β = \beta (XW'X)^{-1}XWy

y = Xβ + ε

y = Xβ + ε

Q_1 + 1.5 x (Q_2 - Q_1)

Each patient counts

Program and Abstracts

27th PCSI Conference
October 19 to 22, 2011
Montréal, Quebec, Canada

Sponsored by
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Scientific Committee

Jason Sutherland (Canada)
Poul Erik Hansen (Denmark)
Dana Burdja (Romania)
Virginia Jordan (United Kingdom)
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Organization

Patient Classification Systems International
SSPIM-Bâtiment CIM 42
CHU de St Etienne
Chemin de la Marandière
42055 Saint Etienne Cedex 2
France
www.pcsinternational.org
Dear Colleagues:

On behalf of the local organizing committee, we would like to welcome you to Montréal, Quebec, Canada, for the 27th annual Patient Classification Systems International (PCSI) Conference. This is the first time the PCSI Conference will be held in Canada, and we are excited to be hosting all of you in beautiful Montréal.

Montréal is the perfect location for this year’s conference, as the merging of historic Old Montréal with the modern downtown metropolis is a perfect symbol of the theme and topics that will be discussed. Under the banner Each Patient Counts, the scientific committee has developed a stimulating program that combines topics that have had long-standing importance to policy-makers, funding initiatives and health system planners with leading-edge discussions about emerging case-mix systems across the continuum of care. Additionally, we offer you the opportunity to do some in-depth learning about a wide array of topics through our pre-conference workshops. This year, an unprecedented number of workshops are being offered, and one or more will surely appeal to you.

Of course, we must also remember to balance work with play. Be sure to take some time to explore Montréal’s underground city, the exceptional shopping and fabulous restaurants. On the night of October 21, the local organizing committee has arranged a gala dinner and entertainment to remember. Plan to be there, as you will not want to miss this event.

Finally, we would like to acknowledge the entire local organizing committee, the PCSI scientific committee and the PCSI executive committee for their support and dedication to this conference. Their behind-the-scenes work made this event possible.

Come early for the workshops and stay late to play, network with old friends and make new ones. Together we’ll make the 27th PCSI conference a truly remarkable experience.

Darren Gerson, Manager, Case Mix, CIHI
Chair, PCSI 2011 Conference Local Organizing Committee

Poul Eric Hansen, President, PCSI
General Information

Venue

The 27th annual Patient Classification Systems International (PCSI) Conference: Each Patient Counts is being held at Le Westin Montréal in Montréal, Quebec, located at 270 St. Antoine Ouest. All meetings will take place at the hotel.

Registration and Information Desk

The registration desk is located on the 9th floor of Le Westin Montréal in the foyer area. The desk will be open at the following times:

- Wednesday, October 19: 7:30 a.m.–4 p.m.
- Thursday, October 20: 7:30 a.m.–4 p.m.
- Friday, October 21: 8 a.m.–4 p.m.
- Saturday, October 22: 8:30 a.m.–2 p.m.

Event Website

Complete conference information is available on the PCSI event website (www.cihiconferences.ca/PCSI2011).

Language

All conference presentations are in English, unless otherwise identified by this symbol 🎧. Simultaneous interpretation will be available at all sessions denoted with 🎧.

Certificate of Attendance

A certificate of attendance will be distributed with the conference documentation upon registration.

Name Badges

Each delegate will be given a name badge at the registration desk. Delegates are kindly requested to wear their badges visibly throughout the conference for identification purposes and admission to the various functions.

Speakers’ Room

A speakers’ room has been reserved on the 9th floor of Le Westin Montréal. The speakers’ room is equipped with computers and internet service. It is recommended that speakers arrive approximately two hours prior to their sessions to check their presentation and/or update it if necessary. Technical support will be available.
Internet
Complimentary internet is available in meeting rooms and public areas of the hotel.

Breakfast
Breakfast on Thursday, October 20 is sponsored by the British Columbia Health Services Purchasing Organization (BCHSPO).

Lunches
Lunches on Thursday, Friday and Saturday of the conference are included in the conference registration fee and will be held on the 11th floor in Montréal Ballroom.

Morning coffee will be held at the following times:

Thursday, October 20: 7:30 a.m.–8:30 a.m.
Friday, October 21: 8 a.m.–9 a.m.
Saturday, October 22: 8:30 a.m.–9 a.m.

Lunches will be held at the following times:

Thursday, October 20: 12 noon–1 p.m.
Friday, October 21: 12:30 p.m.–1:30 p.m.
Saturday, October 22: 1 p.m.–2 p.m.

Coffee Breaks
Breaks have been scheduled throughout the event to allow delegates to network and view the exhibits and poster sessions. They will be held in Montreal Ballroom, 11th floor.

Welcome Reception
Please join us for refreshments and the opportunity to network with colleagues on Wednesday, October 19, starting at 4:30 p.m. in Montréal Ballroom.

Gala Dinner
Join us for a truly memorable evening with Cirque Éloize.

Positioned at the heart of the renewal of circus arts, Cirque Éloize has been creating moving performances filled with magic since 1993.

Based on the multidisciplinary talents of its artists, Cirque Éloize expresses its innovative nature through theatricality and humanity, and combines circus arts with music, dance and theatre in a path-breaking and original manner. With seven original productions to its credit, Cirque Éloize has presented more than 4,000 performances in 395 cities and 31 countries located around the world.
In addition to its tour performances, Cirque Éloize develops personalized concepts for international special events. To date, more than 1,250 events have taken place.

Since 2004, Cirque Éloize’s head office and creative studio are located in the Gare Dalhousie, a historical building. The Dalhousie train station, a former Canadian Pacific (CP) station marks the northeastern edge of Old Montréal and illustrates its long-standing role as one of the city’s railway hubs. In 1886, the first trans-Canada train pulled out of the new Dalhousie Station for Vancouver. From 1986 to 2003, this building housed the National School for Circus Arts of Montreal.

Location:
Cirque Eloize, 417 rue Berri
(Located in the heart of Old Montréal, within walking distance from the hotel)
Reception starting at 7:30 p.m.
Dinner at 8:30 p.m.

Poster Presentations
Posters are located on the 11th floor in the Montréal C and D room. They will be available for viewing from Wednesday, October 19, to Saturday, October 22.

Best Poster Award
The best poster award will be presented during the poster session on Thursday, October 20.

Exhibits
Exhibits are located on the 11th floor. Representatives from the following organizations will be available:
Your Hosts

Patient Classification Systems International (PCSI)

Patient Classification Systems Europe (PCSE) was founded in 1987 in Lisbon. The organization created a network of researchers and users of the casemix concept from health administration, government agencies and academia. From an initial focus on diagnosis-related groups (DRGs), the organization's goals have expanded to include a broader interest in clustering and grouping techniques of clinical and administrative data for health care management and financing. As such, PCSE stimulated the use and refinement of the science of grouping patients within different levels of the health system.

Expansion of the organization throughout the world brought a name change to Patient Classification Systems International (PCSI). It is the only worldwide organization addressing case-mix issues. In the last few years, the annual international conference has brought together a growing number of active participants from all over the world. Originally a group of six idealists from Western Europe and the United States, the organization has now grown to hundreds of members from five continents. The organization hosts one annual conference and offers educational opportunities through its summer and winter school programs.

Canadian Institute for Health Information (CIHI)

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians.

Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.
Sponsors

The 27th annual Patient Classification Systems International (PCSI) Conference would like to express sincere appreciation to the following organizations for their support:

Exhibitor and Friend of the Conference

Established in 1995, PowerHealth Solutions (PHS) has been a leading and innovative player in the health care industry, specializing in business management, decision support and application integration solutions for hospitals and other health care enterprises. Operating solely in the health care industry, and with a wealth of experience and leading-edge technology, PHS has consistently demonstrated its ability to successfully implement its products in any setting.

At PHS, our mission is to help our clients deliver the highest-quality care at the lowest operational costs. We specialize in billing, costing and reporting solutions, with the purpose of improving health care efficiency. Our two principal products are PowerBilling and Revenue Collection (an enterprise-wide tier 1 patient billing solution that is designed to fill the health-industry gaps evident in most generic ERP and financial systems) and PowerPerformance Management (a true patient- and service-level patient costing and revenue management system). Our products deliver a positive return on investment, regardless of organization size.

In addition, PHS is a dynamic and growing organization with a mature customer base in Australia and New Zealand, steady growth in the United States and England, and a successful entrance to Ireland, Hong Kong and the Middle East.

Finally, PHS is ISO 9001:2000 certified (Certification Number QEC14045), with quality-assured systems and processes. Through annual external audits, PHS consistently receives commendations on our excellent levels of process management, especially in systems development, delivery and support.
Delegate Bags, Name Badges and Welcome Reception Sponsor

MedAssets works with health care providers and health plans to achieve sustainable financial and operational performance improvement. The company’s mission is to partner with hospitals and health systems to enhance their financial strength through improved operating margins.

To achieve that mission, the company focuses on enabling its customers to deliver high-quality, affordable health care through a comprehensive suite of evidence-based best practice technologies and services designed to optimize revenues, secure reimbursement, reduce waste and manage total cost of care.

MedAssets understands that managing costs goes hand in hand with changing human behaviours and understands provider processes and work flows for both revenue cycle and supply chain management. MedAssets’ customers reflect health care providers of all sizes, including integrated delivery networks and health systems, physician offices, as well as alternate care providers. MedAssets Solutions are delivered and supported through a best-practice operations framework, specialized clinical consulting expertise, shared procurement services, e-commerce, advanced spend analytics and transformational or outsourced services.

MedAssets Spend and Clinical Resource Management Solutions provide a comprehensive suite of offerings that reduce the overall cost of patient care by lowering supply chain expenses, managing the utilization of spend and clinical resources, and integrating episode-of-care analytics.

MedAssets Decision Support Solutions integrates financial, clinical and utilization information for enterprise-wide analysis and decision-making to improve day-to-day operations and operational effectiveness and positively impact future performance. In addition, MedAssets’ solution for Decision Support and Performance Analytics provides an integrated suite of web-based tools to efficiently manage costs, third-party payer contracts and revenues as well as evaluate payer performance across service lines and manage profitability for sustained growth.

MedAssets serves more than 180 health systems, 4,000 hospitals and 90,000 non-acute health care providers, including a case-costing solution for the Ontario Ministry of Health and Long-Term Care and 48 facilities in Ontario. Visit www.medassets.com.
The British Columbia Health Services Purchasing Organization (BCHSPO) was incorporated under the Society Act in January 2010. The BCHSPO was registered to oversee the implementation of patient-focused funding. Under a patient-focused funding approach, hospitals receive financial incentives for delivering acute-care services for a competitive, set price primarily based upon Resource Intensity Weights.

Conference Supporter

Jacob Hofdijk

CASEMIX

www.casemix.nl
**Program**

**Wednesday, October 19, 2011**

7:30 a.m.–4 p.m. **Registration**

9 a.m.–12 noon **Pre-Conference Workshops**

<table>
<thead>
<tr>
<th>Location</th>
<th>Workshop A</th>
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</thead>
<tbody>
<tr>
<td>Ville-Marie A</td>
<td>How to Harmonise Classifications of Procedures for Case Mix Applications? From the Present Situation to the ICHI (International Classification of Health Intervention) Initiative</td>
</tr>
<tr>
<td>Meeting Room</td>
<td>Facilitator: Jean Marie Rodrigues, University of Saint Etienne, CHU,</td>
</tr>
<tr>
<td>9th Floor</td>
<td>Department of Public Health and Medical Informatics, Saint Etienne, France; WHO Collaborating Centre for International Classifications in French Language, Paris, France</td>
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</tbody>
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<table>
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<tr>
<th>Location</th>
<th>Workshop B</th>
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</thead>
<tbody>
<tr>
<td>St-Antoine A</td>
<td>Profiling Devices, Drugs, Implants as a Additional Profile of Casemix Tools Using GS1</td>
</tr>
<tr>
<td>Meeting Room</td>
<td>Facilitators: Jacob Hofdijk (Casemix, the Netherlands), Ulrike Kreysa (GS1) and representatives of Covidien, Meditech and BISLIFE</td>
</tr>
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<td>9th Floor</td>
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<thead>
<tr>
<th>Location</th>
<th>Workshop C—starts at 10 a.m.</th>
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<tbody>
<tr>
<td>St-Antoine B</td>
<td>Costing Patient Care Services—An Introduction Using Worked Examples</td>
</tr>
<tr>
<td>Meeting Room</td>
<td>Facilitator: Nigel Michell, Director, PowerHealth Solutions Ltd.</td>
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<tr>
<th>Location</th>
<th>Workshop D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ville-Marie B</td>
<td>From Case Mix to Clinical Care</td>
</tr>
<tr>
<td>Meeting Room</td>
<td>Facilitator: Dr. Michael Wilke</td>
</tr>
<tr>
<td>9th Floor</td>
<td></td>
</tr>
</tbody>
</table>
1–4 p.m. **Pre-Conference Workshops**

<table>
<thead>
<tr>
<th>Location</th>
<th>Workshop Title</th>
</tr>
</thead>
</table>
| Ville-Marie A     | Workshop E  
Applying Predictive Modelling to Improve the Delivery of Health Care  
**Facilitators:** Dr. Karen Kinder, Steve Sutch and Chad Abrams, The Johns  
Hopkins University |
| Ville-Marie B     | Workshop F  
Case-Mix Systems for Non-Acute Populations Across the Continuum of  
Care: The interRAI Experience  
**Facilitators:** John P. Hirdes, PhD, Professor, School of Public Health and  
Health Systems, University of Waterloo; and Brant E. Fries, PhD, Professor  
of Health Management and Policy, School of Public Health, and Research  
Professor, Institute of Gerontology, School of Medicine, University of  
Michigan; and Chief, Health Systems Research, VA Ann Arbor Healthcare  
System GRECC |
| St-Antoine A      | Workshop G  
Continuity of Care/Contsys  
**Facilitators:** Jacob Hofdijk, Michael Rigby, Contsys Project team and  
Caroline Hyden |
| St-Antoine B      | Workshop C (cont’d)  
Costing Patient Care Services—An Introduction Using Worked Examples  
**Facilitator:** Nigel Michell, Director, PowerHealth Solutions Ltd. |
| Palais            | Workshop H  
Developing an Activity Based Funding (ABF) Model for Non-Admitted  
Patient Services  
**Facilitators:** Joe Scuteri and Lisa Fodero, HealthConsult Pty Ltd., Australia;  
Heather Richards, Canadian Institute for Health Information |

4:30–5:30 p.m. **Welcome Reception**

Montréal Ballroom (11th Floor)
Thursday, October 20, 2011

7:30 a.m.–4 p.m. **Registration**

7:30–8:30 a.m. **Coffee, Posters and Exhibit Viewing**
Montréal Ballroom (11th Floor)

8:30–9 a.m. **Welcome and Opening Remarks**
Fortifications Ballroom (9th Floor)

**Moderator**

Dr. Jason Sutherland

**Speakers**

**Mr. John Wright**
President and CEO, Canadian Institute for Health Information (CIHI)

John Wright joined the Canadian Institute for Health Information (CIHI) as President and CEO on January 1, 2010.

Mr. Wright has more than 30 years of public-sector experience, including as deputy minister of Health and deputy minister of Finance for the Government of Saskatchewan. He also served as president and CEO of several crown agencies in that province, including SaskPower, Crown Investments Corporation and Saskatchewan Government Insurance. Before joining CIHI, he was a lecturer in economics at the University of Regina.

Mr. Wright has served on the boards of governors for the University of Regina and the University of Saskatchewan. He holds a master's degree in economics from the University of Alberta and an honours bachelor of economics from the University of Western Ontario.
Denis Lalumière
Sous-ministre adjoint, planification, performance et qualité, ministère de la Santé et des Services sociaux du Québec

Denis Lalumière is the Assistant Deputy Minister, Strategic Planning, Evaluation and Quality at the ministère de la Santé et des Services sociaux du Québec (MSSS). He has been with the ministry since June 2008. Prior to joining the ministry, Mr. Lalumière was an associate professor at the Université de Sherbrooke. He has experience in community services and long-term care, having worked as the chief executive officer at the Centre de santé et de services sociaux – Institut universitaire de gériatrie de Sherbrooke, the Centre local de services communautaires de Sherbrooke and the Centre local de services communautaires Gaston-Lessard. Mr. Lalumière has a master’s in psychology and an MBA.

Poul Erik Hansen
President, Patient Classification Systems International (PCSI)

Poul Erik Hansen has an extensive history in health economics and the use of data for decision-making at the central ministry level as well as at hospitals, regions and municipalities. He also has experience in construction and use of case-mix systems that can be used for description of the production at hospitals. He has been in charge of health evaluations and the development and implementation of the Danish DRG system from the very beginning in the mid-1990s. The system started as an information system in the 1990s, but was used as a payment tool for the first time in 2000 in the payment of the treatment of patients outside the home country. From 2004 the system is used as a general financing tool in an activity-based system, and in 2007 it will be the central instrument in a financing reform of the health care sector.

Keynote Speaker

Dr. Robert G. Evans
Professor, Department of Economics, University of British Columbia

If You Can’t Measure It, You Can’t Manage It—Are Patient Classification Systems Essential to the Survival of Public Health Insurance?

Expenditures on health care in Canada, as in most high-income countries have been rising rapidly over the last decade. These increases have fed fallacious claims, some ignorant, some malicious, that an aging population will inevitably make universal public health insurance is “unsustainable”. But while “apocalyptic demography” is a fraud, the cost pressures are real. They have led to a number of efforts, present or proposed, to try to mitigate them by changing the terms on which providers of care are funded.
In particular, many governments are exploring greater use of payment by procedure or case to encourage and reward greater efficiency. The Achilles Heel of all such proposals is the difficulty of establishing reliable measures of the cost of particular units of health care system outputs in different settings. The perverse incentives created by divergences between reimbursement rates and actual costs of production are well understood. But “getting the prices right” is a very tough nut to crack. Yet without better information on the reasonable costs of the services our health care systems are buying, continuing “mediflation” may put those systems at risk. The consequences could be dire, as the experience of the United States has demonstrated.

A founding member of the Centre for Health Services and Policy Research (CHSPR) at UBC, Robert G. Evans is a lifelong leader in academia and an internationally esteemed health economist. His groundbreaking comparative studies of health care systems and funding strategies have shaped policy in Canada and provided insight to governments and health agencies worldwide. A decorated academic, Professor Evans is the recipient of Canada’s highest honour for lifetime achievement as an Officer of the Order of Canada. He also served as a member of the British Columbia Royal Commission on Health Care and Costs in 1990, and of the National Forum on Health, chaired by the prime minister of Canada, from 1994 to 1997. His canonical works, “Strained Mercy: The Economics of Canadian Health Care” and “Why Are Some People Healthy and Others Not? The Determinants of Health of Populations,” are considered classics in the field.

In addition to serving as an Officer of the Order of Canada, he is a Fellow of the Royal Society of Canada and an Institute Fellow of the Canadian Institute for Advanced Research, where he was director of the Population Health Program from 1987 to 1997. He is also an honorary life member of the Canadian College of Health Service Executives and of the Canadian Health Economics Research Association, and he is a member of the National Academy of Social Insurance (U.S.). In 2001, he became the first Canadian (and the second non-American) to win the Baxter International Foundation Prize for Health Services Research.

As a University Killam Professor at UBC, Dr. Evans is a prolific author and an active professor, researcher and consultant with the UBC Centre for Health Services and Policy Research and the Department of Economics.

Dr. Evans received his undergraduate degree in political economy from the University of Toronto and a PhD in Economics from Harvard University.
10–10:30 a.m. **Posters, Exhibit Viewing and Coffee Break**
Montréal Ballroom (11th Floor)

10:30 a.m.–12 noon **Concurrent Sessions 1**

| Ville-Marie A Meeting Room 9th Floor | 1A: Morbidity Burden and Case Mix  
Moderator: Brian Ruff  
Profiling High Morbidity Burden in Primary Care: Calibration of a Case-Mix Model, Ran Balicer  
Measuring the Case-Mix of Physician Practices in Primary Care Reform Models in Ontario, Canada, Lyn Sibley  
Analysing the Emergence of Complex Morbidities. A 30 Years’ Follow-Up on a Defined Population in Sweden, Lennart Carlsson |
| Ville-Marie B Meeting Room 9th Floor | 1B: Health System Planning and Funding  
Moderator: Jason Sutherland  
Understanding the Episode of Care for Transplant Patients, Irene Blais  
Planning for ABF as Part of Reforming the Australian Health Care System, Lisa Fodero  
Case Mix Funding in Ireland: From Retrospective to Prospective? Progress Since 2010, Brian Donovan  
Planning for the Future in Switzerland: Adapting the Facilities to the Demand of the Patient, Jean-Claude Rey |
| St-Antoine A Meeting Room 9th Floor | 1C: International Experiences With Case Mix  
Moderator: Paula Monteith  
Romania: Experience and New Steps in the International Patient Classification System Context, Nona Chiriac  
Initial Results and Experiences From the World Bank–Financed DRG Pilot Project in the Republic of Moldova, Mircea Buga  
Feasibility of Implementing Casemix System to Support APEX Programme of HUSM in Malaysia Using UNU-CBG Casemix Grouper, Rosminah Mohamed  
Analysis of the FONDO NACIONAL DE RECURSOS Reimbursement in Uruguay Using UNU-CBG Casemix System, Zafar Ahmed |

12 noon–1 p.m. **Posters, Exhibit Viewing and Lunch**
Montréal Ballroom (11th Floor)

1–2 p.m. **Plenary 2**
Fortifications Ballroom (9th Floor)
Designing Case Mix Systems for Non-Acute Care: The interRAI Experience

Moderator

Darren Gerson

This presentation will examine methodological, conceptual and policy issues related to the development of case mix systems and associated payment systems for non-acute health care settings. It will feature international research by interRAI, a 32-country collaborative network, on case mix systems for nursing homes, home care and mental health settings.

Speakers

John P. Hirdes, PhD,
Professor and Ontario Home Care Research and Knowledge Exchange Chair, School of Public Health and Health Systems, University of Waterloo

John P. Hirdes is the senior Canadian Fellow and a board member of interRAI (www.interrai.org), an international consortium of researchers from 32 countries. He chairs interRAI’s international Network of Excellence in Mental Health and the interRAI Network of Canada, a collaborative network of researchers and graduate students from across Canada. Dr. Hirdes has more than 130 publications in peer-reviewed journals and academic book chapters. His primary areas of interest include geriatric assessment, mental health, health care and service delivery, case-mix systems, quality, health information management, social determinants of health and quantitative research methods.

