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MEETING ABSTRACTS

A1

The Dutch experience: reciprocal influences between (socio-) political processes and casemix systems

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BMC Health Services Research 2007, 7(Suppl 1):A1

Introduction: The Dutch DBC-system was developed and implemented between 2000 and 2005. When compared to other members of the 'classification family tree' it can be concluded that the system is not a logical step in the general line of development of classification systems. On a number of characteristics the Dutch system stands out from the other systems. One major differing characteristic being the fact that the system is not based on an internationally recognised classification system, but on 24 different systems of diagnosis classification, developed by different specialist medical associations. This results in 24 product structures that cannot be compared amongst each other. Another main difference with 'classical DRG-systems' is the episode of care rather than the encounter as a basis of the DBC-product. In the presentation we will investigate into the underlying political process that led to the creation of a deviant system. We will highlight some benefits of the system, but will also point out the fundamental changes that are needed to combine the benefits of the DBC with the benefits of DRG-systems. We will conclude with some assumptions on how the fundamental changes will reciprocally influence the socio-political relations in the Dutch health landscape.

The development of the DBC-system: socio-political influences: The Dutch 'healthcare landscape' consists, apart from governmental organisations, of a number of strongly organised national associations representing amongst others insurers, public and private health providers and medical associations. These parties are embedded in a 'process-design' that is based on consensus decision making as opposed to 'enlightened despotism'. Due to the influences and counter-influences of the national associations and the culture of consensus decision making, the resulting DBC-system can be qualified as a 'negotiated product' rather than an 'expertise product'. On the basis of an analysis of stakeholders and their

different interests some design-characteristics of the DBC-system can be explained. Interests of a majority of self-employed medical specialists, had a strong influence on the creation of 24 diagnosis classification systems. The strong position of public providers as opposed to the marginal position of private providers seems to account for the emphasis on classification rather than funding in the use of the DBC-systems. A map will be drawn representing positions, relations, influence-weights and outcomes of the process.

Results and discussion: Benefits of the DBFC-system and changes to be made: The DBC-system induced major culprits necessitating fundamental changes, but the system also provides advantages to the classical DRG-system. Detailed products give a high level transparency of diagnoses, processes and costs, providing feedback to hospitals to redesign their processes and develop efficiency and quality interventions. Strong involvement of the medical profession in the design of the system increased insight into effects of medical decisions on costs of the system. Information on the whole episode of care provides an incentive to increase efficiency by substitution of inpatient care by day- and outpatient care. Despite the benefits, the pitfalls posed by the system will lead to fundamental changes in the system, combining strong points of actual DRG-systems, with benefits of the DBC system.

Influence of system changes on the Dutch healthcare system: Fundamental changes to the DDB-changes have been proposed but not yet implemented. Still we will attempt to draw out some tentative assumptions about how a changed system may influence positions and relations within the Dutch healthcare landscape.

A2

Implementing a provincial case mix adjusted funding model for inpatient rehabilitation activity: the impact on bed designations

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Background: This paper will describe the implementation of a case mix system for inpatient rehabilitation activity in Ontario

and review the impact of the implementation on hospital bed designation in the province.

Data: In the fall of 2002, the Ontario Ministry of Health and Long Term Care (MOHLTC) mandated the collection of National Rehabilitation Reporting System (NRS) data in all designated adult inpatient rehabilitation beds. From these data we developed a case mix grouping methodology with associated weights. Together these are being used to incorporate adult inpatient rehabilitation activity into the Integrated Population Based Allocation (IPBA) hospital funding formula. In Ontario, designated inpatient rehabilitation is typically provided in two sectors. Within the acute care sector, hospitals may or may not have designated rehabilitation beds. Even in hospitals that do not have designated rehabilitation beds, a patient may receive some rehabilitation while an inpatient, or on an outpatient basis. For example, a patient who has just had surgery may be visited by a physiotherapist to increase range-of-motion and strength while recovering from surgery. Within the rehabilitation hospital sector, facilities typically have designated rehabilitation beds and are usually referred to as rehabilitation hospitals. The care in these facilities is often organized on a programmatic basis, time limited and goal oriented. For example, a facility may have a stroke rehabilitation program that is 6 to 8 weeks long for individuals following stroke. These programs are provided on an inpatient basis and may or may not have an outpatient component at the end. Rehabilitation is also provided in other sectors of the health care system, but not on a designated inpatient basis. Provincial Implementation:

Results and discussion: The province followed a three year implementation plan. During the first year data quality and completeness issues were identified. During the second year these issues were addressed, and regional education sessions were held to educate providers on the new case mix system. In response to the provincial implementation, certain facilities embarked on case mix reviews. These reviews included grouping their inpatient rehabilitation data for the first time in order to understand their case mix distribution and to investigate the issue of 'specialty populations'. One specific issue uncovered was the appropriateness of care being provided in designated rehabilitation beds. For example, Tuberculosis care was being provided in designated rehabilitation beds, however, the care was not typical rehabilitative care. We will discuss the implications of issues such as this and the potential for re-organization of bed designations in this sector.

A3

Casemix adjustment for outpatient service: a tool for resource allocation of social security population in Thailand

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Introduction: Social security scheme (SSS) is a compulsory health insurance scheme covering formal workers in Thailand. The scheme pays health care providers on a flat capitation rate to cover both ambulatory and inpatient care. Capitation payment has caused strong incentive for cost-containment, hence caused under-treatment. To prevent adverse effects, the Social Security Office (SSO) is interested to explore outpatient casemix to complement diagnosis related group.

Objectives: The aim of this paper was to examine a burden of illness for outpatient care in the SSS population and the application for resources allocation to providers of health services.

Data and method: A retrospective study was carried out with secondary data of individual electronic database with the application of risk-adjustment method based on Adjusted Clinical Groups (ACGs). Individual data for outpatient services in 2005 were compiled from the SSO. The data contained demographic information with registered hospital, all diagnoses, and annual charge. The end results yield 65 categories of patients and the resource utilisation as annual charges was analysed comparing between public and private registered hospitals.

Results: About half of the populations had acute minor condition. The differences across two types of health care providers were the number of utilisation and annual charge. Only acute and chronic conditions were selected to examine the pattern of disease, service utilisation, and average annual charge. The results showed the same pattern of disease distribution, while differences in outpatient visit and annual charge were influenced by age and gender.

Conclusion: The burden of illness in a social security population can be described in terms of ACG casemix using the individual data for outpatient care. The differences between health service utilisation and annual charge between health care sectors were the result of differences of inputs and outputs in the defined populations according to their morbidity patterns. Future policy reorientation should aim towards the development of financing policy on ambulatory services according to health needs identifying by morbidity patterns.

A4

Developing casemix classifications for rehabilitation in the UK

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BMC Health Services Research 2007, 7(Suppl 1):A4

Background: The introduction of an episode-based reimbursement system within the UK NHS has led to the development of a new case-mix classification – Healthcare Resource Groups (HRGs), based on diagnostic and procedure codes. Diagnosis is a poor cost-determinator in rehabilitation. In the US and Australia, casemix classifications for rehabilitation have centred on function-related groups using physical dependency for on help for basic self-care as a surrogate for rehabilitation needs. These classifications may work reasonably well for many areas of general post-acute rehabilitation, but do not assess the need

for inputs such as specialist nursing, therapy and medical care, which are important components of specialist rehabilitation programmes in the context of brain injury or progressive neurological conditions.

In the UK, rehabilitation services are arranged in networks which include local general (LGRS), district-based specialist rehabilitation (DSRS) and complex specialised services (CSRS) providing tertiary rehabilitation for the low-volume high-cost group of patients with particularly complex needs. A 'one-size-fits-all' fixed rate episode tariff set at the level for average service costs would lead to financial destabilisation of CSRS, and also those DSRS which manage a greater proportion of complex cases.

Methods: We have developed a set of validated tools to measure the complexity of rehabilitation need, offering direct assessment of rehabilitation inputs which may be used to provide patient level costing of rehabilitation service provision in a standardised format. The Rehabilitation Complexity Scale is a simple tool, which provides a valid and reliable, if somewhat crude, estimation of needs for rehabilitation input (see separate abstract). Feedback from service users suggests that it is practical to apply in time-pressed lower level services, but that it lacks sensitivity to distinguish higher levels of input at the more complex end of the scale. The Northwick Park nursing Dependency Scale (NPDS) and Therapy Dependency Assessment tool (NPTDA) have been developed to provide a more detailed breakdown of needs for nursing, therapy and medical interventions. From these, an algorithm is applied to provide a generic estimate the requirements for staff time in the relevant disciplines.

