

# **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**

**February 2004**

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## I. Introduction

The purpose of this document is to provide background information on acute care inpatient grouping methodologies. Specifically, this document will examine how groupers have been developed, how they have evolved over time, the creation of the Case Mix Groups (or CMG™) system, and important issues for the Canadian Institute for Health Information (CIHI) to consider as it prepares to redevelop its CMG grouping methodology using ICD-10-CA and CCI classification systems.

## II. Patient Grouping Methodologies

A patient grouping methodology is a system that describes discrete clusters of patient types. More specifically, it is a way of relating the type of patients a hospital treats to the resources utilized by the hospital.<sup>1, 2</sup> Cases are categorized based on various types of data, for example:

- i) Clinical data (i.e. diagnoses, procedures);
- ii) Demographic data (i.e. age, gender); and
- iii) Resource consumption data (i.e. costs, length of stay).

Depending on the data elements used for grouping, the end result is groups of cases that are clinically similar and/or homogenous with respect to resource use.

Grouping methodologies were initially developed as a cost management tool to help clinicians and hospitals monitor quality of care and utilization of services.<sup>3</sup> Today, groupers are utilized for a variety of purposes including epidemiological monitoring, clinical management, standardized comparison of hospital activity, hospital budgeting and program planning, hospital funding and reimbursement, and as a prospective payment system. However, no one grouper can be used to do all of these things well. In fact, most groupers have been designed for one purpose (i.e. to measure hospital performance), but then have been used by those who work in health care management to meet other needs (i.e. as payment/reimbursement/funding tool). Multi-purpose groupers are very difficult to develop and maintain, and do not provide desired results.<sup>4</sup>

In the last 25 years, groupers have been developed using two main approaches: clinical input and statistical analyses. Groupers built on clinical input from the medical community only used medical criteria to split cases. Medical criteria sometimes included data elements not routinely collected, and often resulted in too many terminal cells.<sup>1</sup> On the other hand, groupers based solely on statistical analyses, such as clustering, factor analysis, regression, or decision trees, often resulted in terminal groups which did not make sense clinically since they only used measures of resource consumption as the principle splitting criteria.<sup>1</sup>

Those that work in the area of grouper development have since recognized that the development of a practical grouper requires combining these two main approaches.<sup>5</sup> As a result, several basic criteria have been identified as essential for grouper development. Grouping methodologies must limit data elements to routinely collected data, generate a manageable number of possible categories, demonstrate some degree of clinical coherence, and demonstrate statistical homogeneity with respect to either length of stay (LOS) or total resource use.<sup>1</sup>

Today, however, the current approach to grouper development consists of adapting existing systems to country-specific requirements.<sup>5</sup> This is most evident with the Diagnosis Related Groups (DRG) system developed in the United States.

### **III. History of Diagnosis Related Groups (DRG)**

The development of the DRG system was initiated in the United States in 1967.<sup>3</sup> With the introduction of Medicare, hospitals were required to implement a utilization review and quality assurance program to monitor utilization of services and quality of care in order to receive Medicare funding.<sup>3</sup> A group of physicians in Connecticut, wanting some way to measure and evaluate their hospital's performance, approached Dr. Robert B. Fetter and his colleagues at Yale University for help with this problem.<sup>3</sup>

In developing this hospital management tool, Fetter and his team were faced with several major challenges. The final product had to include all hospital services, incorporate thousands of diagnoses and procedures, account for multiple diseases and treatments of individual patients, differentiate between high- and low-cost care, and create clinically meaningful categories. In the years to follow, the DRG system emerged, and several versions were developed using the International Classification of Diseases, Eighth Revision-Adapted (ICDA-8), the Hospital Adaptation of the International Classification of Diseases-Adapted, Second Edition (H-ICDA-2) and Commission on Professional and Hospital Activities (CPHA) classification systems.<sup>6</sup> Between 1980 and 1982, an ICD-9-CM version of the DRG system was created. New Jersey was the first state to adopt and use the DRG system as a prospective payment system (PPS).<sup>1, 2</sup>

