Abstract book

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Wednesday
14th October 2015
Workshops
Clinical Coding: Approaches, Observations and Audit

Presenter: **Kevin Ratcliffe**  
Department of Health and Human Services,  
Tasmanian State Service  
Australia

The workshop will cover;

- the history of coding and coding audit;
- the importance of coding and necessity of standards to reliably report on provision of healthcare, and ensure the availability data for analysis and research into patient care;
- some different approaches to coding audit and outcomes from these different approaches.

In order to evaluate patient care and make evidence based choices in managing that care, we must have reliable data that adequately describe the reality of patient conditions, interventions, and events associated with each episode. Very often information about cost and length of stay, rates of infection and so on are considered, however the quality of coded information is critical to all these issues and sometimes seems under-evaluated. There are several ways to examine the validity of coded data. These often include random audits or reviews of codes assigned against the original medical record. These audits are expensive and require expert coders to re-abstract data, and then to compare ICD code capture and DRG assignment against the original coded information.

A Smooth Introduction to Case Mix for Newcomers

Presenter: **Jean Marie Rodrigues**  
University Jean Monnet of Saint Etienne,  
Saint Etienne, France  
**Dana Burduja**  
PCSI President

The workshop aims to give to newcomers a basic knowledge, in French, of case mix and to inform them how to go further to PCSI international case mix schools in English language if they need. The following topics will be covered:

- Introduction and basic principles: DRGs and case mix (Jean Marie Rodrigues)  
- Implementing case mix systems in different countries (dans les différents pays) (Dana Burduja)  
- Case mix and quality (Jean Marie Rodrigues)  
- Discussion  
- The schools of the PCSI (Dana Burduja)
**Business Analytics for Creating Insight in Healthcare**

**Presenter:** Alfa D’Amato  
NSW Ministry of Health,  
Australia

The workshop will cover the development and implementation of a number of Activity Based Management tools implemented in NSW, Australia. These tools include the Activity Based Management (ABM) Portal – used for benchmarking and identifying clinical variation; the ABM Monthly Monitor Tool – used to analyse the relationship between activity and financial results; the Reasonableness and Quality (RQ) Tool – used to monitor and score the quality of the costing data.

The ‘Business Analytics for Creating Insight in Healthcare’ workshop will focus on NSW Health experience in the development and implementation of Activity Based Management tools. ABM in NSW has been implemented to provide patient-focused insight to decision-makers in health care. The workshop will cover the functionality of these applications as well as providing an overview of the data flow and governance. The workshop will touch on the use of big data in NSW and the process whereby different tools are used to extract the full value from data.

**Patient Costing – Everything you need to know**

**Presenter:** Nigel Michell  
Powerhealth Solutions

Participants will take an active role in defining and running the GL and Patient Costing methodologies to be used in a worked example. Feedback from this process will be used to set-up and run the Patient Costing application. Question and answer questions will be used to ensure that participants have a good understanding of each step of the process. Handouts will be provided and the workshop will assume that participants have an awareness of Patient Costing principles but little understanding of them.

**Improving Population Health Management through Risk Adjustment**

**Presenter:** Stephen Sutch  
Bloomberg School of Public Health,  
Johns Hopkins University  
Alan Thompson  
ACG International,  
Johns Hopkins HealthCare Solutions

The workshop is an introduction to risk adjustment applying population health casemix classification, with concurrent and prospective predictive models. The participants will experience first-hand how to apply risk adjustment and case-mix methods to financial, managerial and clinical management decisions.
As has been demonstrated in both public and private healthcare systems around the globe, risk adjustment contributes to improved clinical management of populations. It is used, for example, to estimate future resource use, establish equitable budgeting and to identify individuals most likely to require additional resources or specific types of care.

The aim of this workshop is to provide insight into the methods and applications of risk adjustment in population health, and share experiences between the participants of the considerations, issues and challenges around the world. Applicable results will be presented demonstrating examples from several countries, including Canada, the US, Spain, Sweden, Italy and the UK.

**Using Data in Hospital Quality Improvement**

**Presenter:** Amanda Ling  
Ramsay Health,  
Western Australia  
**Terri Jackson**  
Adjunct A/Professor,  
University of Melbourne

There is no consensus about the most useful way to identify and classify adverse events in hospital care, however ongoing monitoring of safety and quality performance requires a systematic approach utilising the available data. Available data may include specifically collected data such as registries and audit, administrative data collected for hospital reimbursement, and incident data collections. This results in indicators vs comprehensive measures, preventable vs all, process vs outcomes, bedside vs external reporters.

Internationally, the most common method for identifying adverse events is voluntary reporting by frontline staff, although more recently, patient-reported adverse outcomes, and use of routinely coded data have been advocated. This workshop provides an overview of international systems of classification for adverse outcomes of hospital inpatient care, with an emphasis on the Australian Classification of Hospital-Acquired Diagnoses (CHADx). The factors and approaches that enable productive monitoring of harm – that is, monitoring which supports on-going improvement activity, will be explored.
Thursday
15th October 2015
**Casemix funding/payment systems and methods 1**

The development and implementation of a national Activity Based Funding System in Australia - 4 year progress report.

**Authors:** James Downie

**Introduction**
A national system of activity based funding, based on a National Efficient Price, was introduced in Australia on 1 July 2012. The ABF system underpins payments of almost $35 Billion to public hospitals and directly determines the contribution of the Federal government to the state and territory run public hospital system.

Since the first year of ABF there have been significant methodological improvements in the pricing models used to determine the National Efficient Price, as well a widening of the scope of services covered, to include both subacute and admitted mental health care.

**Methods**
The pricing model has been empirically derived based on costing information collected as part of the National Hospital Cost Data collection.

Classifications have been refined overtime to reflect changes in clinical practice and the most up to date costing information. The non-admitted and emergency department classifications have been revamped and the AN-SNAP classification for subacute services introduced nationally.

**Results**
There has been a significant decrease in the growth rate of the cost per weighted activity unit over the past 5 years. Growth rates have decreased from over 5.1% in NEP12 to less than 3% in NEP15. This is no doubt due to a range of factors including the introduction of a national ABF system.

The NEP has become an accepted cost benchmark nationally and has been used by a number of Treasuries as lever to improve the efficiency of their public hospital systems.

**Conclusions**
Significant progress has been made in the implementation of a national ABF system over the past 4 years including:
The establishment of the Independent Hospital Pricing Authority
The publication of the National Efficient Price Determination
Development of classification systems for non-admitted services and emergency departments
Refinement of the AR-DRG and AN-SNAP classifications
Initial costing studies to support the design of TTR and Mental Health classifications.

There is more work to do including:
Establishment of a national benchmarking portal to enable hospital managers to identify areas for efficiency improvements and compare their performance to their peers
Exploring opportunities for the inclusion of safety and quality parameters in the national
Developing an alternative funding model for small and regional hospitals

Authors: Jenny McNamee1, Conrad Kobel1, Janette Green1, Luise Lago1

Introduction
Small and regional hospitals have so far not been subject to activity based funding (ABF) in Australia. These hospitals are deemed unable to meet the technical requirements for ABF. In most cases they also experience diseconomies of scale due to the need to provide a broad range of low volume services to geographically large but sparsely populated areas. Block allocation remains the main system of funding for these hospitals. The disadvantage of block funding is that it lacks transparency and accountability regarding volume and type of services being funded. Furthermore it does not provide tools to measure and improve efficiency.

Methods
Patient-level activity and cost data were reviewed to identify the structural (fixed) and patient activity related (variable) components of total hospital costs. The data were further analysed to determine the key drivers of the different fixed and variable costs.

Results
The review confirmed that for small and regional hospitals a high proportion of costs are fixed. Costs that were driven by patient activity could also be identified. However, some costs remained unexplained, due mainly to particular local factors and data quality issues. The developed funding model includes fixed and activity based components. A funding safety net was integrated to support minimum staffing levels for hospitals with very low activity but extended opening hours. Additionally, the funding model allows for provision of services across different care settings by specifying equivalency rates.

Conclusions
A simple and transparent funding model was developed that provides funding for structurally based (fixed) costs and activity based (variable) costs. It also includes measures of efficiency for activity based costs and provides clear price signals for agreed (or anticipated) volumes of patient activity. This model could support efforts in improving the efficiency of patient care in small and regional hospitals and could provide transparency and certainty in the allocation of funding.

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Casemix systems and patient’s needs: A systematic literature review on the value of functioning information in reimbursement systems

Authors: Maren Hopfe¹, ², Ric Marshall³, Birgit Prodinger¹, ², Gerold Stucki¹, ², Conal D. Twomey⁴, T. Bedirhan Üstün⁵

Introduction
Current casemix based payment systems for health services need to ensure that payment rates adequately account for actual resource consumption based on patients' needs for services. However, the challenge remains that current diagnosis based casemix systems, such as the DRGs, do need to have the capacity to explain legitimate differences in health service utilization, costs and length of stay in their casemix groupings. It has been argued that functioning information, as one important determinant of health service utilization, is valuable to be taken into account when developing casemix classification systems. In addition, it has been shown, that functioning information complements diagnosis information and reflects patients' need for services more adequately than focusing on disease and intervention aspects alone. However, there has to date been little systematic collation of the evidence on whether the addition of functioning information into existing casemix systems adds value to those systems with regard to the predictive power and variation explained by the groupings of these systems. Thus, the objective of this study is to examine the value of adding functioning information into casemix systems with respect to various outcomes and to discuss the implications of these results for optimizing financing of health services. More specifically, the aims of this study are to identify how functioning information is integrated into casemix systems and to review the value of more systematically adding functioning information into casemix systems with respect to various outcomes.

Methods
We performed a systematic literature review using keywords related to functioning and casemix systems. Peer-reviewed studies, published between 1977 and 2014 were searched in 6 different databases covering medical, social and economic disciplines. We extracted information about study aims, design, country, setting, methods, outcome variables, study results, and information regarding the authors’ discussion of results, study limitations and implications.

Results
In total, 2225 studies were reviewed out of which 14 studies were included. The results provide evidence that adding functioning information into casemix systems fosters homogeneity in casemix groups and improves predictive ability with regard to various outcomes, including costs, mortality or discharge destination. The collection and integration of functioning information was heterogeneous across studies. Results suggest that, in particular, DRG groupings for frail elderly or severely functioning-impaired patients benefit in their precision from the addition of functioning data.

Conclusions
Integrating functioning information into casemix systems is one promising approach to improve those systems' predictive ability and to adequately group cases with similar resource use. Building upon a common framework for operationalizing functioning information based on international standards could be one option to proceed. This would require ensuring that...
such tools for operationalization of functioning and related measures are available and fit for purpose in the specific casemix systems.

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**Monitoring domestic hospital expenses**

**Authors:** Evelyn Van Lochem

**Introduction**

The Dutch system for hospital financing is a mixture of governmental regulations and free market principles. For a selection of treatments prices are prescribed by the government, but mostly hospitals are required to individually make pricing and volume arrangements with health insurance companies. The Ministry of Health, Welfare and Sport imposes a maximum budget (BKZ) of a 22 billion euros on the total expenses on hospital care. Medical doctors, hospitals and ministry have agreed to limit budget growth. However, health care expenses are still growing and have proven to be difficult to control in the past few years. Monitoring expenses has proven to be a complex and extensive task, since detailed information that covers all hospitals in not easily available, and with a considerable time lapse.

At the request of the NVZ (Dutch organisation of general hospitals) and NFU (Dutch federation of academic hospitals) DHD has started to gather the necessary data on a monthly basis and processing contract information. The aim is to enable hospitals and organisations to monitor hospital expenses on a local and national level, and to forecast expenses during the year. Thus making it possible to analyse and anticipate.

**Methods**

Choosing a structural approach after a successful proof-of-concept in 2012, DHD has started implementing the following stages:

In the first year of our research, we have gathered data from 2011 to June 2014. Hospitals were asked to deliver information on a treatment and patient level, and pricing and contracting information for each insurance company.

Contracts between hospitals and insurance companies are either fixed budgets, maximum budgets or post-calculation of negotiated volumes and prices. In the first stage of our research, we only asked hospitals for the main overall budgets. This indicated a maximum of expenses in 2012-2014. The next step is to analyze contracts on a more detailed level, so as to determine what impact these changes have on the total annual amount spent on hospital care.

Over the years, fundamental changes have been made in the financing system for hospital care. Definitions of (DRG) products and rules for invoicing change, sometimes from year to
year. The government has transferred the funding of expensive drugs from a specific budget to the BKZ. The BKZ has been expanded with the same amount, however, the number and use of expensive drugs also increase, causing hospitals to exceed the total BKZ budget amount. This makes comparing different years difficult, since so many factors can be of influence on the expenses. By isolating different effects, we try to estimate the impact of various factors.

**Results**

Comparing the datasets to key parameters e.g. the annual number of admissions and other data sources e.g. invoices to insurance companies showed that nationally our data is within 2% of other data sources for 2012. It also shows that more recent years are still subject to corrections and additions up to an estimated 5%.

Analysis shows that the number of patients treated in Dutch hospitals has diminished by almost 4% between 2011 and 2014. This occurs mostly in hospitals with a high market density and for out-patient treatments, indicating that patients are less prone to go to a hospital for non-life threatening diseases, although accessibility is high. Exceptions are the number of patients under 18 or over 65 years old, and patient with life threatening illnesses such as cardiac or pulmonary problems or cancer. This results in a higher average cost per patient. Average prices of elective treatments like knee or hip replacements, and cataracts have decreased.

**Conclusions**

Improving data quality is one of the main issues for the coming period. The lag in completeness of the data emphasizes the importance of a timely and correct registration process. In 2015 we have started to have monthly data deliveries directly from the Hospital Information Systems; hospitals are still adapting and testing their processes.

Analyzing contracts and specifically the different local agreements, we attempt to find a general approach. Budget ceilings are the most common form of contract, but for sections of hospital care such as expensive drugs or specific patient groups, there are separate agreements that may or may not be interchangeable. One of the main questions is how much detail is needed for a reliable estimate of the total contracted amount.

Changes in the financing system and government policy are causing inconsistencies in the data. They also influence behavior, changing the way activities or products are registered. Since the same codes are used, isolating the impact of behavior is difficult.

Hospitals participate on a voluntary basis. In making it easier for hospitals to deliver the data, and providing them with benchmark and quality information in return, we hope more hospitals will want to invest time.

1. *Information analysis, DHO, Utrecht, Netherlands.*
Coding terminology and clinical classifications 1

Moving towards ICD-10 in Belgium at the expense of ICD-9 coded data?

Authors: André J. ORBAN¹, Luc B. BELMANS²

Introduction
In Belgium, 2015 is the year of the transition from ICD-9-CM to ICD-10-CM and ICD-10-PCS, called ICD-10-BE. Earlier than in the United States, all patients discharged since January 1st are now coded in ICD-10-BE.

To achieve this migration in time, the Federal Public Service of Health, responsible for collecting the minimal hospital discharge data set (MHDDS), increased the pressure on the hospitals to meet the deadlines for submitting their data. At the same time, healthcare institutions had to deal with the challenge of training their coders in ICD-10, simultaneously with a higher workload to finalize in time the last periods coded in ICD-9. Moreover, the external audits the ministry usually performs yearly in each facility were obviously reduced due to the preparations for ICD-10’s transition. On the other hand, a better theoretical formation of the coding teams with regard to anatomy and physiopathology could yield profit prematurely to the ICD-9 coding.

This study aims to analyze to what extent these factors influenced the coding quality of the last data sets coded in ICD-9-CM.

Methods
Materials: Medical and nursing data of inpatient stays with discharge date in 2013 and 2014 provided on voluntary base by hospitals of different size, in accordance with the typical Belgian MHDDS standard.

Methods: Although reviewing the clinical chart remains the gold standard in auditing the coding quality, we decided to use an automated alternative. First of all, we reused and enhanced earlier developed «coding alerts» - a set of queries based on the existing Belgian coding guidelines for ICD-9-CM version 2011. For the facilities that participated in our first study in 2012, the evolution could be measured. For the new participants, benchmarking with respect to the whole group and with earlier results was achieved.

Secondly, we measured the concordance between medical diagnostics and procedures provided versus nursing activity elements. Therefore, we reused the results of our research conducted in 2013. Assuming that the nursing data were not affected by ICD-10’s transition as they are registered in most hospitals by a separate coding team, the evolution in congruency between both could be related to the evolution in medical data quality.

Finally, a brief questionnaire was required of the participants to assess the influence of the increased timing pressure, along with the preparation for the migration towards ICD-10-BE.

Results
The results are being discussed. Individual reports and benchmark data are provided to the participants.

Conclusions
On the eve of the major move from ICD-9-CM to ICD-10-BE in Belgium, the related need for a more detailed patient record and coding accuracy, and the increasing use of the MHDDS for quality and outcome purposes, we evaluate the impact on medical coding quality of both external and internal measures taken to achieve ICD-10’s transition in time.
While most studies report on coding quality issues immediately after introducing a new coding system, we have a deeper look at the last periods submitted in the old system, suggesting that the effect of a coding system change affects a longer time interval than usually expected.

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Clinical coder exam in Sweden. A first try

Authors: Olaf Steinum¹, Irene Bohlin², Veronica Myrelid²

Introduction
There is no officially recognized profession of Clinical Coders in Sweden, although a systematized training education in diagnosis coding according to ICD-10 has been in place since 2000 as a private enterprise in cooperation with many Swedish hospitals, County Councils and Regions.

Educated Clinical Coders have organized themselves in the Swedish Society of Clinical Coders (RDK) which has been organizing a two days’ conference on a yearly basis since 2003.

To enhance the coders’ official status, the RDK have taken initiative to organize a Certification scheme and as part of this gave their first Coding Exam in conjunction to their yearly conference 12 March 2015. The Exam was adapted to the scheme for a morbidity exam recommended by the WHO-FIC EIC (Education and Implementation Committee).

Methods
The Exam was designed in three parts. Part 1: 20 multiple choice questions on coding rules; Part 2: 30 short coding questions (‘How do you code xxx?’); Part 3: 12 short clinical scenarios to be coded. The evaluation was decided to be strict and points were only given for correct codes on the 4th character level. A half point was deducted for incorrect sequencing, for invalid codes and for incorrect choice of principal diagnosis in Part 3. The maximum points were 137.

Results
Of the 100 coders who participated in the Exam, 21 obtained the 80% correct answers limit set as the requirement to obtain the certification Diploma.

Conclusions
Detailed statistics on the results will be presented.

1. Diaqualos AB, Uddevalla, Sweden.
Apraisal Methodology in Computer Assisted Coding

Authors: Oktavian Weiser¹, Klemens Vogel¹, Lothar Zimmermann¹

Introduction
For more than a decade Computer Assisted Coding (CAC) has been a major challenge to achieve. Natural Language Processing (NLP), supervised and unsupervised Machine Learning (ML) techniques as well as the increase of domain coverage of controlled medical vocabularies/ontologies had to reach a critical mass to efficiently parse electronic encounter documents and to achieve reliable coding outcomes. CAC promises augmented coding efficiency, productivity and accuracy expressed as correct and complete, consistent and compliant with coding regulations and guidelines. Leveraging information concealed in unstructured text also opens the gate to secondary usage of high volumes of encounter data within data-science appliances.

Therefore CAC solutions, have now become reliable tools to discover documentation gaps, especially in the context of a transition to a more granular mandatory classification like ICD-10-CM/PCS. Sustained shortage of coders, resulting in backlogs accumulation and an increase in workload, along with poor documentation quality are the motivational factors behind the hospital's and healthcare auditing institution's to implement CAC solutions. Among the key success factors in implementing CAC, the EHR adoption maturity level, the degree of clinical subsystem integration within the Hospital Information System (HIS), the ‘just-in-time for coding’ availability of electronic documents are the most salient. Integration challenges, along with data safety/security constraints, terminology normalization tasks and a reduction of redundant codes are the most often encountered bottlenecks of CAC adoption. Appraising the quality of such systems facilitates an informed decision to select the ‘best of breed’ and is a continuous task after its implementation.

Methods
Intrinsic quality measurements detect the overlap between the result of an automatic labeling of narrative text with codes of the target classification and the ‘gold standard’ which results after a manual coding of the same document corpus using the same target classification.

Given the contingency matrix (see Table 1) for each auto-suggested code in a specified encounter then:
- Precision (P) or positive predictive value (PPV) defined as \( P = \frac{TP}{TP+FP} \) expresses the quality of what did get reported i.e. how many auto-suggested codes are correct?
- Recall (R), sensitivity or true positive rate (TPR) is expressed as \( R = \frac{TP}{TP+FN} \) and measures whether anything was missed i.e. how many correct codes out of all encounter correct codes were auto-suggested?
- F-measure is the weighted harmonic mean of the above two: \( F = \frac{2PR}{P+R} \)
- Accuracy (ACC) is defined as the proportion of correct codes \( ACC = \frac{TP + TN}{TP + TN + FP + FN} \)
- CAC Engine performance is defined as the percentage of the above parameters with respect to the results of inter-coder agreement (e.g. CAC Precision performance CPP = \( P_{CAC}/P_{ic} \))
- DRG correct classification rate expressed as the percentage of encounters that have the same DRG/SOI as the officially reported grouping results.

The proposed test involves 2 experienced, independently working clinical coders having access only to the electronic documentation of a sample of 50 randomly selected encounters per clinic. Coding differences are discussed, conflicts are merged to produce an ad-hoc ‘gold standard’. The coding result of each coder is then compared to the ad-hoc ‘gold standard’ and
the inter-coder agreement rate is computed. In parallel, a third experienced coder, using a CAC enabled application, independently codes the same document corpus without protected personal health information.

**Results**
On pooled data from two hospitals (N = 100) the DRG/SOI classification rate, based upon auto-suggested codes from our CAC engine reached 85%. The remaining 15% reached the same DRG but a different SOI. After answering the cascading questions of the integrated coding decision support module the DRG/SOI correct classification rate was near to 99%.

**Conclusions**
The overall performance of CAC engines can be appraised using the above intrinsic measurements. CAC technology has now reached maturity and wide acceptance in the clinical coding environment and will eventually be adopted on a large scale in the years to come to reduce coding backlogs and streamline the coding process.

**Table 2 - Generic results of CAC engine metrics**

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Precision</th>
<th>Recall</th>
<th>F-Measure</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coder 1</td>
<td>0.893</td>
<td>0.853</td>
<td>0.873</td>
<td>0.865</td>
</tr>
<tr>
<td>Coder 2</td>
<td>0.929</td>
<td>0.987</td>
<td>0.957</td>
<td>0.919</td>
</tr>
<tr>
<td>Coder 3 with CAC engine</td>
<td>0.785</td>
<td>0.856</td>
<td>0.819</td>
<td>0.856</td>
</tr>
<tr>
<td>Intercoder agreement</td>
<td>0.911</td>
<td>0.920</td>
<td>0.915</td>
<td>0.892</td>
</tr>
<tr>
<td>Engine performance</td>
<td>86%</td>
<td>93%</td>
<td>89%</td>
<td>96%</td>
</tr>
</tbody>
</table>

**Table 1 - Contingency matrix**

<table>
<thead>
<tr>
<th>CAC Engine</th>
<th>Gold Standard</th>
<th>Code present</th>
<th>Code absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code present</td>
<td>TP</td>
<td></td>
<td>FP</td>
</tr>
<tr>
<td>Code absent</td>
<td>FN</td>
<td></td>
<td>TN</td>
</tr>
</tbody>
</table>

1. 3M HIS, Neuss, NRW, Germany.
Possible benefits and challenges for the implementation of the ICD-10 in the Dutch hospital reimbursement system

Authors: Martijn Hessels¹

Introduction
In the Netherlands, insurance companies and hospitals have to negotiate about the tariffs, volumes and quality of treatments. Therefore a well-functioning health information system that provides enough information for these negotiations is necessary. One of the main fundamentals of hospital reimbursement systems is correct diagnosis and procedure information collected and registered as routine data. For this purpose, most countries do use an international diagnosis classification system, and use each different methods for including procedure information.

The introduction of this international diagnosis classification could be an asset to optimize the Dutch hospital reimbursement system. ICD data is necessary for optimizing the information, such as case mix information, needed for the negotiations in the Netherlands.

As an input for the discussion how to implement ICD data in the Dutch hospital reimbursement system we performed an analysis that compares the hospital reimbursement systems of France, the United Kingdom, the United States, Belgium, the Netherlands and Germany. Not only the administrated data sets differ from country to country, but also the role these data sets have within different hospital reimbursement systems is subject to variances. This presentation presents facts and conclusions applicable to the Netherlands.

Objectives
In this session the following issues will be discussed:
How do the hospital reimbursement systems in France, the United Kingdom, the United States, Belgium and Germany compare to the Dutch system?
What are the main differences within the reimbursement systems?
Which diagnosis classification systems, diagnosis lists or other diagnosis systems are used.
And which purpose do they serve?
What are the main benefits for a reimbursement system when using an international classification system for diagnosis information, and which aspects may be considered for the Netherlands?

Methods
We performed an analysis comparing the hospital reimbursement systems of the Netherlands and the neighbouring countries France, Belgium, The United Kingdom, and Germany. We also considered the United States of America. Also relevant stakeholders (governmental parties, physicians, management boards of hospitals, internal advisors at health insurance companies) were consulted in each of the participating countries.

Results
The main result of the analysis is an overview of the different reimbursement systems in the mentioned countries and the different ways diagnosis information is used within these systems. Besides this the analysis leads to an overview how uniform diagnosis information based on an international classification system can be used in a diverse range of healthcare information products. In the Netherlands the locally developed diagnosis data set used for the reimbursement system does not have the properties of a classification. The analysis may be
used by Dutch governmental parties when choosing a pathway to implement an international diagnosis classification system within the Dutch hospital reimbursement system.

Conclusions
The hospital reimbursement system of the Netherlands differs from that from other European countries in several aspects. One of the main aspects is the particular market environment in the Netherlands. The performed analysis offers insights about these differences and the challenges for the Netherlands.

In this way the analysis can be the start of the discussion on how to incorporate reimbursement based on health outcomes in a healthcare insurance system with a ‘market environment’, which is the case in the Netherlands. Where does the role of routine data based systems end, and the role of quality registers starts, regarding ‘pay for outcome’ principles? How can routine based high quality ICD-10 data attribute to a good information system?

Population Based Classification Systems and Applications

Patient Segmentation for Population Health Management Using CRGs

Authors: Herbert Fillmore

Introduction
Providers and payers face increasing pressure to understand the populations they serve. Population cohorts range from "non-users" to the critically ill with many degrees of complexity in between. Different segments of the population will present different levels of risk to financial and quality performance. Programs to improve performance are well served by the identification of clinically meaningful cohorts for specialized interventions. This presentation displays results of the application of a new aggregation of Clinical Risk Groups to population analyses in data from the United States. The clinical status and financial impact of patient segments in three settings are presented: 1) a state-wide all payer cohort; 2) a commercial insurances plan's members; and 3) a plan with a mix predominantly of Medicaid and Medicare members.

Methods
Clinical Risk Groups (CRGs) are a classification system for individuals’ health status. CRGs are derived from readily available encounter and claims diagnostic information (including pharmaceutical data) accumulated during the use of healthcare over an extended period of time. CRGs are distinguished from other case mix systems by the output of mutually exclusive classification groups that explicitly recognize and display interactions among conditions and the severity of illness burden. The full array of CRGs includes 1,344 groups. For population health strategic planning, that number of groups is best reduced. We created seven aggregate categories labeled Population Health Segments: Non-user, Health, At-risk, Stable, Simple Chronic, Complex Chronic, and Critical.

These population health segments were applied to a blend of 2013 and 2014 data on over 2 million individuals belonging to the three settings described above and the relative percent of members in each cohort in each setting was compared with the total costs of care for that cohort. Members were excluded that did not have at least 12 months of enrollment or had some of their costs of care external to our data (i.e., those with coordination of benefits.)

Results
Healthy and non-users had the highest membership, representing 70% of the Statewide pool, 48% of the commercial plan, and 41% of the predominantly public plan. None of these cohorts used more than 8% of the total expenditures on health care in their setting.

At the other extreme of complexity, among those with critical health status, the cohorts were smaller: 2% of the Statewide pool, 1% of the commercial plan, and 3% of the primarily public plan. However, the total expenditures for these cohorts were significantly greater than the size of the cohort: 13% of total expenditures for the Statewide pool, 12% for the commercial plan, and 25% for the primarily public plan. Simple and complex chronic cohorts represented other areas of expenditures out of proportion to the size of the cohorts.

Conclusions
These variations have high face validity reflecting what is generally known about population differences among payers. These analyses quantify our understanding. The way these results
are displayed to providers and payers, with the ability to "drill down", has been shown to be critical to their acceptance and usability. This will be demonstrated during the presentation.

As individuals experience more complex disease burdens, they require input from multiple resources including enhanced primary care teams, and eventually interaction with high-value specialists and institutional care. Delivering that care in a timely and efficient fashion requires the development of effective programs at the system level and timely interventions at the person level. Both of those objectives can only be achieved with reliable patient segmentation. We have presented an approach that successfully discriminates among settings and populations to assist managers and clinicians in the design and delivery of appropriate care.


Measuring and understanding patient coordination across the healthcare continuum

Authors: Stephen Sutch¹,², Chad Abrams², Klaus Lemke³, Alan Thompson²

Introduction
Population health approaches to screen patients for Case Management Programs have been developed in recent years in the USA health systems, and increasing in other countries. The tools used include a variety of predictive models to provide initial at-risk populations, and data mining techniques to further identify vulnerable patients with specific patterns of conditions or utilisation. Increasingly these measures are spanning all sectors of care provision, family doctors, outpatients, inpatients and social services.

Care coordination is seen as a critical component to providing effective and safe care to patients, particularly who are seen by multiple carers across multiple settings and organisations.

