termed 'chapters') in the OPCS-4.6, which include:

- Chapter A – Nervous System
- Chapter B – Endocrine System and Breast
- Chapter C – Eye
- Chapter D – Ear
- Chapter E – Respiratory Tract
- Chapter F – Mouth
- Chapter G – Upper Digestive System
- Chapter H – Lower Digestive System
- Chapter J – Other Abdominal Organs, Principally Digestive
- Chapter K – Heart
- Chapter L – Arteries and Veins
- Chapter M – Urinary
- Chapter N – Male Genital Organs
- Chapter P – Lower Female Genital Tract
- Chapter Q – Upper Female Genital Tract

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<sup>127</sup>National Health Service (NHS) Connecting for Health, Background to OPCS-4 development, available <<http://www.connectingforhealth.nhs.uk/systemsandservices/data/clinicalcoding/codingstandards/opcs4/background>> accessed 24, July, 2013.

<sup>128</sup>National Health Service (NHS) Connecting for Health, *OPCS-4 Classification*, available <<http://www.connectingforhealth.nhs.uk/systemsandservices/data/clinicalcoding/codingstandards/opcs4>> accessed 24 July, 2013.

<sup>129</sup>National Health Service (NHS) Connecting for Health, *OPCS-4.6 Latest Version*, available <<http://www.connectingforhealth.nhs.uk/systemsandservices/data/clinicalcoding/codingstandards/opcs4/opcs-4.6>> accessed 24 July, 2013.

- Chapter R – Female Genital Tract Associated with Pregnancy, Childbirth and the Puerperium
- Chapter S – Skin
- Chapter T – Soft Tissue
- Chapter U – Diagnostic Imaging, Testing and Rehabilitation
- Chapter V – Bones and Joints of Skull and Spine
- Chapter W – Other Bones and Joints
- Chapter X – Miscellaneous Operations
- Chapter Y – Subsidiary Classification of Methods of Operation
- Chapter Z – Subsidiary Classification of Sites of Operation.

However, while there are no Chapter O codes, codes that begin with an 'O' are added to chapters when all the available 3-character code blocks are exhausted, but more classifications are needed. They are referred to as 'overflow codes'.

**Table 14: Syntax of an OPCS-4 Code**

1st Character	2nd Character	3rd Character	4th Character
A	0	1	1

## A5. World Health Organisation (WHO)

### *International Classification of Functioning Disability and Health (ICF)*

#### Overview

The International Classification of Functioning, Disability and Health (ICF) aims to provide a unified and standard language and framework for the classification of health and health-related states. It is the WHO's framework for measuring health and disability at both individual and population levels.

Given that an individual's functioning and disability occurs in a context, the ICF also includes a list of environmental factors.

The ICF was officially endorsed by all 191 WHO Member States in the Fifty-fourth World Health Assembly in 2001. Unlike its predecessor, which was endorsed for field trial purposes only, the ICF was endorsed for use in Member States as the international standard to describe and measure health and disability<sup>130</sup>. In particular, the ICF has been used for international and national health and disability reporting as well as clinical and epidemiological use, social policy and research<sup>131</sup>. The ICF is noted for being a framework as well as a classification<sup>132</sup>.

The ICF puts the notions of 'health' and 'disability' in a new light. It acknowledges that every human being can experience a diminution in health and thereby experience some degree of disability. That is, disability is widespread and not contained to one minority. The ICF thus 'mainstreams' the experience of disability and recognises it as a universal human experience. By shifting the focus from cause to impact it places all health

<sup>130</sup>World Health Organisation (WHO), *International Classification of Functioning, Disability and Health (ICF)*, (n.d.), available: < <http://www.who.int/classifications/icf/en/> >, accessed on 25 July, 2013.

<sup>131</sup>World Health Organisation (WHO), *ICF Application Areas*, (n.d.), available <<http://www.who.int/classifications/icf/appareas/en/index.html>>, accessed on 25 July, 2013.

<sup>132</sup>Australian Institute of Health and Welfare (AIHW), *ICF Australian User Guide Version 1.0*, October 2003, available: < <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442455729> >, accessed 25 July, 2013.

conditions on an equal footing allowing them to be compared using the common metrics of health and disability. Furthermore ICF takes into account the social aspects of disability and does not see disability only as a 'medical' or 'biological' dysfunction. By including environmental factors the ICF allows record of the impact of the environment on the person's functioning.

## Structure

The ICF captures:

- Body Functions – Physiological functions of body systems
- Body Structures – Anatomical parts of the body such as organs, limbs and their components
- Impairments – Problems in body function and structure such as significant deviation or loss
- Activity – Execution of a task or action by an individual
- Participation – Involvement in a life situation
- Activity limitations – Difficulties an individual may have in executing activities
- Participation restrictions – Problems an individual may experience in involvement in life situations
- Environmental Factors – Make up the physical, social and attitudinal environment in which people live and conduct their lives<sup>133</sup>.

The ICF hierarchical structure has components, sub-components (termed chapters). These components are:

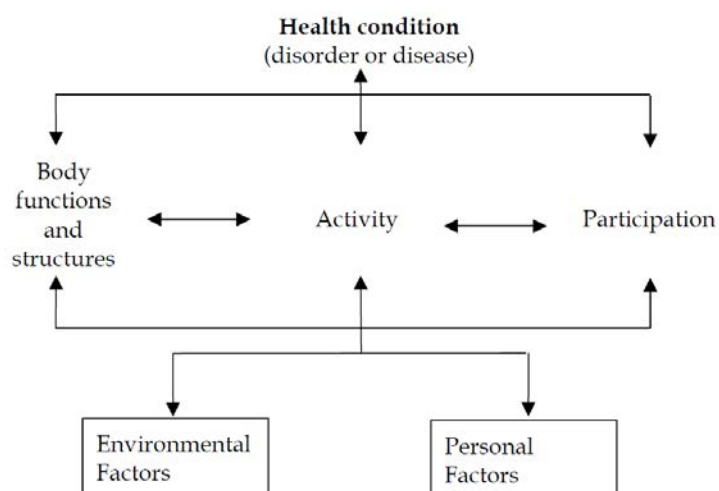
- Body Functions – 8 chapters
- Body Structures – 8 chapters
- Activities and Participation – 9 chapters
- Environmental Factors – 5 chapters.

Figure 15 shows the interact action between components.