The DRG methodology developed at Yale University followed the ICD-9 system's organ-system approach and divided cases into 23 groups called Major Diagnostic Categories (MDC).<sup>1, 3</sup> Within each MDC, cases were then subdivided into discrete patient clusters. Fetter et al. used secondary diagnoses, principal procedure, sex, age, discharge status, complications and comorbidities (as per a standard list), in addition to principal diagnosis, to classify cases into clinically cohesive groups with similar LOS patterns and/or hospital resource consumption.<sup>1, 3</sup> Subsequent DRG systems used all operating room procedures, then also used high cost procedures normally done outside the operating room and birth weight for neonates.

The newly created DRG system, however, was fraught with problems.<sup>7</sup> To begin with, critics felt the DRG themselves were not clinically meaningful since they included regional or organ-specific procedures, or were defined based on medical problem, signs and symptoms, and/or treatments.<sup>7</sup> In addition, the DRG system could not accurately capture severity of illness, relative weights were based on unreliable data, and the system was not viewed as being dynamic to keep up with changes in medical treatment and technology.<sup>7</sup> Several variations, modifications and improvements to the initial DRG system are discussed below.

### **A. Health Care Finance Administration-DRG (HCFA-DRG)**

Despite the shortcomings of the DRG system, the Center for Medicare and Medicaid Services (CMS) formerly the Health Care Financing Administration (HCFA) at the Department of Health and Human Services in the United States adopted the DRG system in 1983 as a Medicare PPS for hospitals.<sup>2</sup> This unprecedented move was “the start of a new method of payment intended as a national price for a hospital stay based on the reason for the hospital stay.”<sup>7</sup> CMS (formerly HCFA) assumed responsibility for annual updates to the DRG system, but modifications focused only on problems relating to the elderly and disabled populations. The modifications responded to changes in technology, newly discovered sources of disease, and lessons learned from other groupers such as those discussed below.

In addition to changes in the DRG system, the underlying codes for diagnoses and procedures were changed annually to accommodate changes in technology and new sources of disease. These coding system changes are decoded by a consortium of agencies and affect all DRG systems that are still using ICD-9-CM.

### **B. Refined-DRG (R-DRG)**

Several years after the implementation of the HCFA-DRG system, HCFA recognized that the presence or absence of complications and comorbidities (CC) resulted in the assignment of different DRG for certain types of patients.<sup>2</sup> The HCFA-DRG system defined a CC as a secondary diagnosis that significantly increases hospital resource use. Wanting to change the use of CC, HCFA funded a project at Yale University during the mid-1980’s to help address this issue and refine the DRG methodology.

The project mapped all CC-related diagnoses into 136 secondary diagnosis groups, where each was assigned a CC complexity level that was disease and procedure specific.<sup>2, 8</sup> Four CC complexity levels were identified: non-CC, moderate-CC, major-CC and catastrophic-CC. Regardless of the medical/surgical split, each secondary diagnosis group was assigned to one of these levels with the exception of moderate-CC for medical cases. If several CC were listed, the refined-DRG (R-DRG) grouper took the highest-level secondary diagnosis. The presence of multiple CC at one level did not result in grouping to a higher-level subgroup. All age and CC splits from the original DRG system were removed and replaced with these medical/surgical subgroups.

Although CMS (formerly HCFA) never adopted the refined DRG system in its entirety, they did incorporate disease and procedure specific CCs in subsequent DRG revisions (see any recent DRG definitions).

