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### A1

**Auditing in the Irish Casemix budget models**

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**Introduction:** Casemix in Ireland is run on a retrospective basis. Budget adjustments are made that relate to costs and activity for the calendar year two years previously. This is presently changing to a prospective funding model which will be informed by a Patient Level Costing project currently in progress. The Irish Casemix budget models are subject to a rigorous audit process.

1. Detailed cost-review queries are sent annually to nominated staff at each hospital. Responses and further queries are exchanged until this process is finalised.
2. On-site costing audits are carried out if issues remain.
3. The suite of audit files allows a top-down audit of hospital activity and direct attention toward areas requiring further analysis.
4. The activity audit files sent to hospitals focus on possible cases of DRG creep. These files bring attention to activity increases or decreases which will have a positive or negative impact on Casemix performance.
5. The costing file allows analysis of cost per case to ensure that it is consistent and reasonable in all hospitals. This improves the quality of costs in the budget models.
6. The ‘Dampening’ rule ensures that unexplained increases or decreases in activity are removed. This results in relative consistency of funding for hospitals year on year.

**Methods**

**Costing**

The NCP has a number of large, standardised Excel files – designed in house – in which each hospital must return its costs broken down by specialty. The completion of these files must be in accordance with the Costing Manual, which is updated annually. A detailed review of each file is conducted against the previous year. This results in a list of queries being sent to the costing staff in each hospital, with a particular focus on costs being allocated to areas outside Casemix, or where exposure to Casemix is low. This is repeated until the process is concluded. During this process, comparisons between hospitals are conducted to ensure a consistent approach is being applied.

**Activity**

Activity is returned by each individual hospital in a monthly download. A monthly set of audit files is compiled by NCP statisticians to show hospital, MDC, and DRG data from a wide range of perspectives. These files allow top-down systematic and ad hoc interrogations of the data to be made. From the files, detailed annual queries to which hospitals must respond are drawn up on DRGs where:

1. There is a significant increase/decrease in DRG activity and value.
2. There is a significant increase/decrease in activity and value across an Australian Refined Diagnosis Related Group system (AR-DRG).
3. There is a trend towards more/less complexity within an AR-DRG.

There should be a direct relationship between changes in activity and changes in cost. Unexplained increases in activity, and monetary value related to these increases, can be targeted for on-site auditing and, if necessary, amended or excluded. The NCP employs a ‘Dampening’ principle which allows for the removal of unexplained increases in activity; as well, there is the addition of activity where significant decreases threaten a hospital’s funding base.

**Results**

1. Detailed cost-review queries are sent annually to nominated staff at each hospital. Responses and further queries are exchanged until this process is finalised.
2. On-site costing audits are carried out if issues remain.
3. The suite of audit files allows a top-down audit of hospital activity and direct attention toward areas requiring further analysis.
4. The activity audit files sent to hospitals focus on possible cases of DRG creep. These files bring attention to activity increases or decreases which will have a positive or negative impact on Casemix performance.
5. The costing file allows analysis of cost per case to ensure that it is consistent and reasonable in all hospitals. This improves the quality of costs in the budget models.
6. The ‘Dampening’ rule ensures that unexplained increases or decreases in activity are removed. This results in relative consistency of funding for hospitals year on year.

**Conclusions**

1. A credible Casemix model requires a high degree of visible audit.
2. The standardised file structure supported by a detailed Costing Manual allows confidence in how costs are reported to the NCP.
3. The cost audit process ensures that reliable costs are entered in the budget models.
4. The activity audit process focuses attention on areas of activity which will have a positive or negative impact on Casemix performance.
5. Further resources are required to expand the audit work carried out, particularly with the results from the Patient Level Costing project and the shift to Prospective Funding.

My presentation will display the approach taken by the Irish NCP to ensure the integrity of the budget models.
A2 Patient-level costing for the Thai Diagnosis Related Group in Thailand: a micro-costing approach

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Cost estimation is important in assessing a health system’s performance. However, most of the costing system that presently exists presupposes that all patients consume exactly the same amount of resources, and little attention is paid to costs at the patient level. Thailand has used Thai DRG for the prospective payment of inpatient care with a closed end, but there is a growing need to have patient-level cost data to calculate relative weight.

This report presents a brief summary of the technical details involved in patient-level costing for Thai DRG version 5. Cost methodology focused on a provider perspective, and cost data were collected from nine hospitals in the North, Central and Northeast of Thailand. These comprised two medical school hospitals, three community hospitals, two provincial hospitals, and two regional hospitals.

The primary data collected included the proportion of working time to apportioned labour cost, patient demographic characteristics, and medical data from 349,275 inpatients. Secondary data included hospital expenditures and the total number of medical services provided by each hospital unit in the fiscal year 2009. Cost analyses consisted of four major processes.

First, hospital cost was analysed using a standard top-down approach. Cost centre identification, direct, indirect, and total cost determination for 14 chargeable service units were examined. Second, the cost-to-charge ratio (C) was calculated by dividing the total cost by the total charge for each of 14 service groups. Third, a micro-costing method was employed for patient-level costing. To determine cost, the charge of each service group was converted to a cost by multiplying the charge by the corresponding C. This was then summed up to derive the total cost for each patient.

Finally, all patient data were grouped into Thai DRG version 5, and then the average cost per admission, average cost per DRG, and RW were calculated.

Recommendation: Micro-costing with a cost-to-charge ratio can be used for cost estimation and calibration of the relative weight of a DRG to establish a hospital payment policy.

A3 Diagnoses-related procedure bundles in outpatient care – results from a research project using secondary data

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Introduction: Currently, one aspect of the discussion concerning healthcare reform in Austria focuses on strengthening the provision of ambulatory healthcare. Consequently, legal changes aim at fostering the development of new structures in healthcare (group practices), as well as implementing alternative payment mechanisms for those entities.

In 2009, we started a research project in the field of diagnosis-related mechanisms of payment for ambulatory care. The project focuses on episodes of care for chronic diseases. The main objectives of this project are to show the feasibility of the available administrative healthcare data, to develop a statistical toolkit in order to identify diagnoses-related procedure bundles in ambulatory care, and to calculate costs for the procedure bundles.

Methods: We use a pseudonymous dataset that contains a full record of ambulatory health data as well as hospital data for 2006–2007. The data is linked using a unique patient identifier.

When calculating procedure bundles, only costly procedures from outpatient care were included. Therefore, we used descriptive statistics to identify the relevant procedures for each specialty. Diagnoses were obtained from ATC-Codes of prescription data and were assigned to each patient via his or her personal record of medication. We limited our research to a number of common chronic diseases (e.g., diabetes, COPD/asthma, dementia).

Three different approaches were used to include patients in the data sample:
1. Patients with no other disease than the disease in question for the time t0 +/- 6 months
2. Patients with no other disease than the disease in question for the time t0 +/- 1 month
3. All patients having the disease in question for the time t0 regardless of any other disease

Next, we applied linear regression to identify those procedures that are significantly related to the single diagnoses included in the sample (within a time span of -90 days/ +180 days from the diagnosis). The significance was measured by the frequency of a particular procedure with respect to all diagnoses of a disease included in the sample.

Finally, we defined procedure bundles as all procedures to the left of the most significant difference between two adjacent procedures.

Results: Results show that for most of the diseases considered procedure bundles can be identified using the methods described above. To a certain extent, significant procedures for each diagnosis represent technical procedures, such as determining laboratory values or ECGs. In addition, expected non-technical procedures (e.g., eye treatment for diabetes patients) could be allocated to the relevant diagnoses. However, we were unable to find feasible bundles for diagnoses where “quasi-unique” ATC-Codes do not exist. The bundles did not vary substantially across the three methods used to include diagnoses in the sample.

Conclusions: The results obtained can be seen as the first step towards describing procedure bundles related to a number of chronic diseases. In the next step, experts will need to refine the bundles. These bundles provide a solid ground for the calculation of costs for diagnosis-related procedure bundles in ambulatory care. The methods used can be implemented in other data sets as well, and are therefore not limited to the context of the Austrian healthcare system.

A4 The UNU-CBGs: development and deployment of a real international open source Casemix grouper for resource challenged countries

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Introduction: Although the Casemix system has been in existence for more than three decades, the deployment of this system in developing countries is very erratic. A call by international donors to enhance the efficiency of existing social insurance schemes by introducing the prospective payment method has prompted many developing countries to use the Casemix system. Unfortunately, the lack of a low-cost, reliable and customizable Casemix grouper, based on an open source, is a major obstacle to the adoption of the Casemix system in these developing countries.