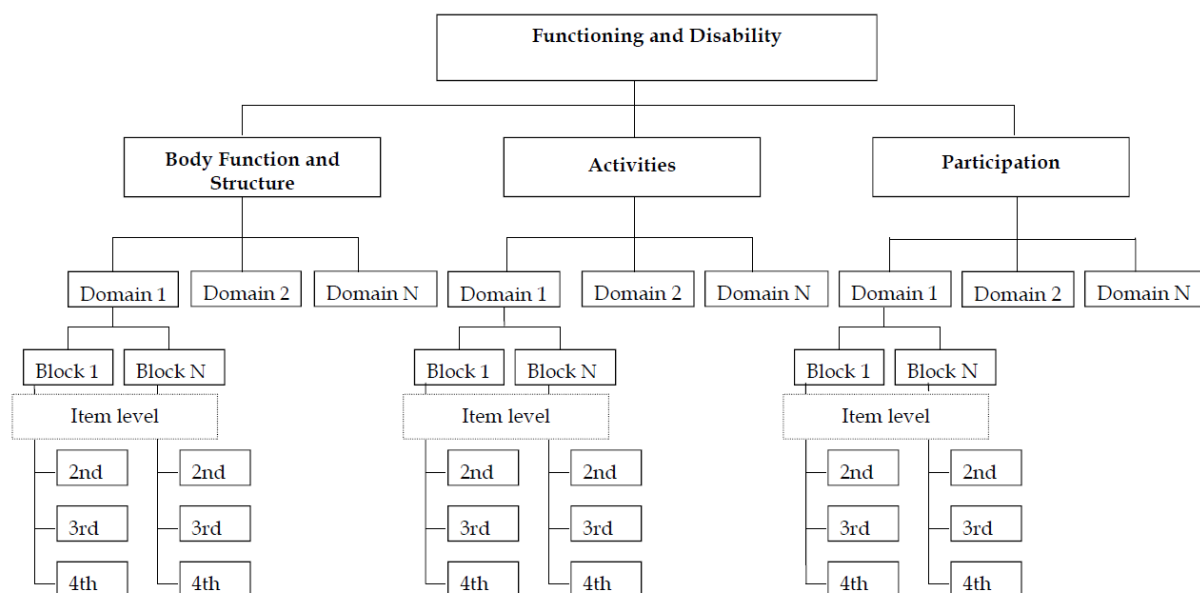
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<sup>133</sup>World Health Organisation, ICF Browser, (n.d.), available < <http://apps.who.int/classifications/icfbrowser/> >, accessed 25 July, 2013.

**Figure 15: Interactions between components of the ICF<sup>134</sup>**



**Figure 16: Hierarchy of classification in the ICF**

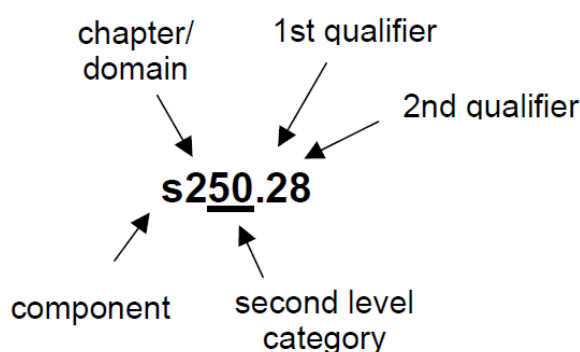


134 Australian Institute of Health and Welfare, ICF Australian User Guide Version 1.0, October 2003, available: <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442455729>, accessed 25 July, 2013.



As well as reflecting component and chapter, ICF codes include qualifiers, to capture the extent of impairment, activity limitation participation restriction and environmental barriers. The code format for ICF codes is outlined below.

**Figure 17: Format of the ICF code**



## Implementation

Countries that use ICF in a variety of clinical settings include Australia, Italy and The Netherlands. At an international level, the WHO is exploring the use of ICF to measure health outcomes and guide disability management in infectious disease programs<sup>135</sup>.

Three main products in Australia that use the ICF result from the national information agreements. They are national data dictionaries that offer a mechanism for promoting national disability data consistency, achieved by devising national data elements based on the ICF (Madden et al. 2003). These are:

- The National Community Services Data Dictionary (Version 3, AIHW)
- The National Health Data Dictionary (Version 12, AIHW)
- The National Housing Assistance Data Dictionary (Version 2, AIHW).

Disability data elements based on a draft of the ICF (Beta-2 version of the ICIDH-2) were approved for inclusion, on a trial basis, in Version 2 of the National Community Services Data Dictionary.

ICF based health and disability surveys have been conducted at national and international level. WHO has used the ICF framework in the Multi-Country Survey Study in 2000-01 and the World Health Survey Program in 2002-03 to measure health status of the general population in 71 countries. From this data WHO and selected Members States are currently generating population norms for selected ICF domains and disability prevalence rates. At regional level UNSD, UNESCWA and UNESCAP implemented a series of workshops for African, Middle Eastern and Asian countries to improve disability statistics using the ICF framework in collaboration with the WHO. At national level ICF based data sets and questionnaires are currently used in a number of countries including Australia, Ireland, Mexico, Zimbabwe, Malawi.

## A6. Australia, Victoria

### *Victoria Integrated Non-Admitted Health Minimum Dataset (VINAH)*

#### Overview

The Victorian Integrated Non-Admitted Health Minimum Dataset (VINAH) contains linked data structures which reflect aspects of service delivery with a health care setting. The data is collected by the Victorian Department of Health.

<sup>135</sup> World Health Organisation (n.d.), ICF Application Areas, available <<http://www.who.int/classifications/icf/appareas/en/index.html>>, accessed on 25 July, 2013.

VINAH was first created in 2005-06 but was initially limited to the sub-acute ambulatory care services program. In 2007-08, the concepts of 'episode' and 'case' were revised and contact level reporting was introduced. The framework has remained largely unchanged to date, however, more programs and services have been added to the data set.<sup>136</sup>

The programs which use VINAH relate to outpatients as well as others, including the following in 2012-13:

- Hospital Admission Risk Program
- Hospital Based Palliative Care Consultancy Team
- Palliative Care
- Post Acute Care
- Residential In-reach
- Sub-acute Ambulatory Care Services
- Transition Care Program
- Family Choice Program
- Victorian Respiratory Support Service
- Victorian HIV Service
- Specialist (Outpatient) Clinics.

## Structure

The VINAH is intended to capture a minimum data set of:

- Clients
- Episodes
- Contacts
- Referrals in
- Referrals out.