Methods
A review of studies was used to identify key factors and confounders of care coordination, both those that will lead to potentially poor coordination, and those that improve coordination. Algorithms were derived to produce a classification of care coordination and interaction between providers using routine hospital, community and family doctor data.

Results
Key measures in examining care coordination includes the number of providers, numbers of doctors and specialties involved, what proportion of care is provided by a majority provider, and whether a generalist such as a family doctor or geriatric consultant is involved. Patient sharing between doctors and specialists has also shown to reduce overall costs, while adjusting for case mix complexity.

Conclusions
Combining simple multiple measures to derive an algorithm and analytics to understand and identify patients at risk of poor patient coordination is an important tool to support case management and support to patients across health care providers and sectors. Programs are
also increasingly identifying social care as well as health care determinants that increase and decrease risk of poor care coordination.

1. Johns Hopkins University, Chandlers Ford, United Kingdom.
2. Johns Hopkins HealthCare, Baltimore, MD, United States.

Case Finding & Population Profiling – Separate Disciplines or Both Sides of the Same Coin?

Authors: Alan Thompson1, Stephen Sutch1,2

Introduction
Key health policy imperatives within the National Health Service (NHS) in England over the last 5 years have seen an increase in the use of risk stratification tools and in case finding activities, particularly in relation to identifying individuals as risk of emergency/unplanned admission to hospital.

Using case finding techniques has been largely confined to providing primary care clinicians with lists of people who may benefit from proactive intervention to prevent an unnecessary admission to hospital. However, clinicians and managers have repeatedly noted two things - firstly people at risk on unplanned hospitalisation are not a particularly homogenous group in terms of the principle intervention being offered and secondly when the existing predictive models are used to try and identify other cohorts of interest such as frail people or those who are the highest cost, the correlation between the list produced by the model and what people observe is lower.

Methods
An exercise was undertaken within a Clinical Commissioning Group (CCG) in Berkshire to profile the whole population, concentrating specifically on what factors are the key divers of cost and hospital activity and to explore the overlap between patients at risk of different adverse outcomes. Patient level (but anonymised) data covering a population of circa 140,000 was used to undertake this analysis.

Results
Results will be shown that illustrate new understanding and insight about key drivers of cost and how the overlap between different at risk groups is not as large as the CCG and others first thought. Initial results demonstrate that multi-morbidity rather than age is the key driver of cost and that the overlap between different risk groups can be as low as 25%.

Conclusions
There has been a focus within the NHS on preventing unplanned admissions to hospital and the principle use of risk stratification tools and case finding techniques has been to identify people at risk of this adverse outcome. However, policy imperatives are evolving and there is increasing interest on other cohorts of individuals who may benefit from proactive intervention and how these can be found using predictive modelling tools and techniques. Our work argues that in order to undertake effective case finding you first need to profile of the population you are managing, then use quite sophisticated case finding techniques to align
the programmes of care available to the needs of the population and then continue to iterate between these activities.

1. Johns Hopkins HeathCare, Baltimore, MD, United States.
2. Johns Hopkins University, Baltimore, MD, United States.

Healthcare Databases and Population Based Case-Mix Systems to Support Decision Makers on Heart Failure Management in an Italian Region

Authors: Pietro Barbieri1, Mauro Maistrello1, Cristina Mazzali3, Alessandra DI MAIO4, Maria Frigerio5

Introduction
Healthcare organizations in Lombardy share a common set of administrative and textual databases. Information is collected in the data warehouse of each healthcare organization and can be retrieved by regional regulatory authority for quality assessment and for healthcare planning. Available information is based on administrative data on inpatients and outpatients, drug prescription claims and on textual data (hospital discharge, ER and ambulatory reports). The integration of different informative sources can allow the development of an extensive but coherent set of indicators that timely can support the understanding of the value generated by the healthcare services in order to overcome performance-based reimbursement systems in a patient-oriented perspective.

Methods
The eligible population of heart failure patients has been selected from inpatients administrative data for the period 2000-2014 by retrieving incident cases according to ICD-9-CM codes. From 2005 to 2012 subsequent admissions for any cause, ambulatory encounters, ER visits, drug prescriptions and mortality have been linked to each incident case. The cumulative incidence was 216 782 cases; the 2011 prevalence was 172 808 patients. Clinical Risk Groups (CRG) classification system was used to profile health services utilization, to describe heart failure sub-populations and to stratify outcome measures. CRG is a population based classification system that assigns each individual into mutually exclusive clinical categories and assigns a severity level if chronically ill. The CRG reads enroll descriptors, diagnoses, procedures and resource data. It assigns all diagnosis codes to one of 537 diagnostic category (acute or chronic) and 37 body systems and assigns procedure codes to a procedure category. Each individual is grouped to a hierarchically health status group and then to a CRG category and severity of illness (SOI). There are 9 health care status groups (from non-users to catastrophic conditions), 272 base CRGs and with SOI , a total of 1080 final CRGs. Statistical analysis was performed by means of SAS 9.2 software: GLM proc was used for multiple regression analysis on financial burden of disease and LIFETEST proc for survival analysis.

Results
Out of 172 808 heart failure patients 98.7% of cases are in status from 5 to 9: 51.7% in status 5 (significant chronic disease), 35.13% in status 6 (significant chronic diseases in multiple organ systems), 6.9% in status 7 (dominant chronic disease in 3 or more organ systems), 2.76% in status 8 (dominant/metastatic malignancy) and 2.21% in status 9 (catastrophic). The distribution of CRG aggregations highlights that only 21% of patients are assigned to pure
heart failure category; 79% of patients are assigned to categories with a combination of one or more chronic diseases other than heart failure.

Two main factors (CRG status and severity levels) are related with resources burden due to hospital admissions, ambulatory care and drug consumption. A multivariate regression analysis was performed to predict individual overall burden (log of the overall cost, given the asymmetry of the distribution) as a function of some measurable independent variables; a significant predictive value was found for: age, gender, age*gender interaction, CRG status, CRG severity levels and death with R-square=0.46.

The strata generated by CRG status are related to significant differences in overall mortality. The Table depicts a decreasing survival related to an increasing status with the exception of status 9 that overlaps with status 7 while status 8 is associated with the poorest survival. Most of subjects in status 9 are heart failure patients with end stage renal disease in dialysis.

**Conclusions**

The heart failure population is characterized by high risk and high cost subgroups across multiple chronic conditions and several levels of severity of illness. A fair agreement has been measured between the weights of the CRG classes and the financial burden of different heart failure sub-groups of patients.

The classification system can assure useful comparisons among different local settings in order to support healthcare planning.

The classification system is clinically meaningful and can generate homogeneous strata which are related to different outcomes. The only found exception can be explained by the availability of treatments with an higher degree of efficacy in status 9 than in status 8.

Kaplan Meier Method: Survival at 500 days

<table>
<thead>
<tr>
<th>CRG status</th>
<th>survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>85.0 %</td>
</tr>
<tr>
<td>6</td>
<td>73.5 %</td>
</tr>
<tr>
<td>7</td>
<td>62.0 %</td>
</tr>
<tr>
<td>8</td>
<td>29.5 %</td>
</tr>
<tr>
<td>9</td>
<td>62.0 %</td>
</tr>
</tbody>
</table>

1. Azienda Ospedaliera di Melegnano, Cernusco sul Naviglio, Italy.
2. Cardiologia 2 - Insufficienza cardiaca e Trapianto, A.O. Ospedale Niguarda Ca’ Granda, Milano, Italy.
3. Dipartimento di Ingegneria Gestionale, Politecnico di Milano, Milano, Italy.
4. 3M Health Information Systems, Pioltello, MI, Italy.
Costing healthcare activities and casemix applications

Improvement of cost allocation in gastroenterology by introduction of a novel service catalogue covering the complete spectrum of endoscopic procedures

Authors: Markus Rathmayer², Wolfgang Schepp⁴, ⁵, Michael H. Wilke¹, Markus Lerch³, ⁶

Introduction
The German hospital reimbursement system (G-DRG) is incomplete for endoscopic interventions and fails to differentiate between complex and simple procedures. This is caused by outdated methods of personnel-cost allocation.

Methods
To establish an up-to-date service catalogue 50 hospitals made their anonymized expense-budget data available to the German-Society-of-Gastroenterology (DGVS). 2,499,900 patient-datasets (2011-2013) were used to classify operation-and-procedure codes (OPS) into procedure-tiers (e.g. colonoscopy with biopsy/colonoscopy with stent-insertion). An expert panel ranked these tiers according to complexity and assigned estimates of physician time. From June to November 2014 exact time tracking data for a total 38,288 individual procedures were collected in 119 hospitals to validate this service catalogue.

Results
In this three-step process a catalogue of 96 procedure-tiers was established that covers 99% of endoscopic interventions performed in German hospitals and assigned validated mean personnel-costs using gastroscopy as standard. Previously, diagnostic colonoscopy had a relative personnel-cost value of 1.13 (compared to gastroscopy 1.0) and rose to 2.16, whereas diagnostic ERCP increased from 1.7 to 3.62, more appropriately reflecting complexity. Complex procedures previously not catalogued were now included (e.g. gastric endoscopic submucosal dissection: 16.74).

Conclusions
This novel service catalogue for GI-endoscopy almost completely covers all endoscopic procedures performed in German hospitals and assigns relative personnel-cost values based on actual physician time logs. It is to be included in the national coding recommendation and should replace all prior inventories for cost distribution. The catalogue will contribute to a more objective cost allocation and hospital reimbursement - at least until time tracking for endoscopy becomes mandatory.

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2. Senior partner, inspiring.health, Munich, Germany.
3. Gastroenterology, University Hospital, Greifswald, Germany.
4. Gastroenterology, Klinikum Muenchen, Munich, Germany.
5. comission for classification and health economy, DGVS, Berlin, Germany.
6. President of the scientific society, DGVS, Berlin, Germany.
The potential for improvement of patient cost data by using decentralized data on the consumption of medicine in a centralized setting

Authors: Mette K. Pedersen¹, Janne Refnov¹

Introduction
The Danish Register of Medicinal Product Statistics is unique on a global scale, as it is the only register about consumption of medicinal products, which covers the entire population of a country over so many years (since 1994). While Danish pharmacies report the consumption of medicine under people’s CPR numbers (social security numbers), Hospitals register their consumption of medicine under ward codes. The consumption of medicine in the hospitals is therefore not identifiable on a patient level in a centralized setting.

Data on the consumption of medicine is essential to the calculation of patient costs in hospitals and eventually the calculation of DRG tariffs by Statens Serum Institut (National Institute for Health Data and Disease Control, Denmark). Even though the data is not collected on a national level, the regions of Denmark (Denmark is divided into 5 regions) have systems for registration of the consumption on a patient level.

This work focuses on the exploration of the regional data on medicine consumption’s potential for qualifying patient costs

Methods
The work has three areas of focus:
1) Data contents: An exploration of the coverage of the registered medicine data (what types of medicine does the data cover?)
2) Quality of the regional medicine data: By i) comparing with the registered consumption of medicine on a ward level and ii) exploring the quality of registration in the data by comparing the data on a patient level to the registered activity in the different wards, the quality of the data is assessed.
3) The regional medicine data’s potential for improving a centralized calculation of patient costs in hospitals: By using prices of medicine reported to The Danish Register of Medicinal Product Statistics the potential for improvement of calculation of patient costs is explored.

Results
The regional medicine data covers a large part of the medicine consumption in hospitals. The regionally registered medicine is of a varying quality - the precision of the registrations seems reasonable when it comes to the precision of time registration (used for joining the data with the registered activities in the Danish hospitals), but the quality is somewhat less good when it concerns quantity of consumption.

Conclusions
The regional medicine data has a (great) potential for improving the precision of calculated patient costs - especially over time. The issue concerning the present quality of the data is that the data is not really used at the present time - neither at a national or regional level. Using the data will give an incentive to improving the quality of registration.

1. Health Documentation (Sundhedsdokumentation), National Institute for Health Data and Disease Control, Denmark (Statens Serum Institut), Copenhagen, Denmark.
French national costing in long-term care for the elderly: first steps of implementation.

Authors: M-Caroline CLEMENT¹, Thomas ANDRE¹, Nelly BOULET¹, Frédéric QUICHON¹, Gaëlle CONTESTI¹, Joelle DUBOIS¹, Véronique SAUVADET-CHOUVY¹, Axelle MÉNU¹, Caroline REVELIN¹

Introduction
In France, the financing system of long-term care for the elderly is being reformed. It concerns nursing homes with medical services for elderly with functional loss or medical problems, called EHPAD (Accommodation establishment for dependent elderly). Currently, EHPAD receive a triple financing from: the national health insurance (CNAMTS) for care; the department for the dependency; and the resident for hosting. In the context of the reform, both the ministry (DGCS) and the agency (CNSA) in charge of long-term care missioned the technical agency of hospital information (ATIH) to extend its costing activities on long-term care for the elderly.

Thus, ATIH conducted two surveys in 2013 and 2014 in EHPAD and estimated the daily cost at around €37,000. In 2015, it implemented a national costing to estimate the cost for the elderly in long-term care according to his medical conditions and dependency level.

Methods
The national costing required, not only cost data of the structure (as surveys), but also individual information about the resident's health condition.

Presently, no data is routinely available in EHPAD. This led ATIH, for the needs of the costing, to implement a specific data collection in EHPAD. On one hand, medical and resources utilization data are gathered on an individual level in each structure four times a year in 2015. On the other hand, 2015 closed cost accounting will be collected in 2016.

Medical data collected is:
- the medical conditions from PATHOS, a French tool that evaluates the care required for a resident on a given day, depending on his "pathological states" (combination between all pathologies and their "care profile" );
- the autonomy level from AGGIR, a French scale for activities of daily living (ADL) that reflects the care load due to dependency through the coding of self-care tasks (functional mobility, bathing and showering, dressing, self-feeding, personal hygiene, orientation and consistency) in three categories (self-governing, dependent, intermediate).

Both previous tools are currently used in EHPAD for the financing renewal: AGGIR once every year for the financing of dependency; PATHOS twice every five years for the financing of care.

- Other medical data: hospitalization in emergency, Alzheimer unit admittance, home hospitalization services, physiotherapy session.

The gathering of resources used focuses on the most important part of the expenses for the EHPAD: the staff (73% of the cost by resident according to the previous surveys). Thus, to estimate precisely the amount of staff expenditures consumed per resident, each structure has to collect during one week the time (in minutes) spent by nurses, nursing auxiliaries and home attendants with each resident for the main services provided (care, ADL, and social life).

A software developed by ATIH merges and anonymizes resident's data before delivering them to a national platform. A quality control process has been implemented to check data reliability and completeness.

Days of attendance by resident will be extracted from a national database (ResidEhpad)
managed by the national insurance.
The 2015 cost accounting of each structure will be collected in 2016 and allocated to
different items of expenditure: accommodation, food service, laundry, ADL services, social
life, care, management activities, property and financial charges.
The amount of each item will then be distributed per resident according to *ex ante* defined
work units (e.g. minutes for staff, days of attendance for food services).
Medical data will be used to define homogeneous groups of residents according to their
medical conditions and dependency level. The groups will be elaborated in agreement with
the stakeholders, the ministry and the agency in charge of long-term care.
A database computing medical homogeneous groups and cost of care will be produced after
adjustment to return the cost in long-term care per medical homogeneous group of residents.

Results
77 voluntary EHPAD with around 5,000 residents have been included in the national costing
for 2015. All participating structures had a one-day training before their inclusion and will
receive a financing according to the quality of their data. The two first data collections have
yet been done. Five EHPAD abandoned because of the workload related to the time
collection. The first results for the 2015 edition will be available at the end of 2016.

Conclusions
At the moment, the implementation of the first national costing in long-term care for the
elderly in France seems to be successful. This costing will be repeated annually at least three
times on the same schedule. The EHPAD recruitment for the next costing has been recently
initiated and will last until the end of 2015, whereas medical data record will start in March
2016.

1. ATIH (Technical Agency for Hospital Information), Paris, France.

The Estimation of Nursing Cost and Nursing Service Weights of Malaysian DRG (MY-DRG) in a Teaching Hospital, Universiti Kebangsaan Malaysia Medical Centre (UKMMC)

Authors: Syed Aljunid¹, Nor Haty Hassan¹,², Roszita Ibrahim¹,², Amrizal Muhd Nur¹

Introduction
Nurses are the largest contributor to patient services in hospitals and have major contribution
in the inpatient care. Although, cost of nursing has increasingly been studied in many other
countries for several purposes, no such study has been done in Malaysia. Hence, due to the
high operating and labor cost in the hospital, it is very crucial in today’s healthcare practice to
measure the cost of nursing. This study aims to impute the nursing costs and nursing service
weights (NSW) of MY-DRG for inpatients at a teaching hospital in Malaysia.

Methods
This study was carried out in UKMMC from November 2012 to August 2014. UKMMC is
the first teaching hospital in Malaysia to use the Casemix system with the main purpose is to
improve the quality of care and managing hospital resources efficiently. All the four years of
hospital inpatients data, from 2009 to 2012 were gathered and included in the study. The data
was obtained from the Casemix database for inpatients and were grouped using MY-DRG,
the casemix system specifically developed for Malaysian. Costing study was conducted using a combination of Top Down and Activity Based approach. The hospital costing data were obtained from five departments including Finance, Human Resource, Nursing Management, Maintenance and Health Information Department of UKMMC. Clinical Cost Modeling software (CCM Version 3.0) was used to calculate cost per day of stay in the Top-down method to assist in the development of nursing service weights. The Activity-Based costing method was used to impute cost of nursing care based on the nursing service time for selected cases and disciplines. Total cost of nursing services for each MY-DRG Group were calculated and the costing data was trimmed using L3H3 method to handle the outliers. Finally, NSW for each MY-DRG was imputed.

**Results**
A total of 90,581 discharges were grouped into 708 MY-DRG groups. Four MY-DRG groups were excluded after the data was trimmed and the remaining 80,542 discharges were included in the final analysis. For non-surgical cases, three out of ten highest nursing service weight, were from CMG F (Mental Health and Behavioral Groups), five from CMG U (Ear, Nose, Mouth and Throat Groups) and two from CMG H (Eye and Adnexa Groups). For surgical cases, four out of ten highest nursing service weight were from CMG M (Musculoskeletal System & Connective Tissue Groups, two CMG U (Ear, Nose, Mouth and Throat Groups), two CMG G (Central Nervous system), one CMG N (Nephro-urinary System Groups and one from CMG L (Skin, Subcutaneous Tissue and Breast Groups). MY-DRG with the five highest nursing cost for surgical and non-surgical cases were presented here. The Non-surgical cases are: H-4-12-I (Other Eye Diseases-Mild; 0.2298), followed by F-4-15-I (Phobia Anxiety and Other Neurosis-Mild; 0.2164), H-4-12-II (Other Eye Diseases-Mild; 0.2135), F-4-14-I (Depressive Disorders-Mild; 0.2106), U-4-13-II (Epiglotitis Upper Respiratory Tract Infection Laryngotracheitis and Otitis Media; 0.2097). For surgical cases, the top five nursing cost weights are: M-1-40-II (Local Excision & Removal of Internal Fixators; 0.1133), followed by U-1-20-II (Other Ear Nose Mouth and Throat Operations; 0.1133), M-1-60-III (Other Operations of Musculoskeletal System and Connective Tissue-Major; 0.1133), U-1-12-I (Sinus and Mastoid Operation-Minor; 0.1133), G-1-20-I (Cranial and Peripheral Nerve Operation-Minor; 0.1133).

**Conclusions**
The Nursing Service Weights in this study shows the variability of resources in nursing care among MY-DRG groups. The high Nursing Service Weights reflects the high nursing resources consumption for the particular MY-DRG groups. However the result also revealed the homogeneity of Nursing Service Weights in some MY-DRG groups. The output of this study can help decision makers in designing appropriate incentive package for reimbursement of nursing services.

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2. International Institute for Global Health, United Nations University, Kuala Lumpur, Malaysia.
Casemix classification systems and its applications for all healthcare types 1

Implementing the Episode Clinical Complexity Model into the Australian Refined Diagnosis Related Groups classification for Version 8.0

Authors: Vera Dimitropoulos

Introduction
Phase one in the development of AR-DRG Version V8.0, included a Review of the AR-DRG Classification Case Complexity Process resulting in a new Episode Clinical Complexity (ECC) Model. The ECC Model allows for the assignment an Episode Clinical Complexity Score (ECCS), to each episode. These scores quantify relative levels of resource utilisation within each Adjacent Diagnosis Related Group (ADRG) and are used to split ADRGs into DRGs on the basis of resource homogeneity.

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

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

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

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

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

The AR-DRG classification structure itself has not been altered for AR-DRG V8.0 apart from changes required as a result of a review of the surgical hierarchy and minor code movements facilitated by incorporation of DTG approved DRG public submissions.
Conclusions
The conceptually based, theoretically derived and data driven characteristics of the ECC Model implemented within the classification provide a strong basis for ongoing refinement of the classification as changes in clinical care and improvements in data quality occur over time.

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

1. National Centre for Classification in Health, University of Sydney, Sydney, NSW, Australia.

A New System to Classify Rehabilitation Facilities Outpatients for Financing Purposes

Authors: Claudia M. Borges¹, Elizabeth Reis², Dália Nogueira³, José Dias², Abdul Suleman³

Introduction
The improvement of living conditions along with medical advances in the treatment and prevention of many diseases has led to changes, with an increased longevity and different health profiles. These changes are the result of the evolution in the treatment of diseases that have become less mortal and more chronic. Many of these conditions lead to the inability to perform the Activities of Daily Living (ADL) which, in turn, cause disability and dependence. The Health Systems face additional challenges and must respond by reorganizing institutions, resources and financing, in order to provide care in agreement with a new pattern of population’s needs. Portuguese outpatient rehabilitation facilities are financed on a fee for service basis, with no differentiation according to the complexity of the patient’s disability. There is no systematic information, regarding patients functional dependence, diagnostics or demographic characteristics. It has been long acknowledged that a financing system detached from the patient case-mix and burden of disease may lead to inequities among providers since there are potential incentives to select individuals with less complex disabilities. Since patients are treated not only by the etiological diagnosis but also by functional dependency, a financing system that does not contemplate the amount of health care needed will lead to an inadequate allocation of resources. An evidence based system for allocating financial resources would be fairer and enable the implementation of a prospective financing system according to the patient’s clinical and functional status. Given the assumption that patients with higher dependency require additional time in rehabilitation and more allocation of resources, the Portuguese Ministry of Health has been studying the development of a financing system for ambulatory rehabilitation according to complexity levels. The main objective was to create a new patient classification system for ambulatory rehabilitation care based on a case mixed group function, to determine the complexity level of rehabilitation outpatients. This variable will be used as a proxy of the care needed to find homogeneous patients groups according to their complexity. The aim of such a PCS is to
characterize the patients receiving ambulatory rehabilitation care within the Portuguese NHS and adjust financing to patient complexity.

**Methods**
A sample of patients was classified in a retrospective manner. Patient dependency level was measured through the ICF Core Sets. Since WHO’s ICF includes more than 1400 categories, this shorter classification instrument was developed (by the ICF Research Branch, mainly sponsored by the Department of Physical Medicine and Rehabilitation and the Institute for Health and Rehabilitation Science in Munich, Germany) for some specific patients groups which can serve as a practical and time efficient tool to classify and describe patients’ functioning. For this purpose only a fraction of the categories is needed and different ICF core sets are being developed for a number of rehabilitation impairment groups. Gender, age and diagnostics (through ICD-10) were also collected. The question was how to tackle such a heterogeneous population. A fuzzy clustering approach to data analysis was used, namely a grade of membership (GoM) representation of data, enabling the creation of a severity indicator for each patient. A Classification and Regression Trees model was then applied to create the different patient groups according to the new severity variable.

**Results**
From a total of 1.850 episodes, 344 (18.6%) were classified in Core set 1 - neurological, 1404 (75.9%) in Core set 2 - musculoskeletal, and 102 (5.5%) in Core set 3 - cardiopulmonary conditions. The CART model resulted in the creation of 51 homogenous patient groups, divided through 14 impairment groups, with 50,1% of the patients being classified into the inflammation impairment group, resulting in a low total casemix index (0.8663) for the studied sample. Only 1,5% of the patients were grouped into non progressive diseases of the nervous system, with a casemix of 1.0943.

**Conclusions**
Ambulatory rehabilitation patients treated within the Portuguese National Health System have common characteristics, namely in what severity and functional dependence are concerned, which enables complexity grouping. Patients with musculoskeletal condition and low severity are the most common within this type of care, showing that less complex patients are more attractive in a fee for service financing system. The creation of an ambulatory patient classification system is the first step to change into a prospective financing system. Presently, instead of just prescribing this sort of care, general practitioners are now measuring patient functional level enabling patient ranking by complexity and, in the near future, the payment adjustment to the patient complexity.

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The Evolution of an Inpatient Grouping Methodology – CMG+, Doing More with Less

Authors: Craig Homan\textsuperscript{1}, Minh Duong-Hua\textsuperscript{1}, Holly Homan\textsuperscript{1}, Patricia Hanna\textsuperscript{1}

Introduction
CMG+ is the inpatient grouping methodology used in Canada. It currently contains 528 distinct cells called CMGs. Canadian cost data are then used to derive standardized cost weights called Resource Intensity Weights (RIWs). In addition to the CMG, additional factors such as age, comorbidities and "Flagged Interventions" are used for final case-specific calibration of the RIWs. This paper will discuss a two year project investigating the effect of simplifying the CMG methodology and RIW calculations on the ability to predict resource consumption.

The simplification primarily revolved around two cost weight adjustments within the methodology, Flagged Interventions (FIs) and age groups. The Flagged Intervention adjustments will be the area of discussion in this paper. FIs are interventions that are markers of high cost patients, despite the fact that they are non-surgical. They may be required for patients with primary diagnoses in any body system, and will display substantially higher cost patterns when compared to other patients with similar diagnoses. Examples of Flagged Interventions include mechanical ventilation, vascular access device, parenteral nutrition, and tracheostomy.

Methods
Prior to 2015, the CMG+ methodology had 17 separate FIs with 17 different cost adjustments. The presence of each FI on its own is linked to substantially higher cost patterns when compared to similar patients who did not require those interventions. For instance if one of two patients with a hip replacement requires mechanical ventilation then they will be expected stay longer in the hospital and require many more resources. The challenge with the 17 FI adjustments however is that they often occur together which leads to thousands of interactions and added complexity to the RIW calculations.

For 2015 therefore, the 17 FIs have been placed into 3 groups based on similarity of cost effect. Each of the three groups has a single cost adjustment, reducing the number of interactions from many thousand to eight. In conjunction with the age split changes we have dramatically reduced the number of potential cells in the methodology. So much so, that we were concerned we might have lost some of the explanatory power of CMG+.

Results
To confirm the impact of our changes we ran goodness of fit statistics, comparing the 2014 methodology to the 2015. The results are shown below. Surprisingly, these statistics showed that we have actually increased our ability to explain cost despite a substantial reduction in the number of variables fed into the model. In particular, the overall R2 went up from 75.5\% to 81\%.

Conclusions
As a result of this analysis the new changes have been fully implemented into the 2015 grouper. The lessons learned here are that too many related variables may over-complicate the cost weight generation so that the volume of interactions hampers the performance.
Overall R-squared

Bias by Factor and Atypical Breakdown

<table>
<thead>
<tr>
<th>Methodology Year</th>
<th>Bias</th>
<th>MAE</th>
<th>R-Squared</th>
</tr>
</thead>
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<td>3106.15</td>
<td>0.8081</td>
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<tr>
<td>2014</td>
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<td>0.7589</td>
</tr>
</tbody>
</table>

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Separation of systematic differences in casemix for better predictability of DRG classification in emergency hospitals

Authors: Hector Reyes¹, Michael Hogberg¹

Introduction
The somatic short-term care will go through a major structural reform within the coming years in Stockholm county council (SCC). The Karolinska University Hospital (KUH) will have an exclusive assignment with treatment with the most highly specialized care for the most complicated cases. The total number of admissions will, according to the plan, decrease with 20% from today's level. Excluded patients will be transferred to the other emergency hospitals (OEH) in SCC. These hospitals will also have new and diversified assignments, which will lead to low cost cases be transferred to outpatient care.

The cost of the KUH is much higher compared to the OEH. There also exist huge differences in casemix, distribution of costs and medical complexity between the KUH and the OEH. The reform will make these differences even larger. Thus there is a need for finding methods that more correctly will describe the care, including refinement of methods that can discriminate the casemix between hospitals, more appropriate trimming methods and calculation of relative cost weights, etc.

In a previous study we analyzed problems in the DRG system that remained after 5% trimming of high cost outliers. We found substantial variation in casemix index (CMI) between years, still asymmetric and skewed distribution after trimming and huge differences in cost between hospitals. This makes the DRG system less predictable.

In this study the objective is to describe and analyze differences in the characteristics of casemix distributions for a large University hospital with highly specialized care compared to other emergency hospitals. Another aim is a separate trimming of OEH after exclusion of KUH, in order to increase DRG system reliability and predictability by reducing some of the differences between the two hospital categories.

Methods
We used cost per patient data from the hospitals for 2013. For studying the difference in casemix between KUH and the OEH as well as the impact on the distribution within DRGs we used statistical measures such as skewness and coefficient of variation (CV) and mean combined with descriptive methods. More than 700 DRGs, including differentiation due to complication rate, are used for classification of in-hospital care. DRG is adjusted for difference in casemix between hospitals to improve comparability of costs, outliers, LOS,
DRG complications or age, etc. Trimming is based on the quartile method and its effects on cost and medical homogeneity is measured with explanatory value (R²).

**Results**

267,000 in-hospital stays in six emergency hospitals in Stockholm County in 2013 were analyzed. With a single common casemix distribution we observed systematic differences between KUH and the OEH. After adjusting data for differences in casemix and trimming with 5% for high cost outliers KUH had 50% higher cost than the OEH. KUH had a 9% share of cost outliers compared to 2.5% for the OEH. The values of CV and skewness are higher for KUH even after trimming for cost outliers. Cost and hospital CMI for KUH differ compared to the OEH. The explanatory value after trimming is 68%.