Methods: UNU-IIGH (United Nations University International Institute for Global Health), in collaboration with the International Centre on Casemix and Clinical Coding of UKM (Universiti Kebangsaan Malaysia) and UNU-IIST (United Nations University International Institute for Software Technology), has developed a Casemix grouper targeted for use in developing countries. The UNU Casemix grouper is a universal, dynamic and advanced grouper employing ICD-10 for disease classification, and ICD-9CM for procedure classification. The grouper covers a wide range of healthcare services in primary, secondary and tertiary settings. These include ambulatory services, in-patient services, daycare surgery, chemotherapy, rehabilitation and mental health.

Results: The UNU Casemix grouper is the first grouper that covers acute, sub-acute and chronic long-stay patients. The grouper extends beyond the classical DRG (Diagnosis Related Groups) classification system by taking into account not only diagnoses and procedures for the creation of ISO-resource
groups, but also special prostheses, special investigations and high-cost drugs. The grouper is structured around 32 CMG (Casemix Major Groups) and 1220 refined groups called CBGs (Case-Based Groups). For each of these CBGs, the severity and resource intensity level ranges from three to a maximum of eight. This is to provide greater flexibility and the more refined classification required when the system is used for provider payment and resource allocations. Also, the grouper includes three additional software applications to facilitate the implementation of the Casemix system in developing countries. These are Data Tool Version 2.0 for data collection; CCM Version 2.0 for clinical coding; and Code Assist, which is a digital coding tool to aid coders in enhancing their productivity. Initially launched in 2009, this grouper is currently being deployed in four countries (Indonesia, the Philippines, Uruguay and Malaysia). Six other countries are in the planning stages of adopting the system.

Conclusions: The development and deployment of the universal, dynamic and advanced UNU Casemix grouper has enabled more developing countries with limited financial resource to implement and sustain the use of a Casemix system and reap the long-term benefits of this health management tool.

A5 Pay-for-Performance quality incentive program – one year pilot program
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Introduction: The Hospital Authority (HA) is a statutory body that was established under the Hospital Authority Ordinance. It has managed public hospitals in Hong Kong since 1991. Hospitals in Hong Kong are divided into seven geographically based clusters. HA has designed a "Pay-for-Performance (P4P) model" which includes incentives to promote productivity and quality. In the second year of this model’s implementation, financial incentives have been introduced to strengthen its focus on quality indicators.

Methods: A set of 11 Quality Performance Indicators (QPI) was selected and developed from a framework of existing Key Performance Indicators (KPI) that were agreed upon by the HA Board of Hospitals and their senior executives. There are two systems of performance measurement:
1. Cluster hospitals whose achievement is close to target.
2. Cluster hospitals that show improvement over their prior year’s performance level.

Performance targets to be achieved by clusters were set for each QPI. With dual measurement, an innovative method for measuring and rewarding quality performance was developed.

Results: There were improvements in all except two indicators in the program, and all clusters showed improvement in three indicators. The HA overall result achieved preset targets in five indicators. The reward received by individual clusters from this program ranged from 63% to 88% of their total maximum potential quality reward.

Conclusions: This paper gives an overview of HA’s P4P Quality Incentive Program. The results after a one-year pilot were mixed; however, there was more improvement than deterioration in performance measurement in the entire QPI. The program has been successful in fostering a culture among clusters to continuously strive for quality, and HA will continue to assess the impact of the program. The program will then be refined and broadened as more data and feedback are gathered.

A6 Can Clinical Pathways enhance the implementation of a Casemix system? A case study in a teaching hospital in Malaysia
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Introduction: A Clinical Pathway (CP) is a multidisciplinary plan of care based on best clinical practice for a specified group of patients with a particular diagnosis. A CP is designed to minimize delays, optimize resource utilization, and maximize quality of care. CPs support the implementation of Casemix by reducing variations of care, increasing homogeneity of cases, improving quality of Casemix data, and enhancing cost analysis in Casemix.

Methods: Universiti Kebangsaan Malaysia Medical Centre (UKMMC) in collaboration with United Nations University International Institute For Global Health (UNU-IHG) has developed, implemented, and evaluated four clinical pathways. These are ST Elevation Myocardial Infarction (STEMI); Chronic Obstructive Pulmonary Diseases (COPD); Elective Lower Segment Caesarean Section (LSCS); and Elective Total Knee Replacement (TKR).

This non-randomized, single-blinded, controlled study used enrolled patients from January 2008 to December 2008 as a control group (non-CP group). CP was assigned to all new patients admitted with the above diseases from the year 2009 until 2010.

Results: There was a significant reduction in the average length of stay (ALOS) of the COPD CP group (5.85 ± 1.92 days) when compared to the non-CP group (7.31 ± 2.75 days, Z = -3.893, P < 0.001). In STEMI, the ALOS for patients in the non-CP group was 8.15 ± 2.25 days, while in the CP group it was 5.52 ± 1.42 days (t = -4.85, P < 0.001). There was also a significant difference in ALOS in LSCS, with the CP group staying 4.04 ± 0.61 days compared to the non-CP group staying 4.99 ± 2.04 days (Z = -3.221, P < 0.001). In TKR, though, there was no significant difference between the ALOS of the CP and non-CP groups (9.93 ± 4.32 days vs. 9.05 ± 3.59 days). However, the age of the patient, co-morbidity, readmission, and complication rates did not differ significantly between CP and non-CP groups.

Conclusions: There was significantly shorter ALOS among patients in CP groups compared to non-CP groups – except for TKR. In general, the implementation of CPs had a positive impact in increasing the homogeneity of cases being managed in UKMMC. Hence, we conclude that the use of Clinical Pathways has enhanced and supported the implementation of the Casemix system in the hospital.

A7 Patient Pathway Aggregation – building on a firm foundation
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BMC Health Services Research 2011, 11(Suppl 1)A7

Introduction: Healthcare Resource Groups (HRGs) are the mechanism by which patient activity is classified according to Casemix in England. They are derived from care-activity data, primarily ICD-10 diagnosis codes and the United Kingdom’s OPICS-4 inpatient and procedure codes, recorded in local hospital systems. Care events are recorded in standard datasets and processed through the HRG4 grouping algorithm to assign appropriate HRGs for each event.

HRGs are the primary funding mechanism for acute care in the English National Health Service (NHS) under the Department of Health’s Payment by Results (PbR) national policy. In the 2011/12 financial year, this covers admitted patient care, outpatient procedures and emergency medicine, with a total estimated expenditure of £30 billion. As a precursor to calculating the national tariff for HRG4 “currencies”, where a “currency” is defined in the Department of Health’s PbR Guidance for 2011-12 as “the unit of healthcare for which a payment is made”, the Department collects annual cost data (Reference Costs) from every NHS provider of care. It uses this data as the basis for setting a national tariff and its related price.

The change in Government in the UK in May 2010 has resulted in a transformation in intended healthcare policy, with planned changes including the responsibility for commissioning of NHS and Specialist Services being transferred to Clinical Consortia and the newly established NHS Commissioning Board. At the same time, the State’s role in direct financial management is expected to be reduced as responsibility for national price setting under the current Department of Health Payment by Results (PbR) policy transfers to Monitor, currently an independent regulator. As highlighted by the proposed Health Bill for 2011, the desire to move to outcome-based payments for healthcare based on patient pathways that are informed by clinical and financial best practice has not waned.
In addition, the renewed emphasis on the patient journey, rather than its constituent parts, has led the Casemix team to reconsider the HRG4 classification in light of the new commissioner audience.

**Methods:** In keeping with the fundamental principles of a Casemix classification being manageable in number, while retaining and indeed pursuing clinical relevance, the NHS Information Centre’s Casemix team recognises the inherent tension between the level of specificity required in a classification to effectively deliver and monitor healthcare provision and performance, and that required to commission healthcare services for a targeted population at the patient level. If a healthcare provider necessarily needs to understand service inputs in order to maximise efficiency and quality, yet ultimately minimise costs, a commissioner will and arguably should adopt a healthcare output, not if a healthcare outcome, perspective. Previous attempts at developing patient pathways as a mechanism for funding healthcare in England have, however, been compromised by an inability to identify the cost of the component elements of healthcare contained therein, or at least on a consistent basis and applicable nationally. They have also been hampered by a lack of available standardised data beyond the traditional hospital setting, especially where care is transferred beyond the hospital and into the community, or to another healthcare provider.