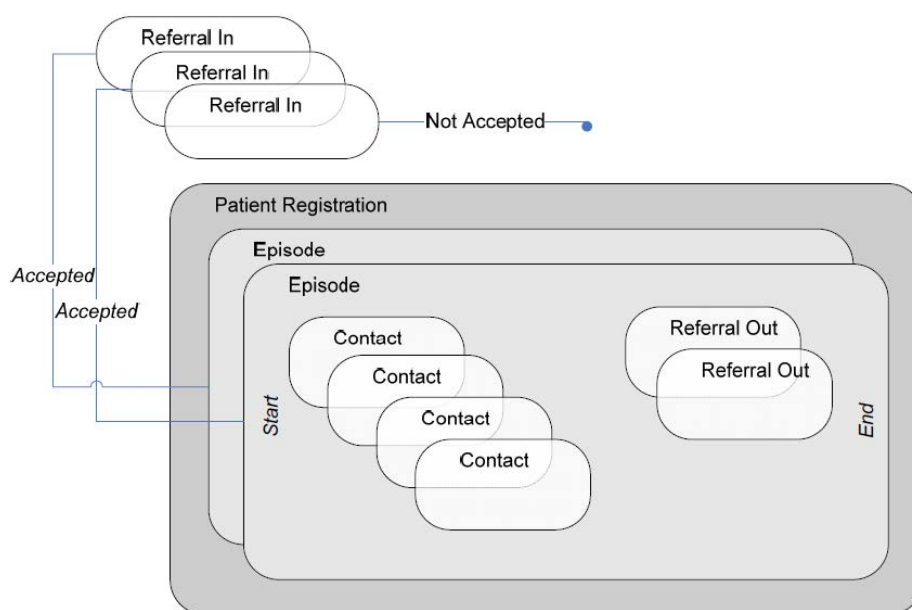
The VINAH compiles patient episodes of care. Episodes of care may include a number of individual contacts and span the period between the referral 'in' to the provider and the referral 'out'. A health care organisation will register the patient when a referral is accepted, at which point the episode of care begins. Providers report activity to VINAH as 'Contacts' during which services are delivered.

At the completion of an episode, the patient may be referred to another service.

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<sup>136</sup>Victorian Government Health Information, Department of Health Victoria, *VINAH9 User Manual 2013-14*, Section 1 – Introduction, 5 June 2013, available: <[http://www.health.vic.gov.au/hdss/vinah/2013-14/manual/vinah9\\_sect1\\_introduction.pdf](http://www.health.vic.gov.au/hdss/vinah/2013-14/manual/vinah9_sect1_introduction.pdf)>, accessed 15 July, 2013.

**Figure 18: High level structure of VINAH** <sup>137</sup>



## Counting

The VINAH model consists of a patient level ‘episode of care’ around which referral and contact information is reported.

Not all contacts reported to VINAH are eligible to be counted as service events for funding. For example, indirect contacts may be reported to VINAH for some programs but only direct contacts can be counted as service events. Multiple contacts delivered on the same day may be incorporated into a single episode of care.

## Implementation and use in funding

Each year the Department of Health in Victoria reviews data elements and the format of the VINAH. The review is undertaken to ensure that the collection supports the Department’s state and national reporting obligations, assists DH planning and policy development, and incorporates appropriate feedback from data providers on improvements.

The most recent modifications, for the 2013-14 specifications include modifications to support Activity-Based Funding (ABF). This was to include a code to value domain of Contact Delivery Mode<sup>138</sup>.

VINAH data is assigned National Weighted Activity Units (NWAU) using the Tier 2 Categories. The steps undertaken are described by the Department of Health, Victoria<sup>139</sup>, to be as follows:

- 1 Service events are derived from VINAH Contacts
- 2 For Outpatient data, the Clinic Identifier for the service event is mapped to a Tier 2 Class, according to the information on the Clinic Management System. For subacute data, the Program/Stream plus the Professional Group is used to derive the Tier 2 Class
- 3 The weight allocated to the Tier 2 class is applied to the service event as the Base NWAU

<sup>137</sup>Victorian Government Health Information, Department of Health Victoria, VINAH9 User Manual 2013-14, Section 1 – Introduction, 5 June 2013, available: <[http://www.health.vic.gov.au/hdss/vinah/2013-14/manual/vinah9\\_sect1\\_introduction.pdf](http://www.health.vic.gov.au/hdss/vinah/2013-14/manual/vinah9_sect1_introduction.pdf)>, accessed 15 July, 2013

<sup>138</sup>Victorian Government Health Information, Department of Health, Victoria 2012, *Final Specifications for Revisions to the Victorian Integrated Non-Admitted Health Minimum Dataset (VINAH) for 1 July 2013*, December, available: <[http://www.health.vic.gov.au/hdss/vinah/2013-14/final\\_vinah\\_Specs\\_2013-14.pdf](http://www.health.vic.gov.au/hdss/vinah/2013-14/final_vinah_Specs_2013-14.pdf)>, accessed on 15 July, 2013.

<sup>139</sup>Victorian Government Health Information, Department of Health Victoria, *Activity Based Funding and non-admitted data collections*, April 2013 available: <[http://www.health.vic.gov.au/hdss/vinah/newsletter/abf\\_and\\_non-admitted\\_data.pdf](http://www.health.vic.gov.au/hdss/vinah/newsletter/abf_and_non-admitted_data.pdf)>, accessed 15 July, 2013.

- 4 If the Indigenous Status of the service event indicates that the patient is Indigenous or Torres Strait Islander, a loading is applied
- 5 The Base NWAU multiplied by the Indigenous Status adjustment (if applicable) produces the NWAU for the service event
- 6 The funding source for the service event is derived. If the Contact Account Class is 'MP', 'MV', 'MG', or 'MA' the service event is in scope for National ABF. Service events with all other funding sources are reported to national bodies but are not be eligible for National ABF.

VINAH is generated and transmitted at least monthly to the Department of Human Services. Real-time submissions of data could be possible in the future through the HealthCollect Portal and the HealthCollect Web Services<sup>140</sup>.

VINAH is one of two mechanisms currently used to collect data for ABF in Victoria. The other is the Agency Information Management System which collects aggregate non-admitted data. Some of the programs and services collected by Agency Information Management System could be included in VINAH in the future.

## **A7. Canada**

### ***National Ambulatory Care Reporting System (NACRS)***

#### **Overview**

The National Ambulatory Care Reporting System (NACRS) contains data for all hospital-based and community-based ambulatory care including day surgery, outpatient clinics and emergency departments. Clinics included are day surgery, cardiac catheterisation (clinic), renal dialysis, oncology clinic, mental health, diagnostic imaging and other. Subcategories beneath these are medical, surgical, cardiac, gynaecology, neurology, obstetrics, paediatric, rehabilitation, rheumatology, ophthalmology, orthopaedic, family practice and special day/night care.