Discussion: The tools provide a standardised assessment of need for rehabilitation input, may also be used to estimate staffing requirements in relation to a given caseload. This presentation will describe the tools and their application to provide patient-level costing of rehabilitation inputs which may be used to inform the development of appropriate tariffs and commissioning currencies across the range of rehabilitation service provision.

A5

Validating the Nordic assessment system/NASS – to the grouping of rehabilitation patients

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BMC Health Services Research 2007, 7(Suppl 1):A5

Introduction: Case-mix of the rehabilitation patients has been actual in many countries. Rehabilitation is delivered in multi-disciplinary teams. Cost-effectiveness of rehabilitation work is of general interest. The definition rehabilitation and structure of the services varies between countries. Case-mix work on rehabilitation has been done previously at least in Australia, Canada and United States. The Nordic countries have a common interest. Therefore the Nordic Centre for Healthcare Classifications has published the first version of grouping logic and continues to work with the issue.

Results: The new Nordic system to evaluate rehabilitation patients, called NASS (Nordic Assessment System), is been introduced. The useability of the grouping for the expenses,

evaluation of the patients and education of the personnel will be presented.

Discussion: The Nordic co-operation in rehabilitation case-mix will continue. A wider perspective, like quality of life and there relation to case-mix applications needs to be examined. This is essential for the case-mix of out-patient care. We have found international collaboration useful in our work.

A6

From a Belgian Nursing minimum dataset to a nursing cost-weight per DRG

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BMC Health Services Research 2007, 7(Suppl 1):A6

Introduction: The Belgian hospital financing system is regarded as one of the systems that are adjusting for nursing care. The actual financing system for nursing activity in Belgium consists of a basic and a supplementary part in budget allocation to nursing wards. The supplementary part of nurse staffing financing is allocated over hospitals based on a 1 to 10 deciles ranking of hospitals. For general hospital care the following main criteria drive the ranking system: Firstly, the relative reimbursement value of performed medical interventions as a total of fee for service bills; Secondly, the value of the mean NMDS – weights per patient day as measured by the national Nursing Minimal Data Set.

The mean NMDS – weights, as one of the ranking criteria, are calculated in a complex manner. Multidimensional scaling projects every nursing ward on a national 'map' within a dependent – independent care dimension and a basic – intensive care dimension. Every nursing ward is positioned within one of 28 care zones on the map taking into account this nursing profile differentiation. The process determines 28 clusters of nursing wards. The cluster in which a nursing ward falls has a unique NMDS weight. This weight is an indicator of the zone specific staffing characteristics, as a combination of a staff qualification index and a staff quantification index (FTE/patient day).

The need for change of this system is clear. In 2006 NMDS was thoroughly updated towards a system of 79 nursing intervention items. NMDSII is the result of broad qualitative sector participation and a statistical quantitative reconfiguration of the system. It is up to date with current nursing practice. It is based on NIC as an international nursing intervention 'language'. And it is a much more accurate representation of what nursing care incorporates in all its different dimensions when compared to the previous version of NMDS.

The current system lacks in one very important aspect: the NMDS – weighting as financial driver is based on a historically determined staffing qualification and quantification per care zone. There is no transparent relationship with nursing care needs which result from patient care needs.

The study was therefore aimed at redirecting the supplementary part financing system from actual towards justified staffing needs as a key criterion for resource allocation.

Methods: At first 112 real patient cases have been written, based on patient records from 35 hospitals. Later on these cases are used to assess variability in nursing care needs and to investigate the relationship with staffing needs and thus also financial needs. The case construction is based on real patient cases, as encountered in Belgian general hospitals. Patient records in combination with additional information from nurses, involved in the specific care delivered, are the basis for case construction. A case describes the whole of nursing care delivered for a specific patient, during one day of stay (24 hours). NMDSI and NMDSII are also coded for each selected patient case. All information is obtained by way of nursing unit visits. Direct record reviewing and continuous contact with involved caregivers ensure the validity of the constructed cases. After case construction, an additional caregiver feedback warrants a genuine description of care as it was rendered in practice.