Brant E. Fries
Professor of Health Management and Policy, School of Public Health, and Research Professor, Institute of Gerontology, School of Medicine, University of Michigan; and Chief, Health Systems Research, VA Ann Arbor Healthcare System GRECC

Brant E. Fries is the President of interRAI, Professor of Health Management and Policy, and Research Professor at the University of Michigan, Ann Arbor, Michigan, U.S., and Chief of Health Systems Research for the Geriatric Research, Education, and Clinical Center at the Ann Arbor VA Healthcare System.

Dr. Fries is a principal author of the Resource Utilization Groups (RUG-III and most recently RUG-IV) systems for classifying nursing home residents, used in a third of U.S. states and nationally for payment to nursing homes. He helped design New York’s and Pennsylvania’s Medicaid nursing home payment systems, incorporating RUGs. As well, he co-authored the National Nursing Home Resident Assessment Instrument (RAI) mandated by Congress. With international interest in assessment systems, he founded and is president of interRAI, an international research collaborative with more than 60 members from 31 nations. He is co-author most interRAI assessment
systems, including the RAI-HC, RAI-MH, RAI-PC and the new suite of systems covering most health and mental health sectors. Dr. Fries currently leads projects to help design allocation systems for home care and to determine eligibility criteria for community mental health, and he has recently completed an assessment of the mental health needs of Michigan prisoners. He is the author of 19 books and more than 130 articles on long-term care and quantitative modelling of health care systems.

2–2:30 p.m. **Posters, Exhibit Viewing and Coffee Break**

Montréal Ballroom (11th Floor)

2:30–4 p.m. **Concurrent Sessions 2**

| Ville-Marie A Meeting Room 9th Floor | 2A: Economic Incentives and Case Mix
Moderator: Dana Burduja
Determining a Threshold Hospital Size for Application of Activity-Based Funding, Joe Scuteri
Issues in Use of CMG+ for Activity-Based Funding in Canada, Stephen Duckett
Explaining Variations in the Cost of Patient Care: A Multilevel Analysis Using Canadian Hospital Data, Recep Gezer
Can Teaching Hospitals Benefit From Casemix System? Outcome of Using DEA to Evaluate Efficiency of Teaching Hospitals in Malaysia, Syed Aljunid |
| --- |
| Ville-Marie B Meeting Room 9th Floor | 2B: Classification and Case Mix Incentives
Moderator: Jiro Okochi
Assessment of the Main International and National Classifications or Terminological Systems of Surgical Procedures Using the CEN/ISO 1828 Standard, Jean Marie Rodrigues
Hospital Behaviour in Response to DRG-Based Compensation Funding Scheme, Michael Galsworthy
The Modern Concept of Sepsis and Its Impact on DRG, Olafr Steinum
Upcoding and Miscoding in Slovenian Hospitals, Katja Grasic |
| St-Antoine A Meeting Room 9th Floor | 2C: Ambulatory Care and Case Mix I
Moderator: Kristiina Kahur
A Process for Counting and Costing Ambulatory Care, Luke van Doorn
Redeveloped CACS Ambulatory Care Grouper: RIW Estimation and Evaluation, Joseph Amuah
Applying Diagnosis and Pharmacy-Based Risk Models to Predict Pharmacy Use in Aragon, Spain: The Impact of Local Calibration. Presentation of Paper BMC Health Services Research 2010, Chad Abrams
Case-Mix Readjusted Analysis of PPR in Patients Admitted in Geriatric One-Day Clinic, Peter Heirman |

4–5 p.m. **Poster Session**

• Best Poster Award

Montréal Ballroom (11th Floor)
If they are to form the basis for hospital reimbursement, DRGs need to reflect accurately the resources used in treating a group of similar patients. But ever more countries are developing their own variant of DRGs. Is this because each country’s patients or patterns of treatment are truly distinct or are some DRG systems better than others? In the EuroDRG project we analyse patient-level data from 11 European countries and for 10 episodes of care to understand why resource use (costs or length of stay) varies for patients who are receiving the same treatment. We specify multi-level econometric models that recognise the clustering of patients in hospitals and examine how much of the variation in resource use is captured by: the DRG to which the patient is allocated; their socio-demographic characteristics; diagnostic characteristics and co-morbidities; quality and adverse events; and the hospital in which they are treated. The analysis yields insights into: the important features of different DRG systems; the characteristics of patients that drive variation in resource use; and the relative efficiency of individual hospitals.

**Moderator**

Ceu Mateus

**Speaker**

Andrew Street

Professor of Health Economics and Director, Health Policy Team, Centre for Health Economics; Director, Economics of Social and Health Care Research Unit (ESHCRU), National Institute for Health Research

Andrew Street is a Professor of Health Economics and Director of the Health Policy team in the Centre for Health Economics and Director of Economics of Social and Health Care Research Unit (ESHCRU), a joint collaboration with the Personal Social Services Research Unit (PSSRU) at the London School of Economics and the University of Kent. He is an editor of the *Journal of Health Economics*, and he currently serves as a committee member for the Department of Health’s analytical sub-group for payment by results and as a board member of the NIHR Health Services Research program.
Dr. Street’s research covers measurement of health system productivity, evaluation of activity-based funding mechanisms, analysis of organizational efficiency and critical appraisal of health policy. He is currently working on the EuroDRG project, which is funded under the 7th EU Framework program.

He has an MSc in health economics (1990), an MA in public administration and public policy (2000) and a PhD in economics (2002), all awarded by the University of York. After completing his MSc, Dr. Street spent three years in Australia working at the National Centre for Health Program Evaluation, Monash University, and the Victorian Department of Health and Community Services. This was followed by a five-year spell with the York Health Economics Consortium. He joined the Centre for Health Economics in April 1999. From 1999 to 2003, he held a special training fellowship awarded by the Medical Research Council and Northern and Yorkshire Region. In 2005, he worked part time in the Delivery Analytical Team in the English Department of Health.

10–10:30 a.m. PCSI General Assembly Part I: Introduction of Candidates for Election
Fortifications Ballroom (9th Floor)

10:30–11 a.m. Posters, Exhibit Viewing and Coffee Break
Montréal Ballroom (11th Floor)

11 a.m.–12:30 p.m. Concurrent Sessions 3

| Ville-Marie A Meeting Room 9th Floor | 3A: Care Quality and Case Mix  
Moderator: Jiro Okochi  
Incremental Costs of Hospital-Acquired Complications in Alberta, Canada, Terri Jackson  
Using Hospital Readmission Rates to Track Quality of Care in Public Hospitals in Singapore, Dr. Shamim Chowdhurg and Ms. Mok Wi Ying  
Health Status and Performance Using Clinical Risk Groups (ACRG3) for the Madrid Region, Marc Berlinguet  
First German Hospital Infection Benchmark Based on DRG Routine Data, Michael Wilke |
| --- |
| Ville-Marie B Meeting Room 9th Floor | 3B: Refining Case Mix Systems  
Moderator: Poul Erik Hansen  
A Methodology for Refining AR-DRG, Christopher Aisbett  
Development of a Classification of Clinical Specialties: Service-Related Groups (SRGs) and Enhanced Service-Related Groups (ESRGs), Deniza Mazevska  
Counting Chronic Diagnoses Is Not Enough: Classifying the Entire Patient Population With a Morbidity Spectrum Measure, Efrat Shadmi  
Should There Be a Limit for DRG Split? A Case of Thai DRG Versions 3 to 5, Supasit Pannarunothai |
| St-Antoine A  | 3C: Health System Planning and Case Mix  
| Meeting Room  | Moderator: Dana Burduja  
| 9th Floor     | Perceptions of the Casemix System by Clinicians After the First Year of Implementation in Hong Kong: A Survey, Mr. Ken Fan  
|               | Case Mix Innovation: Shifting to Integrated Care, Jacob Hofdijk  
|               | Can Clinical Pathways Enhance the Implementation of a Case Mix System? A Case Study in a Teaching Hospital in Malaysia, Syed Aljunid  
|               | How Population-Based Case Mix Has Proven Itself in Canada, Karen Kinder  

| St-Antoine B  | 3D: Case Mix Methodologies and Their Use  
| Meeting Room  | Moderator: Claude Lemay  
| 9th Floor     | Introduction en douceur à la méthodologie des systèmes dits “Casemix”pour les nouveaux venus, Jean Marie Rodrigues, University of Saint Etienne, CHU, Department of Public Health and Medical Informatics  
|               | Utilisation de regroupements d’épisode de soins dans le cadre du financement du réseau de la santé et des services sociaux du Québec, Normand Lantagne, Directeur de l’allocation des ressources par intérim, ministère de la Santé et des Services sociaux du Québec  

12:30–1:30 p.m. **Posters, Exhibit Viewing and Lunch**  
Montréal Ballroom (11th Floor)

1:30–2:30 p.m. **PCSI Featured Abstracts**  
Fortifications Ballroom (9th Floor)

**Moderator**

Jason Sutherland  
• Patient Pathway Aggregation—Building on a Firm Foundation, Paula Monteith  
• Analysis of the Variability of Nursing Care by Pathology in a Sample of Nine Belgian Hospitals, Magali Pirson

2:30–3 p.m. **Posters, Exhibit Viewing and Coffee Break**  
Montréal Ballroom (11th Floor)
Each patient counts

27th PCSI Conference | October 19 to 22, 2011 | Montréal, Québec, Canada

3–4:30 p.m. Concurrent Sessions 4

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<td>Coded Data Quality for Case Mix Payment: Insights From Two External Audits, Beth Reid</td>
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<td>Clinical Documentation Manual Audit, Ken Fan</td>
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<td>The Australian Hospital Patient Costing Standards and Supporting Quality Framework, Jo Murray</td>
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4:30–5:30 p.m. PCSI General Assembly Part II

Fortifications Ballroom (9th Floor)
7:30–11 p.m. Social Event

Gala Dinner

Join us for a truly memorable evening with Cirque Éloize.

Positioned at the heart of the renewal of circus arts, Cirque Éloize has been creating moving performances filled with magic since 1993.

Based on the multidisciplinary talents of its artists, Cirque Éloize expresses its innovative nature through theatricality and humanity, and combines circus arts with music, dance and theatre in a path-breaking and original manner. With seven original productions to its credit, Cirque Éloize has presented more than 4,000 performances in 395 cities and 31 countries located around the world.

In addition to its tour performances, Cirque Éloize develops personalized concepts for international special events. To date, more than 1,250 events have taken place.

Since 2004, Cirque Éloize’s head office and creative studio are located in the Gare Dalhousie, a historical building. The Dalhousie train station, a former Canadian Pacific (CP) station marks the northeastern edge of Old Montréal and illustrates its long-standing role as one of the city’s railway hubs. In 1886, the first trans-Canada train pulled out of the new Dalhousie Station for Vancouver. From 1986 to 2003, this building housed the National School for Circus Arts of Montreal.

Location:
Cirque Eloize, 417 rue Berri
(Located in the heart of Old Montréal, within walking distance from the hotel)
Reception starting at 7:30 p.m.
Dinner at 8:30 p.m.
Saturday, October 22, 2011

8–9 a.m. **Breakfast, Posters and Exhibit Viewing**

Montréal Ballroom (11th Floor)

9–10:30 a.m. **Concurrent Sessions 5**

| Ville-Marie A Meeting Room 9th Floor | 5A: Health System Planning and Funding II  
Moderator: Jean Marie Rodrigues  
Grouping Patients Across Episodes of Care: Refined Clinical Groups (RCGs), Kevin Yu  
Are Clinical and Cost Data One Family at the Start Up of Case Mix Based System Implementation for Hospitals Reimbursement? Daniel Ciurea  
Development and Implementation of DOT: The New Dutch Registration and Invoicing System, Joost Warners  
Making Use of DRG Data: Forecasting Costs in Slovenian Hospitals, Alen Orbanic |
| --- | --- |
| Ville-Marie B Meeting Room 9th Floor | 5B: Maximizing Information in Case Mix Applications  
Moderator: Olafr Steinum  
The UNU-CBGs: Development and Deployment of a Real International Open Source Casemix Grouper for Resource Challenged Countries, Syed Aljunid  
Individual Product Determination in the New Dutch DBC System: How to Make the System Transparent for its Users, Alexander Rengelink  
Levels of Care Methodology to Classify Patients as Tertiary and Non-Tertiary, Yuriy Chechulin  
Using Case Mix Tools to Predict Future Mortality Risk, Vincenzo Opeka |
| St-Antoine A Meeting Room 9th Floor | 5C: Ambulatory Care and Case Mix II  
Moderator: Brian McCarthy  
Australian Developments in Case Mix Classification and Funding of Emergency Department Care, Jim Pearse  
Unexpected or Unexplained High Pharmacy Utilization: Identifying Those Who Do Not Have the Comorbidity to Support Their Pharmacy Use, Chad Abrams  
Using Primary Care Data to Identify Patients to Case Manage in the U.K., Stephen Sutch  
Predictors of Pharmacy Cost in Diabetic Patients at Buddhachinaraj Hospital, Supasit Pannarunothai |

10:30–11:00 a.m. **Posters, Exhibit Viewing and Coffee Break**

Montréal Ballroom (11th Floor)
### Concurrent Sessions 6

**Ville-Marie A**  
**Meeting Room**  
**9th Floor**  
**6A: Innovation in Case Mix Applications**  
**Moderator:** Paula Monteith  
- Comparative Analysis of Rehabilitation Groupers, Klara Dimitrovova  
- Real-Time Monitoring of Patient Outcome—VLAD, Deacons Yeung  
- Taking Care of Hip Fractures: 12 Years of Practice in France (1998–2009), Philippe Oberlin

**Ville-Marie B**  
**Meeting Room**  
**9th Floor**  
**6B: Health System Planning and Case Mix II**  
**Moderator:** Virginia Jordan  
- Episode Grouping and Assessing Appropriateness of Patient Care, Tresa Staeven  
- Collecting Hospital Patient Data in Ireland—The Next Generation, Philip Dunne  
- Is the Disability Profile an Important Issue for Projecting Costs With Aging? Dália Nogueira

**St-Antoine A**  
**Meeting Room**  
**9th Floor**  
**6C: Cost Weight Calculations**  
**Moderator:** Stephen Sutch  
- Patient-Level Costing for Thai Diagnosis-Related Group in Thailand: A Micro-Costing Approach, Orathai Khiaocharoen  
- Development of the Australian All Product Costing Process, Karen Chudleigh  
- Adjusting Non-Standardized Data to Facilitate National Reporting, Sheril Perry  
- Real-Time Cost-Database—An Advantage for DRG-Tariffs and Hospital Budgets, Maria Larsen

**St-Antoine B**  
**Meeting Room**  
**9th Floor**  
**6D: Care Quality and Case Mix II**  
**Moderator:** Heather Richards  
- Measurement of the Elderly’s Participation in the Community: New Domain of Quality of Life Becomes Measurable, Jiro Okochi  
- Evaluating Quality of Care in Hong Kong Through Identification of Potentially Preventable Readmissions Within the Current Unplanned Readmissions Indicator Framework, Dr. K. H. Lee  
- Potentially Preventable Readmissions in Madrid, Marc Berlinguet  
- A Costing Study of Neonatal Intensive Care for Newborn Infants With Birth Weight Between 500–1500 grams, Kathy Conway

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**12:30–1 p.m. Closing Plenary**  
Fortifications Ballroom (9th Floor)

**1–2 p.m. Lunch**  
Montréal Ballroom (11th Floor)
Each patient counts

27th PCSI Conference | October 19 to 22, 2011 | Montréal, Quebec, Canada

Posters

Diagnoses-Related Procedure Bundles in Outpatient Care—Results From a Research Project Using Secondary Data, N. Pfeffer; A. Weisser; G. Endel; C. Scholler; A. Eisl; P. Filzmoser (ID: 1150768)

The Care Coordination Program: A Virtually Integrated Care Delivery Model for Complex, High-Needs Patients, R. Moodley Naidoo; L. Steenkamp (ID: 1164537)

Superiority of Guideline-Adherent Initial Intravenous Antibiotic Therapy for Hospital-Acquired/Ventilator-Associated Pneumonia in Regard of Outcome and Costs Demonstrated by Routine Casemix and Cost Calculation Data, Mr. Rolf F. Grube; Dr. Michael H. Wilke; Dr. Klaus-Friedrich Bodmann (ID: 1143269)

Estimation of the Cost of Hospital-Acquired Infections in Gastrectomy Patients: An Exploration of Methodology, Dr. Jason Lee; Prof. Yuichi Imanaka (ID: 1143297)

A Look at the Use of the Japanese Administrative Database and the Geographical Information System in the Management of Disaster Medicine and Regional Medical Care Planning, Kazuaki Kuwabar (ID: 1144693)

Going From “Unstable” to “Stable” Data, Irena Zupanc; Anne-Marie Yazbeck (ID: 1144765)

Management of Rheumatoid Arthritis Patients in Romania, Dr. Paul Ciprian Radu; Mirela Sandru, M.D; Dr. Ioan Ancuta, M.D (ID: 1152846)

Changing the Game in Physician Profiling, Dr. Nkuli Mlaba; Jf Bruwer; Dr. Roshini Moodley Naidoo; Mr. Darren Sweidan (ID: 1152873)

The Epidemiology of Cancer From Case Mix System Databases: A Longitudinal Approach, Beatrice Trombert (ID: 1153019)

CIHI’s Tool for Estimating Cost, Britta Nielsen; Bob Ren; Ching Huang; Tianyu Zhang; Stephanie Bonnell (ID: 1159511)

Births in Slovenia in 2008; Mothers and Newborns, Anne-Marie Yazbeck; Mojca Omerzu; Dr. Michael Galsworthy (ID: 1141532)

Health Care and Drug Utilisation Pattern in Patients Categorized by Adjusted Clinical Group at Buddhachinaraj Hospital, Phitsanulok, Dr. Nilawan Upakdee (ID: 1152734)
Pre-Conference Workshops

Wednesday, October 19, 2011

Workshop A

How to Harmonise Classifications of Procedures for Case Mix Applications? From the Present Situation to the ICHI (International Classification of Health Intervention) Initiative

**Facilitator/moderator:** Jean Marie Rodrigues, University of Saint Etienne, CHU, Department of Public Health and Medical Informatics, Saint Etienne, France; WHO Collaborating Centre for International Classifications in French Language, Paris, France

**Co-presenters:** Martti Virtanen, CEO, Nordic Case Mix Centre, Helsinki, Finland; Lori Moskal, Canadian Institute for Health Information, Ottawa, Canada; Olafr Steinum, diaQualos AB, Goteborg, Sweden; Dana Burduja, Programs Director, Centre for Health Policy and Services, Bucharest, Romania

**Relevance to PCSI objectives and expected audience:** The diversity of classifications of procedures is the main obstacle to the dissemination of case mix systems around the world and to their comparison. The expected audience is broad, from coders to decision-makers, researchers and academia, case mix offices' technical staff, etc.

**Objectives:** The workshop is meant to present the ICHI initiative based on international terminological resources standards to harmonise, at a world level, the different classifications of procedures and to ask the different stakeholder presenters (WHO collaborative centres, national reference information centres, case mix offices, coders and health care professionals and international organization case mix systems implementers) to comment on the present situation and the ICHI initiative.

**Overview**

**Introduction:** Standardization in Health Care Terminologies: Jean Marie Rodrigues

**ICHI initiative:** Jean Marie Rodrigues and Lori Moskal

**Comment from a case mix office:** Martti Virtanen

**Comment from a national reference information system:** Lori Moskal

**Comment from a health care professional coder:** Olafr Steinum

**Comment from an international organization case mix system implementer:** Dana Burduja

**General discussions**
Workshop B

Profiling Devices, Drugs, Implants as an Additional Profile of Casemix Tools Using GS1

Facilitator/Moderator: Jacob Hofdijk (Casemix, the Netherlands), Ulrike Kreysa (GS1) and representatives of Covidien, Meditech, BISLIFE (names to be confirmed)

For many years, both nationally and internationally, it has been an issue to include innovative devices, drugs and implants within casemix systems. It has been technically problematic to include the devices with the coding system for procedures. With the introduction of the GS1 system, each device can have a unique code. Recently, we have started the initiative to add an additional profile of devices, implants and drugs based on the GS1 code, which can be linked to each device from the market introduction. The workshop will focus on the potential of this additional profile to deal with innovations in casemix systems.

Workshop C

Costing Patient Care Services—An Introduction Using Worked Examples

Facilitator/Moderator: Nigel Michell, Director, PowerHealth Solutions Ltd.

Co-presenter/co-moderator: Patrick Power, Executive Director, PowerHealth Solutions (fluent French speaker)

Relevance to PCSI objectives and expected audience: The workshop will be particularly relevant to PCSI attendees from all disciplines, as it will provide an overview of patient costing principles using worked examples and attendee participation.

Objectives: Following participation in the project, attendees will
• Have an understanding of patient costing principles and their application to different patient settings;
• Understand the concept of the GL cost allocation process, including the concept of overhead and patient care cost centres, the use of cost allocations statistics such as floor area, number of meals served, etc., the need to refine the GL for patient costing purposes and the methodologies for reconciling each step;
• Have an understanding of the patient-level data feeds required and their elements;
• Be able to set up linking rules to allow feeder-level data (theatre, imaging, pathology, etc.) to be linked to the correct inpatient or outpatient attendance;
• Understand the concept of relative value units (RVUs) and their application to patient costing;
• Understand the creation of services for patient costing purposes and the assignment of these to the various patient care areas; and
• Understand the methodologies to be used to reconcile the patient-level costs back to the general ledger.
Overview: Participants will take an active role in defining the GL and patient costing methodologies to be used in the worked example. Feedback from this process will be used to set up and run the patient costing application. Questions will be used to ensure that participants have a good understanding of each step of the process.

Handouts will be provided. The workshop will assume that participants have an awareness of patient costing principles but little understanding of them.

Workshop D
From Case-Mix to Clinical Applications

Presenter: Dr. Michael Wilke

Objective: To find out which added value for clinical work and for the measurement of quality in health care systems can be drawn out of casemix routine data.

Items to be covered:
- Presentations on the use of casemix data in clinical contexts
- Background information on existing methods of quality evaluation in health care
- Collaborative discussion
- Creating inspiration for the participants
- Possibilities for international collaboration

Audience:
- Clinicians dealing with casemix
- IT experts
- Casemix economists
- Clinical coding staff
- Ideally, participants should be knowledgeable of their respective local casemix system; have some clinical background; have some knowledge of data structures and content that is today mainly used for casemix.