A separate trimming of 163,000 cases in the OEH resulted in 155,500 remaining inliers. The explanatory value (R²) was 66.5% when trimming with 5% level for high cost outliers. The homogeneity of the casemix distribution improved, values of CV and skewness show more resemblance to a normal distribution after exclusion of the systematic different casemix of KUH. Maximum divergence between cost index for the OEH compared to their average decreased substantially and were very close to the mean. A strong correlation could be observed between index for cost and hospital CMI for the OEH.

**Conclusions**

Data shows substantial differences regarding distribution of costs between the major university hospital, KUH, and the other emergency hospitals (OEH) in SCC, which deteriorates the predictability of the DRG model. Excluding systematic differences by separate trimming of the OEH resulted in substantial improvement in the characteristics of the DRGs of the OEH. With the cases from the KUH excluded the casemix distribution for the OEH became more homogeneous with 5% trimming for high cost outliers and represented a good approximation of a normal distribution. Improvement could be observed also after adjusting for casemix differences in most of the casemix properties. Average cost index and hospital CMI for the respective OEH were strongly correlated and showed only minor variation around their common average.

To control for and adjust for systematic differences in the casemix distribution are useful means for improving the homogeneity and the predictability of casemix and DRG distribution which gives a more reliable and comparable measure.

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**Development of Thai Ambulatory Casemix for Continuous Care Version 0.1**

**Authors:** Nilawan Upakdee

**Introduction**

Research and development for Thai Ambulatory Casemix for Continuous Care Version 0.1 (TAC-CoC V 0.1) has pilot in 3 chronic diseases: diabetes, hypertension and hyperlipidemia.

**Methods**

The objectives of this study were to develop a casemix classification to capture differences in healthcare resource use of patients. Data came from 5 hospitals in Project of Healthcare
Resource Use of TAC-CoC. Classification and regression tree (CART) analysis of healthcare resource use. A detailed clinical and service utilization was collected on each patient and measured on a yearly basis. Classification and regression tree analysis was used to group patients into similar costs and clinical characteristics.

**Results**
The resulting classification of TAC-CoC Version 0.1 shows that the branch for classifying ambulatory patient has 24 groups. Diagnostic variables were mainly used to classify patients into each group.

**Conclusions**
The results suggest that TAC-CoC Version 0.1 with 24 casemix groups was used diagnostic variables as the main classification factors. The classification has clinical meaning but the overall statistical performance should be tested in the future. The structure of the classification allows for it to be improved over time as models of ambulatory care service delivery develop.

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**Better understanding Penalties on Inpatient Readmissions: the role of Clinically Based Parameters**

**Authors:** André J. ORBAN¹, Peter Heirman²

**Introduction**
Like in many other European countries, Belgian authorities cope with budgetary restrictions resulting from the global economical context. Although the health sector was relatively preserved for a while, as from 2014 the federal government adopted several emergency measures to further reduce healthcare cost making hospitals theoretically more responsible for their spending. More recently, a reform in depth of hospital funding is being prepared and will be implemented in the years to come.

One of the emergency measures introduced on January 1st 2014 was the reduction of fees allocated to hospitals in case of inpatient readmission within 10 days or less after discharge from another inpatient stay in the same facility. In a hospital funding system that is still using, until today, the length of stay as the most important factor for distributing resources among acute healthcare facilities, monitoring readmissions would appear logical. However, this measure doesn’t make use of the richness of the minimal hospital discharge data set (MHDSDS), nor of any other clinically or quality based reasoning. Moreover, the amount of the penalty is fixed arbitrary by the health authority and can be adjusted yearly to meet the planned savings.

The goal of this paper is to compare the current administrative measure to other approaches described in literature, such as a different readmission timeframe, PPR chains or quality indicators.

**Methods**
First, data of AZ Alma were analyzed. AZ Alma is a middle range regional facility counting 451 beds located in a rural area. Medical and administrative data of 2013 and 2014 were taken into account.

In a second stage, we will collect similar data from a few other hospitals to validate our
findings.
Tracing readmitted patients beyond the institution’s borders is out of this paper's scope.

**Results**
At a glance, we see that more than one third of the readmissions that meet the criteria for being penalized, are planned. This ratio doesn’t vary over the whole analyzed period. Another interesting finding is that only a few medical disciplines are responsible for these planned readmissions, suggesting there is a solvable organizational problem.
Looking forward to the other 60% unplanned readmissions, we see a significant higher readmission rate on the first day after discharge (DAD); rate that rapidly decreases to stabilize around average values as of the third DAD. Extending this analysis to all readmissions, regardless of the criteria for penalization, we find an analogous significant higher readmission rate on the first DAD.
Using APR-DRG’s, we finally apply the 3M€,* PPR chain algorithm and some quality indicators to our results to explore the clinical meaning of these unplanned readmissions and help to predict them.
International literature and previously performed Belgian studies are reviewed. These results are being discussed.

**Conclusions**
Belgium is at the beginning of a significant (r)evolution in hospital funding. Monitoring the readmission rate is very important from a financial point of view to avoid misuse of the system as well as from the aspect of quality of care. To realize both objectives, it is essential to take clinically based parameters into account, exploiting in this way the powerfulness of the MHDDS. Doing so should help physicians and other healthcare professionals to better understand the need of readmission management and create a discussion basis to contribute together to a sustainable healthcare system by preventing unplanned readmissions where possible and to avoid planned ones.
As clustering healthcare organizations into networks will be one of the keystones of our new funding system, policy makers should also extend readmission tracking to the network level, or even, to the countrywide level.

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Coding terminology and clinical classifications 2

Harmonization between ICD-11 and SNOMED CT

Authors: Jean marie Rodrigues¹,², David Robinson³, Vincenzo Della Mea⁴, James Campbell⁵, Alan Rector⁶, Stefan Schulz⁷, Hazel Brear¹¹, Bedirhan Üstün⁸, Kent Spackman³, Christopher G. Chute⁹, Jane Millar³, Harold Solbrig⁹, Kristina Brand Persson¹⁰

Introduction
The project is to achieve semantic alignment between two standards in healthcare clinical vocabulary the World Health Organization (WHO) International Classification of Diseases (ICD) 11 th revision and the International Health Terminology Standards Development Organization (IHTSDO) SNOMED CT (SCT).

Methods
1 For a defined subset of ICD beta foundation hierarchy generate a candidate map from ICD-11 classes to concepts in "Clinical findings" , "Situations" , "Events" or "Social context" branches of the SNOMED hierarchy. T
2 For ICD-11 classes without corresponding SNOMED content, mark as Unmatched . Develop when possible a candidate pre-coordinated SNOMED concept node to be added to core.
3 If none of the above is possible, propose added SNOMED attributes or new attribute values, to create the CO concept.
4 For each pair of ICD-11 class/subclass and SNOMED concept in the equivalence table assess the alignment of the meanings of the ICD and SNOMED definitions)
5 Flag all discrepancies and send them to the WHO/IHTSDO interdisciplinary team

Results
The semantic alignment process is ongoing, to date: 16 751 classes/subclasses of the ICD-11 Foundation component have been studied from approximately 39,000 entities (42.9%)

Conclusions
Thus, all content of ICD-11, the semantic standard for health statistics in mortality, morbidity, primary care documentation and billing, will be linked to SCT, the most fine grained medical terminology system, each of which keeping its own profile as distinct terminology artefacts. This will require certain refinement and redesign efforts increasing the quality on both ICD-11 and SNOMED

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8. World Health Organization, Geneva, Switzerland.
Belgium: from ICD-9-CM to ICD-10-CM/PCS – how a hospital prepares

Authors: Peter Heirman

Introduction
Measurement of a hospital's case-mix was until the end of 2014 done in Belgium with ICD-9-CM. Since the first of January 2015 however ICD-10-CM/PCS has become obligatory for all hospitals. However, since the government realized just how enormous the task ahead is, 2015 will be a transition period. Hospitals need to send their MZG (minimal hospital data) on time, but ICD-10-CM/PCS codes may be substituted with dummy codes if not all data can be collected. Also, data from 2015 will not be used for financing. Hospitals which have fallen behind and don't deliver their data in a timely fashion anymore, will be using this "extra time" to catch up.

The C.H.R. de la Citadelle, one of the larger hospitals in Belgium, was able to keep the deadlines in the past, and now has a full year to perform the necessary preparatory steps. One of these steps was the coding of our hospital stays from January 2015 in ICD-10-CM/PCS and evaluate the quality of the collected data.

Methods
Hospital stays from January 2015 (ICD-10-CM/PCS) and January 2014 (ICD-9-CM) were grouped with APR-DRG v31. Different parameters were compared: Severity of Illness, Risk of Mortality, distribution between Major Diagnostic Categories, distribution in MDC's between Medical and Surgical cases and Data Quality Edits.

Results
Distribution of SoI, RoM and MDC showed minor shifts in the two observed periods. However a major shift was observed between medical and surgical DRG's in most MDC's. Also Data Quality Edits increased significantly.

Conclusions
Problems were detected in multiple area's: selection of principal/secondary diagnostics, quality and detail of discharge letters and of course software used. But the main problem was found to be in the correct attribution of procedure codes. This has led to massive shifts in the case-mix of January 2015 (which luckily will not be used). Off course, this is just part of the first PDCA-cycle. Coding of procedures will need to improve before the end of the year.

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First national baseline clinical coding audit in Qatar – results and insights

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Introduction
In late 2011 The Supreme Council of Health in Qatar mandated a unified classification system of diseases and conditions (ICD 10 AM) as part of the prerequisites and preparations for the introduction of the National Health Insurance Scheme (SEHA). As a result of this all public hospitals achieved full inpatient ICD 10 AM coding starting from January 2013, with private hospitals soon following in July 2013. Since then there hasn’t been any study to assess the accurateness and quality of coded data which is being utilized for claims submission. The aim of the study was to establish the baseline of clinical coding quality and accuracy against clinical coding standards; and to determine the level of coding quality.

Methods
The coding audit used randomized sampling techniques to provide a broad measure of the overall coding performance and to allow for comparison for any future coding audits. The methodology was based on a modified version the Australian Coding Benchmark Audit (ACBA) tool, developed by the National Centre for Classification in Health (NCCH) Sydney, Australia.

A variance slip was used to identify potential coding errors which the hospital was asked to review and either agree or mark for discussion with the audit team. The variance slip was copied by the hospital as a record of the variance and used for education or correction post audit.

In addition a DRG cost weight change was assessed.

There were a total of 1,650 medical records audited from 11 hospitals - 8 public and 3 private.

Results
No exclusion rules were applied in the selection of records for the baseline audit. The largest proportion of specialties represented in this audit are Obstetrics & Gynaecology (14%), General Surgery (12%), Cardiology (10%), Paediatrics (9%), General Medicine (7%) and Plastic Surgery (6%). The total number of specialties covered nationally was 38 different specialties.

In the 11 hospitals audited, there was a total of 1,529 coding errors reported in 1,650 records. The total number of records with a coding error is 648 and a total of 16 documentation errors were registered. The overall national rate for "records with a coding error" is 39%.

Out of the 1,529 coding errors reported, 1,002 errors (66%) were related to diagnoses and 527 errors (34%) were related to procedures.

The 1,529 coding errors also constituted 99 shifts in the AR-DRG (Australian Refined - Diagnosis Related Group). If accepting and correcting all coding errors, 41 of the 99 DRG (Diagnosis Related Group) will be shifted to a higher price DRG while 58 will be shifted to a lower price DRG.
Conclusions
The results of the first national baseline audit on clinical coding quality shows that much work is needed for continual training and education for the coding industry in Qatar. Recommendations for further learning in specific areas in the Australian Coding Standards are highlighted and conducting clinical specialty workshops with particular emphasis on improving coding quality are suggested.

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3. Chief Executive Officer, Qatar National Health Insurance Company, Doha, Qatar.
4. Policy and Coordination Unit, Supreme Council of Health, Doha, Qatar.
General Casemix 1

Malaysian Diagnosis Related Group (MY-DRG): Development of Cost And Service Weights For Radiological Procedures At Universiti Kebangsaan Malaysia Medical Centre (UKMMC)

Authors: Syed Aljunid1, Roszita Ibrahim1, Amrizal Muhd Nur1, Nor Haty Hassan1, Siti A. Zafirah1

Introduction
There is a paucity of literature on the use of cost and service weights for radiology procedures. It is important to estimate costs per DRG in many developing countries using casemix as provider payment tool. Most studies estimating costs for radiology procedures usually concentrate on the cost of consumables and equipment and using the step-down costing method. Very few studies employed activity-based costing methods to estimate the costs for radiology procedures. The specialized impact of manpower hours involved in producing the results of the radiology procedures as well as the costs for maintaining the relevant equipment over the years must be included in the costing. The Universiti Kebangsaan Malaysia Medical Center (UKMMC) has been using the Malaysian Diagnosis Related Group (MY-DRG) since 2002, as a patient classification system that stratifies disease severity and used to estimate costs per episode of care. The long term objective is to use the casemix as a tool to enhance quality and improve efficiency of healthcare services. The MY-DRG casemix system is based on UNU-CBG grouper with a maximum of 1,250 DRG groups. In 2011, a total of 121,221 radiology procedures was done in the Department of Radiology. However, the actual costs of providing these radiology procedures were not imputed. We embarked on a study to determine the costs of radiology services for each MY-DRG based on the severity of illnesses. This information can be used to guide healthcare providers or specialists to make informed decisions regarding the use of appropriate investigations in order to reduce wastages of resources and support efforts of UKMMC to enhance service efficiency.

Methods
A cross sectional study was conducted from January to December 2013 in all units in the Department of Radiology in UKMMC. Activity- Based Costing was used to impute the cost of radiology services provided by all units in the department. All non-surgical cases discharged from UKMMC in 2011 were grouped into MY-DRG and included in this study. The radiology cost for each MY-DRG group was then imputed. The costing data were trimmed using L3H3 method and radiology service weights were then calculated. The top ten common cases in the MY-DRG list was selected for analysis, using a patient database of 16,173 patients from the non-surgical category admitted to UKMMC in 2011. The radiology procedures cost for each MY-DRG groups were then imputed and the mean total cost per episode of care was estimated.

Results
Out of 25,754 discharges in 2011, 16,173 (62.8%) cases were non-surgical cases. These cases were selected for this study. After the trimming process, twenty MY-DRGs with the highest radiology service weights are presented. Six out of twenty MY-DRGs with highest radiology service weights were from Central Nervous System Groups. The highest is MY-DRG G-4-26-I (Other Nervous System Disorders-Mild) with the radiology service weight of 0.1899.
This is followed by MY-DRG N-4-10-I (Renal, Urinary Tract Neoplasm & Kidney Failure-Mild; 0.1642), MY-DRG G-4-25-I (Concussion -Mild; 0.1497), B-4-11- II (Hepatobiliary & Pancreas Neoplasms- Moderate; 0.1482) and U-4-15-I (Other Ear, Nose, Mouth & Throat Disorders-Mild; 0.1366).

Conclusions
In order for the UKMMC to improve its level of efficiency, medical specialists should be informed of these findings so that they can take appropriate steps to reduce unnecessary use of radiology procedures in managing their patients. Radiology services are significant components in each MY-DRG group of non-surgical cases managed at UKMMC, ranging from 8.1% to 19.0% of the total cost per episode of inpatient care. Therefore, it is suggested that the same study should it can be applied to other discipline such as pediatric, surgical and O&G, which will provide more accurate data compared to the conventional casemix costing.

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‘Mind The Gap’ – Assisting hospitals challenged by the introduction of Activity Based Funding

Authors: Mark O’Connor¹

Introduction
Activity Based Funding (ABF) has been introduced in Ireland. 2015 has served as a conversion year where differences between the reported costs for treating coded patients and the payment tariffs that these patients would attract have been reported to hospitals without any actual financial impact. Hospitals with large negative differences will need to take corrective action in advance of any actual budgetary adjustments in order to maintain funding into the future.

Methods
The HPO conducted a forensic analysis of and visited a hospital with a large negative deficit to audit and investigate areas of concern. Presentations were made to senior management, both administrative and clinical, to create awareness of ABF and to highlight the importance of good clinical coding and costing and their future impact on hospital finances.

Clinical coding:
An analysis of the prevalence of higher complexity A-level Diagnosis Related Groups (DRGs) within each ADRG (Adjacent DRG) was done for all hospitals within ABF as these DRGs attract higher payment tariffs to reflect the higher costs incurred in treating these patients. Graphs for each hospital were produced that detailed the % of A-level DRGs for the top 20 most valuable ADRG in each hospital and compared hospital performance against the average across all ABF hospitals.

Costing:
An off site forensic analysis of costs over a 3 year period from 2011 - 2013 was carried out. Financial costs had risen considerably over this period and as the hospital is a hub hospital within a larger group there were concerns this it was bearing an unduly high proportion of
these increased costs. There was an in-depth analysis of any other financial factors likely to contribute to negative ABF performance.

**Results**

**Clinical coding:**
The ADRG graph showed that the hospital had a lower % of cases in higher complexity A-level DRGs and that this was consistent in all of the top 20 ADRGs and beyond. This was prepared in advance of the site visit and was a major part of the presentation to hospital management. The B70 ADRG relating to Strokes was selected and used as an example to show the impact of clinical coding on financial performance and show how important it is to have a fully staffed clinical coding department that can fully code patient complexity within the coding deadlines.

**Shared costs:**
The hospital appeared to be carrying a disproportionately high share of these costs. This was particularly the case for medical pay costs where salaries for consultant time spent off site were not being identified and deducted from costs.

**Manual processes:**
Costing within the hospital was very reliant on manual processes and in some cases staff were required to transpose manual ledgers into Excel formats. Patient Level Costing (PLC) data would be invaluable in this hospital, enabling it to focus on groups of patients where the differences between cost and value are most extreme. However the hospital has not been able to participate in previous PLC studies due to inadequate IT systems and a lack of resources. The HPO was able to highlight these issues and meet with IT to detail the requirements and the importance of future participation in PLC activities.

**Agency pay:**
There was a high level of agency pay for vacant posts. This was highlighted to management.

**Conclusions**
The conversion year has been an essential building block in the ABF process to identify potential funding gaps and to create awareness across the acute hospital system of the impact of ABF. Some hospitals have large deficits between the cost and the value of their activity and are lacking the resources and knowledge to identify the causes. These hospitals initially require a degree of outside assistance to identify these causes and why they exist and to educate senior management of both the current position and the inevitable future impact of any shortcomings in clinical coding and accurate costing. The HPO fulfilled this role and produced a detailed report to provide a foundation for changing the hospital's ABF performance.

LOST IN AR DRG TRANSLATION – the story from Croatia

Authors: Karolina Kalanj1, Karl Karol1, Jurica Toth2

Introduction
With support from the World Bank, Croatia began implementing AR-DRG vers 5.2 in 2007. While the intention of the program was to improve the efficiency of the hospital system, the absence of commitment to reform made this difficult to achieve. The shortcomings of the process were as follows:

1) Insufficient training - DRG training for hospitals was in the main limited to a 3 day program for a restricted number of staff with no follow up provided
2) Only three DRG books were procured and translated - the alphabetical indexes of diagnoses and procedures were not included in the training material
3) There was little follow up to gain a good understanding of the activity based payment system - namely, the need to pay hospitals fairly for their output and yet provide incentives for efficiency gains
4) Ill considered amendments to the classifications and inconsistent setting of the nominal base prices which confused hospitals’ understanding of the potential implications on them.

The outcome was that hospitals had little understanding of the DRG system and relied on the web based DRG grouper as a coding tool. Coders - doctors and nurses, got into a habit of accepting codes that did not necessarily reflect the cases treated. In other words, coding was imprecise and there were few mechanisms to check accuracy.

Between 2007 and 2014 DRG data was used purely for reporting purposes and hospitals were able to view their performance and compare it with their peers. The institutions however, did not seem to pay attention to the comparative results of their performance as there was no impact on their historic budgets. Their only objective was to report data required by the Croatian Health Insurance Fund (HZZO).

The result was that over time, the recognition of the rationale behind the implementation of the DRG system was lost. The magnitude of the problems became evident only when the HZZO began to link payments to activity measured by DRG, in 2015.

The failure of DRG implementation during the firsts seven years resulted in serious deficits in knowledge within the system on how to effectively move onto the next phase in which performance based payment which would produce incentives for hospital efficiency gains.

Moreover, as soon as hospital revenue was linked with DRGs, hospital financial managers began to recognise the inequity of a payment system based on average DRG prices. Tertiary and specialist hospitals in particular argued that there was a need to recognise that their long stay cases did not fit into what they thought was a simplistic payment formula

Methods
Croatia has 33 acute hospitals of which 5 are tertiary hospitals which account for 46% of the national acute inpatient hospital expenditure. We divided hospitals into 2 groups tertiary hospitals and others as we presumed that majority of long admissions and most complex cases will be treated in tertiary hospitals.

We used publicly available data for all acute hospitals in Croatia for the period 2009-2014 including: number of DRG cases, ALOS per DRG, hospital budgets and deficits and number
of acute beds. Of particular interest was the calculation of the percentage of cases that exceeded: 18 day ALOS (chosen as it is the accepted average high trim point ALOS used in Australia before additional payments are triggered); and 90 days in AR-DRG AO6Z (mechanical ventilation longer than 96 hours)

We also undertook a coding audit of 500 sample cases in one tertiary hospital

**Results**
Main findings are:

a) The number of admissions from 2009 to 2014 reduced from 630,893 to 594,707 cases per annum, while waiting lists increased.
b) During this period, the total hospital expenditure increased, both events increased the average cost per case while the casemix remained the same.
c) Number of acute beds remained the same.
d) Tertiary hospitals reported 10% cases in which ALOS was longer than 18 days.
e) ALOS for DRG group A06Z was significantly different for tertiary hospital when compared to other hospitals (33.5 versus 23 days), moreover 8% of A06Z cases stayed more than 90 days (with much of that time spent in ICU), suggesting that tertiary hospitals may be underpaid.
f) Only 16% of sample DRG coding was in accordance with the coding standards.

**Conclusions**
Eight years of working with DRGs in Croatia had not created a foundation on which the system can build and move into the activity based funding phase. Hospital efficiency seems to have deteriorated, coding accuracy is poor, and the system is encountering difficulties with its payment formula.

The problems have been noted by the HZZO which is taking steps to re-start DRG implementation by: investing in DRG system capacity building; embarking on a comprehensive DRG training program; enhancing the audit function; and reviewing the payment formula. HZZO goal is to build sustainability for the on-going development of activity based funding in Croatia

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Optimizing clinical treatment using DRG routine data – the PCT study

Authors: Michael H. Wilke¹, Mike Schenker², Wolfgang Heinlein³, Klaus F. Bodmann⁴

Introduction
Clinical treatment of patients is often based on guidelines derived from randomized control trials (RCT). RCTs not necessarily reflect clinical routine reality. Therefore clinical routine data compromised in DRG datasets maybe a valuable source of information.

In this study, procalcitonin (PCT) a biomarker that distinguishes between bacterial infections and other reasons for inflammation was examined using clinical routine data from DRG and PCT results from the lab.

The objective was to determine whether guideline adherent use of PCT in the monitoring of antibiotic treatment strategies is useful and has a positive economic effect. If the antibiotic treatment is correct, PCT should fall to a normal value within 12 days. The endpoints were ‘survival’ and ‘length of stay’ (LOS) in survived patients.

Methods
We received DRG data in the German P21-format used for DRG analysis from 6 hospitals. On top of this the hospitals provided PCT lab results with date and value.

First we identified cases with ‘Sepsis’ as there is very good evidence that PCT is useful in the treatment of this disease. We did this by identifying the respective ICD-10 codes for Sepsis.

Next we added information to the dataset representing ‘organ failure’ an important prognostic parameter for sepsis.

Then we determined whether the use of PCT (identified by the series of measurements) was ‘suitable’ to enable good monitoring. We also identified the number of ‘episodes’ of pathological PCT values. If PCT was falling to clinically ‘safe’ value and was rising later again, we split this into episodes.

In the next step we built two groups of patients via applying a matching using a propensity score. The matching criteria were identified by a linear regression analysis.

All statistics were performed with IBM SPSS Version 19

Results
From 358,763 cases 3,854 had an ICD for ‘sepsis’. Out of these patients 2,003 patient records showed at least one pathological PCT-test. Out of these 1,778 had one episode of sepsis (determined by the occurrence of pathological PCT results). 671 patients showed a suitable series of PCT-measurements to determine ‘improvement’.

After matching we had 222 patients in the groups ‘improvement’ and ‘no improvement’.

From 222 patients 200 in the ‘non-improvement group’ died, while only 51 patients died in the ‘improvement’ group (p=0,000; chi-square test).

Although only a few patients survived in the ‘no improvement group’, we performed a t-test on the length-of-stay in the two groups. In the ‘improvement group’ LOS was 23.16 days and 33.59 days in the ‘non-improvement’ group (p=0.004; t-test for unbound samples).

Conclusions
Discussion
This analysis shows two major results. First of all routine data from DRG coding enhanced with lab data can be used for clinical and economical analyses. Second it clearly shows that a PCT-measurement that shows PCT going down to a ‘safe’ value is a highly significant predictor for survival.

As the number of patients from this fairly big sample is reduced with each step in the
analysis, the question is why such a low number of patients receive guideline adherent PCT-testing (only 671 out of 1,778 patients). Moreover from these an even lower number showed ‘improvement’ (i.e. PCT going down). This can be due to two reasons: either doctors in ICU are not aware of the usefulness of measuring PCT to monitor their antibiotic therapy or they measure PCT but do not adjust their therapy even when PCT is staying in pathological areas. As the number of surviving patients in the ‘no improvement’ group is much lower than in the ‘improvement’ group, we have to conclude that the advantages in LOS cannot fully be taken into account.

Conclusion
Using routine data for clinical analysis is possible and relatively inexpensive. Using PCT for monitoring the quality of antibiotic treatment and adjusting antibiotic regimens when PCT stays high has a significant advantage in survival.

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Knowledge and Perceptions on Casemix System Among Information Technology Staff of Hospitals in Malaysia and Indonesia.

Authors: Syed Aljunid¹, Syed M. Hamzah¹, Syed A. Mutalib², Shariffa E. Wan Puteh¹, Amrizal Muhd Nur¹

Introduction
Knowledge and Perceptions (K&P) of health plays an important role in adopting the new technologies and practices. Deficiencies in K&P towards Casemix can lead to misunderstanding and possible delay in implementation of the system. Meanwhile, Information Technology (IT) is one of the important components in implementing Casemix hospitals. Casemix System has also become an essential tool in managing the hospital. This study is focussed on assessing the K&P among the hospital IT staff to assess their capacity reflecting support to casemix system that might impact on sustainability of the system.

Methods
The study was conducted among 243 IT staffs from various hospitals located in Malaysia and Indonesia using a cross sectional; using a standardised locally experts' validated questionnaire. Users' Knowledge, Attitude and Perception were determined from respondents using a Likert response scale. Alpha reliability analysis showed an acceptable value of 0.722 for 10 items on knowledge, 0.802 for 12 items on attitude, 0.710 for 10 items on perception and 0.687 for combined 32 items. The p value of less than 0.05 was taken as significant. Median score were taken as the cut-off point for determination of high and low Knowledge Attitude and Perception level. The respondents were participants of a series casemix training workshops conducted by International Centre for Casemix and Clinical Coding (ITCC) of National University Malaysia in 2014. ITCC has been involved in providing capacity building programme in Malaysia and Indonesia since 2005. All IT staff attended 15 training casemix training workshops in Malaysia and Indonesia were selected and included in the study.
Results
There were two hundred and forty three (243) questionnaires distributed to the hospital IT staff. The response rate is 100%. Among the respondents, 106 (44%) are male, and 135 (56%) are female. Respondents from Indonesia dominated at 84.2% and the rest were from Malaysia. Respondents from the provincial level hospitals dominated at 76.1% while the remaining respondents (23.9%) were from regional and districts hospitals. Age was normally distributed at 35.27 (SD= 7.55) years and a median year of experience with casemix system was only 2.07 (IQR= 1) year. There was no significant relationship between age, gender, years of experience and hospital types with the score of Knowledge and Perceptions. However using the Pearson Correlation test there was a positive significant correlation between users Knowledge and Perception. Respondents with high Knowledge score are more likely to have positive perceptions towards casemix (p < 0.01). Assessment on the IT staff’s experience showed that 48.1% of them felt that they had inadequate Casemix training; 18.1% expressed doubts on diagnosis and procedure coding; 33.7% was unsure if Casemix groups have any impact on their hospital tariff; 25.9% agreed that their hospitals did not had good costing data; 35.9% agreed that clinicians put up resistance in clinical pathways implementations; 33.3% agreed that National Casemix Centre (NCC) has provided support for Casemix implementation and 63.4% agreed that Casemix system expedited the claims process.

Conclusions
Knowledge was proven to be positively correlated with Perception. However other variable were not associated with IT staff’s Knowledge or Perception. In addition, a huge number of respondents experienced that the Casemix grouper is user friendly, and felt that they must be sufficiently trained in the Casemix. Continuous training is essential to enhance users' knowledge and skills. This will influence users perception and enhance their support for smooth implementation of Casemix system.

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Friday
16th October 2015
Costing healthcare activities and casemix applications 2

Assuring the accessibility of health care in the Netherlands: combining subsidies and DBC’s

Authors: Harm Lieverdink

Introduction
Economic theory is clear: because of market failure governments intervene in health care. There are various instruments available. In case of the risk of people having no access to health care governments can subsidize health insurance programs. Another way is to subsidize health care providers in order to ensure the provision of health care, without individual payments by the patient (governmental provision).