The data is collected by the Canadian Institute for Health Information (CIHI) who receives the data directly from participating facilities or regional health authorities or ministries of health. Data collection methods may vary by facility.

#### **Structure**

The NACRS collects demographic, administrative, clinical and service-specific<sup>141</sup>. Not all data elements are mandatory at the collection point. In 2009 the NACRS database was modified to allow for different levels of data submission for emergency visits, referred to as data submission levels 1, 2 and 3 where:

- Facilities submitting to the NACRS database under submission levels 1 and 2 report a subset of the full NACRS
- Facilities that have been reporting the full NACRS data set are categorised as submission Level 3.

Level 1 was introduced in 2009 and is only applicable to the emergency component of the NACRS. It is a subset of the full NACRS data set, with approximately 30 mandatory data elements, including wait times indicators, such as Time of Registration, Time of Triage, Time of Discharge and Triage Level. This level does not allow for fully coded diagnosis (ICD-10-CA) and intervention (CCI) information and this level of data cannot be grouped by CACS.

Level 2 is also only applicable to emergency care. This option has become available since 2010 and contains the same data elements as Level 1, except completion of at least one of the NACRS pick-lists is mandatory. As per Level 1, if data are submitted at this level, CACS grouping is not available.

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<sup>140</sup>Victorian Government Health Information, Department of Health Victoria 2013, *VINAH9 User Manual 2013-14*, Section 5a – Transmission and Compliance, 5 June 2013, available: [http://www.health.vic.gov.au/hdss/vinah/2012-13/manual/vinah8\\_sect5a\\_transmission\\_compliance.pdf](http://www.health.vic.gov.au/hdss/vinah/2012-13/manual/vinah8_sect5a_transmission_compliance.pdf), accessed on 15 July, 2013.

<sup>141</sup> Canadian Institute for Health Information, *NACRS Data Elements 2013-14* (n.d.), available < [http://www.cihi.ca/CIHI-ext-portal/pdf/internet/NACRS\\_DATA\\_ELEMENTS\\_2013\\_14\\_EN](http://www.cihi.ca/CIHI-ext-portal/pdf/internet/NACRS_DATA_ELEMENTS_2013_14_EN) >, accessed on 26 July, 2013.

Level 3 is applicable to all ambulatory care and is the full NACRS data set, which includes all mandatory and optional data elements in addition to coded diagnosis (ICD-10-CA) and interventions (CCI) required to group by CACS.

The option exists for facilities to submit data at both Levels 1 and Levels 2.

For two of the NACRS data elements, data is collected based on 'pick lists'. These are:

- The Presenting Complaint List (aligned to data element 136), containing common symptoms, complaints, problems or reasons for seeking medical care
- The Canadian Emergency Department Discharge Diagnosis Shortlist (aligned to data element 137), including more than 800 diagnoses in common terms, which are mapped to ICD-10-CA codes.

Client visit data is collected at time of service in participating facilities<sup>142</sup>.

## Implementation

In 2011–12, a total of 18,143,511 abstracts were submitted to the NACRS, compared to just under 17 million in 2010–11.

The reference population consisted of 386 facilities in Canada. New coverage in 2011–2012, included three Saskatchewan facilities, six British Columbia facilities and 15 Nova Scotia facilities<sup>143</sup>.

## A8. Canada

### *Discharge Abstract Database (DAD)*

#### Overview

Originally developed in 1963, the Discharge Abstract Database (DAD) captures administrative, clinical and demographic information on hospital discharges (including deaths, sign-outs and transfers). Some Provinces and Territories also use the DAD to capture day surgery.

Data is received directly from acute care facilities and submitted to their respective health authority or ministry/department of health. Facilities in all Provinces and Territories except Quebec are required to report. The final data is collected by the Canadian Institute of Health Information (CIHI) who then populate other databases, including the Hospital Morbidity Database and the Hospital Mental Health Database<sup>144</sup>.

#### Structure

The data for DAD is classified using the ICD-10-CA and CCI to code diagnoses and interventions in hospital separations reported to DAD. All DAD records are reported in ICD-10-CA and CCI. Data elements are grouped into nineteen different categories. These include: <sup>145</sup>

- Abstract identification
- Calculated length of stay
- Patient demographics

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<sup>142</sup>Canadian Institute for Health Information, *National Ambulatory Care Reporting System (NACRS)*, (n.d.), available <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/hospital+care/emergency+care/nacrs\\_metadata](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/hospital+care/emergency+care/nacrs_metadata)>, accessed on 26 July, 2013.

<sup>143</sup>Canadian Institute for Health Information, Data Quality Documentation, *National Ambulatory Care Reporting System – Current Year Information, 2011-2012*, (n.d.), available <[http://www.cihi.ca/CIHI-ext-portal/pdf/internet/nacrs\\_exec\\_summ\\_2011\\_2012\\_EN](http://www.cihi.ca/CIHI-ext-portal/pdf/internet/nacrs_exec_summ_2011_2012_EN)>, accessed on 26 July, 2013.

<sup>144</sup>Canadian Institute for Health Information, Discharge Abstract Database (DAD) Metadata, available: <[http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/hospital+care/acute+care/dad\\_metadata](http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types+of+care/hospital+care/acute+care/dad_metadata)>, accessed 26 July, 2013.

<sup>145</sup>Canadian Institute for Health Information, DAD Data Elements 2013 – 2014, (n.d.), available: <[http://www.cihi.ca/CIHI-ext-portal/pdf/internet/DAD\\_DATA\\_ELEMENTS\\_2013\\_2014\\_EN](http://www.cihi.ca/CIHI-ext-portal/pdf/internet/DAD_DATA_ELEMENTS_2013_2014_EN)>, accessed 26 July, 2013.

- Admission data
- Discharge data
- Patient service information
- Service transfers
- Provider information
- Diagnosis Information
- Intervention Information
- Special Care Information
- Basic Options
- Mental Health Indicators
- Project Information
- Blood Information
- Reproductive Care Information
- Licensed Vendor Assigned Values.

### **Counting**

The data collected is separations.

### **Implementation**

The datasets are collected for all provinces and territories in Canada except for Quebec.