Workshop presentation:
The following topics should be reflected:
- Extending the benefits of casemix data
  - Quality indicators (AHRQ, OECD, others)
  - Prevalence or incidence statistics drawn out of the data
  - Implementation of innovations
  - Casemix effects of introducing new clinical practices
- Chances and limitations
  - Are the allegations among clinical researchers real limitations or is it a question of communication culture?
  - What could be done to promote the multidisciplinary use of the data?
- International implications
  - Where do we have data that could be used even for international comparisons?
Workshop E

Applying Predictive Modelling to Improve the Delivery of Health Care

**Presenters:** Dr. Karen Kinder, Steve Sutch and Chad Abrams, The Johns Hopkins University

**Objective:** The advantages that predictive modelling offer to more efficient management of patient care are not restricted to predicting costs. As has been demonstrated in both public and private health care systems around the globe, predictive modelling contributes to improved clinical, financial and managerial management. These include the ability to

- Predict high-risk individuals for inclusion in care management, pharmacy management and disease management programs;
- Estimate future resource use;
- Identify individuals at risk of hospitalization;
- Identify patients whose pharmacy expenditures are greater than what is predicted based upon their morbidity profile alone; and
- Establish equitable budgeting.

The aim of this workshop is to provide an insight into the numerous applications of predictive modelling in the ambulatory health care sector, from integrated care networks to primary care clinics and, finally, at the individual provider level.

**Methods:** The workshop will open with an introductory presentation on the numerous applications of predictive modelling within the integrated and ambulatory care sectors. Provided that sufficient interest is demonstrated in terms of participation, the workshop would be divided into individual sessions based on three applications:

- Financial management/budgeting
- Pharmacy management/patient identification
- Case management/patient identification

Each session will be comprised of presentations illustrating real-world case-mix applications. The workshop would conclude with a plenary session which would summarize the take-home messages of the three sessions and include a discussion on the future of predictive modelling.

**Presentations:** Applicable results will be presented from several countries, including Canada, the U.S., Malaysia, Sweden and the U.K.

**Conclusions:** The participants will experience first-hand how to apply case-mix to clinical, financial and managerial decisions.
Workshop F

Case-Mix Systems for Non-Acute Populations Across the Continuum of Care: The interRAI Experience

**Presenters:** John P. Hirdes, PhD, Professor, School of Public Health and Health Systems, University of Waterloo; and Brant E. Fries, Professor of Health Management and Policy, School of Public Health, and Research Professor, Institute of Gerontology, School of Medicine, University of Michigan; and Chief, Health Systems Research, VA Ann Arbor Healthcare System GRECC

**Objectives:** This workshop examines case-mix systems developed by the interRAI research group (www.interrai.org) for various care settings serving non-acute populations, including nursing homes, complex continuing care hospitals, home care and inpatient psychiatry. The clinical assessment systems developed by interRAI have been adopted by numerous jurisdictions internationally, including Canada, where data from interRAI assessments is managed nationally by the Canadian Institute for Health Information (CIHI).

Three case-mix systems will be examined: a) Resource Utilization Groups (RUG-III and the more recent RUG-IV system); b) Resource Utilization Groups for Home Care (RUG-III/HC); and c) the System for Classification of In-Patient Psychiatry (SCIPP). The discussion will include technical details on the methods used to estimate and predict costs in each of the three systems using staff time measurement studies (in the case of RUG-III/IV and SCIPP) and combined formal and informal care costs (in the case of RUG-III/HC). It will also consider the relationship of case-mix systems with clinical practice, performance measurement and payment systems. In addition, the workshop will explore inter-connections between different sectors of the health care system and examine the possibilities and limitations of pan-sector case-mix solutions for non-acute populations. Finally, the potential application of knowledge gained from the non-acute settings to case mix for the frail elderly and persons with disabilities in acute care settings will be considered.

Workshop G

Continuity of Care/Contsys

**Facilitators/Moderators:** Jacob Hofdijk, Michael Rigby, Contsys Project Team and Caroline Hyden (names to be confirmed)

Based on the new developments of the CEN 13940, a new workshop will be organized about the concepts and the implementation of continuity of care systems within health care, integrating prevention, health promotion, health care and social care. The workshop will deal with concepts and practical experience.
Workshop H

Developing an Activity Based Funding (ABF) Model for Non-Admitted Patient Services

**Facilitator/moderator:** Joe Scuteri, HealthConsult Pty Ltd., Australia

**Co-presenter/co-moderator:** Lisa Fodero, HealthConsult Pty Ltd.; Heather Richards, Canadian Institute for Health Information. Additional presenters to be confirmed.

**Relevance to PCSI and expected audience:** Coders, clinical costing staff, decision-makers, IT, researchers and academia, case-mix offices' technical staff, etc.

This topic is expected to be very relevant to PCSI, as it incorporates case-mix development principles and involves an international team of experts sharing their experiences in developing ABF models for non-admitted services. It draws together the key components of case mix, i.e. counting, classifying and costing services to produce an ABF model. We'd expect that the audience would be made up of a mixture of health professionals, including medical and non-medical staff, finance staff, clinical costing staff, clinical coders, decision-makers, researchers, academia, etc.

**Objectives:**
- To discuss a framework for building an activity based model for hospital-based non-admitted patient services; and
- To share international experience of building the various components of an ABF model for non-admitted patient services (e.g. counting rules, classification systems, costing, funding model, etc.).

**Overview:** Australia is currently embarking on a national health reform. The national health reform is largely focused on reforming the financing of health care services in Australia. As part of this work, Australia is developing ABF models for all health work streams (e.g. acute admitted, sub-acute, non-admitted and emergency). This workshop would involve sharing some of the experiences in Australia with regard to building an activity based funding model for hospital-based non-admitted patient services. Presenters from within and outside Australia would share their experience in building various components of the ABF model. For example: Australian speaker on counting rules, a Canadian speaker on classification systems, a U.S. speaker on costing and perhaps a U.K. speaker on funding.
Abstracts

Thursday, October 20, 2011

SESSION 1A—Morbidity Burden and Case Mix

ID:1151322

Profiling High Morbidity Burden in Primary Care: Calibration of a Case Mix Model to Account for the Burden Primary Care Physicians Are Faced With

Introduction: Primary care encounters are more complex than those of specialists. Primary care physicians (PCPs) face a diverse patient population, are tasked with diagnosing and treating a wide array of health conditions and are in charge of integrating all aspects of care. The Johns Hopkins University Adjusted Clinical Groups® (ACG) system provides a number of patient classification tools. Our aim was to calibrate the mutually exclusive ACG categories using counts of morbidity types in order to represent the burden PCPs cope with.

Methods: EMR-based diagnoses from all medical encounters (primary, specialty, and hospital care), as well as cost and healthcare utilization data were attained from Clalit’s data warehouse for a representative sample of 300,000 adult Clalit members (~10%) in 2009. The entire sample was classified into one of 70 ACGs. We identified large variations in the number of morbidity types (another component of the system termed Aggregate Diagnostic Groups (ADGs)), with an average of 4.58 (SD: 3.24) ADGs in each ACG cell. These variations in the non-mutually exclusive morbidity types were shown to be highly correlated with various types of resource use. To account for this variability we calibrated the ACG cells according to the number of ADGs. Each ACG was thus divided to 1-9 sub-groups according to the number of ADGs, resulting in 233 new categories. We then assigned a weighted score to each new category. The weighted score was the average 2-year relative total cost (total ambulatory and hospital costs for 2009-2010 divided by the average 2-year costs for the entire sample). The 233 categories were divided to 10 bands according to 10th percentiles of the relative resource use weights. Regression models were used to assess R2 of the weighted score based on these 10 bands in determining annual concurrent and prospective cost, drug utilization, and PCP visits. All utilization was trimmed at 3 SD above the mean to reduce the effects of outliers. The explanation of resource use provided by the 10 band weighted score was compared with the classification of the original ACG’s weighted scores.

Results: The calculated weights ranged from 0.12 to 3.6 in the ten bands, and resulted in an R2 of 25.8%, 34.8%, 39.8%, 43.2% for total costs, community care costs, PCP visits and drug consumption, respectively. These outcomes were better than outcomes attained with the original ACG weighted score, in explaining variability in community care, drugs, and PCP visits (R2 of 31.0%, 18.1%, 15.7%, and 27.9% for total costs, community care costs, PCP visits and drug consumption, respectively).
Average patient weight among all patients of a single physician ranged from 0.52 to 1.88. Sum of weights of all patients for a single physician was a practical measure for the burden on a single physician, and ranged from 588 to 2982, with minimal year-to-year variability. This single parameter proves to be a useful, stable, easy to interpret and acceptable morbidity measure for resource allocation among PCPs.

**Conclusions:** Morbidity type count is a strong predictor of morbidity burden in primary care, and a powerful modifier within non-homogenous ACGs. Weights based on these modified ACGs grouped into ten relative resource bands are a useful tool for fair allocation of resources in primary care based on overall patient morbidity burden.

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1165286

**Measuring the Case Mix of Physician Practices in Primary-Care Reform Models in Ontario, Canada**

**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 rosters (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.

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Analysing the Emergence of Complex Morbidities. A 30 Years’ Follow-Up on a Defined Population in Sweden

Introduction: Background: Many studies have been made on the diagnosis level. Few studies have clarified the patient aspect with the not so unusual mix of combined diagnoses. Even fewer studies have displayed the continuity of care over time in the patient’s perspective.

Objectives: The overall aim was to display the pattern of morbidity in a defined population over time, based on each individual’s combined diagnoses registered in all types of care. The objective of this study was to explore and analyse which types and combinations of morbidities lead to a very complex multimorbidity status later on.

Methods: Methods and materials: Longitudinal data from a database with more than 20,000 individuals were used, comprising all health care delivered to them in their county within a 30-year-period. Diagnoses were grouped by the Johns Hopkins ACG case-mix system, version 9.0.1i. 1,000 patients, selected by the most complex morbidity states at the end of the period, were analysed in detail.

Results: Results: The pattern of the burden of morbidity could be displayed during a 30-year-period in terms of more or less complex morbidity categories. The multimorbidity patterns could be traced back to the first emergence of combined diseases.
Conclusions: Conclusions: Analyses of longitudinal patient medical records reveal changes in terms of complexity in the burden of morbidity in defined populations over time, which might lead to better understanding of multi- and co-morbidity among individuals.

Discussion: Numbers of specific diagnoses were shown to differ over time, although they did not influence very much the types of morbidities. This first work-through of the database from the individual patient’s perspective revealed some gaps in the continuity of registering into the store, not found earlier.

Further research: Some types of morbidity were seen as more common than others as a trigger for a more complex multimorbidity among patient groups. This might be a good start to launch projects aiming at understanding the emergence of co-morbidity and multimorbidity among patients.

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SESSION 1B—Health System Planning and Funding

ID:1165288

Understanding the Episode of Care for Transplant Patients

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 MoHTLC has funded a case-costing project to assist 48 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.

Method: 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 various complex 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.

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Planning for ABF as Part of Reforming the Australian Healthcare System

**Introduction:** A key part of Australia’s national health reform policy is to implement activity-based funding (ABF) for public hospitals from 1st July 2012. The Council of Australian Governments (COAG) established the Health Reform Implementation Group (HRIG) to oversee the execution of the reforms. HRIG, in turn, created an ABF Sub Group to advise on implementing ABF.

The HRIG ABF Sub Group established five Advisory Working Groups (AWGs) aligned to the following workstreams: subacute, emergency, non-admitted, and mental health care. As well, the groups were aligned to the National Hospital Cost Data Collection (NHCDC). The terms of reference for the AWGs included “the development of a work plan for the implementation of ABF”, which will contribute to an “overall national work plan to implement ABF”.

**Methods:** The HRIG ABF Sub Group decided that the proxy classifications systems to be used in the initial ABF implementation were Australian Refined-Diagnosis Related Groups (AR-DRGs) for acute admitted, Australian National Sub-Acute and Non-Acute Patient Classification System (AN-SNAP) for subacute, NHCDC Tier 2 Clinics for non-admitted, and Urgency Related Groups (URGs) for emergency services. Work Plans were needed to determine what was required to implement ABF by 1st July 2012 using the proxy classifications.

The planning methodology consisted of five parts. First, designing and distributing a survey for each workstream to assess the existing data collection and the availability of support infrastructure across states/territories. Second, preparing a scoping/gap analysis paper by analysing survey responses and interviewing state/territory representatives. Third, preparing the five draft Work Plans. Fourth, reviewing the draft Work Plans at the final meetings of the AWGs. Fifth, developing the Overarching Work Plan.

**Results:** Across three meetings with the AWGs, Work Plans were developed which defined the projects that must be done to attain the minimum position in terms of ABF infrastructure in each workstream under the following headings: scope and data set coverage; classification; counting rules and unit of count; costing; funding model; support infrastructure; data quality assurance; and governance.

The planning process revealed the state-of-play across the ABF workstreams as:

- **Subacute** – The initial focus of AN-SNAP will need to be on activity occurring in designated services. Implementation will be easier to achieve 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. Approaches to counting non-admitted patients vary greatly across states/territories.

Emergency – Most states and territories have data collection systems that include the ‘Emergency Department (ED) diagnosis’, which is required to assign URGs. Initially, URGs can only be used in hospitals that have a recognised ED. UDGs (diagnosis not required) can be used for other emergency services. URGs will still need to be refined and updated prior to being used for ABF.

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 presented.

Conclusions: The Work Plans show that it will be difficult to achieve a common starting point across states/territories for ABF by 1st 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.

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Case Mix Funding in Ireland: From Retrospective to Prospective? Progress since 2010

Introduction: We presented on this topic at last years' conference in Munich and this presentation will cover the progress since last year.

The current Health Funding in Ireland will be summarized to give some context. The funding methodology is a historical Block Grant with adjustments for inflation/deflation, new developments, one offs and an adjustment for Case Mix.

Case Mix funding in Ireland is Budget Neutral which means that it is a zero sum game. Funding is redistributed between hospitals based on the calculated measure of efficiency by comparing each hospital's costs and activity against their peers. Activity is Case Mix adjusted to reflect the variation in complexity within each hospital to derive a Hospital Base Price.

The Case Mix Funding System used in Ireland covers the areas of Inpatients, Daycases, Outpatients and ED activity. The National Case Mix Programme uses the Australian Refined DRG Classification system and ICD –AM coding system for Inpatients and Daycases only. For Outpatients we use Treatment Resource Groups which are essentially specialty based and weighted attendances for ED.

The requirement to move to a funding system whereby “Money follows the patient” is now Government policy. Work commenced in the journey from Historical Block Grant Funding to Activity Based Funding in 2010 and is ongoing in 2011.

Methods: A Prospective Funding Group within the HSE identified the issues in moving to such a system of funding. The Prospective Funding Group was chaired by the CEO of one of the largest hospitals in the country. The group identified the issues from a number of perspectives including costing, coding, hospitals and funders. These issues will be outlined in detail during the presentation. The group identified Patient level Costing as the key issue and the reasons will also be detailed in the presentation.

The Group decided that the Prospective Funding objectives should be:
- The system be transparent, understood and reward providers fairly.
- It should drive and support good clinical practice and financial efficiency
- Should reward appropriate high quality care

International Developments in relation to Case Mix Funding was also a driving factor for moving to Prospective funding with most of the leading countries in Europe using DRG based funding systems.

Results: Progress to Date.

The Report on the first Patient Level Costing Study which commenced in 2010 has been completed and the recommendations contained therein accepted. The report included a “gap analysis” of issues to be addressed by hospitals going forward will be discussed at the Conference. A second study is under way at present and expected to be completed by October 2011.
In the mean time a new Government has been elected whose policy is that money allows the patient. This is in line with recommendations from the previous Minister's Expert Group on Resource Allocation.

The Ministry of Health have also requested that the HSE implement prospective funding for a number of elective Orthopaedic DRG’S on a prospective funding basis for the second half of 2011. This will be used as test run for what issues are likely to arise on full implementation of a Prospective Funding system and will be covered in detail in the presentation.

Conclusions: Case Mix Funding has been in operation in Ireland on a retrospective basis since 1995 and the move to a prospective an Activity based funding will represent a sea change. Essentially we will be moving from an incremental basis of funding to bottom up approach with funding following the patient. The journey from retrospective to prospective is in the early stages and we will be seeking to learn from the experiences of other countries at this conference to assist us along the way.

The commencement of Prospective Funding for selected Orthopaedic DRG’S in 2011 is the first step on the road to full implementation.

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Planning for the Future in Switzerland: Adapting the Facilities to the Demand of the Patient

Introduction: Together with a new nationwide financing system to be introduced for acute and long-term care in Switzerland in 2012, a new planning for facilities will be imposed on the "cantons" (regional authorities in charge of healthcare): they will have to provide lists of care centers chosen to meet their patients' demand. Only these selected centers will then be financed by insurances and cantons (dual financing system).

Methods: With such financial implications, fine-tuning the planning of adequate facilities becomes of high importance. A new solution has been developed using activity-based data and insurance data to forecast future demand, in particular in the field of rehabilitation after cardiac problems.

Results: Using routine data, a combination of medical data (MDC 5), insurance data on patient insurance coverage (private, semi-private and basic) and hospital discharge data (to which type of non-acute facility was the patient discharged) allowed to predict the size, specialties and structure of the necessary facilities.

Conclusions: The paper will describe the method, present examples of actual situations and discuss the limits.

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SESSION 1C—International Experiences With Case Mix

1152825

Romania – Experience and New Steps in the Context of the International Patient Classification System

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 (NSPHMPDHB) 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 (NHIH, 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.

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1165093

Initial Results and Experiences from the World Bank Financed DRG Pilot Project in the Republic of Moldova (July 2010 – June 2012)

Introduction: The main aim of this two year pilot project is to determine whether case-mix concepts, and underlying data requirements (clinical coding, cost data modeling, case mix classification etc.) can be implemented and obtained from the nine pilot project hospitals and whether Moldovan decision-makers decide to implement a form of case-mix based financing beginning in a limited fashion with sound transition policies beginning January 2012 or January 2013.
Methods: This paper discusses the current and ongoing experience of case mix pilot activities in Moldova, beginning with the following activities that make up the key work conducted to date and the work that is ongoing with the current nine hospital pilot project:

Main Activities:
- Selection a representative group of 9 hospitals to pilot all necessary case-mix concepts, including coding, data collection, grouping, costing, analysis activities, and policy development
- ICD 10 coding training was provided to all pilot project hospitals, along with procedure coding training according to the Australian procedure coding system (research licensed awarded by the Commonwealth Government)
- Collection of clinical data began in March 2011 with a slow uptake as expected, but as of June 2011, about 70% of five months of clinical data is available from almost all of the pilot project hospitals
- DRG grouping of the clinical data will occur starting in July using the research version of the AR-DRG grouper and will be ongoing
- Initial development of cost weights and relative values for case-mix calculations is expected to begin in late 2011, early 2012
- The necessary technology infrastructure and development of software to collect data has been achieved

Results: Project decisions related to the technical activities outlined above were taken together between international experts and local authorities in order to respect the local context, including cultural and political issues, which is critical for long-term sustainability.

Clinical coding and clinical data collection started March 2011 so preliminary DRG grouped data results from these Hospitals are expected to be produced around July 2011, in time for final presentation and paper.

Cost data collection and modeling will start July 2011, so probably individual hospital costing data and simulation can be presented at the Conference.

By the time of the Conference, preliminary decisions based on initial results are expected in respect with continuation and extension of the ongoing work: payment and reimbursement to be based on case mix data for pilot hospitals and extension at national level of standardized clinical coding and data collection (clinical and cost data)

Conclusions: In Moldova, the government has taken full responsibility from the beginning in driving case-mix efforts before first pilot project was even implemented. Having decision-makers highly proficient in case-mix principles before the technical staff is involved is critical in garnering the type of support needed for a large scale financing reform, which is the ultimate aim of both the MOH and the NHIC. The current pilot project can be thought of as more than just a pilot since decision-makers are keen on moving quickly towards implementation.
Each patient counts

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The proficient decision makers still need the project support in order to stabilize the technical components before expanding and going forward and more than this, to build up local capacity able to take over at all levels: technical day to day activities, adaptation and localization, reimbursement mechanism design and implementation and long term development of the system.

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Feasibility of Implementing Casemix System to Support APEX Programme of HUSM in Malaysia using UNU-CBG Case Mix Grouper.

Introduction: Hospital USM (HUSM), established in 1983, is the second oldest teaching hospital in Malaysia. The 747-bed hospital is owned by University of Science Malaysia (USM). HUSM is located in the Kelantan, one of the least developed state in the north east region of Malaysia. In 2011, HUSM has decided to implement the casemix system as one of the initiative to improve quality and efficiency of its services in line with the status of the USM as the premier university in Malaysia awarded with APEX (Accelerated Programme for Excellence) status by Ministry of Higher Education of Malaysia. Under APEX, USM, is given autonomy and flexibility in administration and access to additional funding from the government. The long term objective is to transform the university into a centre of excellence at par with top universities of the world. HUSM in collaboration with United Nations University-International Institute for Global Health and International Centre for Casemix and Clinical Coding of National University of Malaysia has developed a three year programme to gradually implement casemix system in the hospital. A pilot study was carried out to assess the feasibility of using UNU-CBG Grouper as the grouping tool in HUSM.

Methods: The pilot project was started with a series of workshops to introduce the casemix concept to the management and all the staff of HUSM. A high level Steering Committee was formed to monitor the project. Four working groups were established for the implementation: the Coding, Costing, Clinical Pathway and Information Technology Groups. All in-patient medical records for patients discharged in 2009 and 2010 were reviewed and selected for the pilot study. Two trained coders coded the diagnosis using ICD10 and procedures using ICD9-CM classifications. In UNU-CBGs the first level of classification is Casemix Main Group (CMG) and the second level with higher degree of granularity is Case-Based Group (CBG).
Results: A total of 43,273 medical records contained adequate information to be grouped using the UNU-CBG Groupers. This represents 60.6% of the total discharges for the two years period. 60% were female. Most the patients were of younger age group with 29.7% below the age of 20 years, 21.2% between the age of 21-30 years and only 14.5% are above 60 years. Most of patients were discharged well (96.8%), 2.6% died and 0.6% took at own risk (AOR) discharged against the advice of doctors. The average length of stays for most of cases (79.3%) are less than 5 days, 13.9% stayed between 6 to 10 days, 3.3% stayed between 11 to 15 days and only 3.5% stayed more than 15 days. Three most common cases grouped in CMGs are CMG-O for Deliveries (20.7%), CMG-W for Diseases of Female Reproductive System (10%) and CMG-M for Diseases of Musculoskeletal System and Connective Tissue Groups (7.3%). The top five CBGs are CBG O-6-13-I Vaginal Deliveries-Mild (11.3%), CBG P-8-17-I Neonatal Conditions-Mild (4.1%), CBG O-6-13-II Vaginal Deliveries – Moderate (3.1%), CBG W-4-16-I Prepartum Diseases (3.1%) and O-6-12-I Vaginal Deliveries with other procedures – Mild (2.5%). A total of 1,806 discharges were ungroupable. Common reasons for ungroupable are coding errors of principle diagnosis (49.7%), no birth weight for babies (33.5%), coding errors for deliveries (7.9%) and wrong gender (5.5%).