In reality we see intricate combinations of chosen instruments and their policy backgrounds. In the Netherlands government also subsidizes a number of health care components in order to ensure their accessibility (called an availability contribution). Examples are specialized burns care, acute curative services, and acute trauma care. Which components have to be subsidized is subject of political decision-making.

Distinctive for the Dutch health care system is the role of the health insurer: the insurer has the legal duty to ensure the accessibility of health care for its policyholders. This would imply that health insurers also pay for the components mentioned. However some health care components can not be payed for by health insurers entirely without creating market distortions.

The result is a very complex and sensitive distribution of responsibilities between government, health insurers and health care providers. Government defines the components that will be subsidized by the government, insurers often also have to pay (DBC’s), providers have to apply for subsidies, and are also financially accountable. This accountability often includes the paid DBC’s. The Dutch Healthcare Authority finally controls this system. This paper explores the Dutch method to ensure accessibility of health care by subsidizing care providers, the consequences for health care expenditures, methods to determine the rate subsidies-DBC’s, and the accountability of care providers.

Methods
We use a descriptive analysis of:
- the political decision-making on health care subsidies
- the total amount of subsidies
- the calculation models of the Dutch Healthcare Authority
- the accountability of health care providers who receive a subsidy

Results
Provisional results are:
- in the public and political debate on the acute curative services in rural areas the government was asked to ensure their accessibility, the government agreed using the argument of the risk of market distortion
- the total amount of subsidies is small compared to the payments of health insurers
- calculation models progress as well as the way health care providers account for the subsidies received
The government in the Netherlands uses so-called availability contributions (subsidies) to ensure the accessibility of health care. Although the total amount of these subsidies is small compared to the total health care expenditures, the public and political debate is often fierce. Practically, governmental intervention and payments by health insurers, based on DBC's, are often used in combination. Models to calculate the subsidies as well as the way health care providers account for their expenditures and revenues are progressing.

1. Dutch Healthcare Authority, Utrecht, Netherlands.

A method for comparing coding practice between different hospitals in Norway.

Authors: Eivind Dalgard, Olav Lenvik

Introduction
The presentation will be about how the clinical coding is organized at Akershus University Hospital (Ahus) and how structural benchmark analyzes are used to look for coding variations among Norwegian hospitals.

We have developed a method to compare (benchmark) the coding practice at Ahus with other hospitals.

Methods
We receive the relevant data from the government (NPR). These are activity-based data for last year for all the hospitals in the country. In this material, we look closer at some DRGs and compare the share in certain DRGs at our hospital with equivalent DRGs at other hospitals. (see attachment). We use Qlikview for processing, categorizing, and presenting the data.

Results
It seems that the part with complicated DRGs (among DRG pairs) varies a lot between hospitals where there is no natural reason for this, and this has been sustainable over many years.

Conclusions
As we see it, the most natural cause of differences pointed out is variation in coding practice between the hospitals. This extensive variation again leads to unwanted divergent distribution of government grants.

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Costing the patient not the classification (UK, Australia, Middle East)

Authors: Gavin D. Mowling¹, Kevin Ratcliffe²

Introduction
Challenging financial times mean that limited health finances are already stretched to breaking point.

Understanding the true costs of clinical variation helps drive hospital efficiencies. It underpins accountability of clinical decisions and resources consumed by patients.

Unfortunately many clinical costing systems are still being implemented that use combinations of external relative value units (RVU), statistical processes, and simple time based measures instead of explicit linkage of provider and service utilisation to patient consumption. These approaches restrict the ability to link Service provision and management to patient cost explicitly.

Patient based costing and analysis of patient-level service provision and consumption of resources allows all elements including service quality to be factored into the delivery of healthcare to patients. If costing is based on patient consumption variation in resource use should be reflected in the costs and can be measured. It highlights missing and poor data quality needed to carry out bottom up costing (theatre sessions as opposed to actual minutes).

This presentation examines recent cost studies conducted in Australia, the UK and the Middle East; describing the level of actual consumption and service level data used in the study and how these impacts on the opportunities to use the cost study results in providing useful management information to the hospitals involved and can limit Casemix development.

It also provides an examination of the benefits to be achieved and demonstrates that costing method must be explicitly described as part of the information presented along with costing results

Methods
Using example templates and best practice to identify best practices in bottom up costing, this includes the following:

- Theatre sessional costing
- Out of hrs costs for testing (Rad/Path)
- Nursing times re-profiled for acuity/hrs on the ward
- Actual Ward costs.

Highlighting the need for greater accountability of how the GL is constructed and maintained by management accounts, as this is a cornerstone for the costing process. Key lessons learnt and what to avoid for the best costing outcomes.

Results
Looking at the cost distribution for top down against bottom up costing submissions.

Showing how bottom up costing results are linked to accountability and forge a deep relationship between finance and clinical staff.
Linking the outcomes to the bottom up costing process and how this helps to give the patients the best service and quality available.

Results will be shown in a live reporting environment in QlikView.

**Conclusions**
Using top down costing process to build an activity based funding mechanism will lead to instability in health economies.

Bottom up costing increases accountability, links information, finance and clinical staff together to form a united front to tackle the financial hardships that are being felt worldwide.

Clinical staff are now using true bottom up costing to create real business cases for investment into services.

They are also driving the agenda for what is available for costing studies and are now also looking at the quality of data into the process, which is not possible to validate by the finance/Information staff.

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Integrated care models for health and social care 1

Payment systems to incentivize integrated care for patients with a hip fracture in an acute setting

Authors: Jim Pearse¹, Deniza Mazevska¹, Donald MacLellan², Gavin Meredith², Liz Hay²

Introduction

Hip fracture in older people is one area where integration of services particularly within acute care can make a real difference to the quality of life and survival of patients. Many health systems have developed clinical guidelines and/or minimum standards for managing older people with a hip fracture within the acute care setting and beyond. In addition, some systems have also developed incentives for managing hip fracture patients according to these guidelines/standards through funding.

In 2013 the New South Wales (NSW) Agency for Clinical Innovation (ACI) formally documented a set of Minimum Standards (MS) for the management of older patients with hip fracture. The MS include an integrated model of care within the acute care setting, including management of the patient’s pain as soon as they are attended to by ambulance services and/or present to the emergency department, orthogeriatric model of pre and post operative management (which includes review of the patient by a geriatrician and joint management by a geriatrician and orthopaedic surgeon, and a multidisciplinary team approach to get the patient ‘surgery ready’ as quickly as possible), timely surgery, early mobilisation post surgery (and continued management of pain), and measures to prevent refracture prior to the patient leaving the acute care setting.

Some hospitals within the state had already adopted a number of the MS, as there had been work in this area since the early 2000s. In 2014 the ACI commissioned a formative review of the MS, with the aim of evaluating the MS themselves, articulating barriers and success factors for their implementation and identifying some early impacts of the standards on patient outcomes (including survival). This paper reports on this work as well as the implications of the findings for incentivizing integrated care for hip fracture patients in the acute setting through funding.

Methods

A mixed methods approach was used for the evaluation, which was guided by an evaluation framework. Quantitative data was analysed for all NSW hospitals. It included linked patient data with the ability to track individuals with hip fracture. The data included initial presentation to an emergency department, details of the patient’s hospital inpatient stay and survival post the hospital admission. The data included transfers of patients between hospitals, which is particularly relevant for rural and/or small metropolitan hospitals that don’t perform hip fracture surgery and instead transfer patient’s elsewhere. In addition, six hospitals were studied in depth, including interviews with a range of key staff. Three of the hospitals were considered early adopters of the MS, and three late adopters. The six case study hospitals manage 20% of all hip fracture patients in NSW.
Results
The results show a clear benefit in terms of survival of patients amongst the early adopter hospitals of the MS compared with the later adopters after controlling for various patient characteristics, but improvements overall for all hospitals implementing the MS. They also show improvements in time to surgery for all hospitals implementing the MS, with greater improvements in the earlier adopters. The findings regarding survival and early surgery are consistent with evaluations of similar international models. There was strong support for MS from all stakeholders, and the main barrier to implementation was competing priorities with other quality and safety initiatives.

Conclusions
The formative evaluation of the NSW MS for the management of older patients with hip fracture has shown that the actual standards, which are based on an integrated model of care within the acute setting are sound, and that they have clear benefits in terms of patient survival, time to surgery and other measures. The study provides yet more support for the need to implement evidence based guidelines/ standards for an integrated model of managing patients with hip fracture. However, hospitals have many competing priorities, and one sure fire way to ensure that guidelines/ standards are implemented is through incentivizing this through funding. Australia is currently exploring this at a national level, and one state (Western Australia) has actually implemented such a system. This paper will reflect further on this, including drawing the experiences of systems internationally to achieve integration of care of hip fracture patients within the acute care setting.

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Use of the Casemix System Outcome in Restructuring the Teaching Hospital Administration to Improve Efficiency and Quality for Sustainable Health Care.

Authors: Rosminah B. Mohamed1, Syed Mohamed Aljunid B. Syed Junid2

Introduction
The role of the Administration is to support and enhance the health care mission of the Universiti Sains Malaysia teaching hospital. Its role has two elements, firstly to support and enhance the activity of the hospital, its staff and students and secondly to protect the institution from liability and ensure that it complies with internal and external legislation. Casemix System has been implemented at this teaching hospital for the past two years after a series of an intensive capacity building workshops involving clinicians, nurses, head of hospital departments and units. The purpose of adopting Casemix System is to increase efficiency, improve quality of care and enhance transparency in decision making. The strategy is to ensure that the implementation of clinical activities clear and objective driven. Therefore, the Casemix Steering Committee of the hospital is set-up to serve as an internal body to monitor clinical practice.

Methods
Analysis of minimum data-set collected from the Patient Medical Records and the Finance department of USM hospital was consecutively conducted from 2012 to 2014. Data was
cleaned and group using Maaysian DRG i.e MY-DRG casemix grouper, which is based on UNU-CBG international casemix grouper. The output of the analysis including the patients’ demographic characteristics, clinical outcomes and the trend hospital expenditure for the respective years were presented to the university’s top management to be used for strategic planning.

**Results**
Overall complexities of cases managed in the hospital shows an increasing trend. Less complex cases with Severity Level I shows a reduction of 8.1% while cases in Severity Level II and III increased by 5.4% and 3.9% respectively. Average length of stay of patients remained the same at 3 days. The quality of coded data shows some improvement with reduction in ungroupable rate of 4.8%.

**Conclusions**
The outcomes of this Casemix System implementation had satisfied the hospital’s top management. The acceptance of Casemix System as a hospital management tool has made it possible to enhance the efficiency and quality of the hospital delivery system. Output of the Casemix System has been use as essential information in the restructuring of the hospital administration that took place recently to support the mission of APEX programme of USM teaching hospital.

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**Payment Development for Thai Traditional Medicine Inpatient Casemix, TTMIC**

**Authors:** Orathai Khiaocharoen¹, Supasit Pannarunothai², Chairoj Zungsontiporn ³, Pramate Stienrut ⁴

**Introduction**

**Background:** Thai traditional medicine (TTM) is the practice of healing based on Thai wisdom that had not been thought of reimbursement process. **Objective:** To develop the payment method for Thai Traditional Medicine Inpatient Casemix (TTMIC).

**Methods**
This action research employed 4 steps to develop TTMIC: 1) standard data identification, 2) data collection and edit, 3) classification-calibration and evaluation and 4) cost analysis and payment suggestion based on the final version of TTMIC. The study was conducted from fiscal year 2012 - 2014. Eleven hospitals voluntarily joined the study organized by the Department of Thai Traditional and Alternative Medicine (DTAM). Inpatients recruited from 11 hospitals were classified into three categories based on the extent of treatments taken part by Thai traditional medicine providers: minimal, moderate and exclusive. The independent variables for classification include the International Classification of Disease tenth revision with Thai modification (ICD-10-TM) code for Thai traditional medicine diagnosis. Dependent variables were length of stay and standardized charge as a proxy of cost to
calculate relative weight (RW). Coefficient of variation (CV) and reduction in variance (RIV) were the main statistics used.

**Results**

There were 18,198 inpatients with TTM only 16,930 inpatients data were analyzed dropping out inpatients with minimal treatment of TTM. Majority of cases (97.7%) were treated at community hospitals (16,045 cases), 60.8% were women (10,293 cases). Average age was 47.2 years (SD=25.2). Average day stay in hospital was 8.3 days (SD=22.3). The patients were classified into 22 groups as suggested by TTM providers from 11 hospitals. Most of TTMIC groups (72.7%) had CV of cost lower than 1.5 and RIV of cost was 25.3%. The most common TTMIC was the respiratory tract disease covered 4,369 cases (25.8%). The TTMIC that had the highest RW was patients with paralysis (3.4037). If the DTAM were to use TTMIC to pay 11 hospitals the cost of TTM services, the DTAM would need a budget of 17 to 49 million baht (1US$=32 baht).

**Conclusions**

TTMIC was appropriate in terms of clinical and statistical homogeneity. **Recommendations:** Development of the next TTMIC version should look for additional variables for classification, such as refined diagnosis and procedure codes according to the TTM approaches. Furthermore, cost data and standard data set for submission of data for reimbursement process should also be developed to set up sustainable mechanisms for reclassification and recalibration if TTMIC is to be formally included in the national health benefit package.

**Keywords:** Casemix, Thai traditional medicine, payment model

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2. Centre for Health Equity Monitoring Foundation, Phitsanulok, Thailand.
4. Department of Thai Traditional and Alternative Medicine, Ministry of Public Health, Nonthaburi, Thailand.
Population Grouping: The Canadian Experience

Authors: Douglas Yeo, Holly Homan, Craig Homan, and Victoria Zhu

The Journey so Far in Developing a Canadian Population Grouping Methodology

Introduction
In April 2015 the Canadian Institute for Health Information (CIHI) released the alpha (initial) version of its population grouping methodology and software. It is the first grouping methodology developed in Canada that has every person registered for public medicare as its target population, and looks at the population over an extended period of time and over multiple healthcare settings. The methodology consists of a case mix classification accompanied by predictive indicators of morbidity burden.

Population grouping methodologies have been used in some Canadian provinces for many years. The applications include population segmentation, risk adjustment, and funding. However, until this past April the only available methodologies were developed outside of Canada based on non-Canadian data. The motivation for CIHI to develop a population grouping methodology was repeated requests from CIHI clients for a made-in-Canada population grouping methodology.

Methods
The initial release of the Canadian population grouping methodology and software is the result of two years of development work. Initial discussions on CIHI offering a national population grouping methodology included the possibility of licensing an existing proprietary methodology. In 2012 the pros and cons of "buy versus build" were debated and resulted in a decision made that CIHI would build a methodology.

Discussions early in the project involved the question of whether the case mix classification should be mutually exclusive (i.e. a person is assigned to only one case mix group) or whether it should be additive (i.e. a person can be assigned to multiple case mix groups). The merits of both approaches were debated. A decision was made to proceed with the development of an additive classification as the foundation of the grouping methodology, and that development of a mutually exclusive classification would follow at a later phase.

Debate was also held on which sectors of clinical data were critical to include in the methodology. Specialized data on functional status and mental health for sub-populations are not collected comprehensively across all provinces. However, pan-Canadian comparisons using the population grouping methodology outputs requires that the scope of input data be consistent across provinces.

The project involved the gathering, organizing and analysis of person-level clinical and financial information from hospital and primary care. This proved to be particularly challenging for the registry data and for primary care data. Collection standards are not consistent across provinces. In particular, the available primary care data consists of physician billing data. Those data are not collected for the purposes of research, and so considerable quality checks and cleaning was required.
Results
The project thus far has resulted in an alpha version of the methodology that contains an additive classification. It also contains two cost weights, one retrospective and the other prospective, that reflect variations in total healthcare cost for hospitals and physicians, based upon a person’s morbidity.

Conclusions
Feedback on the alpha release of the methodology indicates that the development project has been a success so far. There is more work planned to refine and enhance the methodology: expansion of the scope of the healthcare settings and data that are used in the methodology, implementation of a mutually exclusive classification, incorporation of socioeconomic factors into the predictive indicators, development and implementation of more predictive indicators, and client training and support. The beta release of the methodology is planned for October 2015, followed by version 1.0 in the spring of 2016.

1. Canadian Institute for Health Information, Ottawa, ON, Canada.

Health Condition Categories for a Canadian Population Grouping Methodology

Introduction
In April 2015 the Canadian Institute for Health Information (CIHI) released the alpha (initial) version of its population grouping methodology and software. It is the first grouping methodology developed in Canada that has every person registered for public medicare as its target population, and looks at the population over an extended period of time and over multiple healthcare settings. The methodology consists of a case mix classification accompanied by predictive indicators of morbidity burden.

The case mix classification in the alpha release consists of 214 health condition categories, age categories, and sex. The 214 health conditions are considered an "additive classification" since a person can be assigned to multiple categories.

Methods
Development of the 214 health condition categories was the result of an iterative process. This process included project team clinical experience, a literature review to identify relevant health conditions, and querying of historical data to understand the health conditions that are frequently treated in different health sectors and/or are costly. The resulting health condition categories were vetted by advisory groups composed of physicians, health system administrators and researchers. Examples of the 214 health conditions include cirrhosis, diabetes mellitus, osteoarthritis, serious burns, and fracture femur.

Data used in the development of the health condition categories consisted of hospital episode datasets and physician billing datasets. In these datasets, diagnosis information was recorded using the International Classification of Diseases (ICD). The development of the 214 health condition categories included the construction of a mapping of ICD codes to the health condition categories. To facilitate the use of residential care data in the grouping methodology, clinical data elements from the Residential Assessment Instrument - Minimum Dataset were also mapped to the health condition categories.
For each person to whom the grouping methodology is applied, 214 yes/no (presence/absence) tags are assigned, one tag for each of the 214 health conditions. The methodology looks retrospectively over a two year period to identify and tag the health conditions a person had in that period. Tagging rules are also applied when looking at the physician billing data; for 139 conditions considered chronic or having long-lasting effects, and needing on-going monitoring by a physician, the methodology requires two or more physician visits in order for it to be confirmed. If the health condition is observed in hospital data, then it is considered present even if observed only once.

For the upcoming beta release, clinical overrides are being developed. Some pairs of health condition categories are related and commonly occur together. Such pairs include disease progression (e.g. chronic liver disease and cirrhosis), symptoms common in the presence of a disease (e.g. seizures and epilepsy), and diagnoses associated with the process of diagnosing a disease (migraine later determined to be a transient ischemic attack). When both conditions are present for a person, a clinical override would result in one of the health conditions being untagged for that person. The goal of these clinical overrides is for the health conditions categories to provide greater clinical and resource homogeneity within the group of persons that have been tagged with a health condition.

Results
The 214 health condition categories contained in the alpha release of the population grouping methodology provide a solid clinical classification of the population. They are useful to in population profiling, risk adjustment, and funding. They also provide a foundation for the development of the population grouping methodology’s predictive indicators and mutually exclusive classification.

Conclusions
Feedback on the 214 health condition categories in the alpha release has been quite positive. There is more work planned to refine the categories, the tagging rules, and the clinical overrides. These refinements will be reflected in the beta release of the methodology, planned for October 2015.

1. Canadian Institute for Health Information, Ottawa, ON, Canada.
Cost Weights for a Canadian Population Grouping Methodology

Introduction
In April 2015 the Canadian Institute for Health Information (CIHI) released the alpha (initial) version of its population grouping methodology and software. It is the first grouping methodology developed in Canada that has every person registered for public medicare as its target population, and looks at the population over an extended period of time and over multiple healthcare settings. The methodology consists of a case mix classification accompanied by predictive indicators of morbidity burden.

One of the aims of the methodology is to provide insight into the burden of health, or health risk, of the population. With this in mind, the alpha release contains predictive cost weights, developed to depict the healthcare-cost risk of each person, based upon their clinical characteristics as represented by the 214 health condition categories.

Methods
The alpha release includes two predictive cost-weight indicators, one for the retrospective period and the other for the prospective period. The methodology assigns a value for each of these two indicators, to each person who is registered for healthcare. Each of these cost weights encompasses multiple health sectors. Linear regression models were employed with cost as the response variable, and using predictor variables of age, sex, and the 214 health condition categories.

Based on current and historical information on health services utilization, the population was stratified into three sub-populations: health system non-users, users without any health conditions, and users with health conditions. Predictive models were fitted separately for each sub-population, and for each of the retrospective and prospective cost weights.

Ordinary Least Square (OLS) estimation method was used for the health system non-users and the users without health conditions. Since people in these two sub-populations do not have any health conditions, both the retrospective and prospective cost weights were calculated based on age-sex categories. OLS assigned a predicted cost to a person estimated as the average cost of each of the 38 age-sex categories. However, as an exception, each non-user in the concurrent period was assigned a retrospective cost weight of zero.

For any eligible user with one or more health conditions, both the retrospective and prospective cost weights were produced and assigned by Weighted Least Square (WLS) estimation method using presence or absence of each of the 214 health conditions as the predictors. OLS was first used to obtain a predicted cost for each observation (i.e. person). Each person was then assigned to 1 of 15 groups based on the number of health conditions they had, and the average variance was calculated for each group, based on the average residuals from the OLS predicted values. The inverse of the average variances were next used as the weights in the WLS estimation of the model parameters, to generate the final predicted cost of each person. An exception to this is that any person who was not eligible for healthcare on the last day of the concurrent period was assigned a prospective cost weight of zero. Cost weights were then obtained by dividing the final parameter estimates by the overall average cost.
Results
The explanatory power of the regression models is satisfactory. The overall $R^2$ value for the retrospective model reaches 40%. The goodness of fit analysis on validation data demonstrates that the predictive models are stable and indicate no evidence of overfitting to the estimation data.

Conclusions
The predictive models of alpha release provide a useful tool to forecast the health system utilization, for both the retrospective and prospective periods.

This is the first stage of predictive indicator development in the Canadian population grouping methodology. In the beta release, the cost weight models will be updated. For the users with health conditions, the predictive models will include interactions among pairs of the 214 health condition categories. Functional status information on people receiving continuing care services, and socio-economic status information will also be added as predictors in the models.

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A Mutually Exclusive Classification for a Canadian Population Grouping Methodology

Introduction
In April 2015 the Canadian Institute for Health Information (CIHI) released the alpha (initial) version of its population grouping methodology and software. It is the first grouping methodology developed in Canada that has every person registered for public medicare as its target population, and looks at the population over an extended period of time and over multiple healthcare settings. The methodology consists of a case mix classification accompanied by predictive indicators of morbidity burden.

The case mix classification in the alpha release consists of 214 health condition categories, age categories, and sex. These 214 health condition categories are considered to be an "additive classification", since a person can be assigned to multiple health condition categories. Building upon the foundation provided by the 214 health condition categories, a mutually exclusive clinical classification is also being developed for release in the beta release of the population grouping methodology. In the mutually exclusive classification, each patient is attributed to only one case mix group, determined through a hierarchical assessment of clinical and cost factors.

Methods
The alpha version of the additive classification contains 214 health condition categories. These categories were used as the starting point for the mutually exclusive classification. The 214 health condition categories were first rolled up to form 111 grouper cells. This was done to ensure high volumes at the cell level but also leave room for further adjustments without dramatically increasing the number of cells. The 111 cells were also vetted with a physician panel to ensure clinical meaningfulness.
One of the key elements in the creation of a mutually exclusive grouper is establishing a clinical/cost hierarchy for tagging and ranking the key diagnoses for each person. The hierarchy orders all of the grouper cells and provides a logic through which a person with multiple diagnoses can be assigned the most significant cell.

Each of the 111 cells was also linked to a higher level category. The categories provide divisions between chronic and acute conditions, cancers and mental health. They also split between major, moderate and minor diagnoses. The creation of these categories allowed for the testing of all 111 cells to determine if the presence of comorbid conditions in specific categories impacts expected resource consumption. The first set of results provided evidence that a number of the cells should be split in the presence of any major or moderate comorbidity. This brought the number of cells up to 177 and provided a substantive increase in the explanatory power of the grouper.

The next stage was to investigate cost distinctions between patients with varying numbers of overall conditions, irrespective of what those conditions are. The theory in this analysis was that patients with many problems might require more frequent and complex care than those that have single, or few, diagnoses. Analysis did in fact show a very strong correlation between the number of comorbid conditions and cost, so a number of possible splits were considered based on the number of comorbid conditions. The implementation of these count splits resulted in a total cell count of around 143 and provided a very substantial increase in the explanatory power of the classification.

**Results**

Initial results show good explanatory power for the mutually exclusive classification, with $R^2$ as high as 46% on retrospective costs. This compares favourably with similar classifications internationally.

**Conclusions**

The mutually exclusive classification will be a valuable addition to the Canadian population grouping methodology. It has been built with the traditional principles of case mix design in mind: mutually exclusiveness, clinical meaningfulness, cost homogeneity, and manageable number of groups. While it is still in its preliminary stages, the structure and results look very promising and work will continue leading up to its release in the spring of 2016.

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Casemix funding/payment systems and methods 2

Implementing Activity Based Funding in Ireland.

Authors: Brian Donovan

Introduction
This abstract is an update from a presentation in Qatar on the introduction of an Activity Based Funding in Ireland.

The introduction of an Activity Based Funding (ABF) approach to hospital funding is a key element of the reform and an essential building block for Universal Health Insurance (UHI), the stated policy of the current Government. The plan for ABF is a phased one and the full roll out of is a multi-year project.

Phase I of ABF was implemented in 2014 in the country’s 38 hospitals participating in Casemix. The work now underway represents the very early elements of such a system and is best described as the embryonic phase, as the aim is to change behaviour and practice while maintaining financial stability during the transition period, allowing hospitals to prepare for subsequent phases of implementation.

Methods

ABF in 2014
Hospitals initially received their full budget in 2014 as part of the normal budgetary process. A major element of their budget was ‘earmarked’ as ABF The amount earmarked was determined based on inpatient and day case activity levels and DRG prices set by the Healthcare Pricing Office (HPO). The balance of the budget was regarded as a normal block grant.

For 2014 each hospital was provided with an activity target which was primarily based on HIPE data for each hospital for the year to the end of June 2013. The activity target was profiled for the year on a monthly basis reflecting the seasonality issues associated with such activity.

At the end of each month each hospital was provided with a report detailing the activity carried out during the period by coding activity to HIPE in the normal manner and timescales. The HPO carried out their standard validation checks and review process to determine the level of funding that equated to the activity carried out. Once hospitals delivered the planned activity levels there was no effect on budgets.

Indicative Benchmarking
An Indicative Benchmarking analysis was also completed at the end of 2014 using forecasted cost and activity data. In practice ‘indicative benchmarking’ compares a hospitals expenditure in the ABF areas against their ABF revenue. The gap between revenue and expenditure is being called a transition adjustment. For those hospitals who are operating above the national average price, plans will be required to move the unit costs of that hospital towards the average. The period over which that move must be completed has yet to be determined, however ABF will bring a level of scrutiny and focus on to those hospitals which will create
significant pressure for change.

In order to allow the system time to understand the indicative benchmarking, 2015 is being regarded as a ‘conversion year’

**Results**

**Evaluation Framework**

We know that the transitional adjustments are as a result of both ‘measurement’ issues (accuracy of coding, accuracy of costing etc) and ‘efficiency’ issues (LOS, skill-mix etc). The job in 2015 is to stratify these elements for each hospital so that we can isolate any which are structural in nature and develop plans to address those which are not.

We are developing an ‘Evaluation Framework’ which will be circulated to all hospitals. This document will set out the major areas where checks need to be undertaken on the benchmarking data and give indications of what data is available to support hospitals in assessing their own position. We have also engaged an external company to undertake systematic HIPE audit which will allow each group to validate the quality of their HIPE coding.

**Conclusions**

The indicative benchmarking is the first step on a journey towards full Activity Based Costing (ABF). During 2015 the HPO will work with the Acute Hospitals Division and the group CFOs to investigate the range of reasons for hospitals running above and below the national average price.

ABF will represent a sea-change for the Irish hospital system and has the potential to change the conversation about Irish health expenditure. It can move the debate from a dialogue about deficits to a dialogue about unit-costs, quality of patient outcomes, volume of cases and type of cases. ABF provides explicit linkage between money and cases, thereby creating a new way of describing health expenditure. In time, payments can be linked with clinical objectives, driving better outcomes for patients.


**The U.S. Medicare Program's Quest to Obtain Value for Money Spent: Tying Case-Mix Payments to Performance, Quality, and Efficiency**

**Authors:** Jugna J. Shah

**Introduction**

The United States, Secretary of the Department of Health and Human Services, made it very clear in January 2015 that by the end of 2018, more than 90% of all Medicare payments will be tied to quality and alternate payment models. To achieve this, there are a myriad of initiatives underway in the U.S. today to incent hospitals and physicians to provide high quality, low cost health care services to patients without any compromise in outcomes. The Medicare program is investigating new payment initiatives in search of finding what it calls, "Alternate Payment Models" (APMs) to use in all different care settings (inpatient,
outpatient/ambulatory, day surgery etc. for both facility and physician reimbursement). Some of these are already under-way as pilot projects. For example, there are bundled care payment initiatives (BPCI) underway aimed at testing new ways that Medicare can pay for larger bundles of services. There are new episode initiatives also being introduced daily, such as the recent proposed rule on new hip and knee replacement episodes of care.

Other initiatives are already underway where a larger and larger percentage of hospital's total reimbursement from MS-DRGs for example is placed at risk if hospitals do not achieve or exceed a number of different performance thresholds. These initiatives increase or decrease the case-mix level payment a hospital receives based on performance. All of the initiatives underway or those being evaluated for implementation aim to advance the concept of having larger and larger bundles of services that are paid at a single rate - such as an episode of care payment or a flat rate for integrating care across sites of service. For now, many of these larger bundles consist of services often described by different case-mix/classification groupings, but over time this is likely to change.