202 head nurses of 69 general hospitals rated the patient cases. The cases were randomly assigned to the raters. All cases are rated during two consecutive rounds, as part of an adapted Delphi approach. Every head nurse had to rate on average about 10 cases and every case was evaluated on average by 8 nurses. Three main questions were posed concerning staffing needs: 'How big is the required nurse time need for care delivery as described in the specific patient case to ensure quality of care?', 'Taking into account current level of ward staffing, how many patients with this nursing care profile can one nurse care for?', 'Suppose there would be no limitations on ward staffing, how many patients with this nursing care profile can one nurse care for?'. The different questions allow evaluating internal consistency of the rating procedure.

The response during the whole rating process equals to 92% of expected ratings. A number of alternative staffing needs assessments were calculated to evaluate external consistency: TISS, NARVEL, San Joaquin and AGGIR.

In a second part of the study all NMDSII interventions were rated on time needs separately, independently of any patient case, by 20 randomly selected head nurses. The combination of NMDSII items in each patient case, used in the first method, makes it possible to sum the separate nursing intervention time needs as a result of the second method, to incorporate the whole patient case content. This makes the findings of both methods, patient case based and intervention level based, directly comparable as a measure of criterion validity.

In the analysis of both case and intervention ratings the following rule was applied to adjust for a skewed distribution: If the Shapiro-Wilk normality test showed no significant deviation from normality ($p < 0.05$), the mean was considered a fair measure. Else the Huber robust mean was selected. Estimates were expressed as relative weights. Two other validated nursing workload weighting systems were compared to the constructed relative point system: the use of 'Points_closon' and 'Points_gent'.

Results: The rating of nursing time needs based on patient cases varies from a minimum of 28.38 minutes up to 80 minutes. Internal consistency was high (r between .76 and .97, $p < 0.01$). There is a considerable degree of variability present between ratings.

A very strong relationship exists between the estimated time and the TISS patient classification system regarding intensive care. This confirms previous research. The geriatric AGGIR – estimated time relationship is also strong. However the relationship with San Joaquin for general care is weak and with NARVEL for paediatric care is the relationship non existing.

There is a high correlation ($r = 0.90$, $p < 0.01$) between the sum of nursing weights per intervention and the patient case rating of nursing time.

The correlation between the newly developed nursing weights for NMDS-II and the Closon and Ghent weights for NMDS-I is more than 0.93 ($p < 0.01$).

Discussion and conclusion: Valid, reliable and usable nursing weights per NMDS-intervention have been developed. The nursing weights have been validated by using 112 clinical cases. Both estimate approaches are highly consistent with each other, with NMDSI based systems and with accurate external patient classification systems.

The main conclusion of the study is that it is possible to weight nursing care based on an appropriate staffing level instead of actual staffing levels. The study provides valid, reliable and usable nursing cost-weights for DRGs.

NMDSII has the features of classic patient classification systems, but it is a national and hospital wide system. It is endorsed by sector participation and statistical analysis. And it is a dataset that can be linked to other relevant datasets such as HDDS.

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A7

The effect of medical needs to the disability based patient classification system – a critical review of disability based patient classification

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Background: Disability based patient classification systems have been studied/developed in several countries. The limitations of these systems are its complexity and low explanatory power, not representing medical needs of patients. Object of this study is to critically review limitations of disability based patient classification systems in the light of disability components and medical needs of the patients, then to construct a code-set, which identifies patients' functioning, medical and rehabilitation needs.

Methods: Disability based classification systems including RUG-III, FIM, TAI and the classification system for the long term care insurance (LTCI) law in Japan were reviewed with regard to explanatory and outcome variables including disability and medical needs. The author is especially interested in the use of medical and rehabilitation needs used as explanatory variables. In addition, attention was paid to complexity and the power of estimation of each system. For this purpose, a secondary analysis of a large scale one-minute time study was performed to understand the correlation between medical and disability variables.

Results: RUG-III had the largest number of rehabilitation related and medical care related explanatory variables, and it was followed by the Japanese LTCI classification system. FIM and TAI based system included variables related to patients' functioning.

A secondary analysis of TAI data suggested that disability scale used in the case-mix system explained total medical cost better

than classification in case mix system. Variation of medical needs of the patients was large even in a same classification category and explanatory power of disability scale was not sufficiently high.