Conclusions: The outcome of this pilot study showed that it is feasible to implement the casemix system using UNU-CBG grouper in HUSM. The medical records system in the hospital could be further enhanced by ensuring that the minimum data set for casemix system is captured routinely. Although the rate of ungroupable is quite low, more efforts should be made to train the coders on the coding rules as required by the casemix groupers.

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Analysis of the FONDO NACIONAL DE RECURSOS Reimbursement in Uruguay Using UNU-CBG Case Mix System

**Introduction:** Uruguay has a health system that integrates services provided by both public and private healthcare organizations. The Fondo Nacional de Recursos (FNR) is funding the resource intensive specialized care for the entire population of Uruguay, with input from all organizations providing health services – public and private- in Uruguay. It is managed by an honorary committee composed of representatives of the Ministry of Health, Ministry of Finance, Highly Specialized Institutes of Medicine (IMAEs) and others. Periodically, the IMAEs - which are those providing the service of highly specialized medicine - negotiate the reimbursement rate per delivery with FNR. The criteria used for the determination of the reimbursement rate is not very patient centric, and therefore there is only one reimbursement rate for a particular disease, irrespective of the severity of the disease.

**Methods:** Sanatorio Americano, an IMAE hospital, has been involved in the implementation of DRG base case mix system for the last 2 years. We in our hospital used the severity based DRG system to do the patient level costing. In year 2009, the hospital was attended by 8,657 inpatients. We use UNU-CBG Case-Mix grouper to generate case-mix groups. For the costing purpose all the inpatients are divided into four (4) different categories. These are a) Non IMAE patients (patients not reimbursed with FNR rate) (n= 4,513), b) Cardiac IMAE patients (n= 2,892), c) Orthopaedic IMAE patients (n= 1,107), and d) Other IMAE patients (n= 145). The last three categories of patients are reimbursed using the FNR reimbursement rate.

**Results:** The average cost of treatment of the Non IMAE patients is 60,258 Pesos, for Cardiac IMAE is 78,842 Pesos, for Orthopedic IMAE is 62,197 Pesos, and for other IMAE patients is 73,253 Pesos. The FNR reimbursement is done at a flat rate, irrespective of the clinical severity of the patients.TThe highest reimbursement to cost ratio is 1.27 for Cardiac IMAE cases of mild conditions followed by 0.99 for Orthopedic IMAE cases of moderate conditions. The lowest reimbursement to cost ratio is 0.04 for Other IMAE severe cases.

**Conclusions:** DRG system with severity adjustment can better describe the real resource consumption of the patient. Here we compare the reimbursement done by the FNR against the cost of treatment calculated using the DRG base costing. It is evident that the reimbursement rate specially for the higher severity are not representative of the recourse intensity of these cases.

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SESSION 2A—Economic Incentive and Case Mix

1152588

Determining a Threshold Hospital Size for the Application of Activity-Based Funding

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.

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1152749

Issues in Use of CMG+ for Activity Based Funding in Canada

**Introduction:** There is increasing interest in introducing Activity Based Funding in Canada. Canada’s case mix classification system CMG+ performs extremely well as a way of describing cost variation. But as interest in introducing Activity Based Funding increases, there is now some question about how suitable is the CMG+ classification system for this new purpose. Does CMG+ require any modification? What sorts of options might there be?

**Methods:** There are common statistical criteria for evaluating case mix classifications, in this paper we advance five policy-oriented criteria for evaluating case mix classifications for payment purposes: simplicity and transparency; stability; minimize susceptibility to gaming; minimizing inappropriate rewards; and recognizing legitimate variation.

**Results:** The current CMG+ system is complex but two thirds of cases are in the simplest category (no adjustments to base CMG). In terms of stability, data on how weights for a CMG vary over a four year period will be presented. Issues relating to inappropriate rewards will be highlighted.

**Conclusions:** Options for potential enhancements of the CMG+ system to improve transparency, stability and inappropriate rewards are outlined.

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Explaining Variations in the Cost of Patient Care... A Multilevel Analysis Using Canadian Hospital Data

**Introduction:** Increasing health care spending in Canada, as in other developed countries, has created pressure to restrain costs. In order to control costs we need to know what drives them and why they vary from patient to patient. For cost of hospitalization most of the driving force and variation can be explained by patient-level factors such as age, comorbidities, severity of illness and by hospital-level factors such as labour costs, size and hospital type. Unexplained variation in costs – at least unexplained by the econometric models – may be due to unmeasured factors and differences in effectiveness, efficiency, and appropriateness of the care provided.
**Methods:** In this research we will try to answer why patient costs vary due to measured patient and hospital-level factors. We will use patient level cost data submitted to Canadian Institute for Health Information by participating case-costing hospitals from Ontario, Alberta, and British Columbia. Challenges of modeling health care costs will be discussed. We will use mixed model analysis since our model includes both fixed and random effects.

**Results:** Apart from the effects of demographics we will measure the effects of various conditions categorized by casemix systems, various high-cost interventions, length of stay and hospital type. The focus will be on costs of patients with diseases and disorders of the circulatory system. Results will include the individual and combined effects of covariates on cost of hospitalization.

**Conclusions:** The results are expected to shed a light on the reasons for cost variation among patients with similar conditions.

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**Can Teaching Hospitals Benefit From Case Mix System? Outcome of Using DEA to Evaluate Efficiency of Teaching Hospitals in Malaysia.**

**Introduction:** The analysis of efficiency in hospitals can make a major contribution to improving health services. Casemix system can help to enhance efficiency of hospitals services by encouraging clinicians to reduce variations of care and use of unnecessary resources. UKMMC is the first teaching hospital in Malaysia to use casemix system to enhance quality and efficiency of services.

**Methods:** Data Envelopment Analysis (DEA) model under the assumption of constant and variable return to scale model was used to compare the efficiency scores of three teaching hospitals in Malaysia. Two of the teachings hospitals, HUSM and UMMC has not implemented casemix system while UKMMC embarked of casemix system since 2002. Average efficiency scores of at least at least six clinical departments between the period of 1998 to 2006 were imputed and compared. DEA model was then used to compare the efficiency scores of the three hospitals before and after 2002, the year when casemix system was first introduced in UKMMC. It is hypothesized that hospitals using casemix system would have higher level of efficiency than those which do not use the system.
Results: The mean efficiency scores for HUSM, UMMC and UKMMC were 76.0 percent (range 50.3 – 96.9) , 92.7 percent (range 75.0 – 100) and 91.2 percent (range 85.2-100) respectively. After the implementation of casemix system, the efficiency scores of UKMMC increased by 6.4 percent while scores in the other two hospitals; HUSM and UMMC remained at 2.8 percent and 1.5 percent respectively.

Conclusions: Casemix system has some positive impact in improving the efficiency of teaching hospitals in Malaysia. The gain in the efficiency would have been greater if the system is used hospital budgeting and providers’ reimbursements.

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SESSION 2B—Classification and Case Mix Incentives

Assessment of the Main International and National Classifications or Terminological Systems of Surgical Procedures Using the CEN/ISO 1828 Standard

Introduction: There is a growing need to compare data produced at national and international levels on a range of shared concerns relating, for instance to population based indicators, Electronic Health Record safety, OECD (Organisation of Economic Cooperation and Development), trans border migration of population, case mix and procedure payment . Clinical terminology systems, classifications and coding systems that are drawn upon to that end have unfortunately been developed using independent, divergent or uncoordinated approaches which have produced non reusable systems with overlapping fields for different requirements. For some decades, several broad pre-coordinated or compositional systems have been proposed to users targeting different goals. At the same time most of developed countries have continued to maintain, update and modify their own coding systems for procedures and their national adaptations of ICD, in order to manage and to fund their health care delivery.

Methods: To compare major national and international classifications or terminological systems of surgical procedures we use the latest standard on terminologies of surgical procedures currently pending final approval ENISO 1828. We present the standard in section 2 and the results of the assessment in the light of that standard in section 3. Finally we discuss the role that standard could play not only to support the comparison of classifications and coding systems of surgical procedures but, to facilitate their harmonization towards a more complete semantic interoperability.
Results: Table 1 show that the selected international and national classifications or terminology systems of surgical procedures are based on the semantic categories of the standard with some restrictions for the category Lesion. This is characterized only by SNOMED CT and the Japan Surgical Society system although the other systems may use some Lesion value sets without specifying a semantic category. For the semantic links all the studied systems use has_object but only 4 out of 7 (SNOMED CT, ICHI, CCAM and the Japan Surgical Society) are based on all the semantic links. Only SNOMED CT and ICHI explicitly define the list of domain constraints. None of the systems prescribe the list of minimal domain constraints. From this comparison it can be said that the most recently developed international and national terminologies and classification systems of surgical procedures are based on the CEN/ISO 1828 standard semantic categories. Only 4 out of 7 are based on all the specified semantic links and only 2 out of 7 explicitly prescribe the list of domain constraints with none prescribing a minimal list.

Conclusions: On the path to increasing semantic interoperability to level 2 (understanding the terms with the meaning of the sender) conformance to the EN/ISO 1828 ontology framework standard is an opportunity which has started to be used by the most advanced classification systems [17] and the international ICHI initiative. This use will be completed by explicitly associating the Categorial Structure ontology framework to biomedical terminologies exchanges protocols. This step will ease the development of a full shared biomedical ontology based on an upper level ontology needed to reach the level 3 of semantic interoperability when the receiver or final user can process the data as safely as he can do with his own terms and meaning.

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Hospital Behavior in Response to DRG-Based Compensation Funding Scheme

Introduction: In Slovenia in 2003 the national hospital funding system adopted the DRG system. We sought to identify behavioral changes in diagnosis (ICD-10) coding associated with this transition.

Methods: ICD-10 data for the years 1997 – 2007 were analyzed at various levels of resolution: patient age groups, disease groups (ICD-10 categories), and acute hospitals.
Results: The largest changes in terms of hospital coding occurred in maternity wards with an overall increase in codes per patient (newborn) by approximately 200%. This appeared to be caused by two factors: 1) a lack of recording of diagnoses in some hospitals before the transition and 2) an apparent surge in upcoding in some hospitals after the transition. We also note a wide variety of patterns between the different hospitals.

Conclusions: Better regulatory systems are needed in order to ensure patient safety, quality and validity of data, and fairness in financing.

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The Modern Concept of Sepsis and its Impact on DRG

Introduction: The concept of sepsis has gone through a profound change as a consequence of the 1992 definitions of SIRS (Systemic Inflammatory Response Syndrome). The most important change is the shift of sepsis being considered a severe disease to its recognition as a continuum of generalised body reactions caused by infectious disease.

Methods: Sepsis:

The continuum is defined in three stages which can be expressed as
1. Sepsis defined as infection causing at least two of four criteria (fever, increased heart rate, increased respiratory rate (or hypocapnea) and leucocytosis)
2. Severe sepsis, is sepsis with hypotension and organ impairment and
3. Septic shock, is severe sepsis with circulatory failure and high mortality (the end stage)

For sepsis, the focus is now on the etiology (pneumonia, meningitis, acute tonsillitis, acute pyelonephritis etc.), rather than the generalised body reaction of the infection. The internationally recommended ICD-10 coding is that sepsis, severe sepsis (R65.1) and septic shock (R57.2) are additional codes to the infection causing sepsis. Two logical consequences of coding sepsis can be identified:
1. Severe infections such as pneumonia and meningitis will per se fill the criteria of sepsis - an additional code for the first stage of reaction will be superfluous. Only in cases with infections stated as with severe sepsis or with septic shock, the additional codes are recommended.
2. The traditional ICD-10 sepsis codes A40.- - A41.- shall only be used when the origin of infection causing sepsis cannot be established.

Results: Impact on the DRG systems:
The DRG groups depending on A40-A41 as markers for sepsis (e.g. Medicare DRGs 416 and 417) will not identify cases of severe sepsis or septic shock when the original organ infection is coded according to the recommended sequence (coded first).
Conclusions: The new coding recommendation will allocate cases to organ MDCs according to anatomy rather than to traditional sepsis DRGs (in Chapter 18), unless the grouping algorithms are updated. It is therefore necessary to analyse the new coding rules’ impact on casemix weights to identify necessary measures to be done to secure correct iso-resource grouping. In order to allocate these cases to the optimal resource group, a way of linking the supplementary sepsis codes to the appropriate infection code needs to be identified and established.

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Upcoding and Miscoding in Slovenian Hospitals

Introduction: Upcoding and miscoding is no novelty in DRG systems around the world. The Slovenian health care professionals in acute settings have been challenged in various ways. Patterns of upcoding and miscoding are noticeable. The aim of this research project was to find out in which cases health care professionals have a greater motivation to upcode DRGs and what the main culprits for miscoding are.

Methods: On the basis of DRG data between 2004 and 2009 identify the obvious patterns for the 3 most common upcoded DRGs and the 3 most common miscoded DRGs. Methods for upcoding included practical work in the hospitals, questionnaires from which we evaluated possible reasons for miscoding, statistical analysis (linear and multivariate regression analysis) and data mining. Analysis was performed using different data mining tools: Weka, R, MatLab and SPSS.

Results: Patterns of upcoding were detected in maternity wards, where extensive amount of cases of babies with jaundice was detected (>40%). Miscodings of DRGs were identified in the Oncology wards in two hospitals, where patients going through chemotherapy were wrongly classified as hospitalized (99% of the patients).

Conclusions: Upcoding and miscoding represent anomalies in all current DRG systems. However, with appropriate methods we can tackle the problem and substantially lower its consequences. With regular analysis and recommendations to the hospital we can limit the miscoding and upcoding.

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Each patient counts

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SESSION 2C—Ambulatory Care and Case Mix I

ID:1151408

A Process for Counting and Costing Ambulatory Care

**Introduction:** Our aim is to demonstrate that Ambulatory Care is an important component in the provision of health services. Without it we would place extensive demand on inpatient services in hospitals.

We intend to demonstrate how the classification and costing of each patient in an ambulatory care setting has value and that each service and/or consultation has a meaningful outcome for the funding of ambulatory services.

We will guide you through an approach that will see the generation of cost weights for ambulatory care that can be utilised in the funding of these services, so that appropriate allocations are made to enhance their delivery. While this approach may not be the ideal it allows every organisation to participate.

The ideal approach would be to cost and count at patient level; however in ambulatory care settings this is not possible as many of the feeder systems providing additional support to these services are not integrated and stand alone. Therefore a cost modelling approach in the first instance is a good start.

**Methods:** In order to achieve our goal we used a step function that ensured that all components associated with ambulatory services were included, only those items that were clearly identified as exclusions because of their unique nature were not counted.

Step one was to ensure that all Clinics that provide ambulatory services were identified and that each patient encounter was captured, and then identified into whether it was a Clinician or Nurse encounter.

Step two was to identify from other countries’ experiences as to whether or not there were similar clinics to our own and if there were appropriate service weights associated with these clinics. Again while this may not be ideal it was a good start in identifying what was different in our organisation, and having established the differences an appropriate course of action was able to be taken to address these differences.

Step three was to ensure that the general ledger had the appropriate cost centre structure that captured all costs associated with each clinic and identified each component cost, e.g. medical, nursing wages, medical supplies etc,

Step four was to develop an appropriate allocation statistic for the distribution of costs that were consumed by these clinics from other services that were not fully attributed to the clinics e.g. administrative services, maintenance etc. These statistics were generally floor area, FTE’s etc,

Step five was to identify the appropriate service weight associated with the clinic activity and assign that service weight identifier to the patient encounter and ascertain whether or not the weight was conditional or unconditional.
Step six was to develop a database with all the above components and run the information through a cost modeling application to generate the desired cost weights for each clinic and the average cost for all clinic encounters.

Step seven was to obtain a similar output from another country or service and compare the difference, where there are wide variations investigate that clinic and determine what has cause this variation.

In step eight, after obtaining the final cost weight and average cost, the future patient activity for each clinic was determined and the cost weight and average cost were assigned to this activity. Finally the movement between the allocation of funds to the clinics and the previous allocation were compared.

**Results:** In our experience using this approach we have seen movements of up to and beyond 10% in the allocation of funds. Additionally the classification of patients to inappropriate clinics has also resulted in clinics being underfunded.

**Conclusions:** As we indicated in the introduction this may not be the ideal approach but it is an approach that becomes inclusive for all organisations to participate. The benefits to an organisation utilising this approach assists them in the appropriate classification of their patients to the correct clinics, the correct assignment of funds, and identifies the short coming of non direct allocation from feeder systems that provide a service but are not integrated to the main patient administrative systems. We have found this a useful tool in progressing towards activity based funding.

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**Redeveloped CACS Ambulatory Care Grouper: RIW Estimation and Evaluation**

Introduction: The grouping methodology for ambulatory data, Comprehensive Ambulatory Care System (CACS), used by the Canadian Institute for Health Information (CIHI) has recently been redeveloped. Although CACS, originally developed in 2001, has been updated annually to account for changes in clinical practice and to accommodate client feedback, a true redevelopment had not been performed since it was launched. This, along with the fact that data from additional ambulatory care patient types was being submitted to the National Ambulatory Care Reporting System (NACRS) database by Alberta, determined the need for redevelopment of grouping and RIW estimation.

CACS consists of 239 cells organized into 23 Major Ambulatory Clusters (MAC) based on the body system involved or functional grouping. Each MAC is composed of a number of related cells formed on the basis of various combinations of the grouping data elements.
This paper will describe the statistical analyses done to calculate RIWs for CACS 2011 and its evaluation. It will also describe in detail the regression analyses, the factors used in the regression models, how statistical outliers were determined, and the evaluation of the CACS 2011 RIWs in comparison to CACS 2010 RIWs.

**Methods:** We used data submitted to NACRS between FY 2007-08 and FY 2008-09 from the provinces of Alberta and Ontario. The RIW regression model used was additive. The factors applied in the RIW modeling were Age, anaesthetic technique (AT), and investigative technology (IT). Total cost (adjusted for facility effects) was used as the dependent variable to fit a weighted least squares (WLS) regression using CACS cells, AT, IT and selected interactions between them as predictors. CACS 2011 and CACS 2010 RIWs were compared using goodness-of-fit (GOF) metrics (e.g. bias, mean square error, mean absolute error and r-square) by CACS cells, MACs, CACS Logic Type, and facilities.

**Results:** At the overall system level, CACS 2011 explains cost variation better than CACS 2010 by approximately 11% (69% for 2011 versus 58% for 2010). Also, the MAE associated with CACS 2011 estimates is $130.72 compared to $154.68 for CACS 2010. CACS 2011 RIWs are slightly less biased than CACS 2010 RIWs. In both Ontario and Alberta, CACS 2011 explains cost variation better than CACS 2010 by at least 10%. At the CACS Logic Type, facility and MAC levels, CACS 2011 predicts average costs better than CACS 2010.

**Conclusions:** The evaluation results demonstrated substantial improvement in explaining ambulatory care costs when CACS 2011 methodology is used. As the current methodology evolves, the RIW estimation methodology will be refined to improve cost estimates for a few CACS cells with poor cost estimates. In addition, given that the approach used in RIW calculation is additive, there is more potential for it to be compared to other international systems.

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**Applying Diagnosis and Pharmacy-Based Risk Models to Predict Pharmacy Use in Aragon, Spain: The Impact of Local Calibration.**

**Presentation of Paper BMC Health Services Research 2010**

**Introduction:** In the financing of a national health system, where pharmaceutical spending is one of the main cost containment targets, predicting pharmacy costs for individuals and populations is essential for budget planning and care management. Although most efforts have focused on risk adjustment applying diagnostic data, the reliability of this information source has been questioned in the primary care setting. We sought to assess the usefulness of incorporating pharmacy data into claims-based predictive models (PMs). Developed primarily for the U.S. health care setting, a secondary objective was to evaluate the benefit of a local calibration in order to adapt the PMs to the Spanish health care system.
Methods: The population was drawn from patients within the primary care setting of Aragon, Spain (n = 84,152). Diagnostic, medication and prior cost data were used to develop PMs based on the Johns Hopkins ACG methodology. Model performance was assessed through r-squared statistics and predictive ratios. The capacity to identify future high-cost patients was examined through c-statistic, sensitivity and specificity parameters.

Results: The PMs based on pharmacy data had a higher capacity to predict future pharmacy expenses and to identify potential high-cost patients than the models based on diagnostic data alone and a capacity almost as high as that of the combined diagnosis-pharmacy-based PM. PMs provided considerably better predictions when calibrated to Spanish data.

Conclusions: Understandably, pharmacy spending is more predictable using pharmacy-based risk markers compared with diagnosis-based risk markers. Pharmacy-based PMs can assist plan administrators and medical directors in planning the health budget and identifying high-cost-risk patients amenable to care management programs.

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1152726

Case Mix Readjusted Analysis of PPR in Patients Admitted in Geriatric One-Day Clinic

Introduction: A new kind of one-day hospitalization was introduced in 2007 in Belgium legislation specifically aimed at the elderly patient. Its purpose is the diagnostic evaluation, therapeutic adjustment and rehabilitation in a multidisciplinary fashion. This should prevent a number of hospitalizations for the target population. This study aims at comparing the number of readmission and potentially preventable readmissions (PPR™3M) for patients with the same case-mix admitted or not in the geriatric one-day clinic.

Methods: We retain de data of the year 2009 of the Centre Hospitalier Regional de la Citadelle (Liège). These are processed using the APR-DRG grouper (™3M), which is used in Belgium for the official DRG payment system. The PPR indicators are generated by 3M specific software. These are compared to a benchmark of 45 Belgian hospitals. We also identify the DRG’s where the risk off PPR is the highest. Secondly, we divide our population in two categories: patients aged 75 or more who are treated in the geriatric one-day clinic and those patients aged 75 plus or more who are not. We compare the number of readmissions and PPR to examine if this one-day clinic succeeds in diminishing the number of hospitalizations in this population. We do this globally and case-mix readjusted
Results: The Centre Hospitalier Regional de la Citadelle (Liège) had in 2009 380,030 admissions. 29,212 of these were not planned. They represent the visits of 27,170 patients. With an 30d interval 544 patients had chains and 9 even more than 1 chain. An average of 2.137 admissions per chain was observed. 2.42% of the patients with unplanned admissions had chains, while in the benchmark this is 2.46%. If in a chain planned readmissions are eliminated the number of patients with a chain are reduced with 41.64% (40.33% in the Bench). The readmission are consequently lower (albeit little) than the averaged of the benchmark

The top 5 of our initial medical DRG’s which start a chain are: 140 (chron. obstructive pulm. disease), 133 (pulmonary edema & resp. fail.), 194 (heart failure), 721 (post-op/post-trauma/dev. Infect) and 139 (other pneumonia). The top 5 for chirurgical initial DRG’s are 813 (other comp. of treatment), 194 (heart failure), 143 (other resp. dx exc. Sign/sym/minor), 139 (other pneumonia) and 254 (other digestive system dx).