**Methods**

In this section, current and future methods being used and/or pilot tested by the Medicare program in the near future (2016-2018) will be highlighted. These include but are not limited to the following:

* Quality Measures Being Collected
* Payment Reductions for Poor Performing Hospitals on Hospital-Acquired Conditions
* Payment Reductions for Excess Hospital Re-Admissions
* New Comprehensive Joint Bundle Payment Initiative for Elective Hip and Knee Replacements
* Value-Based Purchasing
* Bundled Care Payment Initiatives & Alternate Payment Models Being Studied by the Center for Medicare and Medicaid Innovation (CMMI)

All of the initiatives that will be presented are aimed at moving the traditional use of DRGs or APCs only as a transactional payment model to a more dynamic payment tool that aims to link the payment for services with other metrics. Leveraging existing claims and cost data is the key in being able to quickly convert existing traditional case-mix based payment systems and/or contracting models into new ones aimed at bringing more value to the patient and reduced cost to the payer.

**Results**

This section will focus on the specific measures and calculations used in the programs that will be highlighted so others can see what Medicare is doing and how it's doing it. Additionally, information on how hospitals are faring under all of the different initiatives will also be shared. The focus on spending money on only high quality healthcare services is becoming more and more evident as the focus on quality measure use and development moves away from process measures to outcomes, patient experience, and efficiency measures. The trend here and measures used will be shared.

**Conclusions**

It is difficult to know whether the U.S. is achieving better value for the money spent under inpatient MS-DRG and outpatient APCs but what is clear is that new approaches are being tested and implemented which hold providers accountable more and more for the care they
provide and the outcomes they are expected to achieve. They are measured against themselves and also their peers. What is clear is that under today's traditional case-mix based payment systems, more and more dollars are being placed at risk and taken away from low or poor performing hospitals and this is only going to increase over time. In addition, hospital providers are being incented more and more to provide high quality services to patients at lower cost without compromising quality and now that everything is being measured and published and CMS is using data to hold hospitals accountable, shifts are starting to occur. All of this is in hopes of improving patient quality, access, and safety while keeping overall Medicare program costs in check. Ultimately, all of the new bundled care and episode initiatives are aimed at transforming Medicare from being a passive payer to an active purchaser of healthcare services.


Hospital contracting and casemix linkage: early impact in a middle-income country

Authors: Jade Khalife¹, Rita Freiha¹, Jihad Makouk¹, Hilda Harb¹, Walid Ammar¹

Introduction
Lebanon has a population of 4.5 million residents, and an estimated 1.5 million refugees, with total health expenditures at 7.3% of GDP. One of the major roles of the Lebanese Ministry of Public Health (MoPH) is as an "insurer of last resort", covering hospitalization for the 52% of citizens who otherwise lack any health insurance. For this purpose the ministry contracts public and private hospitals, servicing about 240,000 patients annually.

In November 2014 the MoPH changed its hospital contracting design from one based solely on a tri-annual accreditation process (in place since 2001) to an annual mixed-model design that additionally includes hospital case-mix, patient satisfaction and policy indicators. This study evaluates the impact of the new model on the casemix of medical cases at seven months post-implementation. We were primarily interested in impact on casesmix of medical (non-surgical) cases, as they have previously been identified as more subject to miss-use/abuse, due to their fee-for-service structure (as opposed to surgical flat-rate).

Methods
Using data extracted from the ministry hospitalization database, we calculated the hospital casemix index (CMI) following a previously developed ICD-based approach, as has been suggested in countries lacking national DRGs (Yang and Reinke, 2006). Our dataset included all patients hospitalized under MoPH coverage between December 2014 and June 2015, and with a length of stay of 2-15 days (regular stay). This represented about 77% of all medical admissions. STATA version 11 was used for data preparation and analysis, with significance level set at 0.05 for all tests. Summary statistics of hospital casemix indices were calculated and the distribution investigated. Paired t-test was used to compare hospital CMI in pre-versus post-implementation, and then repeated among private and public hospitals separately.

Results
A total of 124 hospitals were included in the final analysis model, excluding 5 chronic-care facilities and 3 recently contracted hospitals. Mean CMI for medical cases increased post-
implementation from 1.12 to 1.16 (p=0.0019; 1.13-1.19, 95% CI). Among private hospitals (n=100), mean CMI increased from 1.14 to 1.18 (p=0.006; 1.15-1.22, 95% CI), while among public hospitals (n=24) CMI change approached but did not reach significance (p=0.075).

Conclusions
The hospital medical casemix index increased following implementation of the new contracting model, primarily in private versus public hospitals. Such linkage of casemix and reimbursement rate provides an incentive for hospitals to increase their casemix index. Due to the nature of the MoPH hospitalization pre-approval system and auditing processes, we expect this change to be mainly due to decreased unnecessary hospitalizations and improved ICD coding practices; however, this requires further investigation. The results of this study will be used along with those of other ongoing investigations to inform model developments for future contracting cycles.


Deriving quality of care indicators from routine data & embed quality in financing, a way towards sustainable health in Belgium.

Authors: Chantal B. Licoppe

Introduction
Rationale:
New regulations, a stormy economic climate, changing patient and workforce demographics, and increased consumer attention are forcing healthcare providers to improve the value of care and achieve better patient outcomes and satisfaction all for a lower cost. Everyone agrees that there is an obligation to give quality and patient safety a structural place in the hospital operations. By consequence, it is logical these factors also becomes embed in the hospital financing.

Problems:
Risk adjustment - Comparing caregivers performances is not easy: fair comparisons require appropriate risk adjustment.
Use of administrative data - Monitoring the quality of care requires extensive registration and is time consuming. Administrative data is recorded in most countries, it is readily available but usually set up to collect information related to the resources used. That explains why administrative data is often considered as unreliable to analyze quality of care. Hospitals bias reporting by not reporting complications. Quality of care indicators - Negative outcome are related to multiple parameters, ranging from provider skills & experience, from resources available, but they are often the result of deficiencies in coordination and communication within a provider system. So we believe that specific outcome indicators can reflect the quality of care: high rate of readmissions, high mortality rates cannot be hidden. This was the starting point to consider the use of routine data to monitor quality of care.

Methods
Since 2000, Belgium uses 3M APR DRGs patient classification to support the hospital financing. APR DRG, the leading methodology, is already understood by the Belgian payers and providers. So we naturally use APRs for risk adjustment. Looking for indicators able to reflect quality of care, we found available methodologies,
tested elsewhere, allowing the analysis of outcomes. They show scientific evidence, are able to process large datasets and are resistant to manipulation. Many countries analyze mortality rates, readmissions or complication rates, but these methods show all their power when one concentrates on negative events that are preventable.

We have identified 3 outcome indicators, extractable from routine administrative data, without any changes to the actual Belgian registration and relying on APR for risk adjustment. We have applied them to the data collected in our benchmarking group and studied the impact.

We present results based on a large benchmark dataset collecting data from 70% of the 100 Belgian hospitals and ~65% of inpatient beds, covering almost 12 million admissions. The sample is highly representative of the national data.

**Results**

We present hospital ranking and evolution for standardized mortality ratios RoM adjusted. (With the introduction of APRs v30+, and the integration of the Present on Admission flag (PoA), the indirect standardization can even be improved by using the RoM at admission rather than at discharge. We need to evaluate risk of mortality when patients are admitted, rather than at the end of the stay, when complications and nosocomial negative outcomes might have occurred. A comparison between SMR based on admission RoM vs discharge RoM will be presented.)

We present also prevalence & hospital ranking for Potentially Preventable Complications. Knowledge of type & prevalence of PPC, combined with identification of high risk patients makes data actionable: a prevention plan can be implemented.

Finally we present Potentially Preventable Readmissions: hospital ranking and analysis of the most frequent reasons for readmission in the group. Actionable information: focus on "right care, at the right time, in the right place". Priority #1 is identifying high-risk admissions during the initial admission, so preventive/corrective actions can implemented.

**Conclusions**

The Maryland state experience confirms that such Pay for Performance Programs produced strong results. Hospital-acquired conditions declined by 15.26% over 2 years, with estimated cost savings of 110.957 million over that period. Several other US states confirmed positive results after integration of outcome indicators (PPR/PPC) into their financing system.

Key principals that you should expect to see and/or want to see in a well thought out payment system reform for Pay for Outcome and use of preventables

1) Elimination of payment incentives that result in increased payment for poor quality outcomes
2) Financial incentives should be substantial enough to induce hospital behavior change
3) Financial incentives should be linked to quality outcomes and not to adherence to externally imposed processes
4) Financial penalties for poor quality outcomes should be rate-based and not applied on an individual case-by-case basis
5) Quality standards should be based on the outcomes consistently achieved by the best performing hospitals

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Rehabilitation service development for sub-acute and non-acute patients in Thailand

Authors: Orathai Khiaocharoen¹, Supasit Pannarunothai², Chairoj Zungsontiporn³, Wachara Riewpaiboon⁴, Preeda Taearak⁵

Introduction
Nowadays, the need of rehabilitation in sub-acute and non-acute patients has been continuously increased. Rehabilitation services in Thailand are considered only as part of acute care so that providers are not motivated to provide sufficient services to the patients because the services are not covered by the payment (DRG system).

Methods
This research and development study aimed to develop an appropriate payment model for sub acute and non acute patient (SNAP) in 5 health regions of the National Health Security Office (NHSO) in Thailand (Phitsanulok, Saraburi, Chanthaburi, Udonthani and Songkla). Twenty-four hospitals in five provinces were recruited voluntarily to develop the model. Three steps were set up as follows: 1) setting up the new service and payment system. 2) Implementation of the new system (according to context of each province) and 3) evaluation. Effectiveness was assessed as gain of functional and quality of life on a Barthel Index assessment. Efficiency studies consist of time and cost of rehabilitation care per patient. Data collection involved 3 sources including 1) provider characteristics, 2) patients’ rehabilitation impairment category (stroke, traumatic and non-traumatic brain dysfunction, traumatic and non-traumatic spinal cord dysfunction, and major multiple trauma) and 3) administrative data from hospitals and the NHSO. The study was conducted from July 2013 - February 2015. Data analysis used frequency, percentage, chi-square test, paired t-test, and F-test.

Results
Results: Five regions produced five different rehabilitation services and payment models. The inpatient and extended outpatient with home visit model (of Saraburi) and the extended regional to community hospital model (of Songkhla) were remarkable. Three payment methods were observed: prospective payment with global budget, outcome payment, and performance with outcome payment. Comparing functional outcome with cost of rehabilitation among 3 different payment models revealed that outcome payment significantly increased functional status of the patients but accessibility to rehabilitation services (within the golden period in stroke patients) was still low (13.1% only).

Conclusions
Conclusions: Rehabilitation service led to better outcome, but only a few inpatients who needed rehabilitation services could get access to it. Recommendations: More attention should be paid to care manager for accessibility to continuing rehabilitation service. Moreover payment method should be structured to increase effectiveness of rehabilitation outcome.

Key words: Sub-acute and non-acute patients (SNAP), Rehabilitation, Outcome payment

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Enhancing end of life management

Authors: Sharon Naidoo\textsuperscript{1}, Ismail Rasool\textsuperscript{1}, Hilda Segooa\textsuperscript{1}

Introduction
The aim of this paper is to draw emphasis on the variation in medical costs incurred by the largest open health insurance company in South Africa, Discovery Health Medical Scheme (DHMS), from the provision of benefits during the last year preceding a beneficiary’s death relative to those in earlier years as well as to those of surviving beneficiaries. Building on this knowledge, the paper goes on to showing how Discovery Health’s unique data position is used to identify, segment and understand the beneficiaries on a risk path to death, as well as the approaches by which the palliative services offered to beneficiaries can be enhanced so as to not infringe on the beneficiary’s dignity, subject to the Scheme’s cost constraints

Methods
The benefit enhancement approach discussed in this paper highlights the significance of social support in conjunction with a multidisciplinary approach to specialized medical care in achieving the aforementioned objective. To identify the population at-risk of dying, segmentation techniques were adopted initially to identify the true palliative population from all deaths and then statistical modelling techniques performed to identify risks in the population, behaving similarly to those that have died, in the following year. So a model was fit to all DHMS data which then predicted who is at a high risk of dying in the following year. This population serves as the population to then enroll on an End of Life initiative, supported by his/her doctor and family.

Results
Medical providers in the South African healthcare industry are often at a disadvantage, with insufficient information and tools to make that call about ‘dying’. This in turn results in beneficiaries desperately seeking costly medical attention in the form of, for example, surgeries, high- cost drugs and active cancer treatment that lead to a further deterioration of health.

DHMS is in a distinctive position, having a wealth of claims information by month, by provider and by condition as well as audited/confirmed mortality data dating back to 2008 (which includes a cause of death description). This enables DHMS to inform on which beneficiaries are at risk of dying and to engage much earlier with providers regarding the discussions around palliative care.

Conclusions
DHMS believes that there is value in empowering providers to diagnose and to communicate to beneficiaries the advantages of activating palliative treatment instead of seeking more aggressive treatment during these final stages of life. This empowerment will allow members and families to engage more with the benefit opportunities available to support the very seriously ill.

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Integrated care models for health and social care 2

First steps towards subpopulation funding for integrated care

Authors: Jacob Hofdijk

Introduction
For many years Casemix systems have only been applied in hospital settings as these systems were based on the common availability of discharge data. It has given a solid base for the development and implementation of "DRG" type systems in many countries. But as health care systems were eager to shift their focus on the health issue of the patient and the outcome of care, the search for other solutions was started. As Michael Porter stressed the value of health care interventions will raise if the focus is given to the full cycle of care. Knowing that 50% of the mortality and 70% of the costs is related to chronic diseases, of which many are caused by negative lifestyle management. The Chronic Care Model of Wagner focused on both the important role of the patient (the active patient) and on the multidisciplinary characteristics of the health issues of chronic patients. In the Netherlands a start has been made to combine the available knowledge and the focus on prevention to develop care standards by chronic disease, and adopted by all specialties, disciplines and patient representatives. To promote the use of these care standards, a special funding mechanism has been introduced to fund chronic disease management in primary and partly secondary care.

Methods
The Integrated Care Funding approach is not based on a dataset and a specially developed grouper, but on the nationally approved standard for appropriate care for health issues related to a specific chronic disease. The Care standard model has been elaborated to the Integrated Care Program, which is based on the creation of a health issue web by patient, which suggests a set of appropriate stepped care modules. These will be discussed between the patient and the case manager and will lead to a set of agreed treatment and life goals. These form the base for the individual care plan, which will be executed in close collaboration with the patient and the multidisciplinary treatment team. Essential in the approach is the creation of an entity, which is responsible for the management of the integrated care process. This entity will contract a condition based capitation fee for each patient of the subpopulation they are serving. This approach changes the paradigm from a provider orientation towards a patient oriented approach which adds value to the health of the patient based on the commonly agreed standards of care. It changed the funding system from a fee for service model to a model where the care for the patient is key, and after a couple of years the outcome of the care provided to the subpopulation can be part of the funding equation.

Results
Since 2010 the Integrated Care Funding has been introduced for Diabetes, COPD and Vascular Risk Management mostly in primary care. Since 2010 a research process has been started to develop the Integrated Care Program approach, which integrates these three conditions into one program, preventing the introduction of Disease silo's and re-establishing the holistic approach so well known from primary care. In 2013-2014 a pilot study has been performed in three regions to assess the INCA approach. The test was done with retrospective data and proved the potential of the approach both for providers and in their interaction with their patients. Although the results were positive, the next step in the process of implementation requires the support of the different parties involved, insurance companies,
providers, patient organisations and the ministry of health. As this was just one among the many discussions between these parties, the next step has been postponed.

Although the concept of the Care Standards has in the meantime been widely implemented, for instance also for perinatal care. In that domain the INCA approach proves to be as effective as for chronic diseases. As the process to introduce integrated perinatal care and appropriate funding is in a more elaborated phase the introduction of this person centred subpopulation oriented approach will be introduced in many regions in the next two years.

Conclusions
The Diabetes program has been introduced across the country and has resulted in unexpected positive results.
The introduction of the INCA approach has linked appropriate care as defined and accepted by health care providers and focused on care for the individual patient. This approach tested for chronic diseases, will first be operationalised for perinatal care, killing the silo's between primary and secondary care. It will have a positive impact on the multidisciplinary collaboration between care providers and actively involve the pregnant woman. The new perinatal care organisation will contract perinatal care with the insurance companies, and the traditional funding arrangements with the hospital (DBC-DOT) and with primary care midwives will be replaced by a subpopulation contract!


Growing towards an integrated perinatal healthcare system

Authors: Marnix van den Berg1, 2

Introduction
After the Euro-PERISTAT report of 2004 Dutch politicians decided that healthcare authorities and professionals should focus on improving the outcome of perinatal care (PC) by working closer together. The Ministry of Health installed the College Perinatal Care (CPZ) to implement the recommendations of the steering group "A Good Start". The goal of the CPZ is to reduce the perinatal and maternal mortality by promoting integrated perinatal care (IPC) with appropriate funding. The different professional groups in cooperation with the authorities, are made responsible for the development of the PC standard, which describes the multidisciplinary approach of IPC.

The main question of this paper is: ‘Why is it still so difficult to develop an IPC system, even though we have the same goals?’ Therefor the follow questions shall be discussed:
The special aspects of the Dutch perinatal system compared to other countries.
The first steps towards a shift from a referral based system to a collaborative team based approach.
The shift from the interest of the provider to the interest of the pregnant woman.
The acceptance of the PC standard.
How to introduce the process and what are the forces and interests, regionally and nationally?
The role of the integrated funding system and insurance companies.
Methods
Included within results

Results
The Dutch perinatal healthcare system
The Netherlands have a unique health care system with the distinction between primary and
secondary care. In this system, access to specialized medical care (secondary care) is
arranged through a referral from the gatekeeper, with the intention to avoid medicalization of
simple complaints and procedures. A woman requires a referral from her midwife (primary
care) before visiting an obstetric specialist for specialized medical care. With a focus on
quality, access and affordability, the policy was adopted to substitute medical care by care
provided by primary care and thus closer to the population. For more complex medical
problems, gynaecologists are involved. In these situations women are referred to the hospital,
whilst most of the PC still can be provided by the midwife.
The current referral model keeps the structural partition between the midwife’s perspective
giving birth is a natural part of life and a physiological process, and the position of the
gynaecologist with a focus on the pathological aspects of pregnancy and the complex
delivery. The essential difference of the CPZ approach is that these groups work together as a
team, combining the physiological and pathological aspects in an IPC plan.

First steps towards a collaborative team based approach
In 2009 a steering group with the task of analysing the reasons for high maternity and
perinatal mortality wrote the report "A Good Start". The most important piece of advice was
to create joint responsibility within the network of PC. This means a shift from a referral
based system towards an integrated collaborative system.

The challenges
Five years after the report the outcome of the perinatal chain improved. Professionals are
stimulated to work closer together and work less sectioned. At the same time the improved
outcome results in a decreasing attitude to continue with the introduction of integrated care,
as working less-sectioned already shows results and some might think that is enough. The
issues to overcome introducing the integrated approach have several dimensions. The main
challenges and issues are (dividing) money, (keeping) authority and power, (more) flexibility
and transparency, (less) fear, (supporting) ICT and the (facilitating) system.

Notable is the fact that these forces and interests are discussed at a local and national level.
Locally the various professionals have found each other in developing pathways, working
towards a new organisational structure and new joint premises and communication towards
the clients. Nationally the discussion continues on the how and why of an IPC system,
although the ministry is preparing and promoting the integrated approach.

Conclusions
The Dutch perinatal healthcare system made great improvement over the years. Professionals
working together to provide the best care possible. The promises of the evolution towards an
integrated system are highly-strung. The process of implementing this integrated care concept
is tedious and difficult, but it is the only way to provide more quality in this by definition
transmural and potentially multidisciplinary process. Will this be enough to implement this
process of change? The role of the supporting funding system is crucial and will require
changes on both sides: providers and payers. But is there enough confidence and belief on all
levels? Will we grow towards a real integrated perinatal healthcare system to realise the most important promise? A good start!

1. Q-Consult, Arnhem, Netherlands.
2. Casemix, Arnhem, Netherlands.

A Comparative Analysis of Proxy Measures for Coordination of Care within a South African Insured Population

Authors: Jessica A. Nurick, Simon P. Dreyer

Introduction
The persistence of high healthcare costs, and high cost inflation, is driving governments, insurers and managed care organisations to seek new ways of addressing this problem while simultaneously improving the quality and cost effectiveness of healthcare provision. Fragmentation of care delivery has been identified as a critical area of waste within the healthcare system, encouraging research into the assessment of levels of coordination of care and their relationship with costs and outcomes.

Coordination has been defined in numerous ways and from various perspectives. These definitions are at best proxy measures for coordination. This paper will apply a selection of these proxy measures to a subset of claims data within the South African medical scheme (private insurance) environment and present a comparative analysis of results.

Methods
Our initial work, based on a population of 3.1 million lives, examined the relationship between the number of General Practitioners (GPs; primary care physicians) visited by a patient over 12 months and the patient’s incurred costs, utilisation and hospital admission rates over the same period. Using regression analysis to derive risk-adjusted expected costs and grouping on GPs-visited count, we were able to establish a direct, positive relationship between costs and utilisation, and number of GPs visited. Preliminary results of the analysis are presented in Table 1.

While this work confirmed an important trend, we recognised that the number of GPs visited is a crude proxy for the level of coordination of care and further areas for analysis were identified. In particular, this paper will consider other measures from the literature of the relationship between patient and healthcare provider, including the Johns Hopkins ACG coordination markers and the Herfindahl-Hirschman Index (HHI), a measure commonly used to assess market concentration. An approach using HHI on a US insured population has previously been explored by Frandsen et al (2015)1. We also consider the Bice-Boxerman Continuity of Care Index (Bice TW, Boxerman SB. 1977)2.

Much of the exploratory work on coordination of care to date has been done on the relationships between patients and healthcare providers, as discussed in the previous paragraph. We will however also be exploring the relationships and referral patterns between GPs and specialists in more detail. Pollack et al, in two papers (Pollack CE et al. 2015; Pollack CE et al. 2013)3,4, define care density as a proxy measure for how frequently a patient’s doctors collaborate. We apply this methodology to our South African dataset to
In performing the patient-doctor and doctor-doctor analyses we consider a number of confounding factors and their impact on the ability for coordination to explain differences in cost and outcomes. For example, in addition to age, gender, morbidity (as defined using the ACGs) and insured benefits, we consider factors recognised as worthy of consideration in Pollack *et al*’s work such as race/ethnicity, urban/rural, proximity to healthcare providers and managed care interventions designed to promote coordination of care. These interventions include GP nomination and specialist referral benefit rules.

Owing to the richness of claims (including diagnosis) and demographic data available for this study, we are able to examine several scenarios of coordination and relate them to cost (both in total and by type, such as pathology) and outcomes. These scenarios vary in perspective and control for multiple factors, as described.

References:


**Results**

Preliminary results, more to follow.

**Conclusions**

Preliminary conclusions, more to follow.
Table 1

<table>
<thead>
<tr>
<th>Number of Providers Seen</th>
<th>Total Beneficiary Months</th>
<th>Number of Patients</th>
<th>Actual Total Cost plpm*</th>
<th>Expected Total Cost plpm*</th>
<th>Actual Relative to Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 GPs (0 Specialists)</td>
<td>5 031 921</td>
<td>597 741</td>
<td>R 16</td>
<td>R 204</td>
<td>-92%</td>
</tr>
<tr>
<td>1 GP</td>
<td>13 600 430</td>
<td>1 279 989</td>
<td>R 537</td>
<td>R 592</td>
<td>-9%</td>
</tr>
<tr>
<td>2 GPs</td>
<td>7 915 162</td>
<td>711 642</td>
<td>R 898</td>
<td>R 854</td>
<td>5%</td>
</tr>
<tr>
<td>3 GPs</td>
<td>3 226 550</td>
<td>282 397</td>
<td>R 1 295</td>
<td>R 1 162</td>
<td>11%</td>
</tr>
<tr>
<td>4 GPs</td>
<td>1 074 849</td>
<td>92 548</td>
<td>R 1 747</td>
<td>R 1 532</td>
<td>14%</td>
</tr>
<tr>
<td>5+ GPs</td>
<td>434 078</td>
<td>37 004</td>
<td>R 2 695</td>
<td>R 2 217</td>
<td>22%</td>
</tr>
<tr>
<td>0 GPs (Specialists only)</td>
<td>1 018 376</td>
<td>101 335</td>
<td>R 1 242</td>
<td>R 782</td>
<td>59%</td>
</tr>
<tr>
<td>Total</td>
<td>32 301 366</td>
<td>3 102 656</td>
<td>R 712</td>
<td>R 712</td>
<td>0%</td>
</tr>
</tbody>
</table>

*plpm = per life per month; R = South African Rands (€, 1.00 = R13.49 on 22 July 2015)

1. Health Intelligence Unit, Medscheme, Cape Town, South Africa.
Casemix classification systems and its applications for all healthcare types 2

Development of AN-SNAP V4 to Classify Subacute and Non-acute care

Authors: Janette Green¹, Rob Gordon¹

Introduction
The Australian National Subacute and Non-Acute Patient Classification (AN-SNAP) is a casemix classification designed for four care types designated "subacute" in Australia (rehabilitation, palliative care, geriatric evaluation and management (GEM) and psychogeriatric care) and one non-acute care type. AN-SNAP classifies care across admitted and non-admitted settings. The admitted classes have been used for planning and benchmarking in a number of Australian jurisdictions and the private rehabilitation sector for more than 15 years. In 2012 AN-SNAP was adopted as one of the suite of classifications to be used nationally for funding hospital services. The first version of AN-SNAP was developed in 1996 by the Centre for Health Service Development, University of Wollongong. Three subsequent versions have been developed by the same organisation. This presentation describes the development of the most recent version, AN-SNAP V4. The project was commissioned by the Independent Hospital Pricing Authority and represented an important element in the infrastructure to support the ongoing implementation of a subacute and non-acute ABF model in Australia.

Methods
An iterative approach to the development process was undertaken in which data analyses and clinical consultation processes were combined to ensure that the results were both statistically meaningful and clinically sensible. The project also involved a significant level of consultation with jurisdictions, clinicians and other key stakeholders across the subacute sector to produce a fully revised version of the AN-SNAP classification that reflected current and evolving clinical practice. Clinical, activity and financial data, obtained from a range of sources, were used in the analysis. The primary source of data was the national 2011/12 public sector cost data. Supplementary data were obtained from the Australasian Rehabilitation Outcomes Centre (AROC) and the Palliative Care Outcomes Collaboration (PCOC). Each branch of the classification was reviewed using, primarily, regression tree analysis, with the aim of identifying refinements that improved its performance. This included assessing additional variables where data were available in an effort to incorporate new approaches to the classification.

Results
AN-SNAP V4 comprises 130 classes. The admitted branch of the classification contains 83 classes for overnight subacute episodes/phases, 6 classes for same-day subacute admissions and 6 classes for non-acute care and explained 55% of the variation in cost in the development dataset. The non-admitted branch of AN-SNAP V4 comprises 35 classes. Data were not available to allow the performance of the non-admitted AN-SNAP classes to be calculated.

Conclusions
The classification met the project objectives of being suitable for both funding and clinical management purposes. Overall, the changes incorporated in AN-SNAP V4 can be
characterised as modest. They included changes to the structure and to the splitting variables. Paediatric classes were incorporated for the first time. Refinements to the non-admitted classes provided an opportunity for important discussions, such as when the unit of counting for non-admitted activity should be at the level of episode and when it should be service event. One of the limitations of the project was a lack of data with which to assess options for making major structural changes to the classification. Routine collection of the relevant variables remains an important objective for the on-going refinement of the AN-SNAP classification.

1. University of Wollongong, Sydney, NSW, Australia.

Development of DRG logic for Multiple Significant Trauma patients in cooperation with Nordic countries

Authors: Kristiina Kahur¹, Minna-Liisa Sjöblom¹

Introduction
Many countries have struggled with and faced the difficulties with grouping logic for Multiple Significant Trauma (MST) patients. The main reason for this is that MST patients are a very heterogeneous group, both medically and economically. Their treatment is a major challenge for both the medical care and the appropriate financial reimbursement. Finnish National DRG-center initiated the revision of MST patients’ grouping logic within NordDRG system in 2012 and ended up with introduction of new logic in 2015 in its national version. Nevertheless, the change of logic has not been introduced in other Nordic countries so far because the new model needs to be carefully tested first in order to make the users convinced that it works properly.

Methods
After ca two years of cooperation between Finnish university hospitals, Nordic Casemix Center (NCC) and Finnish National DRG-center, finally in 2015 the new MST grouping logic was introduced in Finnish NordDRG version. Data analysis showed that even though the number of MST cases decreased due to the more "strict" rules of how the MST patient is defined and also due to the fact the conservative cases were not considered as MST cases anymore, the homogeneity in MST DRGs has still been slightly increased. As the new logic is used only in Finnish version, the topic is still under discussion within NCC expertnetwork (consists of the experts from countries using NordDRG system) and was discussed in spring meeting 2015 where Norway came up with some suggestion for further revision of the MST patients’ grouping logic. For more detailed analysis and discussion the working group was created in order to find the best possible way for grouping the MST patients. The grouping logic was revised and the test-grouper was created according to Norwegian proposal, cost-analysis was carried out and the impact of changes from cost homogeneity point of view was evaluated. For analyses the data (2013) of five Finnish university hospital were used (ca 4,3 mio cases). The data was grouped with two different groupers: test-grouper (which included the proposed changes) and Finnish 2015 grouper. The results of two grouper were compared.
Results
The cost analyses showed that the V% of cases grouped with test-grouper (based on Norwegian proposal) would have increased in two out of four DRGs, in one DRG V% would have been decreased and in one DRG it would have remained the same. In total V% would have increased though which from homogeneity point of view was not the desired change. The analysis also showed that even though the # of MST cases in test-grouper would have been increased and the cases which would have defined as MST cases and added would have been clinically complex, the cost of those cases would not have been significantly increased. Thus, based on the proposal clinical meaningfulness of MST patients would have been increased but the cost data would not have supported it.