### **C. All Patient-DRG (AP-DRG)**

Building on the success of HCFA using the DRG system as PPS, New York State passed legislation to use the DRG system as PPS for all non-Medicare patients in 1987.<sup>2</sup> As a result, the New York Health Department (NYHD) had to review the applicability of the HCFA-DRG system for a non-Medicare population, and evaluate it for neonates and those infected with HIV. The NYHD concluded that the HCFA-DRG system was not adequate for the non-Medicare population nor were there any provisions for the neonate or HIV-infected populations.<sup>2</sup>

The NYHD contracted 3M Health Information Systems (3M HIS) to modify the HCFA-DRG system for the non-Medicare population.<sup>2</sup> 3M developed all necessary modifications, and included the Pediatric Modified Diagnosis Related Groups (PM-DRG) developed by the National Association of Children's Hospitals and Related Institutions (NACHRI), and introduced MDC 24 for HIV infection patients. The CC list was further revised, and MDC 25 was added to capture multiple traumas. In addition, modifications were added for transplants, long-term mechanical ventilation, cystic fibrosis, nutritional disorders, high-risk obstetric care, acute leukemia, hemophilia and sickle cell anemia.<sup>2</sup>

### **D. All Patient Refined-DRG (APR-DRG)**

The All Patient Refined Diagnosis Related Groups (APR-DRG) are widely used throughout the United States, Europe and selected parts of Asia. Using the base structure of the AP-DRG system, 3M HIS added four subgroups in an attempt to better describe a patient's severity of illness.<sup>2</sup> This refinement resulted in a significant change to the grouping logic. All age and CC distinctions were removed and replaced with two groups: one to describe severity of illness, and the other to describe the risk of mortality.<sup>2</sup>

Both the severity and mortality groups contained four subgroups: minor, moderate, major and extreme. With these additions, a case was now assigned three distinct descriptors: i) the base-DRG; ii) the severity of illness subgroup; and iii) the risk of mortality subgroup.<sup>2</sup> Subgroup assignment is based on interaction between secondary diagnoses, age, principal diagnosis, and the presence of certain non-operative procedures. Some non-CC in previous DRG systems were now moderate-, major- or extreme-CC or vice-versa, and multiple CC were now recognized.<sup>2</sup> In addition, a completely new set of DRG was developed for the neonatal MDC.

### **E. International Refined-DRG (IR-DRG)**

The International Refined Diagnosis Related Groups (IR-DRG) were created in response to the international community not being able to develop their own country-specific grouper.<sup>9</sup> To fill the international void, 3M HIS built the IR-DRG system using 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 CC, with CC and with major-CC. The IR-DRG does not recognize multiple CC since 3M HIS discovered that most international datasets do not contain more than two secondary diagnoses.<sup>9</sup> In addition, several DRG eliminated from U.S. versions of the DRG system were added to capture those outpatient procedures in the U.S. that are still being performed in the inpatient setting in other countries.<sup>9</sup>

The most unique aspect of the IR-DRG is the underlying coding classification system. The base-DRG were intended to be compatible with both ICD-9-CM and ICD-10 without any mapping between coding systems.<sup>9</sup> Therefore, at least theoretically, cases could be grouped to the same IR-DRG regardless of the coding system used. As a result, the IR-DRG system could accommodate country-specific coding modifications and procedure coding systems. IR-DRG Version 2.0 is currently under development, and will be procedure driven in order to group all types of inpatients and outpatients.<sup>10</sup>

## IV. Development of Case Mix Groups (or CMG)

Case Mix Groups (or CMG) are the Canadian equivalent of the DRG system. Introduced in 1983, the CMG system adapted the ICD-9-CM-based DRG system to accommodate ICD-9/CCP classification systems.<sup>11</sup> The creation of a Canadian grouper stemmed from the fact that those in health care management wanted:

- i) To improve the comparability of national health care data;
- ii) To enhance the relationship between diagnoses and LOS, especially secondary diagnoses that contribute to longer LOS; and
- iii) To provide a tool for utilization management based on Canadian health care data.<sup>11</sup>

Since its creation, the CMG system has evolved over time. Many of its developments are highlighted below in Table 1.