Of the 2831 patients aged 75 or more, 133 were admitted at least once in the geriatric one-day clinic. 36.09% of these were multiple times hospitalized. Of the 2698 other seniors only 29.79% were more than once hospitalized. This higher number of readmissions was observed, even if we selected only a subset with severity 2 or higher or if we compared per DRG

Conclusions: Geriatric one-day patients in our hospital have a higher risk of being readmitted in hospitalization, compared to a similar case-mix group (DRG, severity, age category). The clinic doesn’t succeed in reducing this risk to the level of patients not included. However the selection of patients to go or not in the one-day clinic is not random but clinically. A comparison between hospitals with and without a geriatric one-day clinic should be able to help indicate if a one-day clinic effectively reduces the number of readmissions or rather increases it.

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Incremental Costs of Hospital-Acquired Complications in Alberta, Canada

**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-Admission (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 144 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). Twenty-two 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 septicaemia (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.

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

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**Research Objectives:** Singapore introduced Casemix-based financing for inpatient 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, 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.

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References

Health Status and Performance Using Clinical Risk Groups (ACRG3) for the Madrid Region

Introduction: More than 90% of the population is treated by the public sector in the Madrid region. The Madrid Community is evaluating a population based grouper to enable better description of health status of its population for planning, performance evaluation, utilization review and primary care new funding mechanisms.

Population-based groupers use as input the same Minimum Basic Data Set (MBDS) information from inpatient and day surgery and Medicine discharges as do DRG encounter groupers. Also they can input the multiple diagnoses coming from “carta”, annual primary care and specialized consultations clinical documentation sheets.

Methods: In addition to the clinical information from all 6 325 079 public patients from the Madrid region in 2009, we obtained the units and estimated costs from all sectors, namely from ambulatory sector: outpatient drugs, primary care visits and specialized consultations, external consultations from hospitals, emergency visits, other diagnostic and therapeutic services; and from inpatient sector using the AP DRG classification and US cost weights.

The CRG methodology from 3M Inc is used for this study. This is a categorical model enabling the identification of only one group for each patient. There are close to 1100 CRG groups, including their combination with respective severity of illness level. This classification collapses also into so-called Aggregated CRGs. We document in this study only the coarsest granularity, the nine status levels (ACRG3s).

Results: Table 1 provides the overall distribution for all public sector registered patients in Madrid. 498 128 patients has one or more acute illnesses documented by Status 2. For level 3 and above, we observe, with few exceptions, the normal pattern of monotonic decrease in the number of cases as the status increases and as the level increase within each status , the cells with a zero count means that there are no severity level for that status.
The average cost for inpatient stay is 2,913.54 euros; for one consultation in family medicine, it is 45.06 euros; for nursing consultation, 15.53 euros; for specialized consultation at hospital, 130.69 euros, etc. All units for each registered public health care services Madrid inhabitant are documented and enable the analysis of costs in relation to CRG status.

Table 2 demonstrates the expected pattern of increase in average cost per registered individual as the status level increases (except between status of multiple minor chronic problems and one major/dominant chronic disease) by Madrid district. As an example, the North district has the lowest costs (or best production performance) for all Status levels, except for the patients with one major chronic problem.

Conclusions: CRGs are a useful tool to evaluate the patient structure of chronic problems and adjust for the relative production performance evaluation of various geographical sectors in the Madrid region.

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First German Hospital Infection Benchmark Based on DRG Routine Data

Introduction: Hospital infections are a serious health problem in most countries. Clinical outcome and survival are much worse than in patients without infections. Especially in DRG-based budget environments, many studies have shown, that patients with infections often are cost or LOS-outliers.

In Germany there is a long tradition of benchmarking on DRG-level but very few analyses exist that allow clinical comparisons. Clinical data collections usually do not contain economical information

Methods: We developed an algorithm to identify infections and classify them as community acquired (ca), hospital acquired (ha) or potentially hospital acquired (pha).

By using an existing hospital database that contains data from 174 hospitals and 3.4 Mio. Patients per year we developed a benchmarking tool for the comparison of infections.

We use the following parameters for comparisons:
• no. of and percentage of certain infections in the hospital
• distribution of infections by ca, ha, pha
• variations in LOS for patients w and w/o infections
• extent of deviations from the ALOS of the DRGs
• occurrence of multiresistant bacteria
for each parameter distribution graphs are drawn. Each hospital can determine
the own 'rank' in the group of hospitals.

**Results:** The project is ongoing. Momentarily we are implementing the algorithm
in the database and in Jluy we do the queries.
We expect the results to be ready by end of August 2011.
Special interest will be the comparison of the data (DRG) driven analyses with
other sources, like the German hospital infection surveillance system (KISS).

**Conclusions:** Conclusions will deal with feasibility, accuracy of the results,
imPLICATIONS for clinical practice and transferability in international context.

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**SESSION 3B—Refining Case Mix Systems**

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A Methodology for Refining AR-DRG

**Introduction:** Previous reviews of AR-DRG, such as that by Aisbett, Wiley 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, Sutch 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 differs 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:


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.

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Development of a Classification of Clinical Specialties: Service Related Groups (SRGs) and Enhanced Service Related Groups (ESRGs)

**Introduction:** Service Related Groups (SRGs) and Enhanced Service Related Groups (ESRGs) have been used in New South Wales (NSW), Australia, since the early 1990s, and were adopted nationally in the late 1990s. SRGs reflect clinical specialties, while ESRGs provide more detail of major conditions and procedures within the specialties. Both classifications are based on grouping of AR-DRGs but are differentiated from DRGs in that the classes are exhaustive with respect to other types of admitted patient care other than acute (i.e. sub and non acute and psychiatric/mental health admissions), and that SRGs are designed to mimic clinical specialties within hospitals.

The SRG and ESRG classifications provide the health system with a common language to converse about health planning issues. They standardise local variation in classification of health services and/or designation of patients to those services. They also provide the data structure upon which health departments can develop tools to assist planners in applying standardised approaches to identifying need in the population and constructing health service plans. A good example of this is the development of activity projections, which are aimed at quantifying the future demand for admitted patient activity given projected population growth and ageing, epidemiology, technology and other factors influencing the demand and supply of services. Another potential area is workforce planning, which is a growing issue given the demands on the health system.

**Methods:** This project reviewed the SRG and ESRG classifications used in NSW. The main drivers for the review were:

1. Currency of the existing classification systems. The classifications were reviewed to ensure their currency in a rapidly evolving environment (i.e. including changes in clinical practice, use of technology, and epidemiology of the population);

2. Changes to underlying classification and coding systems. SRGs and ESRGs are (predominantly) groupings of Australian Refined (AR-)DRGs, which are in turn constructed through a complex logic involving patients’ diagnoses and interventions among other key variables. Diagnoses and interventions in Australia are coded using the International Classification of Diseases – 10th Revision – Australian Modification (ICD-10-AM). There were revisions of both AR-DRGs and ICD-10-AM versions since the last major reviews of SRGs and ESRGs in about mid the 2000s. Therefore, a review of these underlying classifications and coding systems was necessary to ensure that their allocations are still appropriate.

The current review was a major one in that it involved a re-examination of the structure of both SRGs and ESRGs. To do this, we reviewed data from NSW hospitals of the structure of their clinical departments and reviewed national and international work on classifications of clinical specialties.
After constructing an initial list of SRGs, we again examined NSW data to analyse the most frequent assignments to clinical specialties for each DRG by individual hospitals. This initial assignment was reviewed internally and some overrides were made based on specific criteria. We then consulted widely with key stakeholders, including clinicians and health service planners.

**Results:** The final SRGs include classes for acute, sub and non-acute and psychiatric/mental health care episodes. Within these, ESRGs have been identified, grouping major conditions and procedures in the case of acute care, and for subacute care, we identify a methodology to subset admitted episodes according to impairment category for rehabilitation for example, using routinely collected admitted patient data. The criteria we use for subsetting ESRGs include major conditions/procedures, use of specialist suite/resources and potentially trends in activity, while maintaining sufficient volumes within each class.

**Conclusions:** While there are more than 650 AR-DRGs for acute care, the SRG classification has 45 classes and ESRGs 141 classes across acute, sub and non acute and psychiatry/mental health, making them a more manageable and focused set of classes for planning health care services.

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1152988

**Counting Chronic Diagnoses is Not Enough: Classifying the Entire Patient Population With a Morbidity Spectrum Measure**

**Introduction:** Persons with similar chronic conditions differ in their overall morbidity. The study examined the degree of variation in the full spectrum of morbidity and in associated health care use among persons with multiple chronic conditions.

**Methods:** A retrospective cross-sectional analyses. Data from electronic medical records from all medical encounters of a representative sample of 279,241 adult enrollees of Clalit Health Services, Israel's largest health plan. The full spectrum of morbidity was measured using the Johns-Hopkins University Adjusted Clinical Groups® (ACGs) System based on one year's (2009) diagnostic information. Chronic condition counts were based on data from the Clalit's chronic disease registries, which align information from several sources, including electronic medical records from physician visits and hospitalisations, data on prescription drugs, and information from diagnostic and lab tests. For cohorts classified as having varying numbers of chronic conditions, morbidity was categorized as low, medium or high and associated relative resource use was calculated for each category.
Results: On average, adult enrollees had two chronic conditions and about five different types of morbidity (as measured by the Aggregated Diagnoses Groups (ADG) component of the ACG System). Having more chronic conditions was not as highly related to increased resource use as was having a more varied morbidity spectrum (i.e., greater variety of types of conditions): Most adults had at least one chronic condition. Only 14.5% of those with no chronic conditions were categorized with no morbidity, representing about 5.6 percent of the adult population. Having more chronic conditions, on average, was associated with greater relative resource use. Yet, inconsistencies are noted. Morbidity spectrum, however, was more strongly related to resource use - patients in higher morbidity spectrum groups had greater relative resource use than patients in lower morbidity spectrum groups in each chronic conditions stratum for each of the resource use variables.

Conclusions: A greater variety of co-occurring morbidity types contributes much more to resource use than a sum of individual chronic diseases. For care management and research applications, it is more useful to know about the entire morbidity spectrum rather than to focus only on chronic conditions.

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Should there be a Limit for DRG Split? A Case of Thai DRG Versions 3 to 5

Introduction: The provider payment method based on diagnosis related group in Thailand has faced serious consideration how many groups of DRGs are acceptable to key providers since the development of Thai DRG version 4 in 2007 and the Thai DRG version 5 in 2010. The more refined groups would make a shift of resources from smaller hospitals to bigger hospitals. Should the decision on a limit for DRG split be made at the development phase or the implementation of the payment phase? This study aimed to compare the DRG splits of Thai DRG versions 3, 4 and 5.

Methods: Inpatient data of 2010 were passed through DRG groupers of versions 3, 4 and 5. The numbers of DRGs in each Major Diagnostic Category were traced using the average length of stay and relative weight as the outcome measure.
Results: Inpatient data of 5.65 million discharge cases were grouped into 1,275 DRGs of the Thai DRG version 3, 1,917 DRGs of version 4 (a 50% increase from the previous version) and 2,449 DRGs of version 5 (a 28% increase). The development of version 4 delivered more splits in MDC08 (new 69 DRGs) and MDC06 (66 new DRGs). The development of version 5 led to reduction of DRGs in MDC00 (22 DRGs) but more in MDC01 (65 new DRGs) and MDC28 (new 57 DRGs). Controlling for disease clusters (DCs or the first four digits of DRGs) to highlight the effects of comorbidities and complications on severity of disease (the fifth digit), 89.4% of the total cases remained in the same DCs when compared version 3 with version 4, and 94.5% remained unchanged when compared version 4 with version 5. For cases with severity changes, the newer versions (especially version 5) toned down the effects of CC, i.e., 3% of 5.05 million cases saw a reduction of severity by version 4, and 15% of 5.34 million cases saw a reduction by version 5 while the increment of severity was 1% for both versions. The wider range of RW by version 4 led to a 5% increase of average RW in patients with same DRGs, and a 40% increase of average RW in patients with DRG changes. A slightly narrower range of RW by version 5 led to a 4% reduction of average RW in patients with same DRGs, and a 24% reduction of average RW in patients with DRG changes. Finally, newer DRG versions better predicted the hospital resource use: bed-days (r-square of 0.186 for version 3, 0.254 for version 4 and 0.277 for version 5).

Conclusions: Newer versions of Thai DRG resulted in more number of groups in many MDCs, a reduction of groups in the pre-MDC (MDC00), and a limit on severity of cases as the influence of the CC. The average relative weight does not always increase as the number of groups increase. More groups better predict hospital resource use.

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SESSION 3C—Health System Planning and Case Mix

1164862

Perceptions of the Case Mix System by Clinicians after the First Year of Implementation in Hong Kong: A Survey

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.

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Case Mix Innovation: Shifting to Integrated Care

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 changes 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.
Conclusions: 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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Can Clinical Pathways Enhance the Implementation of a Case Mix System? A Case Study in a Teaching Hospital in Malaysia

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 costing analysis in Casemix.

Methods: Universiti Kebangsaan Malaysia Medical Centre (UKMMC) in collaboration with United Nations University International Institute For Global Health (UNU-IIGH) 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-blind, 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 ±2.94 (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 has 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.

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1152303

How Population Based Case Mix has Proven Itself in Canada

Introduction: Since 1998, the ACG® System has been successfully applied in 8 Canadian provinces. Used by provincial health authorities as well as researchers at numerous Universities and research organizations, case mix has proven valuable to achieve numerous project objectives. Applications include:
- Characterizing the use of health care services and identifying high utilizers.
- Comparing the illness burden as measured by case-mix with patient reported information.
- Predicting mortality
- Assessing differences by group size for patient access to care, continuity of care, and provision of comprehensive primary care,
- Establishing clinical baseline indicator data for improved provision of care protocols and integrated health service plans,
- Support morbidity based capitation systems
- Monitoring mental health status amongst specific populations
- Identify and quantify patterns of use of public services
- Assessing performance of primary care providers
- Detecting fraud and abuse within the provision of health care services.
- Control for morbidity in research studies

Methods: Examples cited throughout the presentation will include results from studies performed in British Columbia, Manitoba, Ontario and Quebec.

Results: Through adaption to the local context including incorporation of local weights, recognition of local coding systems (i.e. ICD-10 and DIN), and local practice patterns, the results have demonstrated the robustness and value of the ACG System.

Conclusions: The ability to apply case-mix to routinely collected diagnostic and pharmacy codes has provided valuable information to facilitate clinical, financial, and managerial decision making in Canada

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SESSION 3D—Case Mix Methodologies and Their Use

Introduction en douceur à la méthodologie des systèmes dits “Casemix” pour les nouveaux venus

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Dr. Dana Burduja, MSc, Programs Director Center for Health Policy and Services Bucharest Romania, Saint Etienne PhD student

Overview: This session will be delivered in French language and it is intended to introduce new comers (in their native language) to the basics principles and applications of Case mix systems. Recommendations will be given during the workshop about possible more extensive training, during further summer and winter schools organized by PCSI. The audience is broad, from clinical coders and cost accounting specialist from the health sector to decision and policy makers, especially when using French as their working language.

Summary:
- Introduction: DRGs and Case mix, definitions, similarities, differences
- History of DRGs and case Mix
- Basic principles in defining and assigning cases to DRGs
- Implementation and utilization of Case Mix systems in different countries - overview
- Case mix and quality of care
- Topics of the PCSI Winter and Summer School
- Q&As, discussions

Take home messages: This session is aimed at providing French language speakers with the basic principles of case mix development, implementation and uses- from theory to practical application in different health care settings. In-depth knowledge and international experiences sharing can be further achieved by participants by participating in the association Winter or Summer Schools, with different topics and teaching levels.
Utilisation de regroupements d'épisode de soins dans le cadre du financement du réseau de la santé et des services sociaux du Québec

**Presenter:** Norman Lantagne, Directeur de l'allocation des ressources par intérim, Ministère de la Santé et des Services sociaux du Québec

Le Ministère de la santé et des Services Sociaux du Québec utilise depuis plusieurs années le système de classification DRG (Diagnostic Related Group) dans ses analyses. Cet outil a d'abord permis d'établir un modèle de comparaison du coût par patient en prenant en considération le principal facteur expliquant les variations de coût entre les établissements soit le niveau relatif des ressources utilisées. La lourdeur de la clientèle est aussi un élément important dans la détermination d'un indicateur régional de besoins permettant le calcul des volumes attendus pour le programme de santé physique. Les résultats de performance des établissements et les volumes attendus obtenus selon une approche populationnelle sont pris en compte dans l'allocation des ressources qui, depuis 2004-2005, a pour objet de remplacer progressivement la budgétisation historique des établissements.

La présentation fera le point sur les aspects du mode d'allocation des ressources et d'autres outils de financement comme le programme d'accès à la chirurgie en lien avec le regroupement d'épisodes de soins. Plus particulièrement, il sera question de l'utilisation des APR-DRG (All Patient Revised – Diagnostic Related Group) à la base du calcul de la lourdeur de la clientèle et l'apport de cette lourdeur aux méthodes de financement du réseau de la santé et des services sociaux.

**PCSI 2011 Featured Abstracts**

1151751

**Patient Pathway Aggregation – Building on a Firm Foundation**

**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 OPCS-4 intervention 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, if not 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 unbundled events additional to the core care episode, to provide a variable ‘value’ unit for the patient pathway
- 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.

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Analysis of the Variability of Nursing Care by Pathology in a Sample of Nine Belgian Hospitals

Introduction: In 2010, a Belgian study 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\textsuperscript{ii,iii,iv,v}. This is the reason why some researchers try to refine DRG classification into classes of nursing cost per DRG\textsuperscript{vi}. However, it is difficult to find recent data that deals with this.

The objectives of this study are to:
1. Discover if nursing activity is homogeneous by DRG and severity of illness.
2. 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 obligatory 4 * 15 days a year per 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\textsuperscript{vii} and Welame\textsuperscript{viii} 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\* interquartile range was used to select high outliers; the 25th percentile -1,5\* 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.

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Session 4A—Economic Incentives and Case Mix II

1164589

Case Mix-Based Economic Incentives That Work

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.

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Pay-for-Performance Quality Incentive Program – One-Year Pilot Program

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.

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Paying for Quality

Introduction: In the US, Medicare is introducing Value Based Purchasing whereby a portion of a hospital's reimbursement will be linked to quality, in the form of Quality Indicators (70%) and Patient Satisfaction (30%). In Australia, the Council of Australian Governments (COAG) Heads of Agreement: National Health Reform (February 2011) have agreed in principle to the following Quality related reforms, namely:

- An expert panel is to be established to advise COAG on the effective implementation of the national standards and the right balance between reward and facilitation payments.
- The Australian Commission on Safety and Quality in Health Care will develop national standards for clinical safety and quality improvement. The National Performance Authority (NPA), which is to be established from 1 July 2011, will monitor performance of Medicare Locals and Local Health and Hospital Networks, and produce public reports on the performance of hospitals and health care services that are uploaded to the MyHospitals website.

Methods: Value based purchasing in the US is designed to be budget neutral. Medicare will "withhold" 1% of a hospital's payment in 2013. Hospitals will get greater than 100% of their "withhold" back at the end of the year if their combination of Quality Indicators and Patient Satisfaction falls in the top 25% of hospitals in the USA.

For those hospitals that fall below the top quartile, they will receive the appropriate percent back based on their percentile position for the year. Therefore some hospitals will stand to loose significant amounts of their "withhold".
Whilst the US appears to have their Quality payment framework in place, Australia has yet to provide any clear definitions around the model. It appears clear that the creation of the NPA should result in the introduction of rigorous performance indicators at a national level, which will drive both health system quality and performance in Australia, however at this time there is very little information regarding the areas for performance measurement and whether Australian public hospitals will be rewarded, through the efficient price, for quality.

What is clear is that the ‘efficient price’ will be derived from the current costing systems used in Australia. Given the well known issues around the lack of quality and consistency across Australian hospital’s costing information, it seems clear that rewarding hospitals for the production of robust costing information should also fall under the NPA’s purview.

Results: Whilst it is difficult at this time to ascertain what hospitals will need to put in place in order to manage quality, it is clear that a focus on quality will bring positive results, both for the patient and the organisation as a whole. At Community Hospital Anderson in the US, where Dr VanNess is CEO, their focus on quality has facilitated an average cost per adjusted discharge of US$1,800 less than their peers.

For Australia, hindsight is a wonderful thing. The past fifteen years has provided Australian hospitals and Health Departments with several valuable lessons regarding the implementation of Casemix and patient costing system. Some of these lessons include:
1. Focus on the purpose, not only the model.
2. Clinical Engagement
3. Limited pool of costing resources.
4. Critical mass.
5. Career path.
6. Mix of staff.
7. Five year plan.
8. Frequency of costing.
9. Local ownership.

Conclusions: As a physician, who also happens to be a hospital CEO, Dr VanNess has always felt that the focus should always be on quality and patient satisfaction while maintaining cost effectiveness. ‘We don’t know exactly where healthcare reform will take us but I do believe that if an organization is to be successful they must have strong performance on established quality and patient indicators accompanied by low costs. To accomplish these goals, accurate “real time” information to make well-informed decisions will be critical!’

Like the US, Australia needs to link the efficient price in some way with quality. Simply reporting on clinical quality indicators is not enough.
Therefore, under ABF, Australian hospitals should also be rewarded for submitting quality data. If the past 15 years under casemix funding has taught us anything, it’s that a national approach with a focus on standardising the use of the information nationally to better manage hospitals, rather than on the development of the funding model itself; alongside the concept of "central processing/local ownership" and a ten-year plan for ongoing improvements and refinements in the costing process, is what's required if ABF is to deliver the anticipated gains for which it is being put in place.

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The Use of Casemix Data for Identifying Variations in Hospital Care for Elderly Having COPD

Introduction: The introduction of DRG system starting with 2003, and its extension nationwide for Romanian hospitals, made possible to perform various analysis concerning hospital activity based on the data reported. In the context of international concerns for evaluation of hospital performance and practice variation, even in Romania decision makers should be aware about geographic variations in hospital care, resource consumption and should try to evaluate and solve unjustified differences. Since the population all over the world, and in Romania as well, is ageing, the study is providing a detailed analysis about the hospital care for aged people having COPD.