Conclusions
It is important to understand that the quality of the DRG system is measured by the ability to obtain adequate case allocations for highly complex and heterogeneous cases. Specific modifications of the DRG structures could increase the appropriateness of case allocation of MST patients. Same time, the clinical complexity of MST patients not always reveals high cost and therefore the homogeneity does not necessarily increase. In collaboration with NordDRG users the work on testing and developing the MST patients’ groping logic will go on until the most optimal logic suitable for all countries will be developed. The cooperation between countries and data-based analysis is an essential prerequisite for a constructive development of the any DRG system. It is also of high importance actively engage of medical societies in this process.

1. FCG Consulting Ltd, Helsinki, Finland.

Developing a mental health classification system in Australia

Authors: James Downie1

Introduction
As part of the National Health Reform Agreement, the Independent Hospital Pricing Authority (IHPA) is committed to implementing Activity Based Funding (ABF) for mental health services.

At present, there is no single classification used for mental health services. Implementing ABF has been more complex for mental health than other medical and surgical services because existing classifications do not predict resource consumption as well as they do for other services.

Methods
In 2012, IHPA engaged the University of Queensland (UQ) to develop a definition of mental health care for ABF purposes and define the cost drivers. IHPA has since undertaken a six-month costing study with states and territories across a range of mental health services including regional services to test UQ’s hypotheses. A first draft of the AMHCC has been released and is being piloted.
Results
The first draft of the new mental health classification will be presented at the conference, as well as performance statistics, pilot testing results and planning for version 2 of the classification.

Conclusions
The AMHCC will improve the clinical meaningfulness of mental health classification, leading to an improvement in cost predictiveness, and will support new models of care. This paper explains how the AMHCC is being constructed with a focus on regional services, how it will be applied, what has been learnt from the regional sites participating in the costing study, areas for future development, and ongoing opportunities to participate in this work.

1. Independent Hospital Pricing Authority, Sydney, NSW, Australia.

The French medico-administrative database for psychiatric care: the RIM-P

Authors: Anis ELLINI1, M-Caroline CLEMENT1, Axelle MENU1, Anne Buronfosse1

Introduction
The RIM-P stands for « Recueil d’information médicalisé en Psychiatrie » (medicalised gathering information on psychiatry). It is a set of medical and administrative data about psychiatric care. In France, every public or private psychiatric care provider has to collect data using the RIM-P and to transmit it to the ATIH (Technical Agency for Hospital Information) once every three months. The volume of activity recorded in 2014 by the RIM-P is shown in table 1.

Methods
The activities of the 3 types of healthcare services are reported:
- Inpatient, including Inpatient hospitalization, rehabilitation unit, therapeutic host families, therapeutic apartments, hospitalization at home;
- Outpatient day or night services, therapeutic workshops;
- and Ambulatory services including ambulatory care centers and liaison psychiatry (only for public providers).
General practioners and psychiatrists practicing in private office don’t have to collect data for the RIM-P.
The variables of the RIM-P describe both the patient and the provider and could be divided into groups related to five questions: where? Who? How? How long? and when?
The French version of the ICD-10 is used for encoding the diagnoses (main and secondary) and conditions. Dependency is described for inpatients using a daily living scale (AVQ scale).
A specific nomenclature is used for ambulatory care: EDGAR. It allows to describe the purpose (meeting, therapy, etc), the type of the personnel (psychiatrists, nurses, etc) and the site of the practice.
Data related to using isolation rooms and compulsory care is also collected.
A unique anonym national patient identifier allows to follow the patient within the different providers and type of care (acute care, rehabilitation, etc.) and to describe his care trajectory.
Results
To improve the quality of the RIM-P data and to promote its use by stakeholders, two main tools have been developed by ATIH:
- **DALIA Psy**, software for encoders to check data before transmission
- **RME-Psy**, a routine dashboard.
Furthermore, meetings with stakeholders are regularly hold to discuss relevant variables to differentiate the arduousness involved in the management of some cases, as treatment-refractory for example. In the same way, improving the AVQ scale or moving to a different scale to describe dependency is another point of reflexion.
Indeed, improving data quality means not only having more accurate data but also having data with a common and shared meaning for the different stakeholders.

Conclusions
In 2015, 8 years after the official beginning of the RIM-P, 5% of mental health providers still don’t transmit data to ATIH. Besides, the database analysis shows that secondary diagnoses and conditions variables are rarely filled in.
Our challenge is: How to incite psychiatric care providers to collect reliable, robust and exhaustive data for the RIM-P even if it is not used for funding purposes; at least not for now.

Table 1

<table>
<thead>
<tr>
<th>RIM-P year 2014</th>
<th>Unit of count</th>
<th>Public + Private non-profit-making providers (n= 379)</th>
<th>Private profit-making providers (n=179)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient (Full time)</td>
<td>Day</td>
<td>15 540 204 303 390 patients</td>
<td>4 746 904 98 623 patients</td>
</tr>
<tr>
<td>Outpatient (partial time)</td>
<td>Day</td>
<td>4 027 877 107 877 patients</td>
<td>283 648 13 759 patients</td>
</tr>
<tr>
<td></td>
<td>1/2 Day</td>
<td>1 479 628</td>
<td>216 949</td>
</tr>
<tr>
<td>Ambulatory</td>
<td>Meeting/Contact</td>
<td>20 791 566 1 955 833 patients</td>
<td>-  -</td>
</tr>
</tbody>
</table>

1. **ATIH**: Agence technique de l'information sur l'hospitalisation, Paris, France.

From understanding to decision making - experience from BIH

**Authors:** Karolina Kalani¹, Karl Karol¹, Rade BoÅ¾njak², Marija Buha²

**Introduction**
Bosnia and Herzegovina (B&H) comprises two main jurisdictions: the Federation of Bosnia and Herzegovina, and Republika Srpska (it also includes Br?ko District). The Federation of Bosnia and Herzegovina comprises 10 cantons of which the Mostar Canton is one.

As a low income country B&H has a high proportion of health expenditure to GDP and its healthcare delivery system is also beleaguered by poor efficiency, inequality and poor health service quality. Over the last ten years a comprehensive reform of health care system in both B&H entities has taken place. Reforms have focused on financing, organization and the management of the health care delivery.
The development of an incentive based hospital payment system was initiated in 2005 with the idea to pay hospitals based on their output. In 2011 the EU funded a project to implement the Australian AR-DRG system that would allow the measurement of hospital inpatient output and prepare the way for the introduction of an activity based payment model.

**Methods**

This paper analyses activity levels of hospitals in the Mostar Canton to ascertain whether funding is being allocated appropriately by the Cantonal Health Insurance Fund (CHIF). CHIF funds three hospitals in the canton: Clinical Centre Mostar (tertiary hospital); GH Mostar (secondary hospital); and RH Konjic (regional hospital). We calculated the DRG weighed inpatient case load, but separated patients domiciled in Mostar Canton form those residing in other cantons who are funded by their own health insurance funds.

The calculations were based on the following approach:
* Individual hospital CMIs from DRG data were multiplied by the number of outpatient cases to determine the DRG weighted output of hospitals.
* Hospital inpatient expenditures were estimated at 70% of the total expenditures.
* To determine the cost of a weighted case when DRG=1 for each hospital (Base Rate), we divided the weighted output into the hospital expenditure on inpatient care.

**Results**

Summary tables of the DRG data will provide summary information on the number of cases coded; Error DRGs; number of same-day cases; number of surgical cases; average length of stay; and casemix index. The data available was for a period of 9 months and was annualised to enable comparisons.

The following outlines the main findings.

**Findings Clinical Centre Mostar:**
* It would appear that not all cases were coded when compared with the activity data reported by the Cantonal Public Health Institute
* The proportion of Error DRGs (11%) is reasonable at the early stages of coding
* The number of same-day cases (6%) appears relatively low and this could be the result of the particular admission rules that are being used
* An Average Length of Stay (ALOS) of 8.8 is on the high side when compared to other countries and it would seem that there is some room for reduction
* At face value, the casemix index (CMI) of 1.26 is reasonable for a tertiary hospital - but it should be compared with other like hospitals in B&H to establish a trend.
* The casemix index varies considerably month to month, ranging from 1.15 to 1.5 - this indicates considerable variance in the complexity of the hospital case load and may be the result of shortcomings in DRG coding.
* In CC Mostar, incomes per weighed case vary for patients from Mostar Canton to those from outside; the income per weighted case for Mostar Canton patients is KM1751, while for non-Mostar patients it is KM796, a difference of KM954 which is 55% less - for example if CC Mostar was to charge non-Mostar patient on average at the same Base Rate it would generate an additional annual income of some KM10 million

**Findings GH Mostar and RH Konjic:**
* The Proportion of Error DRGs at 37% and 26% is relatively high and indicates poor coding
practice.
* The number of same-day cases is quite variable and appears relatively low at 6% of all cases and this could be the result of admission rules that are being used.
* ALOS of 6.1 for RH Mostar and 7.6 for GH Konjic can be an indicator of lesser case complexity and appears to be quite reasonable in context.
* At face value, the casemix index (CMI) of 1.27 for RH Mostar and 1.16 for GH Konjic is high when compared to the CMI of the CC Mostar which is 1.26.

**Conclusions**
Our paper demonstrated that considering the limited implementation time, CHIF has had some success in using the DRG system to measure the relative efficiency of its hospitals and calculating the scale of adjustments in hospital funding to reflect their inpatient output. Using transparency of available DRG data, CHIF can set the scene for a new hospital contracting model which creates incentives for enhanced performance and thereby greater efficiency. Moreover, the differential charging by CC Mostar indicates the need for an FBIH wide arrangement where hospitals are consistent in pricing patients whether they are domiciled in canton where the hospital is located or come from other cantons.

1. Karol Consulting d.o.o, Zagreb, Croatia.
2. Cantonal health Insurance Fund, Sarajevo, Bosnia and Herzegovina.

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**Is it possible to replace ICD 9 CM Vol 3 by International Classification of Health Interventions (ICHI) in Casemix groupers?: a test with UNU-CBG grouper**

**Authors:** Béatrice Trombert¹, ², Syed Aljunid⁴, Linda Best³, Zafar Ahmed⁴, Hasrul Reeza Mustaffa⁴, Syed M. Hamzah Aljunid⁴, Julien Souvignet¹, ², Sukil Kim⁵

**Introduction**
While the development of national and international CASEMIX (initially named DRG) projects around the world has been facilitated by the use of WHO International Classification of Diseases (from ICD 8 to ICD 10 and including ICD 9 CM and ICD 10 AM, it has been hampered by the absence of an international classification of procedures. Since 2006, the WHO-FIC Family Development Committee has been developing ICHI based on an ontology framework defined in ENISO 1828 named Categorial Structure. Among international CASEMIX systems the UNU-CBG (United Nations University- Case Base Group) grouper has been developed at National University of Malaysia.

**Methods**
There are a total of 4,578 ICD-9-CM codes. The UNU CBG grouper uses 3,851 (84%) codes for assignment to the groups. We tested on these 3,851 ICD-9-CM codes the ability of ICHI to support semantic interoperability between the different CASEMIX systems. The mapping was lexical in 75% of codes and semantic based on ICHI categorial structure with 3 axes and 7 digits.
A database of 34,978 discharges with procedures coded in ICD 9 CM was duplicated in a data base with procedures coded in ICHI. They were both grouped using UNU-CBG Casemix grouper and their outputs compared.
Results
99% of ICD 9 CM codes were mapped to ICHI codes with most of them One to One
Only 90% of discharges were attributed to the same UNU-CBG Casemix groups due to many ICD 9 CM codes mapped to the same ICHI code

Conclusions
ICHI alpha 2 version is less granular than ICD 9 CM Vol 3 procedures coding system and cannot be recommended as such for use in CASEMIX systems grouping and comparison. To reach the level of granularity of ICD 9 CM Vol 3 it is necessary to refine ICHI CAST with more than 3 axes and more than 7 characters.

1. LIMICS, Paris, France.
2. Université Jean Monnet, Saint Etienne, France.
3. University of Sydney, Sydney, NSW, Australia.
4. International Centre for Casemix and Clinical Coding, National University of Malaysia, Kuala Lumpur, Malaysia.
5. Catholic University of Korea, Seoul, Korea (the Republic of).
Saturday
17th October 2015
Benchmarking and comparisons

A National Cost Collection: Bigger, better and more believable

Authors: Kevin Ratcliffe

Introduction
While the National Hospital Cost Data collection in Australia provides a very useful set of AR-DRG level cost weights in both the public and private sectors. This collection has been in place for 18 years and, with few exceptions, has been steadily increasing in reliability, coverage and completeness. However, examination of these cost data at sector and jurisdictional level appears to provide plenty of evidence that there are still significant variations in reported cost unexplained by clinical variation. It is important to examine these differences, to ensure that what is reported is understood in the context of variations in counting, coding, reporting, classification and costing.

Methods
The smaller jurisdictions appear to reveal the greatest variation in cost results from the national. Using data from Tasmania; which is one of the smallest jurisdictions, a body of work was undertaken to examine the impact of the various differences in costing, counting, coding and classification in the reported costs. It is apparent that these differences can materially contribute to variations in reported cost and make uncritical interpretation hazardous. Examination of the private sector cost data also reveals differences in Casemix and length of stay

Results
This presentation describes these differences and the implications for reporting of hospital efficiency more generally. Systemic issues such as difficulties in costing and reporting between sectors are material and will be challenging to resolve.

Conclusions
The variation in costing, counting, classification and reporting approaches suggests that the costing standards and cost study quality assurance processes continue to require development and ongoing review - especially in the context of an Activity Based Funding (ABF) framework.

1. DHHS, Hobart, TAS, Australia.
Costs of acute admitted patients in Australia's public hospitals in 2011-12

Authors: Daniel O'Halloran

Introduction
The National Health Performance Authority released a report on April 30 assessing the relative efficiency of Australia’s largest public hospitals. Hospitals included in the report represented over $16 billion of the $42.1 billion spent on public hospitals for 2011-12. The size of the sector means that efforts to improve efficiency, if well targeted, have a potential to yield significant benefits.

Methods
Data was sourced from the National Hospital Cost Data Collection (NHCDC), 2011-12. This data collection represents approximately 80% of Australia’s public hospital costs. The analysis used comparable costs to compare hospitals against their peers. The inclusion and exclusion criteria for comparable costs were informed by the findings of the Independent Financial Reviews of the NHCDC.

The report focuses on the costs of acute admitted patients, those patients that account for the largest portion of hospital costs. Two measures to assess relative efficiency are presented, Cost per National Weighted Activity Unit (NWAU)[1] and Comparable Cost of Care. Comparable Cost of Care includes ED costs of acute admitted patients, as variation exists in the time patients stay in ED, a factor that influences whether the cost of care is recorded as part of the ED presentation or as part of the patient’s admission.

Relative efficiency is assessed by comparing costs against a unit of activity, accounting for the complexity of patients and individual patient characteristics that can lead to legitimate higher costs.


Results
The Performance Authority has demonstrated that results for individual hospitals are broadly the same using both measures, providing confidence in the findings, and the relativities in hospital efficiency. The Authority found two-fold variation in the average cost per unit of activity across Australia’s largest public hospitals.

The report provides contextual information on the average cost of 16 common conditions and procedures, and the extent to which a relationship exists between the cost of an admission and length of stay. This information can assist healthcare professionals to understand how their decisions contribute to a hospital’s relative efficiency.

Conclusions
The report comes at a critical time of national discussions around the cost and funding of public hospitals. It provides valuable insight into the variation of the relative efficiency of Australia’s largest public hospitals; and for the first time publicly demonstrates that at a point in time, 2011-12, there was two fold variation in the average cost of delivering similar services to similar patients in similar public hospitals. This information and methods provide a platform for future work in understanding the cost of delivering care to patients; and the drivers of such variation.
Acknowledgements
The Performance Authority acknowledges the work of its staff, that of the Independent Hospital Pricing Authority and its staff, PricewaterhouseCoopers and the advice provided by the Authority and report specific advisory committees.

1. National Health Performance Authority, Sydney, NSW, Australia.

Comprehensive Ambulatory Classification System 2 - Doing More With Less

Authors: Holly Homan\textsuperscript{1}, Tina Li\textsuperscript{1}

Introduction
The Canadian Institute for Health Information (CIHI) plays a critical role in the development of Canada’s health information system. Grouping methodologies such as CMG+, and Comprehensive Ambulatory Classification System (CACS) are de facto standards for grouping hospital patients with similar treatment requirements in Canada. Over the years, through their application, these methodologies and their accompanying resource indicators have established a track record for assisting healthcare facilities to effectively plan, monitor and manage the services they provide.

CACS groups many types of ambulatory care data submitted to the National Ambulatory Care Reporting System (NACRS) database. These data include day surgery, rehabilitation and medical clinics, as well as emergency department data. Currently, CIHI processes and groups Level 3 submissions, which include a number of clinical and demographic data elements, in addition to diagnoses and interventions.

To address client’s need to reduce the burden of data collection and improve the timeliness of reporting emergency department (ED) data, CIHI introduced two new levels of NACRS submissions for ED. Level 1 includes emergency department wait time information only, while Level 2 adds to that wait time information with diagnoses from a limited pick-list.

A request from those jurisdictions submitting NACRS Level 2 data to develop groups and resource indicators initiated the CACS 2 project.

This paper will introduce the CACS 2 project and provide an overview of the progress to date, including analysis of the data. It will highlight the effect of interventions on the grouping methodology, discuss the steps in place to remedy the missing interventions and demonstrate how this project will be leveraged to improve the grouping and resource indicators of the emergency portion of the current CACS methodology.

Methods
The methods and findings will be detailed in the paper.

Results
The need for interventions in the grouping methodology was demonstrated by the drop in explanatory power from approximately 50\% to 35\%. A recommendation was therefore made to create a pick-list of interventions for NACRS Level 2 data submissions. Development of the pick-list is ongoing. Progress will be discussed in the paper and in the presentation.
Conclusions
Development is ongoing. Progress will be discussed in the paper and in the presentation

1. Case Mix, Canadian Institute for Health Information, Ottawa, ON, Canada.
Health services planning using casemix

Profiling high utilizers in social and health care

Authors: Tomi Malmström¹, Antti Peltokorpi², Markus Lappalainen¹

Introduction
In health care highly skewed consumption of expenditures are reported internationally, where 10% of the population consume over 70% of the total costs. Previous research has studied high utilization of healthcare but utilization of social care is a less studied field. This research aims at increasing understanding about high utilizers by considering the use of both social and health services, by broadening the definition of high utilization focusing not only on costs but also on fragmentation of service use, and by profiling customer segments belonging to different utilization groups.

Methods
The objective for the empirical part of this research is to explore the service usage and possible characteristics of high utilization in social and health care services in a Finnish municipality. The municipality has a population of 33,520. The empirical part consists of a quantitative study on the usage of social and health care services and the use of these services in 2011-2012 is analyzed. This study uses research data repositories maintained by The National Institute for Health and Welfare (THL), which tracks a range of person-specific usage data over publicly funded social and health care services. The data captures all publicly funded healthcare at an individual level, as well most social welfare usage. For this study, high utilizers (HU) were defined as the costliest 5% of population and low utilizers (LU) were defined as the least expensive 95% of population. Based on the data each HUs’ cost profile was evaluated.

Results
The costliest 5% of population incurred 65% of the total costs and the costliest 10% about 77% of the total costs. Average age did not differ in the analyzed two years among low utilizer, but there was a rise of age among high utilizers from year 2011 to year 2012. HU Females use 0,2 more service categories and incur slightly higher average cost compared to males. Similar trend can be observed among low utilizers.

High utilizers were classified for one service category by their most expensive service and the distribution of expenditures for service categories was observed (Table 1). Most distinctive features in categories is the difference in average age. Time before adulthood and older age, were clearly distinct life stages. Two more categories - adulthood and middle age - were used to divide the expensive service categories by their average age. Life stages by average age were as follow:
1) Children and adolescent (0-18): Child welfare service was naturally a distinct group that consisted of very young people
2) Adulthood (18-40): Social assistance was a category where average age was slightly over 30 years
3) Middle age (40-60): Average age being around the middle age was observed in specialized somatic care, specialized psychiatric care, disability services and mental health services
4) Older people (60+): Primary care: inpatient and service for older people
Conclusions
The research implicates that simultaneous analysis of the use of social and health services at the individual level and diverse definitions for high utilizers are needed in order to identify variety of underlying problems in customer episodes. Customer profiles in different high utilizer groups vary a lot indicating that targeted population segment and service organization-specific programs would be most promising strategies to curb high utilization.
The research contribute to existing knowledge about management of social and health services at the system level by providing new conceptual tools to identify and categorize high utilizers.
### Use of service categories among high and low utilizers in 2012

<table>
<thead>
<tr>
<th>Year 2012 (total cost €81 million)</th>
<th>High utilizers (HU)</th>
<th>Low utilizers (LU)</th>
<th>Ratio (HU/LU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%) of (HU)</td>
<td>Average cost per individual, €</td>
<td>Total cost, €1000</td>
<td>% of total costs</td>
</tr>
<tr>
<td><strong>Child welfare</strong></td>
<td>60 3,6</td>
<td>53 441</td>
<td>3 206</td>
</tr>
<tr>
<td><strong>Disability services</strong></td>
<td>57 3,4</td>
<td>41 651</td>
<td>2 374</td>
</tr>
<tr>
<td><strong>Specialized psychiatric care</strong></td>
<td>151 9,0</td>
<td>20 520</td>
<td>3 099</td>
</tr>
<tr>
<td><strong>Services for older people</strong></td>
<td>796 47,5</td>
<td>17 890</td>
<td>14 240</td>
</tr>
<tr>
<td><strong>Mental health services</strong></td>
<td>235 14,0</td>
<td>15 174</td>
<td>3 566</td>
</tr>
<tr>
<td><strong>Primary care: Inpatient</strong></td>
<td>743 44,3</td>
<td>13 113</td>
<td>9 743</td>
</tr>
<tr>
<td><strong>Specialized somatic care</strong></td>
<td>1145 68,3</td>
<td>10 759</td>
<td>12 319</td>
</tr>
<tr>
<td><strong>Support for informal care</strong></td>
<td>84 5,0</td>
<td>4 494</td>
<td>378 0,5</td>
</tr>
<tr>
<td><strong>Social assistance</strong></td>
<td>159 9,5</td>
<td>4 131</td>
<td>657 0,8</td>
</tr>
<tr>
<td><strong>Services for substance abusers</strong></td>
<td>97 5,8</td>
<td>2 337</td>
<td>227 0,3</td>
</tr>
<tr>
<td><strong>Rehabilitation center care</strong></td>
<td>27 1,6</td>
<td>1 300</td>
<td>35 0,0</td>
</tr>
<tr>
<td><strong>Medical rehabilitation and physical therapy</strong></td>
<td>838 50,0</td>
<td>1 275</td>
<td>1 069</td>
</tr>
<tr>
<td><strong>Primary care: Ambulatory and outpatient</strong></td>
<td>1537 91,7</td>
<td>654</td>
<td>1 005</td>
</tr>
<tr>
<td><strong>Guidance service clinics</strong></td>
<td>123 7,3</td>
<td>414</td>
<td>51 0,1</td>
</tr>
<tr>
<td><strong>Occupational health services</strong></td>
<td>101 6,0</td>
<td>216</td>
<td>22 0,0</td>
</tr>
<tr>
<td><strong>Oral health</strong></td>
<td>639 38,1</td>
<td>203</td>
<td>130 0,2</td>
</tr>
<tr>
<td><strong>School and student health services</strong></td>
<td>107 6,4</td>
<td>196</td>
<td>21 0,0</td>
</tr>
</tbody>
</table>

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The Evolution of Activity Based Management Performance Reporting in NSW – from Top-Down to Predictive Modelling

Authors: Alfa D’Amato

Introduction
The NSW Health Activity Based Management Performance monitoring system has evolved significantly over the last three years to meet the requirements of the stakeholders as well as the system manager. As the health system is embedding Activity Based Management (ABM), business users expect more up-to-date data and reports to track each health services’ performance against activity and cost. The purpose of the ABM Performance monitoring process is to estimate on a year-to-date basis the overall spend on Activity Based Funded services, provide variance against activity targets and, most importantly, combine these results with the overall financial results using a price-volume variance analysis. This process has been performed on a monthly basis for a number of years. At the beginning, the calculations and reporting were performed in Excel-based templates based on top-down cost modelling. The process has now evolved and uses predictive modelling based on the last costing results applied to the current year-to-date activity data. The predictive modelling provides a state-wide view for system managers whilst business users can easily slice and dice cost information by service stream, classification, facilities or specialty level.

Methods
The cost is modelled using Gamma regression and is derived from the latest costing data submission. The Gamma regression extracts and summarises the numeric relationship between each cost driver (predictor) and estimates the contribution of each cost driver to the total formation of the cost. By using relationship estimates from the regression model, it has been possible to predict the cost of new encounters.

Results
ABM is an evidence-based management approach that focuses on patient level data to inform strategic decision-making. Through clinical costing results and other activity data, ABM allows clinicians and managers to identify areas for improvement and make informed decisions relating to patient care through the optimisation of resource allocation. It is a system for continuous improvement and it provides a link with service Key Performance Indicators where activity, cost and performance information is used to attain strategic and operational objectives. The ABF Performance Reporting aims at providing a strategic advantage to all stakeholders involved - not only in casemix, but also in finance and performance monitoring. This development has been embraced by the financial team and is now incorporated in the monthly narrative process.

Conclusions
Activity Based Management in NSW Health has created an opportunity to connect key elements of the system such as finance, purchasing and casemix/ABF. The ABM Performance Reporting solution based on predictive modelling has further strengthened this connection and fostered a transparent environment to collaborate by proving an opportunity to succinctly monitor the health system performance based on price-volume variance. This process allows deeper understanding of the causes of the financial variance as well as activity variance on a year-to-date basis

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Development of a Model to Predict Demand for Rehabilitation from Activity in Acute Care AR-DRGs

Authors: Janette Green¹, Jenny McNamee¹, Conrad Kobel¹, Habib Seraji¹, Suanne Lawrence²

Introduction
Admitted rehabilitation activity accounts for an increasing proportion of health care expenditure in Australia. This presentation describes the development of a tool to predict demand for rehabilitation care generated by acute inpatient episodes provided in Australian public sector facilities. Previous work by Dr Lynette Lee identified a set of "rehabilitation-sensitive AR-DRGs", or AR-DRGs from which patients are more likely to require subsequent rehabilitation. In developing the predictive tool, this earlier work was extended, primarily by quantifying the degree of sensitivity and by incorporating the patient’s age. The model uses variables, both clinical and demographic, found within routinely collected administrative data sets and could be used in routine service planning. Rehabilitation activity can be predicted as the number of episodes or the expected number of bed days. A strategy for "finding" additional bed days was proposed for situations where the prediction exceeds the current level of activity.

Methods
The model was developed using complex statistical analyses of national datasets, informed by a panel of expert clinicians. In the national admitted patient dataset (APC) some, but not all, acute episodes which had been followed by rehabilitation within 28 days could be identified. Predictors of the likelihood of subsequent rehabilitation care were identified from this dataset using logistic regression and a preliminary predictive model was developed. Using published national hospital statistics and data from the Australasian Rehabilitation Outcomes Centre (AROC), adjustments were made to the model parameters to account for activity that had not been identifiable in the APC. AROC data were also used to convert the number of episodes predicted by the model to estimated bed days.

Results
The predictive model comprises tables of probabilities that patients will require rehabilitation care after an acute episode with columns defined by age group and rows defined by grouped AR-DRGs. When applied to national data, the model successfully predicted 83% of the rehabilitation activity estimated to have been generated across Australia. When the model was applied to Tasmanian data, the results confirmed independent sources that Tasmania provides substantially less rehabilitation care than expected. The strategy proposed to "find" the additional beds required reduced the shortfall from 114 to 13 beds.
Conclusions
Clinicians and other stakeholders regarded the model favourably and believed that it was an improvement on current methods available. The model prediction of 83% was a good result, remembering that there are additional patients who are admitted directly from home rather than from acute care. Best practice for the delivery of rehabilitation care incorporates a range of modalities, including hospital and community based models. However, the predictive tool estimates the demand for inpatient care only. Local arrangements will determine the most appropriate way to deliver this care.

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General Casemix 2

The implementation of an All Patient Refined DRG grouper in Portugal

Authors: Claudia M. Borges1, Ricardo Mestre1, Nuno Amaro1

Introduction
The DRG patient classification system is implemented in Portugal since 1989 for production analysis and hospital financing, with different DRG grouper versions being used over the years. It started to be used only in inpatient production and, presently, it includes also ambulatory surgery and some medical procedures. Within the hospital purchasing system, production being financed through DRG amount, nowadays, to more than 50%.

The change to ICD10/CM PCS and the need to obtain more information about the patients being treated in hospitals determined that, in 2015, an All Patient Refined DRG grouper (APR) should be implemented. The way hospital production is characterized using this kind of grouper differs a lot from the way it was with the All Patient version used until December 31st 2014, opening new analysis and financing opportunities but also bringing several challenges both for the providers and for the Ministry of Health. By subdividing each episode into severity and risk of mortality levels an array of new analysis are possible.

Methods
In order to study the impact of a transition to a APR DRG version, the 2012 and 2013 hospital national data basis was grouped in both All Patient DRG (AP) version 27 and APR version 31, in a total of almost 3,5 million episodes. Several analysis were carried out in order to understand the differences between the two systems, with correlations tests being carried out between several variables. Length of Stay Adjusted Index and Mortality Adjusted Index were calculated. Finally, the impact in financing was measured, considering the new production distribution, trim points and relative weights compared to the ones being used.