## ***A9. Canada***

### ***Ambulatory Care Classification System (ACCS), Alberta***

#### **Overview**

The Ambulatory Care Classification System (ACCS) was developed in 1994-5 and implemented in 1997. The classification has not been in use since 2010, when Alberta adopted the CACS following a review to compare the ACCS with the CACS methodology. The ACCS was tailored to Alberta hospital data from each region and classified patients receiving ambulatory services into clinical groups with both similar resource needs and clinical profiles. The purpose of the ACCS was to:

- To provide information for utilisation analyses and management
- Develop the Ambulatory Care relative value index
- Allocate resources with the population based funding formula<sup>146</sup>.

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<sup>146</sup>Alberta Health and Wellness 2009, Alberta Ambulatory Care Reporting Manual, Alberta Health and Wellness, Canada, available: <<http://www.health.alberta.ca/documents/ACRM-09-pt0-7.pdf>>, accessed on 15 July 2013.

The ACCS covered emergency care, non-interventions excluding oncology, but including endocrine, obstetrics, ophthalmology, neurology, respiratory, genitourinary, cardiology services, gastroenterology, ear-nose and throat, musculoskeletal and trauma, mental health, rehabilitation services, procedures and dialysis. ACCS was implemented in both hospital and community based settings<sup>147</sup>.

## Structure

ACCS coding was based on ICD-10-CA and CCI aggregated into 426 cells. The ACCS grouper included intervention and diagnosis cells applied to patients data to classify in the following order:

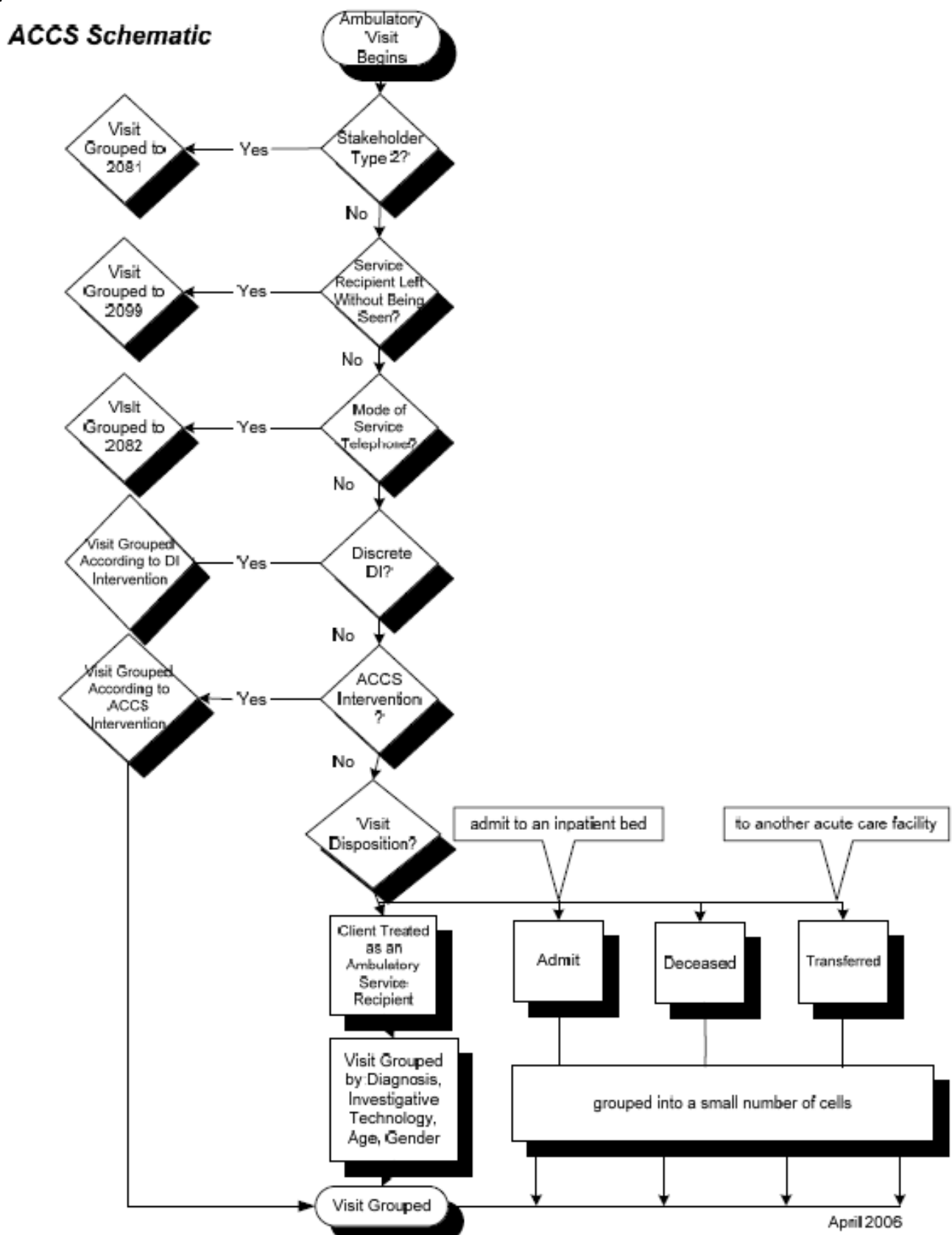
- A non-registered patient (Stakeholder Type 2)
- Not having left without being seen
- Not receiving a telephone service
- Not receiving a Diagnostic Imaging service.

Figure 19 shows the ACCS schematic.

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<sup>147</sup>Health Information Standards Committee for Alberta 2009, *National Ambulatory Care Reporting System and Comprehensive Ambulatory Care Classification System Data Set*, Government of Alberta, available < <http://www.health.alberta.ca/documents/HISCA-NACRS-Data-Draft09-09.pdf>>, accessed on 16 July 2013.

Figure 19: ACCS Schematic



The data feeding to the ACCS was collected through the Alberta Ambulatory Care Minimum Data Set. The required data elements to enable the classification grouping are listed in Table 15.



**Table 15: Data elements used for ACCS**

<b>Mandatory data elements required for grouping</b>	<b>Description and notes</b>
Birth date	Required for age calculation in conjunction with visit date Used for per capita calculations
Gender	
Service Visit Date	Used to calculate age for patient classification
Mode of Service	Indicates service provided is face to face, off site, group session, etc
Disposition	Identifies patient's type of separation
Diagnosis Prefix	Either blank, questionable or query diagnosis
Main Ambulatory Care Diagnosis	Diagnosis condition, problem or intervention that is the main reason for the visit For multiple diagnoses, the one most responsible for the greatest resource use
Secondary Diagnoses	Conditions or problems influencing patient treatment, maximum of 9
Anaesthetic Type	Either general, epidural, spinal Mandatory for day surgery visits only
Main Intervention	Identifies intervention performed, considered to be most clinically significant
Other Interventions	Maximum of 9
Intervention Attributes	Used for further specification
Out of Hospital Indicator	Applicable to patients seen in and ED or Community Urgent Care Centre.