**Table 1. CMG Evolution**

<b>Year</b>	<b>Description</b>
1983	DRG system adapted to accommodate ICD-9/CCP
1987	CMG structure mapped back to ICD-9-CM
1991	Expert team established to ensure CMG reflected Canadian requirements and hospital practice patterns
1992–1997	Modifications to selected MCC: 2-8, 11-15, 19, 24-25
1997	Removal of CC and age splits Introduction of Complexity Overlay (or Plx™) and Age Adjustment
2000–2001	Backward conversion of ICD-10-CA to ICD-9
2003	Revised diagnosis grade list to address variations in coding practice Initiated CMG Redevelopment using ICD-10-CA/CCI

Since the CMG system was a direct adaptation of the DRG system, it shared the same body system approach as its first step to classifying cases. In fact, the MCC in the CMG system are the same as the MDC in the DRG system (see Appendix A.1). However, the similarities stopped there as different criteria were used to further subdivide cases. To begin with, DRG assignment is driven by principal diagnosis, whereas CMG assignment is driven by most responsible diagnosis. This represents the most significant difference between the two systems as most responsible diagnosis attempts to identify the diagnosis that can account for greatest proportion of a patient's LOS versus principal or admitting diagnosis.

The next major difference between these two systems is with respect to how comorbidities and complications are treated. CMG uses diagnosis type (i.e. pre-/post-admission) and the diagnosis grade list to identify other secondary diagnoses impacting LOS and/or where more costly treatment might be reasonably expected. This interaction led to the development of a Complexity Overlay (or Plx) and reflects how complicated a given case is to treat. In contrast, DRG uses pre-defined CC tables that have distinct severity levels (i.e. minor, moderate, major) assigned to a selected group of secondary diagnoses. This measure, however, may not acknowledge significant post admission comorbidities and only uses the secondary diagnosis with the highest severity level.

Finally, as a result of the methodological differences, the CMG and DRG systems differ with respect to the number of terminal cells (see Appendix A.2). CMG has a total of 478 base-CMG groups, whereas DRG has between 321 and 367 base-DRG groups.

## V. Issues to Consider for CMG Redevelopment

### *Why did other countries develop country specific versions of the DRG system or create their own grouper altogether?*

Actually, most other countries did not create their own grouper. They have simply adopted one of the existing DRG systems for their own case mix purposes. Table 2 highlights the DRG systems currently being used by selected countries.

**Table 2. Patient Classification Systems (PCS) Used in Selected Countries<sup>5, 12</sup>**

Country	PCS	Grouper Used for Funding	Diagnosis Coding	Procedure Coding
Canada	CMG/Plx	No (except Ontario)	ICD-10-CA	CCI
Australia	AR-DRG	Yes	ICD-10-AM	ICD-10-AM
Great Britain	HRG	Yes	ICD-10	OPCS-4
United States	HCFA-DRG, R-DRG, AP-DRG, APR-DRG	Yes	ICD-9-CM	ICD-9-CM
Austria	LDF	Yes	ICD-10	ACP
Belgium	APR-DRG	Yes	ICD-9-CM	ICD-9-CM

Country	PCS	Grouper Used for Funding	Diagnosis Coding	Procedure Coding
Bulgaria	IR-DRG	No	ICD-9-CM	ICD-9-CM
Czech Republic	AP-DRG, IR-DRG	Yes	ICD-10	ICPM (Czech)
Denmark	Nord-DRG, Dk-DRG*	No	ICD-10 <sup>1</sup>	NCSP
Finland	Nord-DRG	Yes	ICD-10 <sup>1</sup>	NCSP
France	GHM, EfP	Yes	ICD-10	CDAM
Germany	G-DRG (AR-DRG)	Yes	ICD-10-SGBV	OPS-301 v.2.0
Greece	HCFA-DRG	No	ICD-9-CM	ICD-9-CM
Italy	HCFA-DRG APR-DRG	Yes	ICD-9-CM	ICD-9-CM
Netherlands	DBC	No	ICD-9-CM	CVV
Norway	Nord-DRG	Yes	ICD-10 <sup>1</sup>	NCSP
Portugal	HCFA-DRG	Yes	ICD-9-CM	ICD-9-CM
Romania	HCFA-DRG, AP-DRG, IR-DRG	No	ICD-10	ICPM (Romanian)
Spain	HCFA-DRG	No	ICD-9-CM	ICD-9-CM
Sweden	Nord-DRG	Yes	ICD-10 <sup>1</sup>	NCSP
Switzerland	AP-DRG	No	ICD-10	ICD-9-CM

<sup>(1)</sup> Grouper the country specific system is based on

\* grouper now in use

<sup>1</sup> Nordic modification

However, a few countries (described below) have developed a country specific version of the DRG system, or have created their own system altogether. More important, CIHI should review these methodologies for possible consideration for inclusion into the new CMG grouper.