Results
The APR DRG grouper has more homogenous groups with designations closer to the clinical expertise than an AP grouper. A higher concentration of episodes is possible, with 27,5% of the whole inpatient production being grouped into 8 DRG (spread among the different levels of severity), whereas with the AP version only 22% was grouped into 8 DRG.

Not all episodes classified into cc and cc major DRG in AP are classified into the APR levels of severity 3 and 4. In fact, almost 52% of these episodes are grouped into levels 1 and 2 of severity in the APR. Additionally, on a whole, hospital production results mainly in a low severity level, with 83% of the episodes being grouped in severity levels 1 and 2.

Generally, LOS rises with the increase of the level of severity (with LOS = 4,5 days in level 1, and 23,5 days in level 4). However, there is no strong correlation between LOS and the level of severity. On the other hand, some hospitals demonstrate a strong positive correlation between the diagnosis and procedures number and the severity level.

Length of Stay Adjusted Index indicated that although some institutions manage to have lower LOS, despite a higher concentration of patients in higher levels of severity.

Almost 88% of the episodes are grouped into risk of mortality levels 1 and 2 with, generally, mortality rate rising with the raise of risk of mortality level. Nevertheless, there is a weak positive correlation between mortality rate and risk of mortality rate, with some hospitals with a negative correlation.
Mortality Adjusted Index indicates that some hospitals manage to have a better performance despite dealing with patients with a higher risk of mortality.

Conclusions
An APR grouper needs more detailed information (in terms of diagnosis, procedures and patient characteristics), in order to split the production into different degrees of severity and risk of mortality. Although ICD9CM coding is well spread within the Portuguese NHS hospitals, the main lack of information is in the patient process itself, which compromises an adequate coding. An effort of clinical records quality improvement has to be made and a grouper such as APR is a good tool to begin this process and revise clinical records. Such an high concentration of episodes in severity levels 1 and 2 may, also, indicate an hospital tendency to code attending to the grouping result (and financial return) rather than to the reality of the care delivered. A grouper such as APR, where it is more difficult to guess the DRG result, will deviate attention from this issue and enable hospitals to focus on the register quality.

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Reducing risk events using case-mix system in geriatric facilities

Authors: \[\text{Jiro Okochi}^1, 2\]

Introduction
Frequency of undesirable risk events, such as fall, aspiration pneumonia and pressure ulcer are considered as quality indicators in geriatric care facility. This study analyzed the effect of the standard risk management process and of staffing of a risk manager on prevention of risk events such as falls, aspiration pneumonia, and pressure ulcers. Case-mix classification system was also used to select high risk patient, and analyzed the effect of risk reduction.

Methods

Subject
767 elderly persons using geriatric rehabilitation facilities (Roken) in Japan were recruited from 116 facilities. All elderly persons or their family member as proxy provided written informed consent.

Outcome measures
Two types of outcome measures were used in analysis; A. Process outcome and B. Personal outcome.
A. Process outcome includes such as
1. Full implementation of R4 system (care plan method considered for risk management),
2. Use of standard "Risk manual booklet",
3. Briefing on risks for elderly people at the time of admission,
4. Implementation of risk management measures at the time of care planning.
B: Personal outcome includes reduction of risk events such as falls, aspiration pneumonia, pressure ulcers and dehydration.

Analysis
A standardized intervention of risk-management process was in place in 45 facilities. 66 facilities had risk-manager positions. Therefore these risk-management process and risk-manager positions are considered an intervention at facility level in this study. In addition, ICF staging: a case-mix tool using International Classification of Functioning, Disability and Health (ICF) and the past history of risk events are used as personal factor. Effect of intervention and case-mix classification on improvement of process and personal outcome was analyzed.

Results
Facilities with risk managers and facilities following risk management processes provided better quality of service in terms of risk management for elderly people on the analysis of process outcome.
1. Facilities with risk manager(s) scored better than facilities without risk manager in all of the following including "fully implementing R4 system" (odds ratio= with risk manager 1.5, without risk manager 0.10), "using standard "Risk manual booklet" (odds ratio=2.26 with risk manager, 0.53 without risk manager), and "implementing risk management measures at the time of care planning" (odds ratio= 0.85 with RM, 0.53 without risk manager).

2. Facilities following standard risk management processes (intervention group) scored better than facilities not following standard risk management processes in all of the following including "fully implementing R4 system" (odds ratio=intervention 2.52, non-intervention 0.08), "using " Risk manual booklet" (odds ratio= intervention 1.48, non-intervention 0.74)

3. However we could not observe reductions in personal outcomes such as number of falls, aspiration pneumonia or pressure ulcers as a result of intervention in this study when all patients were included. For example,
   A. Decrease of fall events were observed in the patients with "past history of fall" and ICF staging mobility level =" 3 and 4" , (odds ratio= intervention 1.16; non-intervention 0.82).
   B. Decrease of aspiration pneumonia were observed in patients with "past history of aspiration pneumonia" and ICF staging swallowing level= "2 and 3" , (odds ratio= intervention 1.21; non-intervention 0.82).

Conclusions
Implementation of standardized risk prevention tool and of staffing of risk-manager improved the risk management process. Although the risk prevention process was improved, reduction of risk events was not observed when all patients were included. However, frequency of risk events was decreased after selecting high risk patients using case-mix method. This indicated the importance of specific risk prevention measures taking patients functioning and activity into consideration.
Therefore, this study indicated the importance of case-mix system to reduce risk events and to improve quality of care in geriatric care facilities.

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2. Japan Association of Geriatric Health Services Facilities, Tokyo, Japan.
Readmissions in Germany: A New Analytic Approach Beyond Current DRG Payment Rules

Authors: Marc Berlinguet¹, Dorothee Assenmacher², Andre Cools², Raphael Graf², Axel Bruns²

Introduction
Specific DRG payment rules (Chapter 2) exist for readmissions in Germany. Three sets of different rules apply, related to readmissions for same basic DRG, or for surgical readmissions when the initial admission is from the medical partition of the same Major Diagnostic Category (MDC); and a third set of rules for clearly identified complications. Also the DRG Catalogue identify excluded DRGs. For the readmissions where the above rules applied, the readmission is lumped with the first encounter and not paid separately. Do these rules identify all the readmissions that may be potentially preventable?

Methods
From 3M Medica benchmark dataset, we selected all the discharges from a group of hospitals. This constitutes a sample of 235,805 discharges from 2014.
We applied the 3M Potentially Preventable Readmissions (PPR) algorithm to it. This algorithm parses each readmission and analyzes if the readmission is potentially preventable by looking at the clinical relationship mainly at the base DRG level and also consider additional relationships. We selected here an interval of 30 days for readmissions in same hospital only.

Results
First, we discarded the cases that were submitted to the readmissions payment criteria and were collapsed in single encounters. Then, from the PPR logic, standard general exclusions rules were applied, because the difficulty to identify the readmissions that can be deemed as potentially preventable, mostly in DRGs of metastatic or complex cancers, trauma patients and neonatology. Following the above two steps, 166,195 discharges remained for 138,374 patients, with an annual readmission rate of 1.17% (24,006 readmissions).
162,380 chains of unique admissions or encompassing one or more readmissions within the interval of 30 days were created with the only admission (OA) or the initial admission (IA) within each chain is first identified; one or more readmissions (RA) then follow each initial admission. Transfers to other acute care hospitals (RT) were identified separately.
There are 3696 readmissions or transfers, for an average of 1.039 readmissions or transfers to same or other acute care hospital within 30 days. The PPR rate is 2.19%: this is the ratio of initial admissions (IA) over only admissions (OA) PLUS initial admissions (IA), hence lumping multiple readmissions together, as one episode of readmission(s).
Table 1 provide the Major Diagnostic Categories with the PPR rates above the average of 2.19% within the sample, once PRE-MDC and MDC 18 (HIV) are excluded in addition to general excluded cases from MDCs 15, 20, 21A, and 22.

Conclusions
We do observe readmissions that may be potentially preventable, above and beyond the current reimbursement policies that lump already some readmissions within initial episodes. For each hospital, the preferred analytic approach is to adjust for the respective case-mix of each hospital the DRG and complexity level and calculate indirect standardization using the observed number of readmissions for each observed hospital versus the expected number of readmissions for the whole sample.
The Review of records from individual cases, in particular in MDCs and DRGs that show higher rates than expected would confirm that these readmissions are preventable, and are not due to mapping, documentation or coding issues.

This method identify more readmissions beyond only considering if the readmission is in same MDC, the same base DRG; or if it concerns explicitly stated complications stemming from initial admissions. This work confirms that additional information can help the identification of cases that may be preventable.

MDCs with PPR rate (readmission chains) higher than average. Germany sample. 2014

<table>
<thead>
<tr>
<th>Major Diagnostic Category (MDC)</th>
<th>Total Admissions</th>
<th>Admissions at risk (OA+IA)</th>
<th>Chains with at least 1 readmission</th>
<th>PPR Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood and Blood Forming Organs</td>
<td>2193</td>
<td>1405</td>
<td>51</td>
<td>3.63%</td>
</tr>
<tr>
<td>Infectious and Parasitic Dis (18B)</td>
<td>2937</td>
<td>1801</td>
<td>65</td>
<td>3.61%</td>
</tr>
<tr>
<td>Hepatobiliary System and Pancreas (07)</td>
<td>8459</td>
<td>5843</td>
<td>197</td>
<td>3.37%</td>
</tr>
<tr>
<td>Kidney and Urinary Tract (11)</td>
<td>13309</td>
<td>9279</td>
<td>277</td>
<td>2.99%</td>
</tr>
<tr>
<td>Circulatory System (05)</td>
<td>23296</td>
<td>18752</td>
<td>529</td>
<td>2.82%</td>
</tr>
<tr>
<td>Respiratory System (04)</td>
<td>21585</td>
<td>12755</td>
<td>355</td>
<td>2.78%</td>
</tr>
<tr>
<td>Digestive System (06)</td>
<td>28943</td>
<td>21493</td>
<td>558</td>
<td>2.60%</td>
</tr>
<tr>
<td>Neoplastic Disorders (17)</td>
<td>3611</td>
<td>264</td>
<td>6</td>
<td>2.27%</td>
</tr>
<tr>
<td>Mental Diseases (19)</td>
<td>693</td>
<td>445</td>
<td>10</td>
<td>2.25%</td>
</tr>
</tbody>
</table>

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2. 3M Medica, Neuss, Germany.
Posters
Review of mental health financing arrangements in EU

Authors: Agnieszka Glab, Kinga Szarpak, Urszula Ceglowska, Marta Slomka, Agnieszka Wlodarczyk

Introduction
Financing of mental health care services varies between EU countries. These differences arise most often with demographic conditions, socioeconomic contexts, macroeconomic capabilities, societal attitudes, cultural and religious orientation, and the political commitment and policy priorities. The aim of this article is to review currently used methods of mental health financing in EU member countries.

Methods
Non-systematic review, WHO resources.

Results
The dominant form of mental health financing system in Europe is social health insurance, for example this form is represented in Austria, Belgium, the Czech Republic, France, Germany, the Netherlands and Romania. Although most countries finance their health care through more than one source, European countries rely principally on publicly financed systems, typically through some form of taxation or contribution to social health insurance. Voluntary health insurance (private health insurance), out-of-pocket payments and international aid play smaller role. Although mental health financing systems are diverse they have many common features.

The prevalent form of financing hospital services in mental health is the pay per day reimbursement (Finland, Switzerland, Estonia, Poland), the payment per case (Austria, England, Czech Republic,) and sometimes a combination of them with global budget. Visits to the primary care is financed based on capitation or fee-for-service whereas specialist doctors are accounted as FFS in most countries i.e. Finland, Denmark, Belgium or Switzerland. Financing long-term care often is determined on a separate basis, which takes into account patient characteristics.

In some European countries (England, Netherlands, Germany, Denmark,) a mental health financing systems are based on grouping benefits of the psychiatric care into homogeneous clusters. In England DRG classification units patients based on their health needs rather than the cost amount carried for curing them though the preliminary assessment is pointing at the large variability of costs within individual groups. Instead Dutch DRG are based on classification system of diagnostic and therapeutic clusters. Hence the amount of the rate depends on the diagnosis, the treatment, the type of therapy and the length of stay and is determined based on information about the real workload, the material consumption and the amount of costs of capital. In Germany for clearing and grouping of patients classified on the basis of the diagnosis, clinical status, and the uniformity of treatment cost is used PEEP system. Differentiating factors in the system PEEP is the degree of severity, drug therapy, intensity of therapy in terms of used resources involved in the treatment of the case (number of physicians, psychotherapists, psychologists).

Now, in UE countries a trend of implementing the community-based mental health care is developing. The main purpose of community-based care is to enable a person with mental illness to function in the society and have the opportunity to study and work. Implementation of community model can be observed in Italy, England and Germany. It is observed that community care model is more expensive than the institutional model however is much more cost-effective. International experience shows that the incentive to implement community-
based care is to finance medical services under capitation rates, thus "the money will go behind the patient" regardless of the provision place of health care services. Funding source of community care services can vary from budget of the Ministry of Health, to social care budgets and the other Labor Departments. Moreover, in Italy and in the UK personal budgets were introduced, where patients are given a pool of money which is then spent on the implementation of the necessary services in their everyday functioning. At the end it is worth mentioning how look like the share of spending on mental health care in different countries. Percentage share of spending on psychiatric care in relation to the total budget for healthcare services in developed countries ranges from about 3-5% (Czech Republic, Finland, Greece) to about 10-20% (England, France, Netherlands, Germany, Norway, Sweden).

Conclusions
In determining the optimal method of financing health care you can wonder what type of financing system is best placed into adaptation to changing priorities. Financing psychiatric care can be based on many factors: Mental Health Legislation and Human Rights; Mental Health Policy, Plans and Programmes; Planning and Budgeting to Deliver Services for Mental Health; and Advocacy for Mental Health. However, every planning associated with financing the psychiatric care require financial underpinning so it is important to determine exactly the resources and the appropriate allocation of resources.

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2. Department of Neurochemistry, Mossakowski Medical Research Centre PAS, Warsaw, Poland.

Implementation of the Diagnosis-Related Groups in Poland

Authors: Gabriela Sujkowska¹, Aleksandra swiderska¹, Urszula Ceglowska¹, Agnieszka Wlodarczyk¹

The goal is to describe implementation of diagnosis-related groups in Poland and current characteristics of the system.

1. Agency for HTA and Tariff System, Warsaw, N/A = Not Applicable, Poland.

Authors: Alberto Scasso¹, Elbio Paolillo¹, Diego Genta¹, Silvina Tortorella¹, Guillermo Tabares²

Introduction
The average mortality from traffic accidents in Uruguay was 16 death per 100,000 / person / year in the last triennium; while in the Department of Maldonado this ratio rose up to 24,3 in the same period. Despite its importance, reliable data on costs incurred in process of care of the injuries are unknown.

Objective: provide clinical, epidemiologic and costs data of patients hospitalized in La Asistencial Médica Departmental de Maldonado after suffer a traffic accident. We hope that the present work will be a contribution to the Pillar 5 "response after accidents" Global Plan of Action for Road Safety 2011-2020 United Nations.

Methods
Analysis of the 741 discharges from patients admitted in the hospitals of the Asistencial Médica Departmental de Maldonado as a consequence of a traffic accident in the years 2012, 2013 and 2014. All histories were individualized with an additional code of the International Classification Disease (ICD-10) contained within the Chapter Transport Accident, recorded between V-01 to V-89.

For coding, printed versions of the ICD 10 for morbidity and ICD 9 MC for diagnostic and/or therapeutic procedures of the WHO were manually entered to the computer system PROYECAM by means of the module CODIFICA_HC, which allows record a code for the principal diagnosis and seven codes for secondary diagnoses.

The grouping in Diagnosis Related Groups (DRG) was done automatically using a grouping software.

The cost of each injured patient was obtained from the emergent GRD, using the ECAS charts of (Estructura de Costos de AtenciA’n a Afiliados = Cost Structure of Affiliates Assistance), an information officially sent to the Department of Public Health. We used a costing program developed for Uruguay by the International Institute of Global Health (IIGH) of the University of the United Nations.

The sample was worked as a whole, without removing outliers, since by removing observations we would be losing part of the incurred costs.

Results
There were 741 discharges for accidents, with an average stay of 7.5 days and 857 days bed occupied in intensive care. 77 per cent were motorcyclists, 65 per cent were males and the average age was 36 years. The cost of attention of a patient of this group was twice and a half higher and the hospital stay was almost the double of an average patient.

The mortality in this group of injured that came alive at hospital was 2.41 per cent.

The medical and surgical patients were allocated to almost all the Major Diagnostic Categories (MDC), being mostly neurological, respiratory and trauma.

Conclusions
Care process of patients who have suffered a traffic accident and admitted to the hospital is very complex and care continuity is put to test. It involves all healthcare services and
Additionally they need infirmary care, physical rehabilitation, psychological and social support.

By sample selection, we include the cases from the cause (the accident) which motivates that the distribution of GRD in this study is not normal, as usual.

We should consider 7.5 days of stay in average and two and a half higher cost of these patients, as an opportunity to improve care. In the future we intend to create efficient "teams" of interdisciplinary work and a specific clinical guide for this patients' typology, which constitute a new disease entity more and more frequent, that demands new forms of care.

1. Maldonado, Asistencial Médica de Maldonado, Maldonado, Maldonado, Uruguay.
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Improving coding for DRG assignment in a Brazilian tertiary care hospital

Authors: André A. Osmo¹, Marcia M. Sá¹, Deborah P. Castilho¹, Fábio H. Gregory¹, Carolina G. Pereira¹, Osmeire A. Sanzovo¹, Flavia Vendramini², Marina F. Noronha³, Marc Berlinguet²

Introduction

The DRG Classification System ("Diagnosis Related Groups") is a worldwide methodology that allows comparison between standardized hospital inpatients stays with equivalent consumption of resources. It is used as powerful benchmarking tool between different hospitals. It is not currently used in Brazilian hospitals but there are some academic studies about the system.

This paper describes the implementation of DRGs coding for the first time in a Brazilian hospital. Hospital Sirio Libanés (HSL), a nonprofit hospital in São Paulo, is a 470 beds general hospital (122 ICU beds) with 19 operating rooms performing 24,000 surgeries/year. HSL is a Joint Commission International accredited hospital mainly focused on oncologic and cardiologic patients.

Methods

APR-DRG 3M system introduction was performed in three steps:
Step 1: All 36,258 discharges on a 17 month period (January 2013 to May 2014) were coded and analyzed by application of APR DRG Version 32 Grouper.

The main diagnoses were classified by the International Classification of Diseases ICD 10. For the procedures, we used SIGTAP, a coding table of Brazilian Ministry of Health utilized for epidemiological and reimbursement purposes. This data were map to ICD-9 CM in order to generate the DRGs.

Step 2: From results of step 1, we select 1208 clinical records from the first sample. This number refers to all encounters grouped into MDC 05 and 06 cardiology and digestive systems records.

The clinical records were intensively reviewed and comorbidities, secondary diagnoses and all procedures were included to generate a new round of DRGs.

Results

In step 1 patients were initially distributed into 730 APR DRGs of the 1258 possible codes. The ALOS was 5.7 days with 1.05 secondary diagnosis and 1.0 procedure per discharge on
average. Ninety seven percent of patients were grouped into specific DRG. Severity of illness were lower when compared with the US Norm. After including comorbidities/complications and a more complete identification of procedures performed from Step 2, there are significant changes in the results. 6.5% (79/1208) inpatient encounters are reclassified in different DRGs, most of these changes happen within same MDC and some cases land in different ones (MDC 16 and 23). Including the cases that changed DRGs, 13.6% a significant number (164[MB1]/1208 have their severity of illness modified; 72.6% (119/164) of these have their risk of mortality increased. In step 2 the resulted mean number of diagnosis increased to 5 and the number of procedures coded raised to 3.

Discussion: The public health system in Brazil uses ICD-10 diagnostic and a specific procedures list (SIGTAP) respectively for epidemiological information and provider reimbursement. Only the principal diagnosis and the main procedure are mandatory. Using the APR DRG we had to review the records to include the largest possible number of diagnoses, comorbidities as well as other important procedures performed during hospitalization.

The documented percentage of changes of SOI would be reduced if we excluded the cases that change DRGs.

Conclusions: Recoding allowed a better definition of the severity of illness and risk of mortality and translated also into more specificity in the DRG assignment. Approximately 30% of cases experience changes in their grouping results. These results gave HSL a better understanding of modifications in the coding process that have to be the done to implement DRG and obtain more accurate clinical information. This study helped to deploy the DRG classification system for the Sirio Libanês Hospital (HSL), becoming the first hospital in Brazil to put into routine this system to evaluate the morbidity and other hospital epidemiological information. Since January 2015 all discharges from HSL are coded targeting optimization of the APR-DRG grouping.
Changes in MDC after recoding

Changes in severity in SOI - Severity of Illness after recoding

<table>
<thead>
<tr>
<th>MDC</th>
<th>After recording</th>
<th>01</th>
<th>03</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>16</th>
<th>23</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before recording</td>
<td>01</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2</td>
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<td>1</td>
<td>38</td>
<td>48</td>
<td>79</td>
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<td>07</td>
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<td>1</td>
<td>8</td>
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<td></td>
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</tr>
<tr>
<td>08</td>
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<td></td>
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</tr>
<tr>
<td>Total</td>
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<td>3</td>
<td>27</td>
<td>33</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
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<td>34</td>
<td>42</td>
<td>13</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 - Minor  
2 - Moderate  
3 - Major  
4- Extreme

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Reduction of variance and non-compliance for sustainable health care:  
The use of financial data.

Authors: Anne Krajnc

Introduction  
The healthcare environment in the Netherlands is changing and this enables hospitals to focus more on efficiency and quality of care. In the Netherlands healthcare providers register a lot of data for financial purposes. DBC’s, coupled with a diagnosis and associated activities, are the basis for these financial claims. This extensive registration is needed to declare DBC’s to the healthcare insurers and to patients.

Hospitals and other healthcare providers use this data also for, for example, production forecasts and monitoring of correct claim registration. But besides the financial use, we can now turn this data into valuable process information. By analyzing the data in a different way, by using the diagnosis and activities from a healthcare perspective, we can give insight in potential for quality improvement, efficiency improvement, greater patient satisfaction and cost reduction.
Methods
Variation and non-compliance are main causes for instable and unpredictable healthcare processes. We believe that this directly influences efficiency, quality of care and patient satisfaction.

A new method for analysis of the financial data gives us insight into averages and variance for key process indicators. By giving insight in the process variation and non-compliance, potential for improvement becomes clear.

We determined averages and variance per patient group for several key process indicators in hospitals. Some of these indicators are length of stay, extent of diagnostic research, and number of consults. Variance or deviant averages for these indicators, compared to the norm or agreements in clinical care pathways, can then be further analyzed. These results can also be compared to a benchmark. Causes for variance and derogations, like day of hospitalization, are the basis to enhance quality and efficiency.

Results

Results and conclusions
Financial registration in hospitals is extensive. Using this data, and thus without increasing registration burden, can give process information. This information is the starting point for efficiency and quality improvement. Hospitals are able to monitor their compliance and the variance for specific key process indicators. Insight in causes for these results lead to insight in the changes needed for improvement in the care process. These changes can subsequently reduce variation and non-compliance and therefore improve efficiency, quality of care and patient satisfaction. Using this method, data that has been recorded for financial purposes, contributes to sustainable healthcare.

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Difference between inpatient DRG payment and estimated costs in Portuguese NHS Hospitals

Authors: Bruno D. Moita¹, Rui M. Santana²

Introduction
Portugal began the gradual implementation of a prospective payment system using DRGs in 1989 and 6 grouper updates were adopted until the present date. For a given hospital it is expected that the DRG cost weight equals the expected cost of inlier LOS for that DRG. One of the main advantages of using casemix adjustment is that discrimination can be introduced in specific DRGs in order to value them differently than the expected cost.
It seems to be consensual that costs should be determined at patient level, thus requiring a direct costing approach. The difficulty on obtaining this level of cost detail moved away its implementation in several countries including Portugal. Indirect costing approach using a step-down methodology was gradually implemented in Portugal. Despite data availability, methodology in use presents relevant limitations such as the small level of cost disaggregation and the absence of linkage between cost centers and standardized production centers.
Although government sets DRG tariffs regularly, inpatient production payment is determined...
by the base price set under commissioning contract multiplied by the average casemix of the specific institution verified in a defined year. Four different base prices are defined depending on hospital structural characteristics.

The main objective of the study was to define a standardized method to cost hospital inpatient production reflecting the relative weights of DRG tariffs in force and to compare the results obtained with the prospective hospital funding method currently used in Portugal.

**Methods**

The present study crosses, from 2009 to 2011 and for 53 Portuguese public NHS hospitals, estimated hospital costs and prospective DRG payment for inpatient hospital production. DRG patient discharge database was used with AP21 grouper for the timeframe. Some exclusion criteria were adopted: episodes with negative or 0 days LOS, episodes with coding error DRGs, and episodes from hospitals where prospective DRG payment was not applicable.

Cost accounting database was used to collect, per year and hospital, global inpatient NHS hospital costs. Where data was not available, yet there was historical data, specific year cost was estimated based on historical weight of inpatient cost over the total cost of the hospital. Average cost per diem for each DRG was calculated based on the relative weight of each DRG to casemix index of the hospital. Specific episode cost was obtained multiplying the average cost per diem of DRG by the LOS and the equivalent inlier LOS ratio of the episode.

**Results**

Results has shown lack of adherence between the average costs faced by hospitals, the average current payment method (-20.5%, p<0.01) and the average DRG tariffs in force (-12.4%, p<0.01). The average difference between the current payment method and the DRG tariffs was -9.25% (p<0.01) with positive moderate correlation (+0.463, p<0.01). Considering the subset of pure inlier cases the lack of adherence remained although relative differences changed significantly. Hospital inpatient production was under-financed in 7.1% (p< 0.01) by the current payment method. If DRG tariffs were directly applied production was under-financed in roughly 14.5% (p<0.01). The average difference between the current payment method and the DRG tariffs considering pure inlier LOS episodes was +8.6% (p<0.01).

Significant variations have been found between the 4 structural characteristics groups of hospitals (table 1), between the 5 Portuguese Health Regions and between DRG major diagnostic characteristics.

**Conclusions**

Despite the limitations of cost accounting method in use, global inpatient hospital costs were collected and specific costs by DRG were estimated. The adoption of a widespread, robust and standardized cost accounting method is strongly recommended. Results obtained signal that NHS public hospital inpatient production was significantly under-funded. Significant variations were identified depending of structural characteristics of providers, geographic location and major diagnostic categories. The current payment methodology produces significant financial incentives that have to be taken into account by health decision-makers when aligning hospital priorities with population needs. Further studies are required once the transformation of outlier LOS episodes into equivalent LOS inlier episodes doesn't seem to be neutral for the funding model.
### Average Cost and Payment per Hospital Structural Characteristics Group (2009 - 2011)

<table>
<thead>
<tr>
<th>Hospital Group</th>
<th>Average Cost Weight</th>
<th>Average Cost per Episode for Equivalent Inlier LOS</th>
<th>Average Payment per Episode (Current Payment Method)</th>
<th>Average Payment per Episode (DRG Tariff in force)</th>
<th>Percent Diff. (C)/(B)</th>
<th>P-Value</th>
<th>Percent Diff. (D)/(B)</th>
<th>P-Value</th>
<th>Percent Diff. (C)/(D)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,181</td>
<td>€3,082,42</td>
<td>€2,244,93</td>
<td>€2,269,13</td>
<td>-20.54%</td>
<td>&lt;0.00</td>
<td>-12.43%</td>
<td>&lt;0.00</td>
<td>-9.25%</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Group 1</td>
<td>1,402</td>
<td>€3,247,93</td>
<td>€3,193,39</td>
<td>€3,208,45</td>
<td>-8.13%</td>
<td>&lt;0.00</td>
<td>-7.70%</td>
<td>&lt;0.00</td>
<td>-4.70%</td>
<td>0.28</td>
</tr>
<tr>
<td>Group 2</td>
<td>1,306</td>
<td>€3,582,32</td>
<td>€2,865,58</td>
<td>€2,997,12</td>
<td>-20.01%</td>
<td>&lt;0.00</td>
<td>-16.34%</td>
<td>&lt;0.00</td>
<td>-4.39%</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Group 3</td>
<td>0.958</td>
<td>€2,260,43</td>
<td>€1,646,99</td>
<td>€2,171,49</td>
<td>-27.14%</td>
<td>&lt;0.00</td>
<td>-3.93%</td>
<td>&lt;0.00</td>
<td>-24.15%</td>
<td>&lt;0.00</td>
</tr>
<tr>
<td>Group 4</td>
<td>0.961</td>
<td>€2,307,22</td>
<td>€1,724,64</td>
<td>€2,181,92</td>
<td>-25.25%</td>
<td>&lt;0.00</td>
<td>-5.43%</td>
<td>&lt;0.00</td>
<td>-20.96%</td>
<td>&lt;0.00</td>
</tr>
</tbody>
</table>

* Paired Samples T-Test, 95% Confidence Interval of the difference

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1. Department of Psychiatry and Mental Health, Centro Hospitalar do Algarve, Faro, Algarve, Portugal.
2. Escola Nacional de Saúde Pública, Lisbon, Portugal.