As a result of the divergent classification requirements of healthcare provider and healthcare commissioner in the new NHS, coupled with a need to provide a pathway funding solution for costing and ultimately pricing identified pathways of care, the members of the Casemix team are investigating Patient Pathway Groups (PPGs) that can be assembled from the HRG4 classification.

While this approach has many advantages, those most notable include the ability to:

- Use national Reference Costs at an HRG4 level, including those for comprehensive HRG4 classification that patient pathways as a mechanism for

- Base the elements of proposed pathway groups upon robust, clinically endorsed HRGs

- Adopt an incremental and modular approach to development so that existing datasets can be utilised to provide relatively “quick wins”, with the option to extend the pathway to new settings and service areas as more data become available over time

**Results:** Early findings indicate that in all likelihood PPGs will utilise selective diagnosis entry criteria with event-based pathway modifiers to provide three levels of patient pathway stratification covering routine to complex care, although this has yet to be fully evaluated. Pilot results for a number of pathways are expected in autumn 2011.

**Conclusions:** What is clear is that PPGs offer the possibility of providing a sophisticated aggregate commissioning currency for healthcare that overlays and builds upon the comprehensive HRG4 classification that remains pivotal to provider-level costing.

**A8 Coded data quality for Casemix payment: insights from two external audits**

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**Introduction:** Australia is currently undergoing a change in the Casemix payment environment. This is the result of an agreement to move to a more nationally-consistent approach to activity-based funding (ABF) for services provided in public hospitals. ABF for acute inpatients will be based on the Australian Refined DRG Casemix system, which is derived from the coded clinical data from each hospital admission. Thus, there will be a need to audit the clinical coding to assess the quality of the data in order to determine if the payments based on that coding are correct. In 2009 and 2010, Pavilion Health conducted two major audits of clinical coding in NSW and Queensland. Together, these audits included 55 hospitals and 6,300 records. This paper discusses the insights gained from these two audits.

**Discussion:** Errors in the coded data are not random. Some clinical conditions are more difficult to code than others, and some Major Diagnostic Categories (body systems) have more errors than others. Also, errors within hospitals are not random either. For example, one hospital had a relatively low predicted DRG mismatch of 5.6%, compared to 5.9% for the whole sample. However, it had a relatively large impact on case-weight changes representing nearly A$8 million less in funding. One error in a high value DRG, repeated many times, was responsible.

The education and training of clinical coders varied. The resources needed by the clinical coding teams were not sufficient for the implementation of activity-based funding. In an ABF environment, additional tasks such as internal auditing, analysis, and consultation with clinicians require different and additional skill sets compared with the skills required to code competently.

**Conclusions:** In order for Clinical Coders to meet submission deadlines and provide appropriate coding, they rely on comprehensive and timely clinical documentation. Clinicians and specialties have a responsibility to learn about coding and provide good documentation. There is a case for responsibility by Clinical Governance to audit clinical documentation for accuracy and completeness. Clinician engagement in and education on improving medical documentation is critical in order to improve the variation in Clinical Coding precision.

External coding audits are expensive to conduct and should be aligned with internal audits to gain the maximum educational value from the audits. Other tools such as error checking, both at the time of coding and later using the entire data set of the hospitals, also offer opportunities for improving coding accuracy beyond that afforded by external audits.
for rehabilitation care and palliative care, where there is a relatively wide level of data collection. Considerable work is required to address issues for geriatric evaluation and management and psychogeriatric care.

- Non-admitted – The proxy classification is not yet completed, and the existing version is not used in any routine data collection. All the data available for NHCDC Tier 2 Clinics are produced by mapping from source data, which is collected using another classification system. This situation poses considerable challenges, particularly as there will be no historical data and approaches to counting non-admitted patients vary greatly across states/territories.

- Mental Health – The initial approach for mental health services is to use the proxy classification systems for the workstream into which the service falls. However, the best data on mental health services is in program-specific data collections, not in mainstream hospital systems. Also, there are significant limitations that need to be addressed in the classification systems in relation to mental health care.

- NHCDC – The challenge is to generate costs data to be used as an input to developing national cost weights and setting efficient prices. There is little consistency in the costing methodologies used by states/territories to generate the existing costs data. Extra studies undertaken to address this issue, and to add to the coverage of existing costs data, need to be finished by end of 2011. This poses sizeable challenges in terms of the capacity and capability of the available resources.

The Overarching Plan presents the minimum infrastructure needed to implement ABF within each workstream. It integrates the 99 projects identified across the five AWG Work Plans into 35 higher-level projects. It also identifies projects that are considered essential in order to enable national ABF implementation by the target date. In addition, a risk analysis is performed.

Conclusions: The Work Plans show that it will be difficult to achieve a common starting point across states/territories for ABF by 1 July 2012. ABF readiness also varies across workstreams. Implementation strategies need to challenge states/territories to reach minimum position, but also be sufficiently flexible to allow for ABF to start even where the required data are not available.

Disclaimer: The abstract does not necessarily represent the views of any Australian Government agency.

A10 Determining a threshold hospital size for the application of activity-based funding

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Introduction: Under the Heads of Agreement – National Health Reform, reached at the Council of Australian Governments’ meeting on 13th February 2011, the Australian and State/Territory Governments agreed to establish a national approach to activity-based funding (ABF). They also agreed to fund, wherever possible from 1st July 2012, public hospitals on the basis of a national efficient price for each service provided to a public patient.

Clause 30 of that Agreement states that “some small rural hospitals will continue to be funded by block grants where ABF alone would not enable these hospitals to maintain community services obligations (CSOs)”. To move forward on ABF implementation, the Australian Government Department of Health and Ageing (DoHA) commissioned a project to determine which hospitals should be block-funded (that is, termed CSO hospitals).

Methods: Based on a review of the relevant literature, in the context of implementation of ABF, a CSO was defined as:

...a public hospital that, due to factors outside the control of local management, is unlikely to be financially viable under an activity based funding arrangement that reflects an efficient price set at the national or jurisdictional level.”

Once the definition was in place, the problem was then to identify the factors that are likely to result in a public hospital not being financially viable under ABF. The potential factors considered were volume of services, variability in acute-patient separations and bed days; number of DRGs with five or more acute patients per year; differences in the average cost per weighted separation; road distance to nearest regional hospital; and Remoteness Region of the Statistical Local Area in which the hospital is located.

These factors were chosen because they were potentially relevant, and also because they could be measured using available data. To assess the importance of the factors, potential CSO hospital profiles were constructed using data from national minimum data sets (NMDSs), as well as other sources, for the three most recently available years (2006/07 – 2008/09).

Results: There were 427 smaller hospitals located in regional and remote areas assessed for CSO status. The data analysis produced clear evidence that ‘scale’ is the most important factor driving two of the key statistics that influence the financial viability of a hospital under ABF arrangements (these statistics being costs-per-episode and degree-of-variation in activity). Several measures of scale, including annual separations and bed-days, were tested and found to be correlated. After consideration, annual acute Casemix-adjusted separations was chosen as the scale measure, since it was also the principal grouping variable used to define existing hospital peer groups.

We then tackled the question of setting a scale threshold below which hospitals would be defined as CSO. Five approaches were used: examining the criteria employed to define existing peer groups; looking for discontinuities in the distribution of acute Casemix-adjusted separations across the 427 hospitals; modeling Casemix-based payments to determine how many hospitals might be disadvantaged by ABF; modeling the relationship between average costs and hospital scale; and considering self-reported CSO status. Across all factors, the analysis suggested that a CSO-hospital threshold of between 1,700 and 2,000 annual acute Casemix-adjusted separations was most suitable.

Although a scale threshold was determined, flexibility is required in interpreting the definition, since no mechanistic formula can appropriately reflect the circumstances that might apply to a hospital at a particular time. Also, it is recognized that there are problems with a definition that includes a scale measure based entirely on acute Casemix-adjusted separations. However, given the limitations of the existing data, it was not possible to consider a scale measure that incorporated activity levels for non-admitted and sub- / non-acute care services. These programs usually represent a significant portion of the services provided by small regional and rural hospitals, and a better definition of CSO hospitals would include these activities.