### **Australia**

Australia was one of the first countries to create a country specific version of the DRG system. After using the AP-DRG for several years, Australia realized that in order for the DRG system to remain valid and meaningful for its case mix purposes the grouper needed to be customized.<sup>13</sup> As a result, modifications were made to the DRG system to keep pace with changes in medical, surgical and coding practices. In 1992, the Australian National Diagnosis Related Groups (AN-DRG) were released, and annual updates were made until 1996.<sup>14</sup> In 1997, the Australian Refined Diagnosis Related Groups (AR-DRG) were introduced to better reflect hospital conditions, advances in medical technology, the introduction of new diagnosis and procedure codes, and to address the problems with clinical and resource homogeneity of some DRG.<sup>15</sup>

Recommendations to modify an existing DRG or create a new DRG are made to improve clinical meaning. Unique to AR-DRG are statistical guidelines, which are used to ensure resource homogeneity. New DRG are created through splitting an existing DRG, however, the size of the new DRG must be at least 250 cases, contain at least 10% of the original cases, and produce a reduction in variance or  $R^2$  (at the MDC Level) of at least 5%.<sup>15</sup> Furthermore, this statistical process is subject to clinical review.

### **Great Britain**

In Great Britain, the Health Resource Groups (HRG) were developed primarily to reflect a fundamental change from the DRG grouping logic.<sup>16</sup> Cases are assigned to an HRG based on the procedure codes recorded.<sup>17</sup> If more than one procedure is recorded, then a procedure hierarchy is used to choose the grouping procedure. For minor procedures and non-resource intensive procedures, or when no procedure is recorded, the grouper will assign an HRG on the basis of the ICD-10 diagnosis codes recorded. In the majority of cases where grouping is based on diagnoses, the primary diagnosis is used to assign the HRG. In addition, the presence of exceptional factors (based on a pre-defined list) could affect the base DRG assignment.

### **France**

The French grouper, Groupes Homogènes de Malades or GHM, evolved in 1986 from the HCFA-DRG and was designed to be comparable to the AP-DRG.<sup>18</sup> In 1999, a modified version of GHM called Effeuilage Progressif or EfP was introduced to improve its capacity to explain cost variations and medical usefulness.

The modification to the initial GHM system involved removing CC splits and allowing one or more secondary GHM to be added to the base GHM.<sup>19</sup> These secondary GHM are determined using all secondary diagnoses classified as CC. Determining secondary GHM is an iterative process that relies on specific exclusions between diagnoses and or GHM. The best GHM is chosen based on medical and/or economic criteria. This information is then used to add costs over and above the base cost of each primary GHM (which, is estimated from a non-linear regression-type cost model). As a result, this associate cost model places the complexity of each significant CC on a continuous scale.

### **Austria**

After evaluating the DRG system between 1985 and 1987, Austria introduced its own patient classification system in 1997.<sup>20</sup> The new system was called Leistungsbezogene Diagnose-Fallgruppen (LDF) or performance-related diagnostic case groups. While similar in concept to the DRG, LDF system is based on a more consistent hierarchy.