### Counting

The number of visits is dependent on the number of *unique* service provider staff seen by the patient drove the counting in the ACCS. That is, if one patient sees two different provider types (eg a physical therapist and an occupational therapist), two visits are recorded. However, if one patient sees two of the same provider type at the same time (eg two physical therapists), one visit only is recorded.

### Implementation and use in funding

Progress reporting has found that close to 100% of ambulatory care activity was collected and submitted<sup>148</sup> but data were not used to directly inform funding.

<sup>148</sup>Alberta Health and Wellness 2009, Alberta Ambulatory Care Reporting Manual, Alberta Health and Wellness, Canada, available: <<http://www.health.alberta.ca/documents/ACRM-09-pt0-7.pdf>>, accessed on 15 July 2013.

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# ***Appendix B Primary care classifications***

Additional to the non-admitted and ambulatory classification systems are classification systems that relate to the primary care sector.

The following were identified in the course of this review of international classifications related to non-admitted care:

**United Kingdom – Read Codes**

**Australia – International Classification of Primary Care (ICPC-2 PLUS)**

## ***United Kingdom – Read Codes***

### ***Overview***

Read Codes are a standardised coded thesaurus of clinical terms that have been in use in the NHS since 1985 and are still widely used in the primary care sector. The Read Codes were originally developed by James Read, a general practitioner who developed a list of terms he used in his practice and then asked others to trial and use it. It is regularly updated each three months in response to GP needs by the UK Terminology Centre. The codes facilitate electronic communication and support patient records, reporting, payments, audit, research and the automation of repetitive manual tasks.

The UK Terminology Centre (UKTC) continues to maintain and distribute a number of Read Code-based products. All products are available from the UKTC and are distributed using the Technology Reference-data Update Distribution service. This release is timed to coincide with the UK release of SNOMED CT on 1 April and 1 October each Year. The Read browser, available to download, can be used as a search engine for the Read Codes. Providers are required to purchase licenses from the UK government to use Read Codes. They are mapped to the UK mandated classifications of OPCS-4 and ICD-10 Pathology Bounded Code List.

At this stage, Read Codes have only been trialled in Australia. The Aus Read Trial undertaken in 1994<sup>149</sup> demonstrated that:

- Many of the Read-preferred terms are not suitable in the Australian environment – Synonymous terms are more appropriate. As such a number of key words would be required ‘Australianisation’
- The hierarchy is not always appropriate.

The Read codes were designed for general practice, and therefore included terms used by general practitioners. Read Codes have two versions: Version 2 (v2) and version 3 (CTV3 or v3), which are the basic means by which clinicians record patient findings and procedures in health and social care IT systems across primary and secondary care (eg General Practice surgeries and pathology reporting of results).

### ***Structure***

The version presently used in the UK (READ 5 byte set) includes over 100,000 preferred terms and 150,000 synonyms. The Read Version 3 is even larger than Read version 2, it has 250,000 terms organised in a hierarchical structure.

The classification works as a hierarchical system with five levels, each level being more specific. A criticism has been, with a five level structure, clinicians can go down one path looking for a term and not realise a more

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<sup>149</sup>Family Medicine Research Centre, University of Sydney. The Aus-Read Trial. Report to the Evaluation Steering Group, General Practice Branch, Canberra: Department of Human Services and Health. August 1994.

appropriate term is available elsewhere in the hierarchy. This can lead to poor inter-practitioner reliability in the coding of the same medical concept. Similarly, it can also be overly specific. This can make analysing the data using Read difficult because of its size and its ICD structure<sup>150</sup>. The structure has been also criticised for lacking sufficient specificity in the psychological and social areas.

The following shows an example of a five-layer hierarchical structure with increasing levels of specificity:

<b>Myocardial infarction is a type of...</b>	<b>Ischaemic Heart Disease which is a type of ...</b>	<b>Heart Disorder which is a type of...</b>	<b>Cardiovascular disorder which is a type of...</b>	<b>Clinical finding (diagnosis)</b>
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The Chapter headings in version 2 are categorised by processes of care, diagnoses and drugs.

**Table 16: Chapter headings used in the Read Codes<sup>151</sup>**

<b>Processes of care</b>	<b>A-Z Diagnoses</b>	<b>a-z Drugs</b>
0. Occupations	A. Infectious/parasitic diseases	a Gastro-intestinal system drugs
1. History/symptoms	B. Neoplasms	b Cardiovascular system drugs
2. Examination/Signs	C. Endocr/nutr/metab/immun. Disease	c Respiratory system drugs
3. Diagnostic procedures	D. Blood/blood forming organs dis	d Central nervous system drugs
4. Laboratory procedures	E. Mental disorders	e Drugs for infectious diseases
5. Radiology/physics in medicine	F. Nervous system/sense organ dis;	f Endocrine drugs
6. Preventative Procedures	G. Circulatory system disease;	g Obstetric/gynaecological/urinary drugs
7. Operations, procedures, sites	H. Respiratory system disease;	h Malignant & immunosuppressant drugs
8. Other therapeutic procedures	J. Digestive system disease;	i Nutrition and blood drugs
9. Administration.	K. Genitourinary system disease;	j Musculoskeletal & joint drugs
	L. Pregnancy/childbirth/ puerperium;	k Eye drugs
	M. Skin/subcutaneous tissue disease;	l Ear, nose & oropharynx drugs
	N. Musculoskeletal/connective tissue	m Skin drugs
	P. Congenital anomalies	n Immunology drugs & vaccine
	Q. Perinatal conditions	o Anaesthetics
	R. Symptoms, signs, ill defined condition	p Appliances & reagents etc
	S. Injury and poisoning	q Incontinence appliances
	T. Causes of Injury and poisoning	s Stoma appliances.
	U. Extern cause morbid/mortal	
	V. Unspecified conditions.	

A comprehensive Read Code spreadsheet calculates the coding of a patient.<sup>152</sup>

<sup>150</sup>Users Guide ICPC-2 Plus, available <<http://www.fmrc.org.au/ICPC%20User%20Guide.pdf>>, accessed 12 July, 2013.

<sup>151</sup> Nottingham PIMIS Project team 2007, Information Guides for Practices (Practice Information – Read Code Guide) – Read Codes Version 2 (5 byte), Programme Manager Nottingham GP Specialty Training Programme Office, Nottingham.