Methods: The authors have done literature review about the prevalence and burden of COPD, especially for old patients. Then, a descriptive analysis was performed for the year 2008. All cases reported from all acute care hospitals in Romania, having 60 years and more, with COPD (principal diagnosis ICD 10AM in J40-J47), were included in the study (only valid cases). Gross rates of cases was standardized after sex . The association between the number of cases and the standard of living was tested with Pearson correlation test. T test was used to test differences between the ALOS of cases with COPD versus all cases discharged by hospitals. The multivariate analysis (ANOVA) was used to test if the type of the hospital (city, district, institute, single specialty, private) influence volume of cases. The estimation of the amount of money reimbursed by the insurance fund and the evaluation of territorial differences was performed using the weighted cases from every district and the mean tariff per case at national level.
**Results:** There are differences between districts (after the district of hospital) concerning the volume of cases and the average length of stay. Districts from the North East of the country have more cases and districts in the Center of the country and Bucharest have less cases, reported on the total number of cases discharged from hospitals. The length of stay also varies, between 7.21 and 11.6, while the ALOS at national level is 9.02+-0.91 days. The ALOS for cases having COPD is significant different from ALOS for all elderly cases discharged from hospital.

No significant correlation was found between the standard of living and the volume of cases. There are significant differences in number of cases, after the type of the hospital, the most of the cases are discharged by city hospitals.

The amount of money that should be reimbursed by the insurance fund if all these cases would be reimbursed through DRG system was about 16,211,657 euro, most of them in Bucharest, Prahova and Cluj,

**Conclusions:** Case mix data used for the analysis of clinical activity of hospitals, and together with economic and statistic data can provide valuable information to decision makers for resource allocation and the planning of health services.

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**SESSION 4B—Long-Term Care and Case Mix**

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Aging, Disability and Long-Term Care

**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 may be declining, and that the decline will continue to occur even though the number of very old is increasing. However, it is difficult to find a simple reason to explain trends in institutionalization. Declining utilization rates can be better explained by a reduction of supply, rather than by a decrease in the of prevalence of severe disability.

Financing of nursing home care – and who pays for it– is a particularly salient issue with regard to public expenses. Admission control, and payment for complexity, thus become priorities for those who manage this type of long-term care. The group includes family members, providers, and care-payers. In Portugal, the payment for long-term care is a co-payment divided between the elderly, or their family members, and the state.

**Method:** This paper describes the profile of Portuguese elderly admitted to nursing homes that belong to the non-profit sector.

The main objective of the research was to describe the elderly in terms of their general health conditions and motor and cognitive impairment, and to determine the levels of disability (clinical complexity) that were associated with the different levels of utilization of resources. Recognizing the diversity of the elderly with functional impairments is essential in order to develop policies that are responsive to the range of needs that exist among the elderly.

To establish the disability profile, approximately 200 elderly, residing in various nursing homes, were evaluated. Areas considered were general health, frailty, risk and consequences of falls, swallowing disorders, communication profile, performance of the activities of daily living, cognitive ability levels and depression. The instruments used were a general questionnaire, the Lawton scale, Katz Index, Barthel Index, Mini-Mental State Examination, Geriatric Depression Scale, Verbal Association Test, Braden Scale, and a Swallowing Assessment. In addition, there was also a frailty indicator.

In order to identify the resources that were utilized for the different levels of care, a questionnaire was given to the managers of the institutions.

**Results and Conclusions:** Based on the different instruments used, and the functional impairments found, different levels of complexity were discovered among nursing home residents. However, the payment of care remains almost the same among these residents, except for small differences that do not reflect levels of assistance.
The range of disability within the institutionalized elderly is extremely wide. Service programs and financing mechanisms must reflect the vast range of service needs which the disabled elderly require. For policy purposes, it is generally useful to think of the disabled elderly in three large groups:

- Elderly with mild impairments who do not require the active help of others.
- Elderly with moderate impairments who do not need 24-hour assistance.
- Elderly with severe limitations who require 24-hour intensive levels of care.

The most important conclusion the study reached is that the institutionalized elderly, since they have different levels of dependency, need flexible responses. The policies adopted, the planning of services, and their provision must be related to the assistance the institutionalized elderly need. The frequency and intensity of care is diverse, and these factors have a different impact on public and family spending that must be considered along with a systematic assessment of the dependency levels of the elderly.

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Transitioning to a New Case Mix Grouper to Fund Long-Term Care Homes in Ontario, Canada.

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 equitably 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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Using the Adjusted Clinical Groups, ACGs, to Describe Newly Admitted Nursing Home Residents in Stockholm, Sweden

Introduction: The Adjusted Clinical Groups case-mix system, ACGs, were developed by researchers at Johns Hopkins to predict future use of health care. This system groups patients on their present and former diagnoses within a certain time frame, e.g. one year. The focus, at least in Sweden, has been to validate its use in payment models in primary care. However, the ACG system is able to visualize a lot of clinical information, particularly in the newest version 9. Therefore, we wanted to test if the Stockholm county patient registry data might be used to describe the outcome of nursing home residents by the ACG programme.

Methods: Within the Stockholm County, there are about 400 nursing homes (NH) with a total number of beds of 15,000. For all 5242 newly admitted residents in the year 2009 all diagnoses (49,000 in-patient diagnoses, 22,900 out-patient diagnoses and 30,800 diagnoses from primary care) were collected 365 days prior to the NH placement date. For patients that had died (up to May 2011), that date was linked to the data set. This material was then used in the ACG software available and several of the outcome measures were used in Lifetest analyses, using SAS statistical software.

Results: Of all patients, admitted to NH in Stockholm during 2009, 1803 were men (mean age 83.0) and 3439 were women (mean age 86.4). 2278 of the patients died in NH after an average of 275 days (median 226). Several of the indicators in ACG showed a significantly higher mortality (e.g. Resource Utilization Band (RUB), number of Major ADGs, hospital-dominant diagnoses, number of chronic conditions, and several of the most complex ACG groups) but also some diagnosis groups, e.g., Congestive heart failure, COPD, Renal insufficiency, and Ischemic heart disease. Other indicators did not significantly differentiate the patients regarding mortality, e.g. the Frailty flag, Asthma, Arthritis, Depression, or Hypertension. The results for Diabetes as a whole gave an unclear picture.
Conclusions: ACG as a system for predicting future health care resources was tested on mortality in nursing home residents for the first time. Several of the ACG indicators and diagnoses were clearly predicting a shorter length of stay in the nursing home, while others were not. However, at least for this frail group of older persons, other circumstances should also be taken into account. Among these are the physical functional capacity (ADLs), the cognitive function, pain, and signs of delirium. These are easily caught through a comprehensive geriatric assessment, a technology that could be used more often than today.

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Implementation of Activity Based Funding for Long-Term Care in Alberta

Introduction: On its creation, Alberta Health Services inherited a number of different payment systems for long term care facilities across the province from the previous nine regional health authorities. As part of the merger process, Alberta Health Services moved to introduce a single method of payment for the province. The chosen method was activity based funding using the InterRAI 2.0 RUG III system. This paper describes the issues involved in implementation.

Methods: Data were collected from all 180 long term care facilities in the province.

Results: Considerable differences were found in the average cost per raw and acuity-weighted resident day across the province. Characteristics of high and low cost facilities were explored (e.g. ownership, size). Some long term care facilities were also providing specialty care (inconsistently captured in RAI system). The different costs of these were identified and ways of handling this will be discussed. Alberta Health Services is aiming to change the case mix of long term care facilities as more ‘supported living’ facilities are opened. This issue will also be discussed. Phase-in arrangements will also be highlighted.

Conclusions: Activity based funding for long term care in Alberta is being introduced over a six year period. Issues involved in the implementation involve complex tradeoffs which are discussed.
SESSION 4C—Case Mix and Data Quality

Auditing in the Irish Casemix Budget Models

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. A unique aspect of Casemix in Ireland is that it is budget neutral. The effect of this is that the performance of one hospital affects all of its peer hospitals. To ensure confidence in the process, there is a detailed audit done on the costs and activity of each hospital. Cost audits have been part of the annual Casemix process since Casemix was introduced in Ireland in 1991. In recent years, the National Casemix Programme (NCP) has put an increased focus on activity auditing.

The staff in the NCP have direct access to and regular communication with costing and coding staff in each hospital. This access is essential in enabling a thorough audit process.

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.

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Coded Data Quality for Case Mix Payment: Insights from Two External Audits

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 change 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.

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Clinical Documentation Manual Audit

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 as accuracy 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.

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Data Quality Considerations With Increasing Access and Timeliness of Irish Hospital Activity Data

**Introduction:** The Health Research and Information Division (HRID) at the Economic and Social Research Institute (ESRI) in Dublin, Ireland are in a unique position of being responsible for the collection, collation, monitoring and distribution of the national public hospital activity data through the Hospital InPatient Enquiry (HIPE) program. This gives the HRID the opportunity to monitor collection of hospital activity data from collection of individual patient discharge data through to preparation and provision of national HIPE data sets. This is achieved through clinical coder education, support and development of HIPE software and also through audit, data quality programs.

**Methods:** These HIPE data are being used more than ever before by an increasing number of parties. With value for money and Key Performance Indicators high priorities for many, these data are recognised as a critical tool in Irish health services today. These users are demanding faster turnaround of HIPE data putting pressures on hospitals and the ESRI to provide data faster while still maintaining the same high quality standards. Some fascinating insights have been provided by these data users and researchers using HIPE. With HIPE data deadlines being shortened and turnaround time from patient discharge to data dissemination reducing new issues and challenges arise both at hospital level and within the HRID to support the people and systems providing the data.

This paper will explore some of the issues uncovered by the HRID and by HIPE data users which have highlighted issues around:
- Coder compliance to standards
- Data interpretation by researchers
- Use of hospital feeder systems to automatically provide data to HIPE
- Data set control

**Results:** Lessons have been learned for the ESRI, particularly for the coder educators and the HRID IT team. Projects are now in place to implement stronger checks on data entry, coordinate with hospitals on data quality issues as they arise and in a new initiative to provide tailored education to data users on all aspects of the complexities of these datasets including use of the classification (currently ICD-10-AM/ACHI/ACS) and interpretation of these data. Another major issue now facing HIPE is the interfacing, in a meaningful and useful way, with electronic health records to ensure quality of data is maintained and a balance is attained between automation and human interaction on the reporting on the individual patient record. Finally a challenge that needs to be addressed is how best to address data quality issues both at hospital and more particularly at national dataset level.
Conclusions: With resources limited and demands increasing the challenge facing HIPE now is to maintain truly timely and accurate hospital activity data to inform, monitor and manage hospital services in Ireland. This paper will present some of the challenges and solutions to the issue of maintain data quality while meeting increasing demands for data in a changing environment.

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SESSION 4D—Cost Data and Cost Weights

A Comparison: Estimated Average Inpatient Costs Using CIHI’s Case Mix tools vs. Inpatient Costs from the Canadian Patient Cost Database

Introduction: The Canadian Institute for Health Information’s web tool, the Patient Cost Estimator provides a simple approach to estimating the inpatient cost of different case mix groups. The tool combines two of CIHI’s key products, the resource intensity weight (RIW) for each inpatient case, and the cost per weighed case (CPWC). CIHI also collects patient level costs housed in CIHI’s Canadian Patient Cost Database (CPCD) from over forty costing facilities in Canada. This study compares the patient level costs with the patient level estimates.

By comparing the costs from these sources, we may achieve the following goals: 1. to evaluate the CPWC and RIW methodologies, 2. to isolate scenarios where the costs may not be well estimated using the described methodology, and 3. to understand variations in the estimates in order to enhance the CPWC and RIW methodologies and to understand the limitations of using these tools to estimate inpatient costs.

Methods:

Hospital Level Financial Data 2008 (CPWC)
Canadian Patient Cost Database Financial Data 2008
Clinical Data 2008, grouped by Case Mix Grouping Methodology Plus (CMG+) 2010

The two costs were compared at the level of major clinical category (MCC), case mix group (CMG), Facility, Age and length of stay (LOS).

Only cases from those hospitals that also submit patient level cost data for inpatients to the CPCD were included in the study.
The estimated average cost is calculated by calculating the average RIW by case mix group and age for each case within a specific jurisdiction. This average RIW is then multiplied by the jurisdiction’s CPWC to arrive at an estimated cost.

Corresponding inpatient total costs are calculated using the CPCD as well by case mix group and age for each case within a specific jurisdiction. Those values are then compared with the estimated costs.

Two criteria are used in determining if a cost difference is significant. The first is the relative difference ratio of the two costs in specific categorical groups; the more sophisticated method, the student T-test is also conducted and related p-values are computed, a small p-value (< 0.01 or 0.05) indicates the related cost difference is significant.

**Results:** Summary result tables for the cost differences, the T-Test p-values and relative ratios, graphs of plots by age, MCC and facility are present in the file. Some examples of scenarios where big cost differences occurred are highlighted.

**Conclusions:**
1. Overall, the estimated CPWC*RIW costs are close to actual costs for almost all patient ages. The CPWC and RIW methodologies work quite successfully.
2. Significant differences occurred in some MCC / CMG and some facilities groups.
3. Further study may be conducted to probe the deep reason based on this study.

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The Australian Hospital Patient Costing Standards and supporting Quality Framework

**Introduction:** Since late 2008 the Australian Government and all states and territories have been working towards the development of a national approach to activity based funding (ABF) for public hospital services to commence on 1 July 2012.

As part of this reform process, the Australian Hospital Patient Costing Standards (the Standards’) were developed by the National Hospital Cost Data Collection Technical Working Group (NHCDC TWG) and approved for implementation from 1 July 2009 or NHCDC Round 14 (2009-10).

**Methods:** During 2010 and 2011 the NHCDC TWG identified a number of areas for improvement and the Standards were enhanced with Version 2.0 being released in June 2011. Some of the minor revisions were agreed for collection from 1 July 2010 (Round 15), and major changes such as the application of depreciation rates have been agreed for prospective collection from 1 July 2011.
Further, in 2010 the NHCDC TWG identified the need to develop a Quality Framework to assess the adherence to the Standards as an indication of quality and appropriateness of the data being provided to the NHCDC. (In particular could the data be used for classification development, price setting, determining relative value units and/or cost weight development?).

Results: Given the intended use of the Quality Framework, the NHCDC TWG assisted with the development of a weighting system that would allow scores for individual hospitals to be collated, providing an indicator of the quality of their NHCDC data. A small pilot test was undertaken in late 2010 to establish the validity and fitness for purpose of the draft NHCDC Quality Framework scoring system, with the outcome being a decision to further refine the Quality Framework.

In May 2011 there was agreement to conduct a broader trial on a larger sample of hospitals using the Round 14 NHCDC hospitals to further test, refine and finalise the tool ready for possible national implementation.

Conclusions: The purpose of this paper is to provide an update on the Standards, some of the challenges and hurdles in implementing the Standards and importantly the development of principles and processes around the development of the Quality Framework, and outcomes from the broader trial.

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National DRG Cost Weights in Finland

Introduction: In Finland special healthcare is organized by 20 hospital districts that have implemented CaseMix systems for management and reimbursement purposes within recent years. FCG1 runs the Finnish national DRG center2 that is funded by the Association of Finnish Local and Regional Authorities3, which indirectly represents a large portion of special care funding,

Each year the national DRG center performs cost weight calculation from patient materials collected from hospital districts. A summary of the calculation results are published as Finnish national DRG cost weights. Those hospitals that do not have the resources to calculate their own DRG cost weights can apply national cost weights in their management and reimbursement processes.

Methods: In the NordDRG4 system there are two different DRG groupers. The “inpatient only” grouper is named the classic grouper and “inpatient and outpatient grouper” is named the full grouper. In the cost weight calculation the materials are divided into two sub-materials that are named in the same way:

• classic material contains inpatients
• full material contains inpatients and outpatients
Materials are also combined based on hospital groups. The most accurate cost calculations are received from the university hospitals. The combined university hospital materials form the basis for the national Finnish DRG cost weights. The cost weights are calculated using three different algorithms:

- Raw cost weights: no outlier handling is performed and all patient cases are included in the average cost weights
- Standard deviation: algorithm involves outlier handling in two phases based on cost standard deviation.
- In first phase +/- 3 * STDDEV cases are considered outliers and filtered from the material
- In second phase +/- 2 * STDDEV cases are considered outliers and filtered from the material
- Outlier cutoff points are +/- 2 * STDDEV
- Variation coefficient: algorithm involves different cost weight handling based on the DRG group cost variation coefficient (varcoef):
  - varcoef < 50%: no outlier handling
  - 50% < varcoef < 100%: Outlier points are defined by filtering out 10% of cheapest and most expensive patient cases
  - 100% < varcoef < 150%: Outlier points are defined by filtering out 25% of cheapest and most expensive patient cases
  - varcoef < 150%: the DRG group is discarded

Results: Using three different algorithms and two sub-materials the process produces six DRG cost weight series per one input material. In addition to their own cost weights, hospitals receive the national cost weight series and comparison between their own cost weights and the national weights. In Finland the forerunner in applying DRG systems has been the Hospital District of Helsinki and Uusimaa (HUS). The cost weights from HUS have been used as defacto standard in many national and international comparisons. Therefore also the cost weights HUS are delivered to all hospitals.

Conclusions: Each year the national DRG center performs cost weight calculation from patient materials collected from hospital districts. A summary of the calculation results are published as Finnish national DRG cost weights. Those hospitals that do not have the resources to calculate their own DRG cost weights can apply national cost weights in their management and reimbursement processes.

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Cost Weights for Activity-Based Funding in Canada – Building Upon What We Have

**Introduction:** Canada’s acute-care inpatient grouping methodology CMG+ was developed with an emphasis on explaining cost variations while aggregating inpatients with similar clinical characteristics. After the case mix group has been assigned, a basic cost weight is assigned followed by a series of factor adjustments.

For jurisdictions considering Activity Based Funding within Canada, a simpler methodology for the assignment of payment weights may be desired.

This paper describes how an ABF methodology containing payment groups and weights can be defined within the existing CMG+ methodology.

**Methods:** Decision-tree software was used interactively to analyze data from two major clinical categories, cardiac and respiratory. A set of payment groups was defined within the existing CMG+ methodology and associated payment weights were created. Further data analysis was performed to determine the materiality of the proposed groups before accepting the payment groups. Historical case-cost data was reviewed to determine if the payment weights would be stable from year to year.

**Results:** Results include a comparison of the CMG+ cost weights and the new payment weights. Included in the analysis is a review of the overall goodness of fit, the bias and materiality of the payment groups and weights. As expected, the simpler ABF payment groups and weights explain somewhat less variation in total cost than the CMG+ cost weights. However, the overall methodology is much simpler, with the multiple factor adjustments eliminated and only a moderate increase in the number of ABF payment groups compared to the CMG+ methodology.

**Conclusions:** The construction of ABF payment groups and weights within the CMG+ grouping methodology is feasible, and this approach could be used to create pan-Canadian payment weights.

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Grouping Patients Across Episodes of Care: Refined Clinical Groups (RCGs)

Introduction: Under the Health System Funding Strategy, Ontario recently introduced a new funding methodology, the Health Based Allocation Model (HBAM) for hospital and community care. In the hospital sector, there are five care types or modules, covering services in acute inpatient and day surgery, the emergency room, inpatient adult mental health, inpatient adult rehabilitation and complex continuing care. These modules consist of two components: a service component and a unit cost component. The service component is based on aggregating episodes of care for an individual over a specified period of time. This collection of encounters with the health system is called the person profile.

Refined Clinical Groups (RCGs) are the grouping methodology used to assign a single group to the person profile. This methodology builds on the individual episode level case mix grouping methodology specific to each care type when estimating expected levels of service, or weighted cases.

Methods: There are two steps to the RCG grouping methodology. The first step is to assign an RCG to each episode of care within each person profile. As a result, each episode of care has an episode level case mix group assignment and an episode level RCG group assignment. RCGs are assigned at this level based on most responsible diagnosis associated with the episode.

The second step is to assign an RCG to the person profile. Where there is only one episode of care within a person profile, the RCG assignment at the person profile level is equivalent to the RCG assignment at the episode level.

Where there is more than one episode of care within a person profile, RCG assignment is based on a ranking system. RCG rankings were determined based on three years of data specific to each care type and on the provincial mean weight assigned to each RCG. Rankings are specific to either the paediatric or adult population.

Once RCGs are assigned to the person profile, initial expected weighted activity is determined by assigning the three-year average weighted activity for each RCG/age group. This represents an initial expected weighted activity prior to adjustments such as socioeconomic status and rurality.
Results: RCG rankings were specific to each care type. Table #1 shows the 20 top-ranked RCGs for the adult population in acute inpatient and day surgery. These ranks are based on three-year average weights for each RCG. In this care type, weights are based on HBAM Inpatient Grouper (HIG) weights for acute inpatient activity and Ontario modified resource intensity weights for day surgery activity. As an example, a person profile with two acute inpatient episodes of care with RCG assignments of 131 and 127, would be assigned RCG 131 overall at the person profile level because of its higher rank (3).

Conclusions: The RCG grouping methodology is being used across episodes of care within a care type. Its purpose is to assign a single group at an individual level that accommodates more than one encounter with the health system. This presentation will focus on the application of the methodology across care types and the impact on initial expected weighted activity, in particular by facility types such as teaching and large community.

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Are Clinical and Cost Data One Family At The Start Up Of Case Mix Based System Implementation For Hospitals Reimbursement?

Introduction: Different scenarios are being investigated after 12 months of pilot project activities, as to determine the appropriateness of changing already the parameters for hospitals services contracting and reimbursement with case mix based ones.

The analysis of preliminary data will show at Conference time whether using individual hospitals clinical and cost data at the same time in the start up is compulsory, needed or subject to further refinements before reimbursement can be directly linked with both.

Methods: The main methods used to determine utilization of a new payment mechanism:
- 9-12 months of data analysis from pilot hospitals, clinical and cost data (January 1st to September 30th, 2011)
- Policy review at the Government, Ministry of Health and National Health Insurance Agency

Results: Achieving efficiency and transparency in the health sector are important objectives for both the Ministry of Health (MOH) and the National Health Insurance Company (NHIC) in Moldova and one way to begin achieving these objectives is to study and test the use of case-mix based principles to first understand and then possibly finance the production/services of hospitals for acute care inpatients.
Clinical coding and clinical data collection started March 2011 so preliminary DRG grouped data results from these Hospitals are expected to be produced around July 2011, in time for final presentation and paper.

Cost data collection and modeling will start July 2011, so probably individual hospital costing data and simulation can be presented at the Conference.

**Conclusions:** This paper discusses the current and ongoing experience of case mix pilot activities in Moldova, in the light of the potential change in the financing mechanism starting with 2012:

**Main Activities:**
- Collection of clinical data began in March 2011 (for data starting with January) with a slow uptake as expected, but as of June 2011, five months of clinical data is available from almost all of the pilot project hospitals
- DRG grouping of the clinical data will occur starting in July using a research version of the AR-DRG v.7 grouper license and will be ongoing
- Cost modeling first exercise will begin in late July/early August with initial first round being finalized in the fall of 2011
- Initial development of first payment mode is expected to begin in the fall and be finalized before contracting the Hospitals by the National Health Insurance Agency in January 2012
- Acquiring necessary licenses and issuing regulations to support the project activities

Project decisions related to the technical activities outlined above were taken together between international experts and local authorities in order to respect the local context, including cultural and political issues, which is critical for long-term sustainability.