To begin with, hospital abstracts are split into intensive care unit (ICU) and non-ICU cases.<sup>21</sup> Cases contained with the ICU split are further grouped based on ICU score per day (Therapeutic Intervention Scoring System or TISS). Similar to the DRG, the non-ICU cases are grouped based on principal diagnosis with or without principal procedure, age, other secondary diagnoses. Each patient group has further characteristics, such as mean LOS, lower and upper limits for LOS, a procedure dependent and LOS dependent score, and in some cases special regulations for financing special departments like psychology, geriatrics, and neurological rehabilitation.<sup>20</sup>

## **Acute Care Inpatient Grouper—Redevelopment Challenges**

As CIHI's Grouper Redevelopment team embarks upon revising and updating the current CMG/Plx Grouper, a number of activities should be considered and explored as part of the redevelopment process. These issues include:

- i. Determining the purpose of the grouper. Since the implementation of the grouper, some provinces have utilized the grouper as a component of a funding model. Although this was not one of the original purposes behind the development of the CMG methodology, consideration should be afforded to this requirement.
- ii. A review of the diagnosis grade list as it has not been revised or updated since its creation for the assignment of complexity levels back in 1996–1997. With changes in medical and hospital practice over the last several years, all diagnoses, associated LOS definitions and letter grades should be reviewed.
- iii. Undertaking analyses to determine the feasibility of developing CMG-specific inclusion and exclusion diagnosis grade lists. CMG-specific inclusion/exclusion diagnosis grade lists may result in more stable and meaningful expected length of stay (ELOS) and Resource Intensity Weight (or RIW<sup>TM</sup>) indicators, and minimize or avoid potential coding variations.
- iv. Redefining the current age categories to determine if more meaningful age splits for individual CMG are feasible.
- v. Assessing, and if appropriate, modifying the current MCC structure.
- vi. Conducting analyses, using the most current ICD-10-CA/CCI activity and cost data available, to determine whether new MCC and/or CMG should be created.
- vii. Developing policies to ensure uniformity in the utilization of dagger and asterisks codes.
- viii. Assessing the appropriateness of developing a level of invasiveness flag for each intervention on the CCI list.
- ix. Reviewing, and clarifying where appropriate, diagnosis typing definitions.
- x. Reviewing, and revising as appropriate, the grouper logic and the data elements used for grouping.
- xi. Reviewing, and revising as appropriate, the RIW methodology.
- xii. Developing guidelines for future updates to the grouper and the ICD-10-CA/CCI standards.

## VI. Glossary

Term	Definition
AP-DRG	All Patient Diagnosis Related Groups
APR-DRG	All Patient Refined Diagnosis Related Groups
AR-DRG	Australian Refined Diagnosis Related Groups
CC	Complications and Comorbidities
CCI	Canadian Classification of Health Interventions
CCP	Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures
CMG	Case Mix Group
Complexity	How complicated a patient is to treat based on diagnoses other than MRDx for which prolonged LOS and/or costly treatment might be reasonably expected.
CPHA	Commission on Professional and Hospital Activities
DRG	Diagnosis Related Group
Groupier	A system for categorizing patients based on: <ul style="list-style-type: none"> <li>i. Clinical criteria (i.e. diagnoses and/or procedures),</li> <li>ii. Demographic information (i.e. age and/or gender), and</li> <li>iii. Resource consumption (i.e. costs and/or LOS).</li> </ul> Typically tries to relate the type of patients a hospital treats to the costs incurred by that hospital.
HCFA-DRG	Health Care Finance Administration Diagnosis Related Groups
H-ICDA-2	Hospital Adaptation of ICDA, Second Edition
HRG	Health Resource Groups Diagnosis Related Groups
ICD-10-CA	The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision—The Canadian Enhancement
ICD-9	International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision
ICD-9-CM	International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision—Clinical Modification
ICDA-8	International Classification of Diseases, Eighth Revision—Adapted
IR-DRG	International Refined Diagnosis Related Groups
LOS	Length of Stay