Conclusions: Approximately 349 of the 427 facilities met the proposed definition of a CSO hospital. The key statistics for these hospitals show that the definition identifies a different group of hospitals from those not classified as CSOs. There will always be some debate at the boundary, but key statistics such as beds; staff numbers; admitted episodes; and even emergency-department, outpatient and community-health services numbers, show very significant scale differences.

Not surprisingly, there are also large differences in average cost and activity levels between CSO and non-CSO hospitals. Nonetheless, as national approaches to counting and costing of sub- / non-acute and non-admitted patient care services are agreed upon and implemented under ABF arrangements, the CSO definition and thresholds can be further improved.

A11 Analysis of the variability of nursing care by pathology in a sample of nine Belgian hospitals

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Introduction: In 2010, a Belgian study [1] explored the feasibility of introducing all-inclusive case-based payments for Belgian hospitals. In this kind of financing system, hospital services and patient mix are described
in a simplified way through Diagnosis Related Groups (DRGs). A tariff is fixed in advance for each DRG. DRGs are groups of patients based on economic and clinical homogeneity. Clinical homogeneity is achieved on the basis of medical diagnosis, co-morbidities, medical procedures, complications, etc. Economic homogeneity is achieved by using, first of all, the length of stay (LOS) or cost (or charges) of hospitalization as a classification criterion.

As soon as DRGs were introduced, most nursing research revealed that DRGs were not very amenable to homogeneous integration with nursing care. DRGs only explained 20% to 40% of the variability in nursing care. Coefficients of variation for nursing care per DRG have been reported as varying from 0.22 to 2.56 (2-5). This is the reason why some researchers try to refine DRG classification into classes of nursing cost per DRG [6]. However, it is difficult to find recent data that deals with this.

The objectives of this study are to:

- Discover if nursing activity is homogeneous by DRG and severity of illness.
- Evaluate the correlation between LOS of patients and nursing activity per patient.

Methods: Nursing minimum datasets of nine hospitals were used for the year 2008. APR-DRGs of inpatients were also transmitted by hospitals. The sample is composed of 12734 complete stays (the nursing minimum dataset is only 1.15 days/1 year/hospital). The transformation of nurse activity into nursing time was made by using existing time-by-nurse statistics from two reports published by the Ministry of Public Health (Win [7] and Welame [8] reports).

To evaluate the homogeneity of nursing activity by DRG, an analysis of percentiles and coefficients-of-variation was carried out on DRGs and the severities of illness that included more than 100 patients (3135 patients). A selection of high and low outliers was also done. The 75th percentile +1.5*IQR interquartile range was used to select high outliers; the 25th percentile -1.5*IQR interquartile range was used to select low outliers. The Pearson coefficient was used to evaluate the correlation between nursing activity and the LOS of patients.

Results: The heterogeneity of the nursing activity is high within DRGs. Coefficients of variation vary between 0.47 and 1.40 according to DRG. Interquartile ranges vary from 71 to 455 minutes according to DRG. The correlation between nurse activity and LOS is good (r=0.69, p<0.001). The intensity of the correlation is, however, variable from one DRG to another, varying from 0.05 (P=0.05) to 0.65 (p<0.001). The percentage of LOS outliers is more important than the percentage of nursing activity outliers (5.6% against 5.2%). Only 31.10% of high nursing activity outliers are also high LOS outliers. Only 32.48% of high LOS outliers are also high nursing activity outliers.

Conclusions: As was foreseeable, nursing activity was proven to be heterogeneous within DRGs. This is the reason why nurses often reject all-in-financing systems. Nevertheless, the variability of LOS inside DRGs seems quite as important, and LOS by DRG is, however, the basis of the funding system in Belgium (justified days). Using such an argument to reject all-in systems is not very scientific. The weight of the nursing minimum dataset is marginal inside hospital budgets.

The complete study upon which this abstract is based will thoroughly analyze the variability of activity, hospital by hospital, in order to neutralize the coding effect. As well, an analysis of outliers’ profiles will be carried out.

References

A12
Romania – experience and new steps in the context of the international patient classification system
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Introduction: Over the last 10 years many countries, including Romania, have introduced various models of Casemix financing based on DRGs and, as a result, Romanian specialists became PCSI members over 10 years ago. The first DRG pilot projects in Romania occurred between 1996–1999, and in 2002 Romania officially introduced the DRG system. The PCSI association and its annual conferences represented not only a ‘school’ for Romanian specialists, but also a place to share local developments, successes, and problems encountered in the implementation of DRG in Romania. Now, however, it is time for Romania to share its recent experience of introducing its own DRG system – RO.vi.DRG – which began in 2010.

Methods: The authors have done a comparative analysis between Romania and other countries which use, or are in the process of adopting, the DRG system. For both the Romanian situation and a comparison with other countries, the authors conducted a review of available literature. The authors also performed a quantitative analysis to highlight critical issues in system functioning and the impact of introducing Romanian classification.

Results: The following is a list of the results obtained by the study.
1. Romania is a country with 10 years of experience in DRG utilization. Its health system is no longer in the beginning stages of DRG utilization. Romania’s new classification system is based on the AR DRG v.5 classification, and although some adaptations have been made for the Romanian situation, more still needs to be done.
2. Ongoing DRG system development and refinement activities require important resources. These resources are not only financial, but also human. Human resources, both at the central and hospital levels, are necessary to realize the next level of benefits from DRGs in Romania. A coherent, regular and strong training system is no longer just a requirement; it is an imperative necessity, not only for adequate financing, but also for the improvement and local adoption of the AR DRG classification system, so that it better reflects the Romanian hospital reality.
3. There are some prerequisites for obtaining correct results in hospital financing when using the DRG system. These are complete transparency of hospital-funds allocation, and the existence of a clear policy with defined objectives and long-term goals regarding hospital financing. The DRG system in Romania has currently been extended from 291 to 371 hospitals, but the total amount of money available for reimbursement still seems to be insufficient. As well, the reporting and financing system is not familiar enough to every hospital, and the benchmarking mechanism is insufficiently developed.
4. The experience of other countries where the DRG system works and produces good results shows that it is mandatory to have strong institutions involved in hospital-report monitoring. In addition, it is necessary to develop a clear set of regulations regarding the entire process of documentation, classification, coding, data processing and collection of patient-level clinical information.
5. As long as Romanian legislation considers the upgrading of a patient’s pathology in order to gain more funds just “an error” (which, in a worst-case situation, could lead to the return of the funds), up-coding will increase and create more dissatisfaction at the hospital-sector level. Starting in 2011, some analysis from National School of Public Health, Management and
Professional Development in Health Bucharest (NPHMPODH) triggered controls of National Insurance House (NIH) at the hospital level. However, a concrete and planned mechanism for auditing coding is missing at the national level.

6. Continuous development of the DRG system is not merely a trend; it is a necessity. In order to have this development, it is essential to build effective communication pathways with hospitals in order to understand their reality, and to increase the capacity of the central institutions (NIH, Ministry of Health, etc.) to design and respond to the new challenges.

7. Potential areas for development could be the following: emphasizing equitable hospital financing based on DRG; improving the accuracy of the patient classification system; improving the monitoring system; and increasing hospital efficiency.

Conclusions: We could say that Romania started in the right direction by introducing and developing the DRG system. However, it is necessary to push for a stronger effort, and more professionalism and support, from the decision makers in order to not only keep the system working, but also to be sure of achieving the goals established at the moment of its implementation.

A13 Ageing, disability and long-term care

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Introduction: The probability of entering a nursing home is not the same for everyone. Age, being a woman, and living alone are all risk factors. These risk factors are also interrelated: women have a higher probability of entering a nursing home, largely because they live longer and are more likely to live alone during their last years. Disability also increases the risk of entering a nursing home. The more assistance a person needs, the greater the risk of being institutionalized. Certain types of disabilities have also been associated with increased risk of nursing home admission. For example, people who are cognitively impaired have a greater probability of entering a nursing home because cognitive disorders usually require constant supervision.

The existence of informal caregivers reduces the risk of nursing home use. Many studies have closely examined the role of informal caregivers in reducing the probability of nursing home admission. These studies also show that the attitude families have towards nursing homes influences the institutionalization of a family member.