Conclusion: The scope of each disability based classification system depends on the framework of each model. For example, RUG-III and Japanese classification system for the LTCL law contained more medical explanatory variables compared to the others. These two were developed in relation to fee schedule of long-term nursing care facilities. Therefore these two systems included medical service use in long-term care facilities. In contrast, FIM, and TAI were developed as patient management tools. Although medical components had a positive effect to explanatory power, use of medical needs related variables increased the complexity of classification system, consequently restricting their use as patient management tools. It is suggested that simpler coding system to identify patients medical needs should be developed to improve case management and to represent real needs of the patients.

A8

Evaluating case-mix and predictive modeling measures within the British Primary care sector

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Aim: The goal of this project was to promote the ability of the NHS to apply diagnostic and other clinical information to develop state of the art case-mix measures relevant to medical and fiscal management activities. In addition, it demonstrated the validity of the ACG case-mix system using Read codes.

Data and methods: Data was obtained from three Primary Care Trusts (PCTs) within the British NHS. Four years of data were collected at two of the sites, while two years were collected at the third site. The population of the sites varied from 6,000 to 20,000 in 2005. The independent variables included age, gender and diagnostic information, in the form of Read codes. A range of variables were used to measure resource utilization.

Results: The project looked at three specific applications: population risk profiling, provider performance profiling, and patient identification.

Population Risk Profiling was done to assess the disease burden of populations for resource allocation. There was found to be a very strong relationship between the simple risk score distribution and relative resource use in all three sites. The distribution of Read codes demonstrated that the number of codes per patient differ significantly across practices. The distribution of ACG-PM risk scores by postal code revealed the differences across geographical areas. Eleven conditions have been identified as key conditions in the ACG program. There is significant variation in the distribution of key conditions.

Provider Performance Profiling was performed to assess efficiency across PCTs or providers. For budgetary allocation and performance profiling, concurrent regression models were used to estimate the expected resource use adjusted for demographic and diagnostic information of the patient. The actual and expected resource use were then compared to profile providers performance and measure efficiency.

Predictive modelling was undertaken to identify people at risk for assessment and care planning. Comparisons of the explanatory power of alternative models show significant improvement when ACG measures are added. Highest explanatory power is achieved with total secondary care costs as the dependent variable. For primary care variables, the explanatory powers are much higher for pharmacy use and lab tests. It is possible to identify 4.2% to 21.5% of all true high risk patients from the models. A list of anticipated high-risk patients for 2006 was generated.

Conclusion: Accounting for differences in the health status of populations and their anticipated need for health care services is necessary when considering policies at the individual level, be it the provider or patient level. Our results show that UK populations do vary in their need for health care resources and can be successfully compared across PCTs, as well as on the individual practice level, to assess the disease burden and the health care resource needs of the population. The ACG model proved to work well with the available British data. These results can be directly used for population risk profiling, performance management, or case management.

A9

New approach to grouping newborn/neonatal patients

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BMC Health Services Research 2007, 7(Suppl 1):A9

Introduction: In the spring of 2007, the Canadian Institute for Health Information (CIHI) introduced CMG+ (Case Mix Groups+), Canada's acute care inpatient hospital grouping methodology. CMG+ uses administrative and clinical data to group patients into clinically relevant and resource-homogeneous groups. CMG+ identifies 21 major clinical categories (MCC), similar to Major Diagnostic Categories (MDC), and 558 CMG (analogous to DRG). CMG+ is an ICD-10-CA/CCI native grouping methodology that replaces the ICD-9/CCP based CMG/Pix methodology.

Some of the most significant differences, and improvements, between the old methodology and CMG+ are found within the Newborns and Neonates with Conditions Originating in Perinatal Period MCC. In the neonatal section of the old CMG methodology, cases were assigned to Case Mix Groups based on a set of weight ranges and the presence of particular, but unspecified, diagnoses. No information, other than admission weight and diagnosis, was used to group neonates in this methodology.

Methods: In developing the new CMG+ grouping methodology, considerable thought was given to exploring additional grouping data elements. The elements were evaluated based upon their ability to assist in creating more meaningful groups

from a clinical perspective while being able to account for more cost and length of stay variation.

Results: Two additional data elements, as well as one other existing element, were found that demonstrated marked improvements in both cost and clinical considerations. The two new elements, not taken into account by the old methodology, are gestational age and the presence of specific interventions. In addition, the use of diagnoses, which simply supported general categories in the old methodology (minor, moderate, major), was greatly expanded. In CMG+, specific diagnosis categories have been implemented that not only explain costs well but also create much more clinically identifiable and meaningful groups. These three elements have been combined with the series of admission weight ranges to form improved groups in CMG+.