<b>Term</b>	<b>Definition</b>
MCC	Major Clinical Category—used with the CMG methodology
MDC	Major Diagnostic Category—used with the DRG methodology
MRDx	Most Responsible Diagnosis—the diagnosis, which accounts for the greatest proportion of LOS; used with the CMG methodology.
NACHRI	National association of Children’s Hospitals and Related Institutions
PCS	Patient Classification System (see Grouper)
PDx	Principle Diagnosis—the diagnosis responsible for the hospital admission; Used with the DRG methodology.
Plx	Complexity Overlay (see Complexity)
PPS	Prospective Payment System—pays a fixed amount for each patient treated within a particular health care setting.
R <sup>2</sup>	Reduction of Variance—a statistical test use to measure the proportion of variation in the data that is explained by the grouper model. Commonly used to compare/evaluate groupers.
R-DRG	Refined Diagnosis Related Groups
Recursive Partitioning	An exploratory technique for uncovering structure in data by successively splitting a dataset into increasingly homogeneous subsets until it is no longer feasible to continue, based on a set of “stopping rules”.
ROM	Risk of Mortality—likelihood of dying.
Severity	Qualifies how seriously ill a patient is with respect to loss of function within a given illness/condition (i.e. mild, moderate or severe).
SOI	Severity of Illness—the extent of organ system loss of function or physiologic decompensation.



## VII. Appendix A

### Appendix A.1 MDC vs. MCC Structure

APR-DRG	CMG	HRG	IR-DRG
<ul style="list-style-type: none"> <li>MDC1 Nervous System</li> <li>MDC2 Eye</li> <li>MDC3 Ear, Nose, Mouth and Throat</li> <li>MDC4 Respiratory System</li> <li>MDC5 Circulatory System</li> <li>.</li> <li>MDC6 Digestive System</li> <li>MDC7 Hepatobiliary Sys/Pancreas</li> <li>MDC8 Musculoskeletal Sys &amp; Conn Tissue</li> <li>MDC9 Skin, Subcutaneous Tissue &amp; Breast</li> <li>MDC10 Endocrine &amp; Metabolic</li> <li>MDC11 Kidney and Urinary Tract</li> <li>MDC12 Male Reproductive System</li> <li>MDC13 Female Reproductive System</li> <li>MDC14 Pregnancy &amp; Childbirth</li> <li>MDC15 Newborns &amp; other Neonates</li> <li>MDC16 Blood &amp; Blood Forming Organs &amp; Immunol Disrds</li> <li>MDC17 Neoplastic Disorders (Haematological &amp; Solid Neoplasms)</li> <li>MDC18 Infectious and Parasitic Diseases</li> <li>MDC19 Mental Diseases and Disorders</li> <li>MDC20 Alcohol/Drug Use</li> <li>MDC21 Injuries, Poisoning and Toxic Effects of Drugs</li> <li>MDC22 Burns</li> <li>MDC23 Factors Influencing Health Status &amp; Other Contacts w Health Service</li> <li>MDC24 HIV Infections</li> <li>MDC25 Multiple Significant Trauma</li> </ul>	<ul style="list-style-type: none"> <li>MCC1 Nervous System</li> <li>MCC2 Eye</li> <li>MCC3 Ear,Nose,Mouth &amp; Throat</li> <li>MCC4 Respiratory System</li> <li>MCC5A Cardiac -Circulatory Sys.</li> <li>MCC5B Vascular -Circulatory Sys.