Most users of nursing-home care have multiple and severe impairments, and they are dependent for care in more than three activities of daily living. In relation to general health, the institutionalized elderly have a multiple variety of diagnoses. The more common are diseases of the circulatory system, along with the mental disorders associated with that problem. Those with dementia normally have behavioral problems. Many recent studies have estimated that nursing home utilization rates is a particularly sensitive issue with regard to public expenses. Admission control, and payment for complexity, thus become priorities for those who manage the decision makers in order to not only keep the system working, but also to be sure of achieving the goals established at the moment of its implementation.

A14 A methodology for refining AR-DRG

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Introduction: Previous reviews of AR-DRG, such as that by Aisbett, Willey et al (2007), have shown prior versions of AR-DRG to be among the world’s best in practice, and that further major improvements in grouper performance are unlikely to have occurred. More recent work, such as that by Aisbett, Aisbett, Sutich et al (2008), has shown that hospitals dealing with (age) restricted sub-populations may be disadvantaged by funding mechanisms based on AR-DRG. The understanding here is that DRG systems rely on population-sampling assumptions (as well as matching on influential variables and mathematical modeling) to reduce the risk of biased comparisons of health services. Aisbett’s methodology can be used to identify sets of medical conditions (and procedures) that are associated particularly with increased risk of bias. The research findings also encourage development of AR-DRG along the lines of age-dependent complication levels, so it is appropriate to examine how this knowledge can be implemented to achieve effective refinement. The ultimate aim of this work is to make changes to the current grouper that will lead to better performance as evaluated under the criteria used in the two publications referred to above.

Methods: National and international studies have provided lists of medical codes associated with complication of care. These data can often be sourced for use in research. For example, one outcome of the work in The Information Centre, Casemix Service, National Health Service UK (2007), is the tabulations of secondary diagnosis codes associated with extra-care requirements in paediatrics. These data are directly useful, as demonstrated in Aisbett et al (2008), or as stimulus material for subject matter experts.
Large Australian data sets also allow for the further exploitation of the methods outlined in Aisbett et al (2008). These were based on the examination of resource relativities as exhibited across the health system, and within particular subsets of the system. Aisbett’s Generalized Least Squares (GLS) method identifies when the assumption that there are no material interactions between AR-DRG resource relativities and episode-of-care sub-population fails. This knowledge can then be used in conjunction with code frequency-based partitions of resource use data to identify codes that have age-specific complicating effects. The process of evaluation of a code’s complication and comorbidity level (CCL) (or the impact of a group of codes) can be outlined as follows: 1. Divide the AR-DRGs into a High and a Low set according to the (relative) frequency of the code as a secondary diagnosis in that particular AR-DRG in the whole collection. 2. Divide the collection into subsets according to demographic/health service variables of interest. 3. Conduct Aisbett’s GLS analysis using only the AR-DRGs in each set (High and Low), but use the same demographic/health service variable breakdowns as episode-of-care subsets (sub-populations). 4. Identify whether the resource relativities assumption fails in the High frequency set. 5. For each sub-population, identify whether the Casemix-adjusted cost per episode of care is higher for the High and Low frequency partition. 6. Analyse the outputs above to see if there are interaction effects.

Results: Detailed results are available in Chapter 4 of the publication available at the following web address: Costing Kid’s Care [http://www.pc.gov.au/__data/assets/pdf_file/0017/90611/sub021-attachment.pdf] In essence, groups of codes associated with the distortion of AR-DRG resource relativities may be identified even when individual codes have a low frequency of occurrence.

Conclusions: The approach developed in this research may be applied to a wide range of grouper development initiatives.

A15
Incremental costs of hospital-acquired complications in Alberta, Canada
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Background: Hospital-acquired diagnoses (HAD) not only lengthen inpatients’ recovery times but also incur significant additional costs of care. The focus of previous research has been on ‘highly preventable’ indicator conditions and the cost of individual episodes, rather than on the entire spectrum of unintentional patient harm. As well, little attention has been paid to the frequency of HADs and resulting total costs.

Objective: The objective of this study was to estimate the incremental cost, aggregated system costs, and length-of-stay effects of hospital-acquired diagnoses in eight Alberta (Canada) hospitals.

Methods: Routinely coded diagnosis data, combined with a Present-on-Arrival (POA) flag, were used to group 206,011 inpatient records into the 144 classes of the Classification of Hospital Acquired Diagnoses (CHADx). In Alberta’s larger hospitals, costs are measured using sophisticated bottom-up, patient-level costing systems. We employed a generalized linear model (GLM) with a gamma distribution using a log link relationship between the total cost of hospitalization and all CHADx groups, after controlling for in-hospital death, one-day hospitalization, and the mean of uncomplicated cases in each CaseMix Group (CMG).

Results: Nearly a quarter of the sample (23.9%) had at least one recorded hospital-acquired diagnosis. Across all cases, any HAD was associated with increased costs of C$10,866, more than double the mean cost of an uncomplicated admission, with a mean of 4.7 additional days of stay. CHADx representing the highest per-episode median incremental cost included multi-drug resistant Staph aureus (CHADx 4.3, C$11,357), falls with fractured neck of femur (CHADx 3.1, C$6,679), and pressure ulcers (CHADx 8.1, C$6,512). 36% of two-day CHADx added > 2 days to the median for a similar but uncomplicated stay.

Taking the volume of cases into account, and using an approximation of the mean incremental cost to capture all system costs, urinary tract infection (CHADx 9.2) was the most costly, adding C$19.3 million to system costs. CHADx responsible for the greatest extension of LOS (length of stay) across the system were similar to those adding the greatest costs, with the notable additions of Clostridium difficile infection (CHADx 7.3, +8,813 days) and septicemia (CHADx 4.1, +6,284).

High-level grouping of CHADx showed hospital-acquired infections to be the mostly costly type of complication, adding C$49.6 million, although this finding is sensitive to the way in which HAD conditions are grouped.

Discussion: Few hospital-acquired diagnoses are preventable in every case, but most have been shown to be amenable to a reduction in their rates. POA flags on routine diagnosis data considerably improve the ability to identify compromised patient care, although such data will remain controversial without further efforts to improve medical record documentation. Adding financial and length-of-stay dimensions to discussions about hospital quality improvement may strengthen efforts to reduce harm to patients, as will timely access to local data.

Acknowledgements: The authors wish to thank Alberta Health Services for access to de-identified patient-level data. However, we note that this paper is not endorsed by Alberta Health Services, nor does it represent official AHS policy.

This study was granted ethical approval by the Human Research Ethics Board of the University of Alberta.

A16
Using hospital readmission rates to track the quality of care in public hospitals in Singapore
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Research objectives: Singapore introduced Casemix-based financing for patient and day-surgery cases in the public sector in 1999. The application of Casemix has since been extended beyond financing to fields such as benchmarking, clinical quality and utilization review. Casemix data has been invaluable in enabling the tracking and better understanding of quality of care of healthcare providers, as well as providing a view to better managing them.

In this paper, we discuss the use of Casemix data based on a recent study of hospital readmission rates. The study subsequently led to the incorporation of this indicator into the Ministry of Health’s Scorecard for Acute Hospitals.

Methods: Hospital administrative data of inpatients admitted to public hospitals in Singapore during 2006–2010 were analyzed. 30-day readmission rates were calculated after excluding ‘transfers-out’, ‘in-hospital deaths’, and cases with certain underlying conditions that might potentially affect the risk of readmission (for example, cancer, HIV, trauma). The rates were further adjusted for patients’ Casemix using multivariate logistic linear regression modeling to ensure like-for-like comparisons when comparing hospitals and evaluating trends over time. Factors for adjustment included age, gender, Charlson comorbidity index, and past hospitalization.

Readmission rates were analysed at the ‘All cause’ level as well as at the ‘Condition-specific’ level; i.e., for seven selected conditions: asthma, AMI, CHF, COPD, diabetes, pneumonia, and stroke.

Results: In 2010 the crude ‘All cause’ 30-day readmission rate was 11.6%. Of those readmitted, the admission of 27.3% was due to the same principal diagnosis as their previous admission, and 83.6% returned to the same index hospital. It was found that rates were higher with increasing age. Also identified as the most significant risk factors affecting readmissions were hospitalization in past year, the Charlson comorbidity index, and principal diagnoses of index episodes. In those aged 65 years and older, the readmission rate in Singapore was 19.0%, slightly lower than in the United States (19.6%).
The study also highlighted differences in readmission rates between hospitals, indicating a likely variation in quality of care. This was present at both the ‘All cause’ and the ‘Condition-specific’ levels.