In addition to the current case-mix pilot project work, a major health reform initiative is underway in Moldova and involves the transformation of the existing network of hospitals. The DRG case-mix pilot project is therefore seen as providing substantial support to the current Government efforts in increasing transparency of the services being provided and in coming up with tariffs/prices for these services.

The major focus if payment is linked to DRGs will than move to improving clinical data quality and collection of clinical and cost data and institutional support and capacity building to the existing institutions

There is an expectation that the current project will somehow expand to include additional hospitals, at least from a coding, clinical data collection, and grouping perspective as at least a dozen additional hospitals have asked to participate in the project on a volunteer basis (both public and private hospitals). By June 2012 a decision will be taken by the government to continue moving forward with case-mix or to move on to other methods to achieve efficiency, transparency, and financing.

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Development and Implementation of DOT: the New Dutch Registration and Invoicing System

**Introduction:** In 2005 a new casemix system for hospital was introduced in the Netherlands. This so-called DBC-system had been designed to meet specific local needs. It includes care for outdoor patients and is meant for not only registering, but also paying for delivered care. This first version lived up to the expectations, but turned out to be fairly complex in daily use. This led to the development of DOT, an improved DBC-system which is easier to work with and is also more closely related to international standards. Due to the fall of the Dutch Government in 2010, introduction of this second generation casemix system has been postponed until January 2012.

Along with the DBC-system market principles were introduced for part of the care: the so-called B segment. Prices in this segment are not fixed, but negotiable between provider and insurer. The B segment grew from 10 percent of annual hospital turnover in 2005 to 34 percent in 2010 and an expected 70 percent in 2012.

Yet other relevant developments in recent years included that the overall expenditure on care in the Netherlands exceeded the budgets, which in part was due to the use of the DBC-system.

The development of the new DOT system was carried out in this context of a changing political landscape and new insights and ideas regarding desired containment of expenditure of medical costs.

**Methods:** DBC-Onderhoud, in cooperation with the government and relevant parties, launched a large-scale project for improving the casemix system: DOT (DBC’s Op weg naar Transparantie, or DBC’s towards Transparency). The shortcomings of the original system were addressed in close cooperation with those who use the system in their daily practice: hospitals, doctors, insurance companies, etc. In DOT the myriad DBC’s are replaced by only a few thousand Zorgproducten (Care Products). The rather complicated and not foolproof process of registering, validating and invoicing DBC’s is replaced by a sleeker procedure in which the care product is automatically deduced from the activities done by a grouper. These improvements make the system much easier to manage.

Another improvement is the connection with the international classification of diagnoses ICD10. Although DBC’s strictly speaking do no longer exist within DOT, the casemix system is still called a DBC-system because the care products are as before defined by diagnosis and treatment. The main difference is that the term DBC gets a more generic meaning.

**Results:** The DOT system for 2012 was finally delivered in July 2011. It meets the requirements of improved manageability and facilitating the negotiations between insurance companies and care providers. Currently the implementation of the system is ongoing, still focused on going live in January 2012. Even now changes in legislation are made to facilitate the required changes.
Conclusions: The new DOT system is ready for take-off. The development of the system, which is a complex project in any circumstances, was further complicated by changing constraints throughout the development process. Even so, at the time of writing (June 2011), all signals are green for introduction in 2012. In this presentation we will provide an overview of the new system as well as an update on the current status of implementation.

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Making Use of DRG Data: Forecasting Costs in Slovenian Hospitals

Introduction: After seven years of DRG implementation in the Slovenian health care system, policy-makers are keen to find out on the basis of DRGs what the future trends in the acute settings are. The present DRG system is now considered stable with more reliable data. Forecasting is important for short-term and long-term planning. Our aim was to find out in the retrospective DRG data what the trends are and compare them to the actual collected data and analyze the deviations from the simulations and actual standing of the DRGs on the national level.

Methods: On the basis of the data we ran several simulations and projections to determine the most suitable algorithm for the implementation of possible future forecasting methods. We evaluated the existing methods for medical costs prediction and applied them to the specific Slovenian health care environment. Our model is based on the multiple regression analysis and random forests with the help of several analytical tools, i.e. Weka, SPSS, R and MatLab.

Results: In the first four years we notice deviations between the hospital data and the simulations (projections). This is due to unstable data resulting from the initial problems and stage of introduction and implementing DRG’s. In the subsequent years this deviation is minimized, which illustrates a closer and more realistic forecast.

Conclusions: Although a lot of DRG related data is available in Slovenia, there has not yet been a proper use of this data. We have shown, through use of various algorithms that valid predictions about future health care costs can be made using retrospective DRG data.

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SESSION 5B—Maximizing Information in Case Mix Applications

1151106

The UNU-CBGs: Development and Deployment of a Real International Open Source Case Mix Grouper for Resource Challenged Countries

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 Pro. Version 2.0 for data collection; CCM Version 2.0 for clinical costing; 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.

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**Individual Product Determination in the New Dutch DBC System: How to Make the System Transparent for its Users**

**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 be developed based on ICD-10 chapters and registration in the current DBC system.

The new system would incorporate three large and interdependent changes:
1. A new basic model, RSAD (in English: Register, Extract, Deduce and Declare)
2. A new product structure to determine products
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.
The next step was to open the discussion to specialists, and to decide whether these products were logical, and whether they should be expanded or cut in the first drafts. To enable a discussion between different parties, DBC-Onderhoud needed an online tool that was able to make the product structure transparent. This tool, called the “care product viewer”, was built in cooperation with Casemix, a Dutch consultancy organization. It allowed everyone, literally, to see what was built, what had been changed, and what needed to be changed.

Results: The discussions and iterations on the first draft resulted in the creation of a product structure for inpatient and out patient 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.

Because of the possibilities of this tool, today (in 2011) it is being used by hospitals, consultants, hospital representatives, and insurance companies to analyze the impact on their production of the transition to the new system. As well, the tool will allow hospitals to analyze their production from 2012 onward and evaluate whether a faulty or unexpected product has been determined.

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 ITC will continue to support and service the product throughout the transition period and into production.

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1114345

Levels of Care Methodology to Classify Patients as Tertiary and Non-tertiary

Introduction: Quite often there is a need to identify tertiary (quaternary and tertiary) and non-tertiary (secondary and primary) levels of care (LOC) for health system planning, funding allocation models and clinical purposes. Tertiary care is generally defined as the types of healthcare provided by specialists working in sophisticated medical centers equipped with personnel and facilities for special investigation and treatments. Tertiary care patients are usually referred from primary or secondary care professionals. In contrast, primary care refers to the work of healthcare professionals, usually general practitioners, who act as the patients’ first point of contact with the healthcare system. Secondary care is somewhere in between. It includes services provided by medical specialists who generally take patients from primary care professionals. We present a methodology that enables patients’ classification by quaternary, tertiary, secondary and primary levels of care.

Methods: Using data from the Discharge Abstract Database, the LOC methodology segments cells which are created by a combination of CMG+ (Case Mix Group plus) and age groups. Two age groups are used: adults (ages 18+) and children (ages 0-17). Several indicators are used in determining cells’ LOC. The first one is the concentration of care of a cell, which is measured by the relative distribution. The identified attribute is the number of cases of a given cell among hospitals; the reference attribute is the number of all cases among hospitals. Study units (hospitals) are sorted by reference attribute, cumulative distributions of identified and reference attributes are normalized according to sort order, and the cumulative distribution of identified attribute vs. the cumulative distribution of reference attribute are plotted. Using this approach, the Gini coefficient is computed for each cell by calculating area between curve and 45 degree line. The Gini coefficient can range from 0 to 1. Based on their Gini coefficients, the CMG/age cells are ranked from highest to lowest concentration of care. Another important indicator used is the overall level of care of the settings in which cases in a cell are treated. This indicator is called Average Hospital Tertiariness and is derived based on the concentration of care of individual cells measured by the Gini coefficient. This can be understood intuitively
as the percent tertiariness of the hospitals in which the cases in the cell are treated. Cells are then ranked by their Average Hospital Tertiariiness from the highest to the lowest. The incorporation of this factor into the methodology helps mitigate issues like “rare disease” effects and “false concentration” that a direct measurement of the Gini coefficient alone will not be able to account for. Cells are then ranked by Total Rank, calculated by summing the Gini Rank and the Rank on Average Hospital Tertiariiness. Cells representing the top 10% of the cases are defined as tertiary; those representing the top 1% are considered quaternary. Cells representing the next 40% of the cases are defined as secondary. The rest of the cells (the bottom 50%) are defined as primary. Once the Total Rank is determined and the cut point for tertiary cells chosen, a few overrides are applied. These overrides are necessary because some special situations cannot be handled by the Total Rank.

**Results:** The proposed approach results in the ability to distinguish tertiary (quaternary and tertiary) and non-tertiary (secondary and primary) levels of care. The core product of the methodology consists of a list of CMG/age group cells with levels of care assignments. The tertiary cells in the LOC methodology include about 7% of all cases and 16% of the weighted cases (after overrides).

**Conclusions:** A level of care designation is very important for many applications. For example, levels of care were used in the late 1990’s to inform hospital restructuring in Ontario (Canada) as it was felt that tertiary and other levels of healthcare activities need to be identified to better coordinate and rationalize care within and between hospitals. Levels of care are also used in funding allocation models in Ontario such as the former Integrated Population Based Allocation (IPBA) model and now in the Health-Based Allocation Model (HBAM). The proposed methodology for levels of care classification has many potential applications.

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**Using Case Mix Tools to Predict Future Mortality Risk**

**Introduction:** Discovery Health (DH) is the country’s largest private health care payer, providing health insurance cover to over 2.5 million people. It is part of a financial services group, which includes a life insurance business. This paper explores the potential of integrating case mix tools into the life business.

The current life underwriting process takes into account demographic factors when assessing a life’s mortality and disability risk. Case mix tools provide a richer understanding of a member’s experience and risk. Using case mix tools to predict future healthcare expenditure or death is expected to create a better fit than the standard demographic factors currently used in the life insurance business.
Methods: A generalize linear model is used on 2009 healthcare data for a select group of patients with similar healthcare benefits to create an expected mortality using both the existing life demographic factors, age and gender, and a separate expected mortality using the following case mix tools:

(1) Discovery Episode Groups (DEGs)
The Discovery Episode Groups is software technology using proprietary logic to organize claims data into diagnostically and chronologically related episodes of care. They are initiated by a health care practitioner when a patient first presents for care;

(2) The Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix System
The Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix System is a statistically valid, diagnosis-based, case-mix methodology that allows healthcare providers, funders and policy makers to describe or predict a population’s past or future healthcare needs, utilisation and costs. The ACG System is also widely used by researchers and analysts to compare various patient populations’ prior health resource use, while taking into account morbidity or illness burden.

The results were then applied to the 2010 data set to understand the sensitivity and specificity of the prediction.

Results: There is superior performance in explanatory power when using DEGs and RUB to predict mortality

Conclusions: Overlaying the Discovery Episode Groups (DEG’s) and Resource Utilisation Bands (RUBs) on to the current underwriting factors provides a more accurate prediction of death and thus enables the life insurance business to price more competitively.

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SESSION 5C—Ambulatory Care and Case Mix II

1152597

Australian Developments in Case Mix Classification and Funding of Emergency Department Care

Introduction: Emergency departments provide initial treatment for a range of illnesses and injuries. On one spectrum, they provide care for patients with life-threatening illnesses, who may need resuscitation. On the other hand, they substitute for primary care services, when these are inaccessible (e.g. where they do not exist or the patient cannot access them for whatever reason). Therefore, the complexity of patients requiring treatment in an emergency department varies widely, and so do the costs to treat them.
Due to the ‘drop in’ nature of emergency departments and the need for services to be available around the clock, they have tended to be funded on a ‘historical’ or ‘block’ basis. However, in recent years, countries are applying activity-based approaches to funding them. A building block for activity-based funding is casemix classification.

**Methods:** This paper will examine systems to classify emergency department activity internationally, and focus on historical developments in Australia in this area, leading to the most recent decision to fund this activity using patient diagnosis in addition to triage and disposition (i.e. destination post initial treatment in the emergency department).

Specifically, we will draw on recent work that we have undertaken for the Australian and New South Wales (NSW) governments, the former regarding the funding of emergency department activity, and the latter regarding counting, classification, costing and funding. In the NSW project, we undertook grouping of NSW data to the national ‘proxy’ classification for emergency department care – Urgency Related Groups – and a patient level costing study.

**Results:** In this paper we will discuss the issues that we encountered in using diagnosis as a basis for differentiating patients requiring different levels of resources, how well this explains cost, and the implications of this for funding emergency department activity.

**Conclusions:** We conclude with identifying what is missing in the classification and funding of emergency department services, namely capture of patient complexity and flexibility to enable innovative models of care that assist with better flow and treatment of patients through emergency departments. We provide recommendations for how this may occur.

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**Unexpected or Unexplained High Pharmacy Utilization: Identifying Those Who Do Not Have the Comorbidity to Support their Pharmacy Use**

**Introduction:** There is much in the literate demonstrating the potential benefits of identifying individuals who are consuming more pharmacy services than might be expected given their morbidity (termed “outlier”) and how identifying such patients might be useful for improving outcomes and better managing limited healthcare resources. The goal of this paper is to assess the usefulness of a model specifically calibrated to identify unusually high pharmacy utilizers and to contrast this technique with traditional predictive modeling techniques for identifying individuals at risk for high pharmacy utilization.
Methods: The unexpected high pharmacy user model was developed via a two part process using a split half validation technique using the PharMetrics Patient-Centric Database representing the medical and pharmacy claims and enrollment across 85 geographically diverse health care delivery organizations within the United States. Simplistically, pharmacy ‘outlier’ users were identified and then traditional modeling techniques were applied to calibrate a model specifically to predict this subset. Results of these efforts were then applied to data from Aragon Spain to assess the applicability of this model in real world settings.

Results: The unexpected high pharmacy model yielded similar performance statistics (PPV, sensitivity and specificity) to traditional predictive modeling techniques for identifying high cost pharmacy patient. However, an important distinction between the modeling techniques was that there was little overlap in “who” was being identified.

Conclusions: Simplistically, traditional predictive modeling techniques and the new unexpected high pharmacy utilization model were identifying different subsets of individuals both at similar risk for future high pharmacy. The combination of the two models can help to provide a better sense of the population at risk for high pharmacy use and potentially greater intervention opportunities.

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Using Primary Care Data to Identify Patients to Case Manage in the UK

Introduction: The aim of this paper is to demonstrate the use of population based data to identify individuals with high probability of care management, and the experience of teams in the UK is working with primary care physicians.

Case management is one of the potential applications of population grouping systems and risk protection models. This has been adopted as an approach in programs in the UK to compliment current clinical methods to identify patients.

Methods: The ACG system uses person-based longitudinal data primary care and hospital data.

These data were grouped using the ACG grouper. In addition to the morbidity aetiology, morbidity burden and disease groups, the ACG system also provides output from predictive risk models. The predictive models provide a likelihood of high/risk of cost in the future 12 month period and also an estimation of the cost. A patient case management list is reported from the output for review by general practitioners (primary care providers).
Results: The case management list have provided support to GPs in identifying patients at risk of high future utilization. These provide an affirmation of those patients already being managed, and provides a list of patients who require review and have not previously been identified by the GP/practice.

Conclusions: The method of case management identification is a useful and rigorous (quantifiable) approach to providing additional information to primary care physicians to enhance existing methods. Its provision of summary information related to a patient's multiple morbidities and risk variables provides useful summary clinical information. Future enhanced models can provide tailored solutions to local and health system requirements.

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Predictors of Pharmacy Cost in Diabetic Patients at Buddhachinaraj Hospital

Introduction: Diabetic patients need proper long-term treatment to control blood sugar level and their complications. Patients with higher morbidity burden are more complex cases and more costly to take care. This study aimed to find predictors of pharmacy cost in treating diabetic patients at Buddhachinaraj Hospital, a medical education centre of Naresuan University, Phitsanulok, Thailand.

Methods: Adult diabetic patients aged 20 and higher who attended outpatient clinic at Buddhachinaraj Hospital in 2010 were recruited. Electronic data on demographic characteristics, clinical conditions and dispensed pharmacies during 12 months were analysed by the Johns Hopkins ACG (Adjusted Clinical Group) version 9. Multiple regressions were used to fit the models for predicting annual pharmacy costs.

Results: There were 7,804 cases recruited, 62% were female and 22% aged 65 and higher. The average outpatient visits were as high as 14.0 visits per person per year (sd 10.8, median 13, range 1-146). The average counts for chronic conditions were 2.3 per person (sd 1.7, median 3, range 0-10), however, the average major condition (by major ADG count) was 0.45 per person (sd 0.67, median 0, range 0-4). The average numbers of drug therapy were 4.0 (sd 2.6, median 4, range 0-10). The average pharmacy cost was as high as 42,615 baht (US$1,421) per person per year (sd 74,355, median 12,118, range 0-995,613). The predictors of annual pharmacy cost included the number of drug therapy, the number of major condition, being male, the number of chronic condition, the number of outpatient visit and age respectively (r-square 0.32, p<0.01).
Conclusions: The number of chronic conditions and major morbidity partially predicted the annual cost. These clinical features influenced on the number of drugs dispensed and the number of visit. Unexplained factors such as being male should be explored to increase efficiency of ambulatory care delivery.

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SESSION 6A—Innovative in Case Mix Applications

Enabling Transparency and System Evaluation with National Implementation of Inpatient Rehabilitation Grouping Methodologies

Introduction: For over ten years, inpatient adult rehabilitation facilities across Canada have had access to standardized, comparative indicators, in part, based on two generations of case mix grouping methodologies. The evolution of this reporting system has most recently enabled transparent integration with data and indicators from other levels of hospital-based services.

Methods: In collaboration with a broad range of Canadian and American collaborators, the Canadian Institute for Health Information (CIHI) developed the National Rehabilitation Reporting System (NRS) in the late 1990’s. In part due to a dearth of inpatient rehabilitation grouping methodologies at the time, and also the similarities between data sets, a decision was made to adopt the existing Function Related Groups (FRG). Over the subsequent decade, the maturation of available Canadian data and information for the inpatient rehabilitation lead to the evaluation and development of a new methodology. Developed primarily in one provincial jurisdiction, the new Rehabilitation Patient Groups (RPG) methodology was adopted for pan-Canadian comparative reporting.

Results: Over 100 inpatient rehabilitation facilities access comparative indicator reports based partly on the Rehabilitation Patient Groups (RPGs) methodology. Although full inclusion in either retrospective of prospective payment models has not yet occurred in Canada, use of the RPGs and related cost weights as stratification variables for risk adjustment have taken root. Limitations of the RPG methodology, including uncertainties regarding the potential use of diagnostic co-morbidity tiers and gaps in data for the shortest of inpatient episodes, will likely drive the next evolution of the methodology. Inclusion of RPG-based indicators in a broader, facility-identifiable reporting application alongside inpatient acute and emergency department grouping methodologies have provided additional opportunities for critical assessment of the strengths and areas for enhancement.
Conclusions: Although relatively early in its implementation in pan-Canadian reporting, when compared to inpatient acute methodologies, the Rehabilitation Patient Groups (RPGs) have provided a new variable on which to develop funding and facility, regional and system-wide program evaluation initiatives. Further integration into performance scorecards for the inpatient rehabilitation sector, along with additional critical assessment of the applicability of the current cost weights across all jurisdictions will provide potential enhancements. Initiatives to further expose clinicians, researchers, system planners, and other key stakeholders to the methodology are ongoing. Comparative assessment of similar methodologies for the inpatient rehabilitation sector in other countries, may uncover additional clinical variables to enhance the data set and related applications.

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Comparative Analysis of Rehabilitation Groupers

Introduction: In recent years, the number of elderly has been growing, as the number of people with chronic diseases and/or with potentially disabling diseases. All these changes led to the development of the concept of rehabilitation and the need to create facilities to provide such care. In the USA, in 1983, with the appearance of the prospective payment system (PPS) through DRGs to finance the acute care, the rehabilitation care, among others, were left out of this payment model, since DRGs were not suitable to classify these patients. In Portugal, we can find the same situation, and even today rehabilitation patients are paid retrospectively, on a per diem basis, without any adjustment depending on their complexity. With this type of payment, it is impossible to know what is exactly being paid, and this probably leads to excessive costs and waste of resources.

The aim of this study is to perform a comparative analysis of patient classification systems (PCS) developed for inpatient rehabilitation for PPS; and discuss which one of these classification systems would address better the Portuguese reality.

Methods: A literature search was performed in bibliographic databases and grey literature in Portuguese and English, to conduct a literature review on: patient classification systems for inpatient rehabilitation; patient assessment tools, and functional evaluation instruments. It was also necessary to contact experts in Portugal, Australia and Canada via email.
Results: Two patient classification systems developed exclusively for inpatient rehabilitation were found: Case-mix Groups (CMGs) developed in the USA, and Rehabilitation Patient Groups (RPGs) developed in Canada. The CMGs are used for PPS (per episode) since 2002 for all Medicare inpatient rehabilitation, and RPGs are in the process of being implemented with the same purpose. Two more patient classification systems not exclusive to inpatient rehabilitation, but with “rehabilitation categories” in their structure were found: the Australian National Sub-Acute and Non-Acute Patient casemix classification (AN-SNAP) developed in Australia, and the Resource Utilization Groups (RUGs) developed in the USA. The AN-SNAP pretends to classify all post acute and non acute care, and the implementation of the “rehabilitation branch” for funding purposes is in process. The RUGs are used for the PPS of Skilled Nursing Facilities since 1998, and also has groups for inpatient rehabilitation. Regarding CMGs, RPGs and AN-SNAP, it was found that all include in their classification the variable “functional status”, measured by FIM instrument. The other common variables used for patients grouping are “impairment” and “age”. The RUGs also uses as grouping variables “functional status”, but measures it by an ADL instrument. The variables “time of therapy received” and “type of care” are the other items used for grouping in RUG, because these are considered to be the major cost drivers.

Conclusions: In Portugal, the number of rehabilitation facilities is growing, yet they still cannot meet the demand. This trend, together with the inadequacy of the current funding system, supports the need to implement a PCS for rehabilitation care. From the analysis undertaken in this study, it is considered that the most appropriate system to implement in Portugal would be the CMGs, since: it is designed exclusively for inpatient rehabilitation; it has been used for funding purposes for several years; it has an adjustment by co-morbid conditions for establishment of different relative weighs; and allows a cost estimate of 50%. We can also conclude that the RPG was developed based on the CMGs, and that the rehabilitation branch of AN-SNAP has many similarities with it. That is, there is an overall agreement of the instrument to be used for measuring functional status, and which variables that should be used for grouping. Thus, in Portugal, due to limited financial resources, the CMGs system should be adopted without major changes, as it happened with DRGs.