</li> <li>MCC6 Digestive System</li> <li>MCC7 Hepatobiliary Sys/Pancreas</li> <li>MCC8 Musculoskeletal Sys &amp; Conn Tissue</li> <li>MCC9 Skin, Subcutaneous Tiss &amp; Breast</li> <li>MCC10 Endocrine &amp; Metabolic</li> <li>MCC11 Kidney &amp; Urinary Tract</li> <li>MCC12 Male Reprod. System</li> <li>MCC13 Female Reprod. System</li> <li>MCC14 Pregnancy &amp; Childbirth</li> <li>MCC15 Newborns &amp; Neonates</li> <li>MCC16 Blood, Blood-form Org &amp; Immunol Disor</li> <li>MCC17A Lymphoma or Leukemia</li> <li>MCC17B Neoplasm –Unspecified</li> <li>MCC18 Multisystemic or Unspecified Site Infections</li> <li>MCC19 Mental Diseases &amp; Disorders</li> <li>MCC21 Injury, Poisoning &amp; Toxic Effects of Drugs</li> <li>MCC22 Burns</li> <li>MCC23 Other Reasons for Hospitalization</li> <li>MCC24 HIV Infections (AIDS)</li> <li>MCC25 Significant Trauma</li> <li>MCC99 Ungroupable Data</li> </ul>	<ul style="list-style-type: none"> <li>A The Nervous System</li> <li>B Eyes and Periorbita</li> <li>C Mouth, Head, Neck and Ears</li> <li>D Respiratory System</li> <li>E Cardiac Surgery &amp; Primary Cardiac Conditions</li> <li>F Digestive System</li> <li>G Hepato-biliary/Pancreatic System</li> <li>H Musculoskeletal System</li> <li>J Skin, Breast and Burns</li> <li>K Endocrine and Metabolic System</li> <li>L Urinary Tract and Male Reproductive System</li> <li>M Female Reproductive System</li> <li>N Obstetrics and Neonatal Care</li> <li>P Diseases of Childhood</li> <li>Q Vascular System</li> <li>R Spinal Surgery &amp; Primary Spinal Conditions</li> <li>S Haematology, Infectious Diseases, Poisoning &amp; Non-specific Groupings</li> <li>T Mental Health</li> <li>U Undefined Groups</li> </ul>	<ul style="list-style-type: none"> <li>MDC1 Nervous System</li> <li>MDC2 Eye</li> <li>MDC3 Ear, Nose, Mouth and Throat</li> <li>MDC4 Respiratory System</li> <li>MDC5 Circulatory System</li> <li>MDC6 Digestive System</li> <li>MDC7 Hepatobiliary Sys/Pancreas</li> <li>MDC8 Musculoskeletal Sys &amp; Conn Tissue</li> <li>MDC9 Skin, Subcutaneous Tissue &amp; Breast</li> <li>MDC10 Endocrine &amp; Metabolic</li> <li>MDC11 Kidney and Urinary Tract</li> <li>MDC12 Male Reproductive System</li> <li>MDC13 Female Reproductive System <u>incl. Pre- &amp; Postpartum</u></li> <li>MDC14 <u>Childbirth</u></li> <li>MDC15 Newborns &amp; other Neonates</li> <li>MDC16 Blood &amp; Blood Forming Organs &amp; Immunol Disrds</li> <li>MDC17 Neoplastic Disorders (Haematological &amp; Solid Neoplasms)</li> <li>MDC18 Infectious and Parasitic Diseases &amp; <u>HIV Infections</u></li> <li>MDC19 Mental Diseases and Disorders</li> <li>MDC20 Alcohol/Drug Use</li> <li>MDC21 Injuries, Poisoning and Toxic Effects of Drugs &amp; <u>Burns</u></li> <li>MDC22 Factors Influencing Health Status &amp; Other Contacts w Health Service</li> <li>MDC23 <u>Medical Outpatient Visits</u></li> </ul>

**Appendix A.2 Number of Groups and Subgroups for Selected PCS**

PCS	Year (Version)	Country	Base Groups	Subgroups	
CMG	2002 (v3.0)	Canada	478	370 w/ 4 Plx Levels 108 w/ No Plx Levels Plus subdivisions by 3 age groups	Total = 4,752
HCFA-DRG	1995 (v12.0)	USA	338	Some groups split by age and CC	Total = 492
R-DRG	1995 (v10.0)	USA	367	Some groups split by age and CC	Total = 1,170
AP-DRG	1995 (v12.0)	USA	N/A	Some groups split by age and CC	Total = 641
APR-DRG	2003 (v20.0)	USA	316	Most groups have 4 severity levels	Total = 1,258
IR-DRG	2001 (v1.2)	International (3M)	321	306 w/ 3 severity levels 10 w/ no severity levels 3 non-related O.R. w/ 3 severity levels 2 error	Total = 939
AR-DRG	2002 (v5.0)	Australia	665	Some groups split by age and CC	
HRG	2003 (v3.5)	Great Britain	610	130 groups split by age or CC	

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