**Conclusion:** Readmission rate was assessed as to its validity as an effective ‘Big Dot’ measure for inclusion in the Ministry of Health’s performance measurement and quality improvement framework for acute hospitals. The findings for this indicator have since been shared with the hospitals which subsequently worked out targeted solutions to close performance gaps, with the ultimate goal of raising the quality of patient care. The indicators will continue to be reviewed regularly, and the performance of hospitals will be tracked to monitor improvement over time.

**References**

**A17**

**Individual product determination in the new Dutch DBC system:**

**Introduction:** On January 1st, 2012, the Dutch declaration system (diagnosis treatment combination), which was introduced in 2005, will be converted. The initial development of this conversion was begun in 2007/2008. In all phases of the conversion, information technology has supported and will continue to support the system (that is, in early development, in transition, and from 2012 on into production). In our presentation, we would like to detail information regarding the development of this new system and the support given its development by information technology.

**Methods:** The initial developments that were part of the new DBC (in English: ‘Diagnosis Treatment Combination’) system were done in 2007. These developments were the result of an agreement between all the authorities involved in the Dutch system: hospitals, insurance companies, and the government. The development was called ‘Project DOT’, which can be roughly translated as ‘DBC’s On Their Way to Transparency’. DOT was to define products and its changes:

1. A new basic model, RSAD (in English: Register, Extract, Deducce and Declare).
3. New rules of registration to determine when to declare.

For the second part – the product structure – DBC-Onderhoud used the ICD-10 chapters and registration available in the current system from the DBC Information System (DIS) to develop decision trees. These trees determine the products for a single period of patient care. This new product structure consists of a number of relevant elements.

**Results:** The discussions and iterations on the first draft resulted in the creation of a product structure for inpatient and outpatient hospital care which included approximately 4400 singular products in 123 product groups. These product groups consist of decision trees. Within decision trees, conditions are checked (for example, a registered diagnosis code, or a performed certain-care activity). In the product structure, there are almost 2500 current diagnosis codes, and more than 3000 activity codes, that are used. This structure can be roughly divided into three categories: 1. Intensive, surgical products. 2. Conservative inpatient care products (diagnostics and small treatment for inpatient care; no large surgery). 3. Conservative outpatient care products (diagnostics and small treatment for outpatient care; no large surgery). A patient is treated in the hospital and all provided care is registered (such as diagnosis, diagnostics, outpatient consultation, surgeries, patient days, and so on). After a given period, decided by automatic registration rules, the patient dataset is sent to a central web application, the grouper. The grouper supports the rules of the product structure and determines a care product. For many people this feels like being in a black box, and they want to see how a determination works to be able to understand it. As a result, an online tool was created to allow everyone who was interested to see how a product was determined. The tool shows possible products that can be declared and which type of care – at minimum – should be provided to be able to declare a product. In addition, a wide variety of underlying information about products and product groups is made available.

The initial product structure will be ready for implementation in 2012. However, we know that additional changes will be needed, and that these will lead to a newer version of the product and changes to its structure. As well, all parties involved will need to be informed of these changes in a timely and accurate manner, so that they can assess them. In addition, transparency will be needed regarding the changes. DBC-Onderhoud has provided that via the online tool.

**Conclusions:** When the new system goes ‘live’ in 2012, we will provide Dutch hospitals with a system built from their own registrations, and approved by all representatives involved in Dutch healthcare. This was possible because representatives were able collectively to decide on the development of the system. We will also provide to everyone interested a tool that shows, in great detail, the products and their underlying structural information. ICT has supported the development of this system, and ICT will continue to support and service the product throughout the transition period and into production.

**A18**

**The Care Coordination Program: a virtually integrated care delivery model for complex, high-needs patients**

**Background:** The South African healthcare sector is fragmented. The increasing prominence of non-communicable, or chronic, diseases in both the private and public healthcare sectors contributes to the country’s complex and costly ‘quadruple burden of disease’ (the others being HIV/AIDS, tuberculosis, maternal and child mortality, and violence). These chronic diseases, once they have progressed, are inherently difficult to manage due to their underlying psychosocial components, and their characteristically complex co-morbidities. High costs, without the desired improved clinical outcomes, are common. Elsewhere in the world, such as in the United States, where similar fragmented systems exist, new care-delivery models have emerged to better manage patients with complex conditions. These include vertical payer-
Over the last few years, this development has been supplemented with health insurance coverage to over 2.5 million people. The Care Co-ordination Program (CCP) is DH’s response to the fragmented care received by its members who present with complex healthcare needs, including psychological and social vulnerabilities.

Methods: The target DH population of members likely to benefit in the CCP is identified geographically using the Johns Hopkins Adjusted Clinical Group tool. This tool categorizes members into Resource Utilization Bands. Further, a Disease Burden Index (DBI) is employed to narrow the focus of the CCP to DH members with the greatest need for care. The DBI for the CCP population is 17.071, compared to a significantly lower DBI for the general DH population of 1.024 (see Figure 1).

Sub-acute care providers in the identified high-needs geographic areas who meet structural, service, and management criteria are contracted with DH to participate in a CCP network. At the time of a patient’s admission into an acute facility, a DH care recruiter employs pre-set clinical, social, and psychological entry criteria combined with a FIM (Functional Independence Measure) score to identify patients at risk of sub-optimal quality of care associated with repeated costly admissions. The identified patients are voluntarily enrolled in the CCP and, at this point, a DH care co-coordinator joins the care team of the contracted service provider. The care co-coordinator shares the transition plan and the patient’s electronic medical record with all involved providers, thus ensuring the co-ordination of care following discharge. The co-coordinator is a valuable resource for the patient, managing vulnerabilities during the transition to home and community.

The CCP discharge goal is an empowered patient reintegrated into a safe physical environment supported by knowledgeable caregivers.

Results: Improved clinical outcomes and cost efficiencies are evident from the CCP. In 2010, an average increase of 19% in the FIM score was observed in CCP patients from admission to discharge. Patients with FIM scores between 30 and 80 had the highest FIM gains—an average increase of 27%. Across clinical impairment classes, CCP patients with neurological conditions, stroke, and cardiac illness had the highest average FIM gains (see Figure 2).

In 2010, the average monthly cost for the 175 members who participated in the CCP declined from 23,307 SAR (South African Rands) pre-CCP enrollment to 8,672 SAR following CCP enrollment—a reduction of 62.8%.

Conclusion: The CCP continues to gain traction with 575 DH members currently enrolled in the program. Results thus far are striking, and they justify a greater national presence for the program, as well as its underlying principles of co-ordination and integration across traditional structures. The analytic capabilities and tools employed in the selection and management of the relatively small, current CCP population remain to be tested in a larger national CCP network.

## A19

**Casemix-based economic incentives that work**

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Introduction: Since 2001, the Danish healthcare system has been characterized by a focus on the reduction of waiting lists. By introducing activity-based funding of the regions and hospitals, there has been an increase in activity, a reasonably positive development in productivity, a high degree of patient and citizen satisfaction, and a successful reduction of waiting lists. One of the reasons for this success is that it was possible to use Casemix-based economic incentives actively.

Methods: Over the last few years, this development has been supplemented by a wish to prevent and avoid unnecessary admission to hospitals by including the municipalities as active participants in the healthcare sector. This has been done by using a regulation that makes the municipalities co-financing partners of the regions and hospitals. Since 2012, they have had to pay almost 20% of the regional budget as activity-based financing. Every time a citizen uses the hospital, or a GP, etc., the municipality has to pay. Over the same period, there has been discussion about whether it is possible to find incentives that will lead to the proper treatment of a patient. This can be seen as a response to quality problems that persist in clinical practice.

To support this development, there will be some experimentation with Pay-for-Performance (P4P) schemes that tie a portion of provider payments to performance based on measures of quality. Several key issues will be considered in determining the optimal design and implementation methods for P4P programs. These include:

1. Choice of clinical practice area
2. Size of financial incentives and who should receive them
3. Selection of quality measures and performance thresholds that determine incentive eligibility
4. Data collection methods
5. Best mix of financial and non-financial incentives

Results: In order to move it onto a politically acceptable path, the financing model in the healthcare sector will be changed accordingly. Economic incentives will be used whenever possible. The introduction of these incentives will be done as part of an evolution of the healthcare system, not as a revolution of the system.