<sup>152</sup>Primary Care Commissioning 2012, QOF Read Codes V24, available: <<http://www.pcc-cic.org.uk/article/qof-read-codes-v24>>, accessed on 12 July, 2013.

## ***International Classification of Primary Care (ICPC-2 PLUS)***

### ***Overview***

The International Classification of Primary Care (ICPC-2) is a classification designed for primary care, developed by the World Organisation of Family Doctors (WONCA). ICPC-2 PLUS (also known as the BEACH coding system) is a clinical terminology classified to the International Classification of Primary Care, Version 2 (ICPC-2), designed specifically for use in electronic health records. ICPC-2 PLUS is used to support health professionals to input data into electronic health records in a consistent and reliable way.<sup>153</sup> It provides a user-friendly coding system, allowing health professionals to record patient data and clinical activity, including symptoms, diagnoses, past health problems and processes (such as procedures, counselling and referrals) at the point of care.

The classification was first created in 1987<sup>154</sup>. The second edition, ICPC-2 PLUS, was released in 1998. ICPC-2 PLUS is updated approximately three times per year to incorporate user feedback and suggestions for new content.<sup>155</sup> The terminology is maintained and regularly updated by the Family Medicine Research Centre.

The latest form of the ICPC-2 PLUS can be used in age-sex disease registers, morbidity registers and full electronic health records in primary care. It currently contains approximately 8,000 terms that are commonly used in Australian general practice.<sup>156</sup>

The ICPC-2 is used for primary care classification by health professionals, who input data into electronic health records, including both patient data and clinical activity.

### ***Structure***

ICPC-2 PLUS classifies patient data and clinical activity in the domains of general/family practice and primary care, taking into account of the frequency distribution of problems. It classifies the patient's reason for encounter, the problems/diagnosis managed, interventions, and then orders these data into an episode of care structure.

The classification system has been built on the framework of bundling symptoms and complaints, processes and diagnoses. The structure allows for a natural process of primary care and facilitates access to meaningful morbidly groups (eg all cardiovascular disease, all respiratory symptoms; all skin infections; all injuries). The conceptual creation of the ICPC-2 PLUS can be seen in Figure 20.

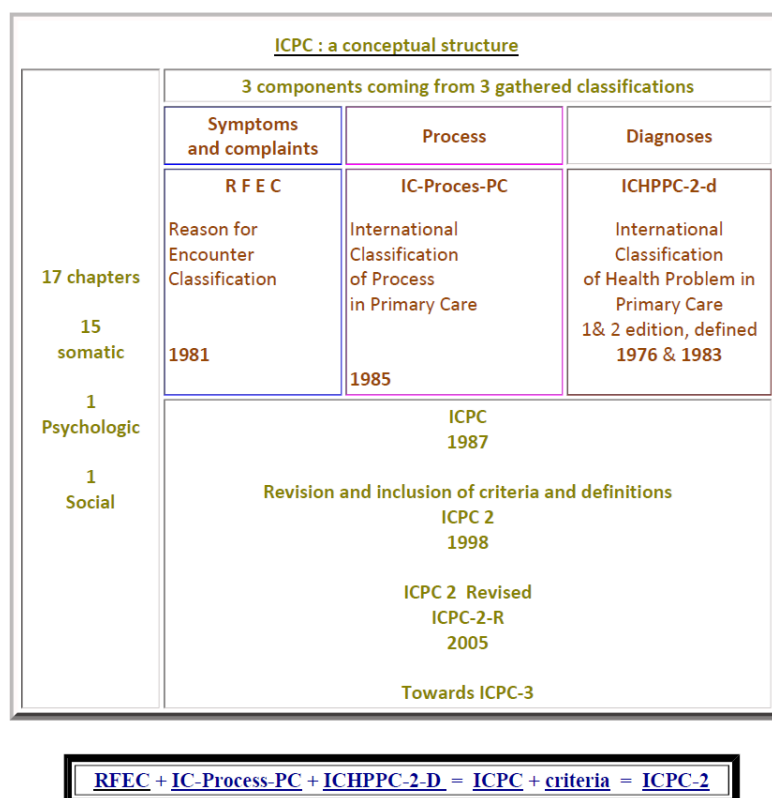
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<sup>153</sup> StatHealth, ICPC-2 PLUS, available <<http://stathealth.com.au/partners-page/icpc-2-plus/>>, accessed 12 July 2013.

<sup>154</sup> World Health Organisation, International Classification of Primary Care, Second edition (ICPC-2), available <<http://www.who.int/classifications/icd/adaptations/icpc2/en/>>, accessed on 12 July, 2013.

<sup>155</sup> Family Medicine Research Centre, University of Sydney, ICPC-2 Plus: The Beach Coding System, available <<http://sydney.edu.au/medicine/fmrc/icpc-2-plus/>>, accessed 12 July, 2013.

<sup>156</sup> Family Medicine Research Centre, University of Sydney, ICPC-2 Plus: The Beach Coding System, available <<http://sydney.edu.au/medicine/fmrc/icpc-2-plus/>>, accessed 12 July, 2013.

**Figure 20: Conceptual structure of the ICPC-2 PLUS and order of creation <sup>157</sup>**

The ICPC-2 PLUS uses the biaxial structure of the original ICPC, comprising 17 sections (termed 'chapters') which are based on body systems that are then further divided into 7 components<sup>158</sup>. This latest versions builds on the seventh component, disaggregating this into five more sub-components. Components are:

- 1 Symptoms and complaints – Originally drawing from the National Ambulatory Care Survey/Reason for Visit Classification
- 2 Diagnostic, screening and preventive procedures – Process code
- 3 Medication, treatment and procedures – Process code
- 4 Test results – Process code
- 5 Administrative – Process code
- 6 Referrals and other reasons for encounter – Process code
- 7 Diseases comprising infectious diseases, neoplasms, injuries, congenital anomalies and other diseases – Diagnosis code.

A full list of codes is available through WONCA International Classification Committee<sup>159</sup> and a further list can be found through Sydney University.<sup>160</sup>

<sup>157</sup> Trix, International Classification of Primary Care Second Edition (ICPC 2), available: <<http://trix.docpatient.net/icpc/icpc-en/struct-en.htm>>, accessed 12 July 2012.