Conclusion: The paper will highlight some of the CMGs resulting from the new approach and will present an R-square analysis that demonstrates clear advances in the explanation of cost variance. It will show that the use of gestational age, interventions, and specific diagnosis groups have helped to create a much more cost-homogeneous and clinically meaningful grouping methodology for newborns and neonates.

A10

Performance indicators in Swedish Health Care

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BMC Health Services Research 2007, 7(Suppl 1):A10

Summary: Sweden has developed national performance indicators to measure quality and efficiency in Health Care. The indicators will be published on a yearly basis on a County Council level.

Aims: The aims are to: 1) Report on the achievement of the counties for the purpose of transparency and accountability 2) To encourage management in health care to start activities to improve performance The first indicator set was published in 2006. There was a great interest in the work and a waste majority of the Swedish county councils have now started a local work in connection to the national work. Next report on performance indicators will be published in October 2007.

Background: Sweden has a decentralized health care system with 20 County Councils/Regions and one municipality with a high degree of autonomy. The counties both finance and manage the health care activities in each county. In this context there has been hard to get a national picture of quality and efficiency in Swedish health care in all. The aim is to find methods to measure if Swedish health care is: Evidenced based, Efficient, Responsive, Accessible, Equal, Safe. Work started in 2006 to develop national performance indicators for open comparisons in health care. The project is a joint project between The National Board of Health and Welfare, The Swedish Association of Local Authorities and Regions and the County Councils.

Data: Data have been collected from a number of databases, for example The National Health Data Registers, National Quality Registers, The National Waiting Time database and The Patient Satisfaction database.

Methods: The counties are compared from four different perspectives; 1) Quality of Care 2) Patient Satisfaction 3) Access 4) Costs and Productivity. A working group has developed the indicators and the final indicator set is then decided by a steering group. All indicators have also been discussed with the counties before being published.

Results: In year 2006 a first indicator set was published embracing 57 performance indicators from four different perspectives of quality and efficiency in health care. The comparisons were open and presented on county level. The majority of the indicators reflected quality from a clinical perspective, for example disease based mortality rates or measures for patient safety. The indicator set also reflects measures for access, patient satisfaction and for health care costs and productivity.

Discussion: The work received a great interest from the county councils but also from the public and the press. A new report will be published in October 2007.

Areas of discussion: For the year of 2007 we expect to have about 70 national performance indicators in the national indicator set. Examples from the comparisons will be presented and discussed in the full paper. The results from last year suggested that there is no obvious connection between costs and quality therefore all counties have an opportunity to improve efficiency in health care. There are also quite big differences between the counties in the results for some indicators. We will discuss these issues in the light of the findings in new results for year 2007. There will also be a discussion about quality in data and a report on the efforts that have been made to obtain better data quality in health care.

A11

Maximizing the explanation of cost and LOS variation while minimizing the effects of coding

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BMC Health Services Research 2007, 7(Suppl 1):A11

Introduction: In the spring of 2007, the Canadian Institute for Health Information (CIHI) introduced CMG+ (Case Mix Groups+), Canada's acute inpatient hospital grouping methodology. CMG+ uses administrative and clinical data to group patients into clinically relevant and resource-homogeneous groups. CMG+ identifies 21 major clinical categories (MCC), similar to Major Diagnostic Categories (MDC), and 558 CMG (analogous to DRG). CMG+ is an ICD-10-CA and CCI-native grouping methodology that replaces the ICD-9 and CCP based CMG/Plx methodology. (CCI is the Canadian Classification of Health Interventions.)

The impetus for developing a new acute care grouping methodology was two-fold: 1. To maximize the benefits associated with the clinical specificity provided in the updated classification systems ICD-10-CA and CCI. 2. To address the concerns related to coding variation that was observed in the previous CMG/Plx methodology. The complexity (Plx) component of the methodology, introduced in 1997, relied almost solely on comorbid conditions.