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**Estimating cost per patient using a top down approach: inpatient services adjustment**

**Authors:** Rui M. Santana¹,², Gloria Gonçalves³, Ana P. Marques¹, Sonia Faleiro³, Gonçalo Cunha³, Teresa Magalhaes¹,², Silvia Lopes¹,², Bruno D. Moita⁴

**Introduction**

Information on hospital costs is essential for healthcare management. The common use of this information is to help decision making process, for reducing uncertainty and risk of managers. This information is relevant for price definition, promoting sustainability, efficiency and profitability analysis, economic studies or even to evaluate the creation of value in health. There are several options for costing healthcare organizations and inpatient services. The state of the art usually identifies top-down or bottom-up approaches. The most popular methods are ABC, time driven activity costing, absorption costing or patient costing. The aim of the study is to estimate cost per patient using predictive modelling, adjusting for inpatient service, for the purpose of profit & losses analysis. This is the first milestone of a
major project where we developed a business software focused on board members of a hospital.

Methods
We used inpatient discharge data from a Portuguese hospital between 2012 and 2014 (n=37,929 episodes), organized into 32 inpatient services. Cost information was collected from hospital’s cost accounting system. Preliminary work implied matching the production centers (32) and the cost centers (25). Cost per inpatient day in each service was used for estimating cost per episode, based on individual length of stay and service(s) of treatment. A multiple regression method and principal component analysis were run, having estimated cost per patient as the dependent variable. Independent variables were gender, age, n of comorbidities, type of admission, DRG type, n secondary diagnoses, n of procedures, service, birth weight, surgery (Y/N), transfersences. Predicting model was reached considering a sample that was split in 70% for training and 30% for test. Each model per inpatient service was selected (between multiple stepwise regressions and principal component analysis) by using Mean Absolute Prediction Error (MAPE) criteria. We also included statistical test and analysis for homogeneity, multicolinearity, autocorrelation and normality of residues in each model.

Results
The results from the modeling process could be observed on table 1. In this table we can analyse the main characteristics and components (variables) of each model per each inpatient service. The variables that were included in each model presents, according with their statistical significance, varies in each inpatient service. Based on the MAPE (mean absolute prediction error) we found the best equation for estimate the cost per episode in each service. Preliminary results didn’t evidence a clear picture about what method performed globally better. The multiple stepwise regression method presented better results on eleven inpatient services and principal component analysis on thirteen.

Conclusions
With available data, we developed a top-down allocation method, crossing data from accounting and production centres. A multiple stepwise regression method and principal component analysis that set adjustment for inpatient characteristics to estimate hospital costs were also tested. This is an ongoing project, supported by an informatics tool that is flexible to consider other cost information and predicting future costs with lower error. This model could help managers for the purposes of budgeting, planning, monitoring and evaluating financial performance of internal functional units.
### MAPE results

<table>
<thead>
<tr>
<th>Service</th>
<th>MAPE (MLR)</th>
<th>MAPE(%) (PCA)</th>
<th>Best Solution</th>
<th>Train Set (70%)</th>
<th>Test Set (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENSIVE CARE UNIT</td>
<td>8.65%</td>
<td>8.57%</td>
<td>PCA</td>
<td>223</td>
<td>95</td>
</tr>
<tr>
<td>ORTHOPAEDICS</td>
<td>0.95%</td>
<td>1.67%</td>
<td>MLR</td>
<td>618</td>
<td>265</td>
</tr>
<tr>
<td>CARDIOLOGY</td>
<td>0.72%</td>
<td>0.65%</td>
<td>PCA</td>
<td>1.079</td>
<td>462</td>
</tr>
<tr>
<td>SURGERY 1</td>
<td>2.66%</td>
<td>2.51%</td>
<td>PCA</td>
<td>706</td>
<td>302</td>
</tr>
<tr>
<td>INTERNAL MEDICINE 2</td>
<td>4.40%</td>
<td>3.95%</td>
<td>PCA</td>
<td>939</td>
<td>403</td>
</tr>
<tr>
<td>SURGERY 2</td>
<td>3.19%</td>
<td>3.26%</td>
<td>MLR</td>
<td>651</td>
<td>279</td>
</tr>
<tr>
<td>INTERNAL MEDICINE 1</td>
<td>5.43%</td>
<td>5.32%</td>
<td>PCA</td>
<td>661</td>
<td>283</td>
</tr>
<tr>
<td>CVA UNIT</td>
<td>1.25%</td>
<td>0.66%</td>
<td>PCA</td>
<td>253</td>
<td>109</td>
</tr>
<tr>
<td>GASTROENTEROLOGY</td>
<td>1.09%</td>
<td>1.40%</td>
<td>MLR</td>
<td>563</td>
<td>241</td>
</tr>
<tr>
<td>UROLOGY</td>
<td>1.72%</td>
<td>1.65%</td>
<td>PCA</td>
<td>482</td>
<td>207</td>
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<tr>
<td>PAEDIATRICS</td>
<td>2.86%</td>
<td>13.46%</td>
<td>MLR</td>
<td>328</td>
<td>140</td>
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<td>PSYCHIATRY</td>
<td>0.32%</td>
<td>0.20%</td>
<td>PCA</td>
<td>239</td>
<td>103</td>
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<tr>
<td>NEUROLOGY</td>
<td>1.33%</td>
<td>1.37%</td>
<td>MLR</td>
<td>175</td>
<td>75</td>
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<tr>
<td>GYNAECOLOGY</td>
<td>1.62%</td>
<td>2.21%</td>
<td>MLR</td>
<td>493</td>
<td>212</td>
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<tr>
<td>INTERNAL MEDICINE 3</td>
<td>2.83%</td>
<td>2.90%</td>
<td>MLR</td>
<td>344</td>
<td>148</td>
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<tr>
<td>PNEUMOLOGY</td>
<td>2.93%</td>
<td>2.87%</td>
<td>PCA</td>
<td>283</td>
<td>121</td>
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<tr>
<td>OBSTETRICS</td>
<td>0.8%</td>
<td>3.21%</td>
<td>MLR</td>
<td>523</td>
<td>224</td>
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<tr>
<td>PALLIATIVE CARE</td>
<td>3.35%</td>
<td>0.43%</td>
<td>PCA</td>
<td>146</td>
<td>62</td>
</tr>
<tr>
<td>INTERNAL MEDICINE 4</td>
<td>2.06%</td>
<td>2.19%</td>
<td>MLR</td>
<td>257</td>
<td>110</td>
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<tr>
<td>INFECTIOLOGY</td>
<td>2.82%</td>
<td>2.56%</td>
<td>PCA</td>
<td>134</td>
<td>57</td>
</tr>
<tr>
<td>NEONATOLOGY</td>
<td>25.58%</td>
<td>22.28%</td>
<td>PCA</td>
<td>186</td>
<td>79</td>
</tr>
<tr>
<td>OPHTHALMOLOGY</td>
<td>0.004%</td>
<td>0.01%</td>
<td>MLR</td>
<td>234</td>
<td>101</td>
</tr>
<tr>
<td>NURSERY</td>
<td>3.98%</td>
<td>3.79%</td>
<td>PCA</td>
<td>377</td>
<td>161</td>
</tr>
<tr>
<td>RHEUMATOLOGY</td>
<td>2.70%</td>
<td>2.80%</td>
<td>MLR</td>
<td>87</td>
<td>47</td>
</tr>
</tbody>
</table>

*MLR - Multiple Linear Regression Model
**PCA - Principal Component Analysis Model

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3. Altran Portugal, Lisbon, Portugal.
Evaluation of cost and length of stay’s homogeneity per APR-DRG, for oncological inpatient stays in 11 Belgian hospitals

Authors: Magali Pirson¹, Julie Van den Bulcke¹, Dimitri Martins¹, Pol Leclercq¹

Introduction
Some months ago, the Belgian Minister of Social Affairs and Public Health presented a road map to introduce a prospective lump sum funding system in hospitals, based on Diagnosis Related groups (DRG). In such a system, hospitals receive a fixed amount per case, depending on the disease of the patient. In countries that have adopted this mode of financing, an all-in system is never applied to 100%. Extra funding is applied to different types of activity such as long term care, mental health care, revalidation, teaching and research in academic hospitals, some expensive drugs and equipment, some innovative technologies, patients whose length of stay (LOS) or costs are deviating (outliers), etc. This differential funding is appropriate especially when the DRG classification is not indicative of the health state of the patient or when there is significant cost heterogeneity within the same DRG group.

Cancer care represent in Belgium approximately 3% of total health care expenditures. The magnitude of oncology expenditures and the growth of the expenditures, partially explained by the ageing of the population, lead to an increasing interest in this subject.

The objectives of this study are: (1) analyze medical and economical characteristics of oncological patients from different hospitals and (2) assess the homogeneity of costs and LOS for inpatients in oncology-DRGs

Methods
Inpatient Cost data (hospital perspective, year 2012) are retrieved from 11 Belgian general hospitals. Inpatients with a primary diagnosis, relating to oncology (ICD-9-CM code 140-239) were selected (n= 6 063). Hospital stays were classified according to All Patient Refined Diagnosis Related Groups (APR-DRG), version 15 (V15) and 28 (V28).

The coefficients of variation (CV) are calculated, for DRGs and SOI with more than 30 stays, in order to measure the homogeneity of costs and LOS per APR-DRG and per severity of illness. They were calculated after removal of cost outliers. High (HO) and low outliers (LO) have been estimated using the following rule: \( HO = P_{75} + 1.5 \times IQR \) (interquartile range), \( LO = P_{25} - 1.5 \times IQR \)

Results
52.23 % of inpatients are grouped into 3 DRG (136 RESPIRATORY MALIGNANCY, 363 BREAST PROCEDURES EXCEPT MASTECTOMY, 221 MAJOR SMALL & LARGE BOWEL PROCEDURES). 94.5% of patients have secondary diagnoses and 58.8 % have already been readmitted to hospital during the year. 49.3 % of patients are males, 94.7 % come from their home, 77.3% are sent by a specialist doctor from the hospital. The mortality rate is 10.4 %.

15.7% of patients had an intensive care unit stay. The average LOS (standard deviation) is 9.31 days (11.87) and the cost is €7 641.34 (€10 112.12). The outlier’s rate is 4.4 % with V15 of APR- DRGs and 5.1% with V28. In V15, the highest LOS, for DRG and SOI with more than 30 patients, is observed for DRG 221 (MAJOR SMALL & LARGE BOWEL PROCEDURES), SOI 4, with 24.98 days. The highest cost is also observed for this DRG and
SOI: 22.314,72 €, (n=44). In V28, the mean LOS is 18.57 days and the mean cost is 18759.37€, for this DRG and SOI (n= 106). The CV for costs and LOS are higher with V28 of APR-DRGs than with V15, varying from 0.20 to 1.12 for LOS and from 0.14 to 0.94 for costs. On average with V28, cv are 0.62, which does not suggest a too large heterogeneity. Costs are more homogeneous than LOS and version 15 of DRGs leads to a better homogeneity (table 1).

The heterogeneity of some of DRG and some severities of illness is explained by differences of costs and LOS between hospitals.

**Conclusions**
The objectives of this study were to analyze medical and economical characteristics of oncological patients from different hospitals and to assess the homogeneity of costs and LOS of inpatient stays, per APR-DRG and per SOI.

The results of this study have highlighted a homogeneity of costs and LOS for most APR-DRG and SOI, suggesting that a prospective payment system per APR-DRG would be applicable for those patients. Surprisingly, the homogeneity of costs and LOS seems more important with V15 of DRG than with V28.

**Length of Stay**

<table>
<thead>
<tr>
<th></th>
<th>V15 (n=5 791)</th>
<th>V28 (n= 5 752)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.59</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>0.63</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>Min</strong></td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Max</strong></td>
<td>1</td>
<td>1.12</td>
</tr>
</tbody>
</table>

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**Effective Tool in Polio Management “Mahboob Power Evaluation and Therapeutic (MPET) Chart” Original Research Article by Mahboob ur Rahman**

**Authors:** mahboob rahman

**Introduction**

Background:
Elimination of disease of Polio is the top most priority of the Govt. of Pakistan as well as all the provincial governments. Each year polio eradication efforts are made on regular basis in which various governments, non-government organizations, INGOs, International donors and civil society takes active part. But despite all these enormous efforts still a considerable number of polio affected children emerge throughout the country. The province of Khyber Pakhtunkhawa is especially very vulnerable in this regard due various reasons; the migrants and refusals are the two most common causes. Thus, the people especially the children when
get affected by the polio and become paralyzed then they need special and long treatment at home and the at the health facilities. There are various treatment and rehabilitation measures for treatment of polio and use of MPET chart is one of them.

Objectives:
The aim of our study was to use and see the utility of the redesigned Mahboob Power Evaluation and Therapeutic chart in the treatment of polio affected children.

Methods
The study was under taken in a controlled environment in Habib Physiotherapy Complex, Peshawar. Physical Observation method was used for treatment and assessment of results of the Physiotherapy tool. In the treatment muscle assessment was done, reviewed after 4 months. The improvement in Muscle power is noted and new plan given. Data was collected through recording results from the Muscle chart. The participants were selected random on the basis of as and when came to HPC for treatment. The whole polio affected population of Khyber Pakhtunkhawa was the population of the Study and 30 number of polio affected people was the sample size.

Conclusion:
The MPET Chart is an effective tool in Post Polio Paralysis Management.

Key Words:
Key words used were:- Physiotherapy, MPET Chart, Redesigned MPET Chart, Therapeutic Regime, Oxford Muscle Testing Chart

Results
Improvement Status of Polio Patients after Implementation of MPET Chart (n=30)

<table>
<thead>
<tr>
<th>Response Status</th>
<th>Responded 63 % (19)</th>
<th>No Responded 36 % (11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Followed (n= 13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvment Status</td>
<td>Yes 61 % (08)</td>
<td>No 38 % (05)</td>
</tr>
<tr>
<td>Non Improvement Status</td>
<td>Yes 0 % (0)</td>
<td>No 100 % (06)</td>
</tr>
</tbody>
</table>

The Success rate is 61% as responded by using the said Chart.

Conclusions
MPET chart is an effective tool in post polio paralysis Management.

MPET Chart
Mental Healthcare financing in Poland – challenges for the future

Authors: Marta Slomka¹,², Agnieszka Glab¹, Urszula Ceglowska¹, Agnieszka Wlodarczyk¹

Introduction
The Ministry of Health is a key person governing of health policy and public health issues, planning the health care budget, and supervising health care and the provision of highly specialist care in coordinated units. Actually, a mental health care system is divided into out-patient treatment centers (ambulatory) and in-patient care (hospitals), each with their own separate finances and administration. This separation has hampered continuity of care of the individual patient. Some of the facilities, mainly the out-patient centers, were taken over by local governments (municipalities).
The aim of this paper is to introduce mental health system payment in Poland in a context of social needs and requirements.

Methods
Available Polish literature and fundamental policy documents were studied. Mental health legislation acts were reviewed including executive acts as well as the National Mental Health Program (2011-2014) which is an Act for the National Mental Health Program implementation.

Results
In 2014, mental health expenditures was 3,7% of the total health budget. Mental hospital expenditures was 74.5% of the total mental health budget. Note that The Ministry of Health covers only a small part of the mental health care expenditures (e.g. national health programs). Costs of public mental health care are primarily covered by the National health Found (NHF), which is technically under the Ministry of Health, but is financially dependent from annually tax-deductible of 9% of personal income. The financing is currently based on contracts made by NHF with mental health care facilities for specific health services. Both the quantity and price of services should be mutually negotiated. The core is based on mental hospitals or mental wards at general hospitals where the main form of care is determined by a person-day. The most numerous category of mental health facilities are ambulatory outpatient clinics. There are four types of outpatient clinic: psychiatric clinics for adults, psychiatric clinics for children, clinics for alcohol dependent persons and clinics for drug abuser treatment where the cost of care are calculated per visit. Allocation of funds among hospitals and health care clinics was based on the total previous year budgetary spendings of particular facilities and did not take into account a detailed cost analysis.
This leads to opportunistic attitudes, low quality of an increasing number of visits and to an increase in the total number of patient-days, causing over-crowded rooms in mental hospitals. It can also negatively affects on deinstitutionalization in psychiatry, resulting in prolonging hospital stays and preventing the reduction of beds in large mental hospitals. Another problem is the serious financial difficulties in large psychiatric hospitals, which have a higher than average number of long-term patients.

Getting together, this strategy for providing mental health care is insufficient in terms of provision of cost-effective health care services and adequately address social needs related to mental health. It is worth to mentioning, that the most meaningful results of disadvantages described above.

The first positive trends in mental health care development are outlined in the Mental Health Program and accompanying documents accepted by the Minister of Health. The program defines specific goals to be achieved to the year 2014. The most important goals are the following: prevention of the suicides, prevention of depression, significant reduction in the number of beds in large mental hospitals and a significant increase in the number of community-based forms of care.

The second step is choosing for the first object to tariff in Poland the psychiatry and drug abuse treatment (launching is expected by the end of September 2015). The expectation for this tariff is very high in a light of shifting gross of the patients towards so-called coordinated model of mental health care. The cost of this transformation will be established on the basis of historical data collected through the tariff process.

Conclusions
It can be concluded that evolution of mental health services has been influenced technical and professional considerations. The mental health system in Poland is steel evolving from the central large hospitals towards community-based care. It is known that the changes were rather slow due to financial limits and lack of clear demand from users. Recent transitions offer opportunities to increase impact of users and their families. The big question is to introduction of health system increases prospects for well co-ordinated mental health policy and may lead to rise qualities in access to services.

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Using Completion of Documentation in Medical Record as a Patient Safety Strategy

Authors: Saeed Al Qahtani

Introduction
One of the most critical part in improving quality care and patient safety is completing the documentation in Medical Records, indeed more efforts are doing by healthcare providers to ensure the completeness, accuracy and availability of medical chart but still we need to have strategies to make sure that health care institutions are providing same care to their patients. In this paper I focus on the completeness of patient record by using appropriate tools,
strategies and techniques to reducing medical errors that happen due to incompleteness of documentation in the Medical Record.

Methods
The Key Objectives are
1) Improve quality of care and patient safety.
2) Identify the relationship between incomplete medical record and medical errors.
3) Identify the factors that lead to completeness of medical chart.
4) Study the impact of medical staff competency on the documentation completeness.
5) Support documentation in patient clinical record through the compliance with medical records policies & procedures and international patient safety goals requirements.

Results
The key components of Patient Safety in Medical Records are as follows
1) Confidentiality and security of data and information
2) Retention time of medical chart
3) Protection of patient chart for loss, destruction and unauthorized access
4) Patient identification
5) Effective communication among health care providers

On the other hand, there are some strategies to be developed and implemented in order to ensure the completeness of medical record like developing and implementing policies and procedures, training and education of medical staff, conducting surveys (auditing chart contents) and putting documentation in patient clinical record as permanent item in medical staff morning meetings and effective credentialing system throughout the organization. Each hospital should promote culture of completing documentation in medical record by using posters, brochures and educational sessions. In some hospitals which use electronic record still not save in regards documentation of medical records. It might shutdown for short / long period so each hospital must have proactive strategy in case a failure in health information system.

Moreover some hospitals which use electronic record partially they face some obstacles in improving clinical documentation like forms duplications and conflict in policies and procedures.

Conclusions
Finally, the documentation in medical record is using as a reduction medical errors tool where it plays a vital role to support physician’s decisions, however without completed medical records. It is wasting of time, money and anticipating high medical errors. Therefore, each organization should put this issue (completing document) as hospital strategic goals and each practitioner must work toward this goal.

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Development of Comorbidity Complication Procedure Matrix (CCPM): A revision proposal for a Japanese case-mix classification system that more closely reflects severity

Authors: Sayuri Shimizu¹, Koichi B. Ishikawa², Shunya Ikeda³, Kiyohide Fushima⁴

Introduction
The Diagnosis Procedure Combination/Per-Diem Payment System (DPC/PDPS) launched in 2002 by the Ministry of Health, Labour and Welfare of Japan. As the DPC produces a tiered tree structure with the condition name as the top layer, the level of one node (parent: branch condition) impacts all of the child nodes, and thus affects the structure of the diagnostic categories. Further, when there are a large number of branch conditions, there was the problem that the leaf nodes located on the tips increase too much.

The comorbidity complication procedure matrix (CCPM) that takes severity into consideration has been investigated as a new method of evaluation that enables both an accurate reflection of differences in the necessity of medical resources based on severity and control over the number of payment categories. It is expected that CCPM, by creating a matrix with various conditions reflecting the volume of medical resources while maintaining the format of diagnostic classifications to a certain extent, can enable comprehensive evaluation that according to severity, while controlling the explosion in the number of leaf nodes and compressing the number of branches. In this study, therefore, we have developed CCPM using the example of community acquired pneumonia.

Methods
Targeting patients hospitalized with pneumonia, acute bronchitis and acute bronchiolitis, only those with community-acquired pneumonia were extracted based on severity classifications. Analysis was performed on two levels using the nationwide discharge administrative database of the DPC/PDPS 1,057 hospitals voluntarily participated in the DPC Research Group conducts survey in 2012. 1) we determined the variables to be evaluated with CCPM and created a new DPC tree. 2) We could create a matrix that conformed to the treatment state and reflects appropriate medical resource consumption, and in which the number of branches was restricted. The data finally used for analysis was 135,549 cases.

As the CCPM clarified differences in comprehensive treatment fees per day based on severity, we created a tree for each severity level. Next, we carried out decision tree analysis for each severity level to investigate the variables to be used in the CCPM. For the target variable, we used rough comprehensive treatment costs, and, for the explanation variables, age (up to 14, 15-64, 65-74 and 85 and over), secondary conditions, pneumonia severity, scheduled/emergency hospitalizations, gender, emergency transport and hospitalization route were used. It was decided not to use outcome indices (LOS, change) or pharmaceutical usage data. Based on the variables described above, we developed a tree using a regression model and, following that, this was trimmed down using a regression tree. The regression tree model used the R function rpart?recursive partitioning and regression trees?. We developed the tree by setting the tree complexity parameter cp (complexity parameter) to a small value and, following that, trimmed down the regression tree. With the recursive trimming, in addition to observing the necessity of the trimming using the plotcp function, the logical meaning of the branches were determined by comparing the number of patients per branch and medical fees per day. The variables were determined using the CCPM, based on the results of the trimming. We performed decision tree analysis using medical fees per day and average LOS as the target variables, and set the matrix thresholds. The new DPC tree was recalculated.
based on the threshold and the classifications were corrected further from a clinical perspective.

Results
The average value for medical costs per day tended to increase in age order, while for schedule/emergency hospitalizations, a statistically-significant difference in medical costs for each category. The results of the regression tree showed that in the medical cost category, age and scheduled/emergency hospitalizations were effective variables. For the CCPM, age, scheduled/emergency hospitalizations, surgery, artificial respiration, severity of pneumonia and secondary conditions were adopted. We amended the branch conditions, and eventually the DPC tree (284 branches) were reclassified into 9 categories and a multi-dimensional CCPM classification was created. It was confirmed that compared to the current DPC classifications, the required medical resources were reflected to a greater extent.

Conclusions
We clarified that, with CCPM, the necessary amount of medical resources can be reflected and the number of classifications controlled while maintaining the basic structure of the diagnostic group classification tree diagram. We shall continue with our aim to implement this by 2018 while exchanging opinions with clinicians and investigating deployment of CCPM on a nationwide level.

Impact Of Coding Errors In Assignment Of Malaysian-DRG (MY-DRG) In University Kebangsaan Malaysia Medical Centre.

Authors: Syed Aljunid¹, Siti A. Zafirah¹,², Amrizal Muhd Nur¹, Roszita Ibrahim¹, Shariffa E. Wan Puteh¹, Nor Haty Hassan¹

Introduction
Coding of Diagnosis and Procedures are among the basic requirements for implementation of casemix system. UKMMC is the first hospital in Malaysia to use casemix system for enhancement of service quality and efficiency since 2002. The hospital used Malaysian-DRG casemix grouper, which is customised from UNU-CBG casemix system. In the casemix system, coding of Diagnosis and Procedures are essential during the process of determining the MY-DRG code. Poor coding quality will relate to the wrong assignment of MY-DRG code and this may have negative impact on hospital income in countries that used casemix system as provider payment tool in health financing programme. Appropriate cost of care incurred by hospital providers based on casemix, can only be calculated with an accurate diagnosis and procedure codes. The aim of this study is to analyze the impact of diagnosis and procedure coding errors in the assignment of MY-DRG code University Kebangsaan Malaysia Medical Centre (UKMMC).
Methods
This study was conducted in UKMMC from January to December 2014. 415 cases were randomly selected from 35,090 of Patient Medical Records (PMR) in UKMMC in the year 2013. These cases have been coded by UKMMC Clinical Coders. An independent expert coder with more than 20 years experience in coding but is not working in UKMMC was appointed to review the PMR and re-code the diagnosis and procedures of the selected discharges. ICD-10 and ICD-9CM were used to code for diagnoses and procedures, respectively. Researchers compared the both the original codes and the re-coded diagnoses and procedures. If the codes differed, the codes by independent expert coder are considered to be the correct ones. The new codes were then used and the discharges were grouped using the MY-DRG grouper. Lastly this new MY-DRG codes were compared with the original MY-DRG code in order to identify the impact of coding error in assignment of MY-DRG code.

Results
Overall it was found that in 87.4% (395/415) of the discharges contained at least one coding error. Errors in secondary diagnosis were the highest, which occurred in percentage of 33.4%(357/395) of the cases followed by secondary procedures with 24.6% (263/395), principal procedure with 21.5% (230/395) and primary diagnosis with 20.6 % (220/395). In the primary diagnosis, the errors were mainly found at the 4th digit level (29.5%, 65/220) of ICD-10. However for secondary diagnosis, and secondary procedure, the discharges were mainly being under-coded (75.6%, 270/357 and 55.1%, 145/263). For the principal procedure, the errors were mainly found at the 1st digit level (36.5%, 84/230). From the coding error cases, 66.6%(257/395) has resulted changes in their DRG codes. Out of this 257 cases, 45.5 % (117/257) resulted in changes in the DRG assignment, 33.1%(85/257) resulted changes in the assignment of severity level and 21.4% (55/257) resulted in changes in the Casemix Group (CMG). In total, changes to MY-DRG codes after the recoding process resulted in a total loss of RM625, 812.00 to UKMMC.

Conclusions
Coding error is high in UKMMC, especially for the secondary diagnoses and secondary procedures. Some of these coding errors have resulted changes in their DRG codes with more than half of the cases resulted in lower hospital tariff. In order to prevent the hospital from facing any further loss in income, the hospital should embark on intensive training of the current coders. The hospital should also institute continuous monitoring of coding quality.

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Regulatory constraints of national tariffs setting process in Poland

Authors: Urszula Ceglowska1, Anna Chodacka1, Gabriela Sujkowska1, Agnieszka Wlodarczyk1

Introduction
National tariffs setting process for health care services in Poland started from 1st January 2015 by establishing new department in the Agency for Health Technology Assessment - the government institution and the advisory body to the Ministry of Health regarding financing
health care technologies and services from public resources. Since then, the Agency for Health Technology Assessment and Tariff System (AOTMiT) work on developing methods for calculating national tariffs and toolkits for collecting cost data from healthcare providers. Mental health has been chosen as a first area where national tariffs will be calculated. The deadline for data analysis was May 2015 and then postponed to September 2015 due to difficulties with data collection. AOTMiT’s activities related to calculating national tariffs are financed through deduction from health insurance premiums (0.07% annually). Health care providers who signed contract with AOTMiT for data submission are paid on the basis of number of records provided for finished inpatient episodes and number of records for particular services (e.g. consultations with specialists, home visits) delivered in outpatient settings. Separate fees are paid for patient-level data which are manually drawn from patient discharge cards for inpatient care and from available medical documentations for outpatient care. Besides, fixed fee is paid for accounting data from each cost centers (e.g. ward, emergency room) for which the data about delivered health care services was submitted. Health care providers faces financial penalties due to inaccuracies in submitted data. Crucial assumptions for data collection process were to collect retrospective data on clinical costs related only to completed hospitalizations for the period of last 2 years and for the sample of mental health care providers not less than 10%. The goal is to describe regulatory constraints faced during the first national tariffs setting process in Poland.

Methods
Descriptive analysis of national tariff setting process based on key documents regarding regulation of clinical costing and cost data collection as well as experience gathered during the first process of setting the national tariff for mental health services.

Results
The situation facing currently in Poland is a lack of clinical costing standards and non-mandatory use of electronic cost databases. Considering that good quality of the input data is the key to ensuring the quality of the final costing outputs, therefore it is important to introduce unified clinical costing standards. However, according to Ministry of Health regulation on mandatory requirement for health care providers to follow clinical costing standard will come into law in 2020. Furthermore, weak computerization of Polish health care providers first of all hamper the process of data collecting at hospital level and secondly do not allow providers to participate in data collection process for national tariff calculation. Other major limitation of calculation tariffs is that submitting cost data is not obligatory for health care providers. The only incentive that AOTMiT can use to encourage health care providers to submit data is revenue. Initially, clinical cost data has been collected from 74 mental health care providers (approximately 5% of the total sample), some of which are private or public. Whereby, the data collection stage has been extended to get required 10%. After failed data collection process the survey aimed at understanding the reasons of withdrawal from signing the contract with AOTMiT was send to health care providers. Between reasons for withdrawal from data collection process healthcare providers indicated mainly three reasons - low revenue (88,8%), too complicated data template files (70,4%) and contract penalties (66,6%). Considering the feedback from health care providers the data template files were simplified and contract penalties were withdrawn. Those assumptions refers only to mental health tariff calculation. For the purpose of the next national tariff setting separate procedures will be developed in order to facilitate the process for the providers while retaining appropriate data detail.
Conclusions
Without regulatory obligations for health care providers to cooperate with AOTMiT the data collection process is challenging. Another obstacle is lack of obligatory and unified system of data collecting what significantly hamper gaining consistent data and reliable cost comparison. Moreover, most health care providers in Poland do not have electronic system for collecting cost data and therefore cannot participate in data collection process. To sum up, clinical costing standards should be mandatory established together with obligatory electronic system for cost data collection. A consistent costing approach should be followed across all healthcare providers to enable reliable comparison.

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