Conclusions: The Ministry of Interior and Health finds that the use of economic incentives can support the movement of the healthcare sector in a politically specified direction.
A20
Clinical documentation manual audit
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Introduction: Preliminary audit studies in HA (Hospital Authority) hospitals have shown that diagnosis and procedure data reported in the electronic records were very accurate. However, appropriateness is as important an issue in clinical documentation. With the introduction of internal resource allocation based on Casemix Pay for Performance (P4P), the relevance of clinical documentation became apparent. During the first year under the new P4P, there was significant improvement in clinical documentation, but large variations were observed between clusters in the extent to which specific clinical conditions were reported. In addition, clinicians were puzzled by the perverse incentives to report diagnoses and procedures entirely for financial reasons. As a consequence, HA introduced the concept of grouping standards, that is, a series of agreed upon rules that would describe when specific International Classification of Diseases codes carry significant resource implications.

Objective: During 2010-11, 22 grouping standards were developed through consultation with clusters and representatives of clinical specialties. In order to validate these standards, and to assess the accuracy and appropriateness of current documentation practices, a second and major manual audit was conducted.

Methodology: This manual audit of approximately 10,000 patient records was undertaken in January and March 2011. A stratified, randomized sample of records was extracted, with approximately 30 records applied against each of the major hospitals. Each hospital’s records were audited using a predefined methodology by staff from other clusters or Hospital Authority Head Office.

Results: This paper describes the manual audit and examines the implications of its results for appropriate clinical documentation.

Conclusions: Auditing is an important tool in ascertaining the accuracy and appropriateness of clinical documentation practices, as well as in validating existing grouping standards.

A21
Perceptions of the Casemix system by clinicians after the first year of implementation in Hong Kong: a survey
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Introduction: The Hong Kong Hospital Authority (HA) introduced a Pay-for-Performance (P4P) resource- allocation policy using a Casemix system in late 2008. Clinicians played a vital role in its implementation, especially with regard to the accuracy of clinical data. The purpose of this study was to:
1. Assess the short-term impact of Casemix-based funding as perceived by clinicians on clinical practice and quality of patient care after one year of implementation.
2. Examine any association between the characteristics of the clinicians (rank and specialty) and their perceived impact of the Casemix system on clinical service.
3. Identify the barriers encountered by clinicians on the effective implementation of this new policy.

Methodology: A pilot quantitative study was done in March 2010 on a large, public general hospital in Hong Kong. All clinicians working in the hospital were recruited. A self-administered questionnaire, developed using recommendations from available literature, was used. Three aspects were looked at: the background characteristics of the clinicians, their perceptions about the impact of the Casemix system, and the clinicians’ knowledge of the Casemix system.

Five-point Likert scale, true-false, and open-ended questions were used. Analyses were performed to examine the relationship between the variables using Pearson’s chi-square test or Fisher’s exact test, where appropriate.

Results: 1. 520 questionnaires were sent out and the response rate was 17.3%.
2. More than 2/3 of the respondents did not perceive any change in their clinical practice or the quality of care, efficiency of work, or fairness of resource allocation.
3. More than 2/3 of the respondents agreed that there was improvement in clinical documentation, but at the expense of their time.
4. 60% of the respondents did not agree that the system induce gaming.
5. Participants’ knowledge of the Casemix system was generally poor, particularly among junior clinicians who, in addition, had a lower participation rate in the Casemix promulgation session conducted by the HA Casemix Office. The junior clinicians also expressed anxiety about having to carry out clinical documentation without being given clear guidance.

Conclusions: After the first-year implementation of the P4P/Casemix policy in HA, clinicians did not perceive any negative impact on patient service, and they agreed that there was improvement in clinical documentation. The perceived lack of both knowledge and access to knowledge among the junior clinicians needs to be addressed. Lastly, a post-implementation survey was found to be useful in providing evidence to facilitate the formulation of communication strategies in the implementation of a corporate Casemix system.

A22
Measuring the Casemix of physician practices in primary-care reform models in Ontario, Canada
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Introduction: A number of different blended-payment models for primary-care delivery have been introduced in Ontario, Canada over the last decade. These models have different incentives and, therefore, have attracted different physicians and patients, depending upon their geographical location and practice characteristics. As policy makers at the Ministry of Health and Long-Term Care evaluate and consider possible changes to these models, it is important that they be able to characterize the Casemix of patients who are enrolled to them, and to understand the healthcare needs of those who have not enrolled with a primary-care model. This study evaluates a method for summarizing the Casemix of primary-care rosters, and it examines the variations of Casemix between and within the different model types.

Methods: The study population includes all residents of Ontario who were registered with the Ontario Health Insurance Plan (OHIP) on March 31, 2010, and all primary-care physicians who belonged to a primary-care reform model on the same date. Each individual in the province was assigned a morbidity weight using the Johns Hopkins Adjusted Clinical Groups (ACG) Casemix System along with diagnosis data collected during the previous year. The Casemix of each physician’s roster was summarized with a Standardized ACG Morbidity Index (SMI), which is the standardized average morbidity weight of all patients on the roster. The roster SMIs were compared across and within the three following group types: enhanced fee-for-service, capitation, and team-based capitation.

Results: The study sample included 6,579 physician rosters which consisted of 9,225,428 patients. The mean SMI of enhanced fee-for-service rosters was higher than the SMI for both types of capitation groups (1.22 vs. 1.03; p<0.001). The interquartile range of the enhanced fee-for-service rosters (1.30-0.93) was greater than both the capitation groups (1.20-0.88) and the team-based capitation rosters (1.18-0.88). The 95th percentile of the enhanced fee-for-service rosters was 1.74 with the other two groups having a 95th percentile of 1.52.

Conclusions: The rosters of physicians in enhanced fee-for-service groups have a higher average morbidity burden and greater variation in morbidity than the capitation group rosters. Being able to easily and reliably measure the morbidity burden allows decision makers to identify and fairly reimburse physicians whose patients have a higher burden of illness.
A23
Understanding the episode of care for transplant patients
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Introduction: Funders and policy makers are looking for ways to manage increasing healthcare costs and provide funding for entire episodes of care that extend beyond a single stay or visit at a healthcare institution. In Ontario hospital funding is based on global funding, which is a lump sum distributed annually to hospitals. A small percentage of funding in Ontario is based on volume and fixed fees for selected procedures. In a departure from the current funding policies, the Ontario Ministry of Health and Long-Term Care (MoHLTC) is formulating a strategy to increase patient based funding. This initiative is known as Patient based Payment (PbP). To execute this change in funding policy, the MoHLTC is extensively using patient level cost data to develop strategy and funding models. To gather evidence based information, the MoHLTC has funded a case-c costing project to assist 46 facilities produce patient level cost data. The current information systems and reporting standards in Canada are designed to record patient-care information by patient type during a single stay or visit in one institution. Although patients may receive health care from multiple healthcare providers, patient information is not linked or accessible by the multiple healthcare providers. The limitations of the current information systems have resulted in patient data that is difficult to access even within a single healthcare facility. The single episode of care (one stay or visit) is not representative of the healthcare needed, or the entire cost of care related to a condition. This is particularly true for patients living with chronic diseases, or patients who have received complex medical procedures such as transplants and, ultimately, the healthcare services received throughout a patient’s life. The transplant process is complex and can be divided into four phases: pre-transplant, assessment and waiting period; donor procurement; peri-operative; and post-discharge phase. Pre- and post-transplant healthcare services are not included in the procedure based funding and may be provided by multiple healthcare providers. Moreover, post-transplant care has increased as a result of improved survival rate resulting in continued healthcare.

In response, we propose to develop a linking of patient data describing complete care for all activities related to transplant. We suggest that a new model for episodic care is needed that provides funding for an entire episode of care. This will result in the proper incentives for improved care between providers. In this paper, we identify challenges and opportunities for this type of work in the future.

Methods: In 2008, The Hospital for Sick Children in Toronto (SickKids) examined the cost of transplant patients, including pre- and post-transplant healthcare services. This was done in order to understand the cost of the various organ transplantations throughout the full continuum of care. Using the SickKids transplant registry, 356 transplant patients were in this study. The study analyzed pre- and post-transplantation activity including inpatient admissions, outpatient activity (medical daycare and clinics), diagnostics, and allied health services (e.g. social work, physiotherapy, child life, dietetics). A full year of patient activity was linked to 44 transplantations encounters. The combined transplant and patient activity data was linked to the cost data.