Methods: Data mining demonstrated that during the five year period between 1997 and 2001 there was a noticeable increase

in the number of comorbid conditions coded in Canadian hospitals. Some portion of this change can be attributed to changing mix of patients and more complete coding; however, much of the increase occurred as a result of unclear rules for capturing comorbid conditions and inconsistent application of coding standards. Due to these inconsistencies, case mix comparisons across hospitals and jurisdictions became increasingly more difficult.

Results: One of the goals in the development of the new CMG+ methodology was to minimize the reliance on comorbid conditions and thus to some extent, minimize the effect of inconsistent diagnosis coding. To do so, CIHI introduced a factor methodology based heavily on interventions, in an attempt to refine the grouping methodology and maximize the explanation of cost and length of stay variation. A methodology based heavily on interventions is less susceptible to coding variation since there is less need for interpretation by the coder and interventions are more easily audited: an intervention either took place or it did not and it was either documented or it was not. As well, although the use of comorbid conditions was not eliminated, the number of conditions considered in the methodology was drastically reduced.

Discussion: The paper will highlight the rigorous approach used to identify comorbid conditions that remain as a part of the CMG+ grouping methodology. Details will be provided on the process of establishing minimum cost impacts for the presence of each comorbid condition and establishing minimum data quality results based on a large scale reabstraction study. Additionally, the paper will demonstrate through an R-Square analysis the significant effect of the three intervention-based factors: Flagged Interventions, Intervention Event and Out of Hospital Intervention factor. The new CMG+ methodology with the intervention-based factors will be compared to the previous CMG/Plx methodology to demonstrate a marked improvement in ability to account for cost and LOS variation.

A12

P4P in Australia

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Introduction: Following a high profile scandal relating to quality and safety of care, the health authority in the Australian state of Queensland is introducing a pay for payment (P4P) component into its new hospital prospective payment system.

Discussion: P4P will include both pay for reporting to collect additional clinical data and payment for adherence to key clinical process makers. This paper describes the model used to choose conditions amenable to use in a P4P system, together with detail of the indicators used for payment.

A13

Patient based patterns of morbidity, a 17 year follow-up on patient records in primary care in Sweden

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Background: Longitudinal studies on clinical categories of patients in primary health care are rare, as are studies of the individual co-morbidity. In Sweden diagnoses have been recorded and stored in electronic patient records for a long time but so far have not been used for follow-up on categories of patients.

Aim: The aim of this paper was to test the feasibility of retrieving diagnosis data from a long period of time and to elucidate the patterns of clinical categories of patients over time by applying the Adjusted Clinical Groups[®] case-mix system to encounter data from primary health care units in one limited geographic area.

Methods: Longitudinal data from 17 years were retrieved from the primary health care centre in Gagnef in Dalarna county council in Sweden. The Swedish primary health care version of the diagnosis codes were mapped to the full version of the ICD-10 classification. The 7.1 version of the Adjusted Clinical Groups software was utilised.

Results: It was feasible to elucidate the longitudinal pattern of morbidity during all 17 years. The categories of patients according to the case-mix system showed great stability over time. On the diagnosis level some distinct shifts over time were found.

Conclusion: Diagnoses from electronic patient records in primary health care during seventeen years could be used to elucidate the morbidity pattern among people in a defined geographic area. From a patient perspective the case-mix system used showed great stability over time in terms of categories of patients with similar morbidity pattern. From the diagnosis perspective a slow shift in some types of diagnoses could be seen. The need for rules of coding and registering diagnoses in primary health care has to be emphasized.

A14

Does the Patient Clinical Complexity Level (PCCL) reflect nursing acuity?

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Background: Approximately 30% of inpatient costs relate to nursing care. Many hospitals are relinquishing their use of patient dependency systems following the introduction of ratio based nursing awards and the omission of this functionality from replacement computer systems architecture. Ratcliffe* has proposed a PCCL adjusted bed day and activity model for the allocation of nursing costs. (*Ratcliffe, Kevin; Clinical Costing of Nursing Activity – Benchmarking Project.)

Aims: To examine the relationship between Patient Clinical Complexity Level (PCCL) and nursing activity/cost as measured by patient dependency scores, and therefore ascertain the suitability of the PCCL as a patient dependency surrogate.