<sup>158</sup> Chapters include General and unspecified; Blood, blood forming organs, lymphatics, spleen; digestive; eye; ear; circulatory; musculoskeletal; neurological; psychological; respiratory; skin; endocrine, metabolic and nutritional; urinary; pregnancy, childbirth, family planning; female, genital system and breast; male genital system; social problems. International Classification of Primary Care Second edition (ICPC 2), available <<http://trix.docpatient.net/icpc/icpc-en/capit-en.htm>>, accessed at 12 July, 2013.

<sup>159</sup> Wonca International Classification Committee (WICC) n.d., ICPC-2, available: <<http://qicpd.racgp.org.au/media/57417/icpc-codes.pdf>>, accessed 12 July, 2013.

Figure 21 demonstrates the biaxial structure of the classification and how different components can be compiled with the chapters for the body systems. In all there are only 1,300 cells meaning that the classification is both manageable and user friendly<sup>161</sup>. The coding process compiles an identifier using the chapter code and the component code.

**Figure 21: The biaxial structure of the ICPC-2 PLUS classification** <sup>162</sup>

Admin

Components	Chapters																
	A	B	D	F	H	K	L	N	P	R	S	T	U	W	X	Y	Z
1. Symptoms, complaints																	
2. Diagnostic,screening prevention																	
3. Treatment, procedures medication																	
4. Test results																	
5. Administrative																	
6. Other																	
7. Diagnoses,disease																	

A	General	L	Musculoskeletal	U	Urinary
B	Blood, blood forming	N	Neurological	W	Pregnancy, family planning
D	Digestive	P	Psychological	X	Female genital
F	Eye	R	Respiratory	Y	Male genital
H	Ear	S	Skin	Z	Social
K	Circulatory	T	Metabolic, endocrine, nutrition		

## Counting

A patient visit is the base unit of count and all associated activity is recorded for each visit. As terms are entered into the database, the computer automatically allocates a term code. Each term has a unique identifier which allows more specific storage in the medical record. When trying to find or count groups of patients in practice you type the term for the type of the condition and can specify further if necessary<sup>163</sup>.

The code is linked to the electronic record and therefore from the identifier could be used to extract any information recorded on the electronic record.

## Implementation and use in funding

The structure is simple, having 1,300 cells, and the terminology is maintained and regularly updated by the Family Medicine Research Centre.

ICPC-2 PLUS is primarily used in Australia. It is installed in various software packages and used in electronic health record (EHR) systems by approximately 3,200 GPs in more than 500 practices throughout Australia. It is also used in research projects, including the BEACH (Bettering the Evaluation and Care of Health) program,

<sup>160</sup>University of Sydney, Appendix 4: Code groups from ICPC-2 and ICPC-2 PLUS, website: <http://prijipati.library.usyd.edu.au/bitstream/2123/7772/5/Appendix%204.pdf>, accessed 12 July, 2013.

<sup>161</sup>Family Medicine Research Centre, University of Sydney in cooperation with World Organisation of Family Doctors (WONCA) 1998, Users Guide ICPC-2 Plus, available: <<http://www.fmrc.org.au/ICPC%20User%20Guide.pdf>>, accessed on 12 July, 2013.

<sup>162</sup>Family Medicine Research Centre, University of Sydney in cooperation with World Organisation of Family Doctors (WONCA) 1998, Users Guide ICPC-2 Plus, available: <<http://www.fmrc.org.au/ICPC%20User%20Guide.pdf>>, accessed on 12 July, 2013

<sup>163</sup>Stathealth, ICPC-s Plus, website: <<http://stathealth.com.au/partners-page/icpc-2-plus/>>, accessed on 12 July 2013.

the national study of general practice activity. The terminology is therefore often referred to as the BEACH coding system<sup>164</sup>.

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<sup>164</sup>Family Medicine Research Centre, University of Sydney 2012, ICPC-2 Plus: The Beach Coding System, available: <<http://sydney.edu.au/medicine/fmrc/icpc-2-plus/>>, accessed 12 July, 2013.

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## Appendix D Discussion on $R^2$

One criterion relevant to compare classification systems is how well those systems explain resource variation. This is often measured using the ‘reduction in variance’ summary statistic, ie the ‘ $R^2$ ’ statistic, or sometimes the ‘Adjusted  $R^2$ ’ statistic.

However, often comparing the  $R^2$  statistics between systems is not a true comparison between because the patient data sets on which those measures were derived are different in terms of sample size, time period, and patient sub-population.

### **$R^2$ statistic**

Formula:

$$R^2 = \frac{\sum_1^N (y_i - f_i)^2}{\sum_1^N (y_i - \bar{y})^2}$$

Where:

- $N$  is the number of observations in the dataset
- $i$  is the observation counter, ranging from 1 to  $N$
- $y_i$  is the modelled quantity, such as episode cost, of the  $i$ th observation
- $f_i$  is the average modelled quantity of the classification category to which the  $i$ th observation belongs
- $\bar{y}$  is the average modelled quantity of all the observations.

$R^2$  is a measure of how much variance in the observed quantity the classification system explains. If the variance within each category of the classification system is small, then the differences  $y_i - f_i$ , between the observed quantity and the category average, will be smaller than the differences  $y_i - \bar{y}$ , between the observed quantity and the overall average. If this is the case for many of the categories, then the numerator in the formula will be much smaller than the denominator, resulting in a low  $R^2$ .

Lower  $R^2$  indicates that a classification system is explaining more of the variance in the observed quantity. If, on the other hand, the categories do not explain the variance in the observed quantity, and the group averages are not closer to the observation than the overall average, then the differences  $y_i - f_i$  will not necessarily be smaller than the differences  $y_i - \bar{y}$ . Then the numerator will not be small compared to the denominator, resulting in a higher  $R^2$ .

Higher  $R^2$  indicates that classification system does not explain as much of the variance in the observed quantity.

### **Adjusted $R^2$ statistic**

Formula:

$$R^2 = \frac{\sum_1^N (y_i - f_i)^2 / (N - p - 1)}{\sum_1^N (y_i - \bar{y})^2 / (N - 1)}$$

The terms are the same as above, and  $p$  is the number of categories in the classification.

Similar to the unadjusted version, adjusted  $R^2$  is a measure of how much variance the classification system explains. The key difference is that it takes into account the number of categories that are used in the

classification, compared with to the total number of observations. An adjusted  $R^2$  will always be greater than the unadjusted  $R^2$ , however using this measure not only assesses the reduction of variance of the classification system, but also its efficiency: if two classification systems offer a similar reduction in variance (ie have a similar unadjusted  $R^2$  the adjusted  $R^2$  will be lower for the system with fewer categories, indicating that this is a more “efficient” system.