Result: The study demonstrated that the cost of transplantation for the peri-operative phase accounted for only 41.1% of the hospital’s total costs for treating transplantation patients. Pre- and post-inpatient activity accounted for 26.4% of the hospital’s costs, while ambulatory and diagnostic activity accounted for 32.5% of the hospital’s costs.

Conclusion: Reporting systems currently in place limit the ability to describe resource intensity and clinical care for the full continuum of care. With the shifting and chronic patient populations that exist today, including transplants, there is an increasing demand on the healthcare system. Information systems need to be enhanced to link episodes in order to appropriately measure and fund patient activity and costs throughout a patient’s disease management. The Hospital for Sick Children has extensive experience providing the continuum of care from initial diagnosis through to post-treatment care. Some of this care is delivered to patients over many years and in consultation and coordination with other healthcare providers. Yet despite this extensive clinical experience, the understanding of the delivery of care is difficult because of the disparate and silo-ed patient information. Funders, healthcare and information management providers should work together to pool knowledge and experiences and collaboratively design episode of care models. The episode of care model can be the catalyst for new approaches to delivering healthcare.

A24
Casemix innovation: shifting to integrated care
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Introduction: The vested interests of both hospitals and medical specialists in the current system are blocking a breakthrough to a real patient-centred approach within healthcare. Adapting the funding system to cut across traditional silos of healthcare seems to be the key; however, these vested interests are preventing the introduction of a process of change which is needed for this paramount innovation.

This national approach will be presented to assess its international potential, since all countries face the same long-term care crisis of a lack of resources to meet the health needs of their populations. It will also be presented as an innovative approach to Casemix, as the clustering of patients is done based on clinical dimensions, and not on groups defined by statistical analysis of available data.

Methods: Since the year 2000, Dutch hospitals have begun to register data by episode, starting with a referral to a medical specialist at a hospital. At that moment, within the IT systems, a care-trajectory record is created for the specific health issue. The information at the level of the episode is used to support the physician during the care process, but it is also gathered into management databases at the institutional level. With this information, profiles can be created at different levels of aggregation, for example, for individual patients, at the provider level, at the level of diseases treated, and for many other ad hoc views.

By the structural linking of the data to the health issue of the patient, described by both care request and diagnosis, a new dimension has been created in the resource management of hospitals. Since the shift in the funding of hospitals from budgeting to contracting will be completed in 2012, hospitals need to change their information management strategies. In the presentation, examples of this newly developed management information will be presented.

The next step in the process of health reform dealt with chronic diseases. This was partially driven by the spectacular growth expectations in this area for the coming decades. To prevent a long-term care crisis in 2025, action was needed. An important development was the introduction of the concept of the care standard, which describes good care for chronic-care patients based on guidelines and protocols. The Dutch Diabetes Federation developed the first care standard in 2003. The care standard describes three main aspects of the prevention of and care for chronic diseases: the care, the organization, and the indicators of quality. One other principle of the care standard is the individual care plan, which will be coordinated for and with the patient as well as by a multidisciplinary team of care providers.

The care group was introduced as a new entity to contract, in one market, the different care providers involved in chronic disease management and, in a second, the insurance companies. After the pilot, the contracting of disease management programs for diabetes was nationally covered. One important element of the program is the development of software to not only exchange information between providers, but also manage the treatment plan.

Results: The Dutch shift to patient-centered care has resulted in real information flow in the care delivery system. It has altered the relation between the stakeholders so fundamentally that the existing budgeting system will be replaced completely by 2012. The introduction of health-issue funding for chronic diseases, both for the most common, like diabetes, as well as for rare diseases like cystic fibrosis, has opened new frontiers in healthcare delivery involving the patient and, ultimately, also integrating social care.
The traditional healthcare silos are breaking down. Care providers and patients are looking for state-of-the-art, 2.0 solutions to develop supporting information systems that link to the personal health records of patients to further improve patient quality of life.

**Conclusion:** The Dutch approach has created a new dimension in the application of CaseMix. It has created direct links between healthcare delivery, costs, and outcomes. The method taken for chronic diseases has linked prevention and healthcare, and it provides a way to extend the paradigm shift of demand-oriented care delivery across the traditional silos.

Another important breakthrough is the creation of a new dimension in CaseMix tools. Instead of developing CaseMix classification systems primarily based on the statistical analysis of the costs involved in providing care, the new integrated-care approach is based on clinical standards.

So, in the end, the dreams of Codman and Weed will come true. The next generation will be provided with a sustainable healthcare system that involves the patient and uses problem-oriented records, even across institutions.

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**A25**

**Transitioning to a new Casemix grouper to fund long-term care homes in Ontario, Canada**

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**Introduction:** Health system accountability and the capacity to care for the elderly with increasingly complex care needs is a challenge across many jurisdictions. The move to increasing accountability has necessitated greater and improved measurement of healthcare processes and outcomes. In 2005, the response by the Ontario Ministry of Health and Long-Term Care was to implement the Resident Assessment Instrument (RAI)-Minimum Data Set (MDS) 2.0. One purpose for the introduction of the assessment tool was to facilitate the transition to a new CaseMix grouper with associated weights.

In long-term care in Ontario, homes are funded based on an envelope system. The majority of expenses related to resident care are provided for in the Nursing and Personal Care (NPC) envelope, which is 100% adjusted for resident acuity. The NPC envelope represents approximately 60% of envelope funding in the sector. Since 1993, this adjustment was based on the Alberta Resident Classification System (ARCS). Assessors from the Ministry measured ARCS once a year, and, from these data, residents were classified into one of seven CaseMix groups to formulate the province’s CaseMix measurement. Long-term care (LTC) homes are funded based on their specific CaseMix measure relative to the provincial CaseMix measure. Over time the validity of ARCS, and the ability to fairly and equivalently distribute funding based on it, came into question. The introduction of the RAI-MDS 2.0, and the CaseMix grouping algorithms associated with it, provided alternatives in order to improve the allocation of funding based on CaseMix.

In collaboration with sector representatives, the Ministry determined that the Resource Utilization Groups (RUGs) 34-group model was best suited to CaseMix-adjusted activity in long-term care. A transition model was developed and implemented in order to ensure system stability.

**Methods:** The transition plan was developed in collaboration with the long-term care home sector. An advisory group, supported by a technical group, oversaw the development of options for the transition. The plan was based on the following principles:

1. **Simplicity:** the plan was to be as simple as possible in terms of the number and complexity of components. The fewer the components, and the less complex they were, the easier the plan would be to understand, communicate and implement.

2. **Stability:** the plan was to mitigate any instability that would be introduced into the system by switching to RUG III (e.g., corridors).

3. **Transparency:** the plan was to be transparent in that all components of the model were to be known and communicated to all stakeholders.

4. **Sufficient notice:** in advance of implementation of the transition plan, sufficient notice was to be provided to LTC homes and other stakeholders regarding implementation dates and impact of the plan on homes.

5. **Revenue neutral to the province:** CaseMix transition was not to increase costs to the NPC envelope.

**Results:** Due to the phased implementation of the MDS 2.0 assessment, the plan was implemented in two waves. In total, 217 homes were transitioned beginning April 2010 (Phase 1 – V homes). The remaining homes (400+) will transition starting April 2012.

The transition will last for three years for each wave. Therefore, the first group of homes will be through transition as of April 2013. During transition, a 5% corridor is being applied to the CaseMix Index (CMI) so that the difference in CMI from year to year cannot be greater than, or less than, 5%. As a result of applying the corridor to the first group of homes, there were no homes whose funding decreased by more than 1% in the first year of transition.

Homes that began their transition in 2010 are now in their second year. The maximum decrease in funding after applying the corridor was greater than in the first year, although this was mitigated by an incremental funding allocation.

**Conclusions:** To date, the plan has been successful in transitioning the long-term care sector to a new CaseMix grouping methodology. Successful strategies employed included involving sector representatives in developing the plan; communicating widely; providing detailed face-to-face education on the plan, its components and impact; and keeping the plan simple.

This presentation will discuss the details of the development of the plan, as well as the year-two and -three estimates of funding changes as a result of the application of the corridor. Ongoing and emerging challenges will be described.

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Cite abstracts in this supplement using the relevant abstract number, e.g.: Tsui et al. Transitioning to a new Casemix grouper to fund long-term care homes in Ontario, Canada. BMC Health Services Research 2011, 11(Suppl 1):A25