Method: Patient dependency, length of stay, transfer, and nursing cost data were extracted from the Royal Women's Hospital patient costing system, and nursing costs allocated to patients according to their individual patient dependency scores. Costs relating to 6 Patient Care Areas [PCAs] (3 general wards, ICU, surgical, & oncology wards) wholly costed by the existing patient dependency data were examined. Investigation into the relationship between PCCL scores, length of stay, and acuity was undertaken by plotting case frequency by LOS and PCCL, and by depicting total and daily cost variability by PCCL using box plot techniques. Variability of average daily cost by PCCL across DRGs was illustrated in graphical form.

Data: In 2005/6, the Royal Women's Hospital treated 32,673 patients. 18,169 cases were subsequently identified as being treated within the 6 patient care areas under investigation (representing 21,015 case/PCA splits) and were further trimmed to 18,127 cases (total cost < \$100,000, daily cost < \$2,500). Nursing costs for these areas totalled \$29.1 M and were allocated across 895 service codes (allocation types) representing approximately 464,000 allocation items.

Results: Analysis of total cost by PCCL across the targeted costed population base revealed a correlation of $r^2 = 0.1157$ and the PCCL/Length of Stay relationship showed a similar correlation of $r^2 = 0.1206$. The daily cost/PCCL relationship was insignificant at $r^2 = 0.0223$, though correlation of the median daily cost was significant at $r^2 = 0.9117$. Results of further analysis of daily costs by PCCL within each Patient Care Area were inconsistent.

To eliminate the potential confounding influence of relatively fixed high nurse/patient ratios within the ICU area and the uncertain clinical relevance of unqualified newborns¹, these cases were excluded to produce a new costed population comprising 12,689 acute cases. The revised total cost/PCCL correlation improved to $r^2 = 0.1525$ and the PCCL/Length of Stay relationship increased further to $r^2 = 0.1638$. However, the daily cost/PCCL correlation remained insignificant at $r^2 = 0.0079$ while the median cost relationship deteriorated to $r^2 = 0.3856$ in a negative direction.

Conclusion: These results suggest that length of stay rather than nursing intensity increases with PCCL. Furthermore, the inconsistency of the PCCL cost relationship across DRGs does not support the use of the PCCL as a global measure of nursing acuity.

A15

Case mix adjusting short stay inpatient mental health episodes

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Introduction: Inpatient mental health represents a significant component of hospital activity, with costs exceeding C\$194 million (\$180 million US\$). The Province of Ontario has recently implemented a minimum data set reporting for hospital activity occurring in adult inpatient mental health beds. The mental health dataset is based on clinical conditions and mental health (mental function, ability to develop and maintain relationships and adapt to change). A case mix classification system for inpatient mental health activity is currently being evaluated. Evaluation of the case mix classification system has revealed that a significant portion of inpatient mental health hospital admissions are short stay (0–3 days length of stay, or LOS), whereby insufficient clinical data is collected regarding clinical conditions and mental health to case mix adjust patient stays. We propose a methodology to case mix adjust inpatient mental health short stay admissions and validate using available information.

Data: The Ontario Ministry of Health and Long-Term Care (MOHLTC) mandated the collection of the Resident Assessment Instrument – Mental Health (RAI-MH) for all activity occurring in inpatient mental health beds in the Province of Ontario (12 million residents) in 2005. Since implementation, there have been 105,001 patient assessments. Of these, 14,976 assessments (14.3%) are short stay admissions, representing 25% of episodes. For those mental health patients admitted from the Emergency Department (ED), 66.6% of patients have an electronic discharge summary containing summary diagnostic information, triage level and ED case mix classification (and cost weights). In addition, for a subsample of ED records, daily cost records from the Ontario Case Cost Initiative (OOCI) are available to validate ambulatory-based cost weights.

Methods: Using data from the ED discharge summary and ambulatory case mix classification results, per diem costs (and cost weights) are estimated for inpatient mental health short stay admissions. The results are validated by comparing estimated costs to daily ED costs from the OOCI. Performance of cost weights is evaluated by computing the mean square errors of estimated costs.

Results and conclusion: Inpatient mental health is an important component of hospital activity and existing DRG-based classification systems have proven to be inadequate descriptors of patient cost. The current inpatient mental health case mix classification system cannot classify, and weight, short stay episodes. The methods proposed in this abstract estimate, and validate, per diem cost weights for short stay mental health patients. The results of this analysis are intended to complement the classification system being considered for widespread implementation for case mix adjusting mental health activity in the Province of Ontario.