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Real-time Monitoring of Patient Outcome - VLAD

Introduction: Comparisons of hospital-specific performance are typically presented using cross-sectional analyses; however, they can be inadequate in quality care monitoring. This might due to: 1) averaging over time can “hide” important variations in the clinical experience of individual patients; 2) even if a problem is identified, the traditional approach might not give front line doctors any help in identifying which patients were involved. To overcome these issues, we needed to monitor performance in terms of the sequences of good and bad outcomes over time, as well as targeting specific patients for clinical review. This can be applied in real time if required.

Traditionally, this has been done by using cumulative sum (CUSUM) charts. However, these charts are difficult to understand from a clinician’s point of view. Recently, there is increasing interest in an alternative approach - Variable Life-Adjusted Displays (VLAD) with statistical control limits. These charts are much easier to interpret clinically and use a real-time monitoring manner.

In this paper, we explored the concept of VLAD as applied to measuring the outcome (in-hospital mortality) of in-patients with Acute Myocardial Infarction (AMI) in Hong Kong Hospital Authority hospitals.

Methods: We used 4000 acute in-patients with AMI as principal diagnosis (500 consecutive AMI cases per 8 major hospitals), starting from April 2009, to investigate the VLAD approach. The VLAD chart with control limits showing cumulative differences between expected and observed mortality of patients. The expected mortality calculated from risk model based on age, sex, risk of mortality (3M™ International Refined-DRGs (IRDRGs)), 5 DRGs* (common procedures undertake) for prediction of the in-hospital mortality of AMI. Control limits were set to allow one false positive every 1,200 patients (or one every two years for major hospitals), based upon a Markov Chain Monte Carlo Simulation.

Remarks: *- DRG04120: IP NON-COMPLEX RESPIRATORY SYSTEM PROCEDURES; DRG05115: IP CARDIAC CATHETERIZATION; DRG05106: IP OTHER CARDIOTHORACIC PROCEDURES; DRG04102: IP LONG TERM MECHANICAL VENTILATION WITHOUT TRACHEOSTOMY; DRG05140: IP PERCUTANEOUS CARDIOVASCULAR PROCEDURES.

Results: For these 8 major hospitals, half of them did not flag a signal, i.e. VLAD within control limits. Three of them hit the lower control limit, i.e. these three hospitals had sufficiently cumulatively more deaths than expected; while one of them hit the upper control limit.
Conclusions: The VLAD charts can provide a useful visual tool for real-time monitoring of patient outcomes. By identifying the changes in pattern of outcomes over time we can flag specific groups of patients for clinical review. This could potentially provide earlier identification of factors impacting on the quality of patient care and leading to improved patient outcomes.

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Taking Care of Hip Fractures: 12 Years of Practice in France (1998-2009)

Introduction: Hip fracture is a major concern for public health: immediate and one-year mortality remains high and, despite extended intensive rehabilitation care, patients frequently suffer from diminished abilities. Ageing of the population adds to the burden of this pathology on the health care system. Looking at the long-time evolution of hip fracture incidence and treatment will allow possible improvements for the future.

Methods: Based on the medico-administrative data bases, which cover all the public and private French hospitals, this study looked at the 1998-2009 period.

Patients 55 years or older, discharged from acute care hospital with the primary diagnosis of hip fracture (S72.0, S72.1 and S72.2 ICD-10 codes) were selected, even if they had no operation. Patients without primary diagnosis of hip fracture, but with specific procedures (i.e. hip hemi-arthroplasty or femoral neck osteosynthesis) were also included (<5 % of the total number of stays). Periprosthetic, peri-implant or tumoral fractures were excluded.

Results: Acute care stays increased from 75,200 in 1998 to 79,200 in 2009, mainly for men (+ 3,000). During the same time, standardized hospitalization rate decreased from 46.2 to 36.7 for 10,000 inhabitants. This fall was much more important for women (55.4 to 43.2) than for men (29.5 to 25.1).

Non university public hospitals were still predominant in treatment of hip fracture, with an increasing part attaining 54 % in 2009. University hospitals increased slightly (+2 pts) while private hospitals decreased (for profit: -9 pts) since 1998.

During the same time, acute care mortality decreased from 5.7% to 4.5%. A small part (5%, stable) of the patients had no operation, often due to their bad general status (15% mortality in this group, half of deaths <5th day).

Considering surgical treatment, osteosynthesis increased from 51% to 55% in 12 years, and prostheses lowered from 45% to 43%.
Types of fractures were coded in ICD10: in 2009, 36% were coded as “extracapsular” fractures (S72.1 or S72.2) and 64% as “intracapsular or not other specified (NOS)” (S72.0). But coding practices varied largely according to each hospital and cannot be considered absolutely precise.

Nevertheless, osteosynthesis was predominant for the “extracapsular coded” fractures, (94% in public hospitals and 84% in private in 2009). In this group, with all other things being equal, probability to have prosthesis increased when the patient suffered coxarthrosis and was hospitalized in private hospitals.

For the other types of fractures (i.e. coded “intracapsular and NOS”), prosthesis was predominant (>63%), either total or hemi- arthroplasty. Total arthroplasty was used in 24% of this group in private for profit hospitals, 20% in private non for profit ones, 15% in university hospitals and 11% in non university hospitals. With all other things being equal, probability to have total arthroplasty decreased with the age of the patient, but doubled if coxarthrosis was present. When hospitalized in non university hospital, probability to have total versus hemi- arthroplasty diminished.

Regional variations in hip fracture incidence are slight, but variations in treatment methods are more important.

**Conclusions:** One of the goals, when French health plan was defined in 2004, “decreasing hip fracture incidence of 10 % in 5 years”, was reached. Prevention and treatment of osteoporosis and public campaigns on falls prevention, largely developed during that time, could explain a large part of these results.

But, despite professional recommendations, there are still variations in treatment methods among regions or categories of hospitals.

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**SESSION 6B—Health System Planning and Case Mix II**

**Episode Grouping and Assessing Appropriateness of Patient Care**

Episode Grouping and Assessing Appropriateness of Patient Care will encompass a description of the methods behind episode construction specific to the Thomson Reuters Medical Episode Grouper (MEG) product. An episode is defined as a clinically homogenous and meaningful unit of analysis that can be used to evaluate the complete picture of a patient’s condition by grouping together inpatient, outpatient and pharmaceutical claims data. The methods described will include an emphasis on the disease classification system, which is centered around the clinical and severity based methodology of Disease Staging.
The use of MEG will be discussed through the illustration of various customer use scenarios. Patient level analytics that are applicable with MEG encompass the following areas:

- Evaluate return on disease-management programs
- Analyze cost and use
- Conduct provider profiling
- Evaluate quality of care
- Identify higher risk patients
- Evaluate appropriateness of care

An in-depth walkthrough will be given to depict how MEG can be used retrospectively to evaluate the appropriateness of care rendered to a patient and steps outlined for the types of intervention that could be applicable to the scenario for the patient, the provider of care, or the payer of care. This example illustrates not only the variation of care rendered, but also the opportunities for intervention that exist within the healthcare continuum to ensure the rendering of appropriate and effective care.

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**Collecting Hospital Patient Data in Ireland – The Next Generation**

**Introduction:** A significant challenge for all hospital patient activity collection systems is to remain relevant in the dynamic area of health information systems. The on-going improvements to computer technology coupled with rapidly changing user requirements necessitate a constant need for data systems to be upgraded and to adapt to change. This paper reports on the recent Irish experience in upgrading the national hospital activity collection database and reviews some of the benefits gained from this.

In Ireland, the HIPE (Hospital In-Patient Enquiry) national data collection project collects almost 1.5 million records on in-patient and day case activity annually from 60 acute and non-acute hospitals. The information including diagnoses, procedures and administration data is collected by trained clinical coders who input these data into software developed and supported by the Health Research and Information Division at the ESRI. Collated national file data are used extensively within the ESRI for reporting and research and are also transmitted to the Irish health authorities on a monthly basis where they are used for multiple purposes included national analysis and CASEMIX.

**Methods:** The previous data entry system, referred as Windows HIPE, was developed and released to all hospitals in 2000 for the collection and reporting of HIPE data. However the changing and new user requirements led to the redevelopment of the system using current computer technologies. The new HIPE Portal was released in 2010 and one of its main aims is to facilitate greater multi-user access to the HIPE data. The migration of the software and databases in all the hospital nationally was challenging, taking a number of months in a phased implementation.
Results: The new HIPE Portal represents a major undertaking and is a platform for future developments in the HIPE project. A new feature is a series of additional data collection screens, attached to HIPE records, facilitating the collection of detailed clinical information for a number of national specialties. The inclusion of these screens is one example of how the HIPE Portal is facilitating greater use of the hospital activity data in Ireland by an increasing number of stakeholders who can access the core HIPE data set in conjunction with these additional data. For example, the Irish national stroke register have a tailored additional screen to collect detailed information on patients in hospital being treated for stroke/TIA.

Conclusions: The HIPE portal builds upon the previous data entry system and significantly extends it, introducing an enhanced, more flexible and expandable system that meets the challenge of providing a robust and adaptable data collection and reporting system. This system is needed to meet the demands of the changing health information systems in use in Ireland.

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Is the Disability Profile an Important Issue for Projecting Costs with Aging?

Introduction: The increase of the very old that tend to be more dependent and the prevalence of more chronic diseases are likely to determine a higher prevalence of disability. The consequences are not only the necessity of different levels of care, but also a greater impact on public expenses.

Although many people are able to maintain high levels of physical and mental functioning to very old ages, for others, the aging process results in a reduced ability to live independently. Elderly that find difficulties to perform the activities of daily living require some type of care. One important issues to take into account is that the disability is heterogeneous, requires different levels of care and has different consequences on social expenses.

Methods: The main objectives of this research are to characterize the disability profile of the Portuguese population over 65 years in order to identify factors that influence disability in old age, analyze the impact of different levels of disability and point out the necessity of defining profiles of disability in order to control public expenditures. The data was obtained from the National Health Surveys (NHS) carried out between 1987 and 2005.
The study includes a characterization of those aged 65 or more and a comparison of the results from NHS. The NHS includes questions about the performance of the activities of daily living. The assessment of performance on the activities of daily living is made by a set of questions (which evaluate each activity) that have the same weight in the final score. This is important insofar as the number of disabled elderly and the type of disability they have, vary depending upon the way disability is measured. For the purpose of the present research two major levels were defined: No disabilities referred, and at least one disability referred. Those who were dependent were classified as having mild disability (1 to 5), moderate disability (6 to 12) and severe disability (more than 13).

Results: For data gathered in the last health survey, the final disability scores were explained by a set of variables, according to the estimation of a multiple regression model.

The disability profiles that emerge from the analysis support the development of prospective scenarios to project the economic impact of the use of long term care on public expenditures, in the period between the base year 2010 and 2060.

Data analysis showed a predominance of females, low levels of literacy and self-perceived health status concentrated on ‘reasonable’ and ‘bad’. The analysis of long-term disabilities reveals that age, sex, education, income, some chronic illnesses and self-perception of health status are the variables that best explain the disability score (adjusted R2=0.32).

Data also shows a higher prevalence of severe disabilities such as being confined to bed and/or dependent on feeding. The percentage of elderly that reported to have any kind of disability reveals an average annual growth rate of -2.7% between 1987 and 1995, 3.12% between 1995 and 1998 and -0.82% between 1998 and 2005.

According to the population projections until 2060, and assuming that all elderly dependent of care will actually receive it, the analysis of public expenditure shows that spending could increase 76% if health conditions remain similar to those of the last health survey. If a scenario of expansion of morbidity is to be observed, public expenditure could increase 198%. In a scenario of compression of morbidity, public expenditure may decline 43%, and if levels of disability were in line with the last survey but with less severity, public expenditure could grow 32%.

Conclusions: According to the data provided by the different National Health Surveys this study shows the impossibility of identifying a clear trend in elderly health and dependency profiles.

Many studies have been showing that the resources needed to support the frail elderly have a higher socioeconomic burden than health spending with aging in general. Thus, this study has also shown that the disability must have a proper field of analysis and the dependency profiles must be determined in order to allocate different types of care and funding must be sustained in these profiles.
If we intend to make a more complete analysis of the impact of disability on public expenditures, the disability profile must be extended at more specific levels. The NHS have a generic view of the problem itself and should be a starting point rather than a final element of analysis.

Many of the results are estimated according to data based on samples of households. However, household surveys may underestimate the elderly living in nursing homes and others that are not licensed as nursing homes. This research alerts to the need of surveys specially designed to the elderly that covers not only those who are living in households but also those who receive any type of long term care.

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SESSION 6C—Cost Weight Calculations

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Patient-Level Costing for the Thai Diagnosis Related Group in Thailand: A Micro-Costing Approach

Cost estimation is important in assessing a health system's performance. However, most of the costing system that presently exists presumes 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 (RCC) 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 RCC. 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.

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Development of the Australian All Product Costing Process

Introduction: The National Hospital Costa Data Collection (NHCDC) has been undertaken in Australia on a voluntary basis since the initial National Cost study in 1992-93. The collection is now in its 14th annual round (2009-10) and currently reports over 90% of all admitted acute episodes treated in public hospitals, and 70% of all episodes in private hospitals. Most of the costs in the public sector are reported within episode level cost studies (85%).

The NHCDC’s primary focus over many years has been the collection and analysis of acute inpatient admitted costs – largely because the classification was well developed and the production of national cost weights for the Australian Refined Diagnosis Related Groups (AR-DRGs) was seen as a major benefit for the industry as a whole. Other product data such as emergency departments and outpatients has been collected for several years but in the absence of robust classification systems there was minimal focus on the results.

Methods: In 2010 during the development of the Australian Quality Framework, the NHCDC Technical Working Group (TWG) identified problems with current approaches to product fractioning that could potentially result in material differences in the full range of product costs. Historically hospitals might only cost one or two product categories for the purpose of submitting data to the NHCDC. There are two inherent risks in this approach. The first is that there are inconsistent approaches to determining the product fractions, creating potential distortions in the costing of all product classes. The second is that if all a hospital’s products were costed, the fractioning may result in more or less than 100% of the hospital’s general ledger expenditure being absorbed by the costing process.
Results: In 2010 during the development of the Australian Quality Framework, the NHCDC Technical Working Group (TWG) identified problems with current approaches to product fractioning that could potentially result in material differences in the full range of product costs. Historically hospitals might only cost one or two product categories for the purpose of submitting data to the NHCDC. There are two inherent risks in this approach. The first is that there are inconsistent approaches to determining the product fractions, creating potential distortions in the costing of all product classes. The second is that if all a hospital's products were costed, the fractioning may result in more or less than 100% of the hospital's general ledger expenditure being absorbed by the costing process.

Conclusions: This paper will present data highlighting the distortions that can occur if individual product costing is done in isolation and the impact of differences in approach to the treatment of non-patient products, and will discuss the development of the all product process and the subsequent effects on the costing results.

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Adjusting Non-Standardized Data to Facilitate National Reporting

Introduction: The project highlights how simple adjustments to grouping features can be applied to address systematic coding differences across jurisdictions. In the Province of Quebec data are captured such that diagnosis and intervention classification systems are the same as the rest of the country. However, differences in how this information is submitted to the Canadian Institute for Health Information create fundamental reporting differences. Specifically, for data submitted from the province of Quebec the differentiation between significant and non-significant pre-admission comorbid conditions cannot be made whereas in the rest of the country this differentiation is possible. As a result, Quebec data, when grouped to CMG+ significantly overestimates the diagnosis driven comorbidity adjustments, resulting in higher estimates of cost and length of stay.

Methods: To address this difference in coding standards, the diagnostic information submitted by Quebec was compared to that of other jurisdictions in Canada. A simple CMG specific modification was applied to the Quebec data to adjust the comorbidity distribution towards that of the other jurisdictions. After careful review of data trends and options, the referent jurisdiction for Quebec was defined as the province of Ontario for all but the mental health CMGs. The comorbidity level distribution in Quebec was matched as closely as possible to the Ontario comorbidity level distribution.
Results: The adjustments applied to the CMG+ logic resulted in the desired decrease in proportion of cases assigned to comorbidity levels greater than 1 in Quebec. This type of principle, when applied at a CMG or DRG level, can effectively remove the bias associated with data that does not conform to standards while achieving the benefits of the other components of the case mix methodology. Analysis of the results support that the adjustments made also resulted in the desired changes to CMG+ indicators, and are comparable to this jurisdictions peer and appropriate for comparative reporting.

Conclusions: This correction is only to reduce the portion of Quebec comorbidity adjusted cases, and allow for meaningful indicator assignment. The underlying Quebec data, as stored in the data warehouse have not been modified, and as a result there remain more diagnosis reported than other jurisdictions. Any analysis including reporting of significant diagnosis codes other than the MRDx will remain higher in Quebec data.

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1152481

Real-Time Cost-Database - An Advantage for DRG-Tariffs and Hospital Budgets

Introduction: The Danish DRG-tariffs are based on a cost-database formed by combining activity data from the hospitals and activity based distributed accounts submitted once a year by the hospitals to the Ministry of Interior and Health. The quality of the cost-database has developed over the last ten years starting with data from only three hospitals until today where all Danish hospitals participate. However, the quality of the cost-database is still not sufficient given the importance of the DRG-tariffs in the funding of the Danish hospitals.

Thus, to improve the quality of the cost-database a project has been started to enable a real-time update of the cost-database. The goal for the next two years is that the cost-database is updated once a month with both updated activity and cost data.

Methods: The method to ensure a real-time cost-database is to expand the Ministry of Interior and Health database containing activity data from the hospitals. It is important to have a steady flow of data that describes the treatment and procedures provided at the hospitals. At the same time it is important to have a dialog with the hospitals on how to raise the quality of the activity based distributed accounts.

Results: The motivation for the project is to make the cost-database more relevant for the hospitals in their day to day budgeting etc., and hereby create an incentive for the hospitals to ensure correct information in the distributed activity based accounts.
Conclusions: The Ministry of Interior and Health sees three advantages from this
project. Firstly more accurate DRG-tariffs, secondly better information for each
hospital on their unit cost of their production and finally a good benchmarking tool
that can encourage best practice to be shared between hospitals.

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SESSION 6D—Care Quality and Case Mix II

Measurement of the Elderly's Participation in the Community -
New Domain of Quality of Life Becomes Measurable

Introduction: The goal of community based care for the elderly persons is to
retain their activity and participation levels in the community. Aim of this study is to
incorporate activity and participation domain of the ICF as a goal of rehabilitation
for case-management. Since PCSI 2009, the authors has constructed health-
measurement scales for elderly persons using the ICF concept and its codes. This
year, we have added participation in these scales.

Methods: To construct a care-management tool based on the ICF, we developed
list of participation in three domains, leisure activity (12 items such as watching TV),
social participation (7 items such as participation in voting) and communication (9
item such as conversation with friends). The Participants were 3499 elderly persons
using institutional or day services of long-term care insurance in Japan. Rasch
analysis was performed with RUMM2030 software.

Results: Data were obtained from 1590 institutionalized (man 317, female 1273,
average age 86) and 1818 day service users (man 317, female 1041 average age 81).
Of these randomly selected 300 data were used for Rasch analysis. Table 1 shows
the location and item fit of leisure activity. Traveling was the most difficult item, while
Watching TV was the easiest items.

Conclusions: Most of the participation related items of leisure, social activity and
communication showed good fit to the Rasch model and therefore these items can
be used for scaling participation of the elderly persons. With this new measurement
scales, health care professionals can now count participation in their care-management
model. When we use conventional ADL assessments, such as FIM or the Barthel index,
users can only determine whether they require help for a certain disability, such as bed
transfer or toileting. With these new tools, we can now have a clear image of whether
patients are participating in leisure, social activity or communication.

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Evaluating quality of care in Hong Kong through identification of Potentially Preventable Readmissions within the current unplanned readmissions indicator framework

**Introduction:** Potentially preventable readmissions (defined as readmissions that could likely have been prevented by better care during the initial admission, improved discharge planning, or improved post-discharge care) can provide important hospital quality information. and is compared overall and at hospital cluster level with the currently used indicator in Hong Kong: the unplanned readmission indicator.

**Methods:** We used all 2010 acute care admissions, 590,247 stays from all 22 major acute hospitals of Hong Kong, collapsed in 7 hospital clusters. We used the Potentially Preventable Readmissions (PPR) from 3M Inc. as the method to designate hospital readmissions within 30 days of an initial admission (IA) as preventable or not. The PPR method necessitates the All-Patient Refined Diagnosis Related Groups (APR DRGs), a grouping classification from the same developers of the International Refined DRGs (IRDRG), currently used to group and measure case-mix in Hong Kong. Hence, we examine all possible combinations of categories of IAs and readmissions. The readmission is defined as potentially preventable if there is a plausible clinical relationship between the patient’s APR DRG during the IA and the APR DRG during the readmission. *(HCF Review 2008; 30:75-91).* The US Florida state publishes state-wide adjusted PPR rates for public hospitals and we use its 2008 norm to compare with our PPR rates.(www.floridahealthfinder.gov/compareCare/SelectProcedureCondition.aspx).

Some limitation in the comparison with the Florida norm is warranted given the relatively high number of ungroupable stays in the APRDRG classification, 43657 stays or 7.4% of all cases. This may be due to post-coding mapping using valid codes from different years, this being acceptable by the IRDRG grouper but not accepted by the APRDRG grouper.

The Hong Kong Hospital Authority (HA) used unplanned re-admissions for acute care as an important performance indicator for several years. However in 2010, HA introduced a new definition of “unplanned readmissions” to more closely link performance to specific hospitals. Under this new definition an unplanned readmission is documented when an acute admission occurs through the emergency department within 28 days and when the admission specialty of the subsequent episode is the same as the discharge specialty of the initial admission.

**Results:** Using the current HA indicator, in 2010, overall crude unplanned readmission rate is 10.4% with a range between 8.2% and 11.4% by hospital cluster. The observed PPR rate is 8.74% (34 352 PPR/ 392 958 “at risk” stays (once logical clinical exclusions are applied); and between 6.9 and 10.4% by hospital cluster.
The indirect standardized rate (using Florida norm) is 1.52 (cluster range: 1.24 to 1.73). In ranking the best cluster in PPR is third using URR; the less performing is the same; two cluster change 2 ranks or more.

**Conclusions:** We do observe a significant reduction of the percentage of clinically defined potentially preventable readmissions in relation to the broader, but less specific, unplanned readmission rate (URR).

Quality indicator measuring readmission rate is important. The current measurement of unplanned readmissions in Hong Kong may benefit from refinements to identify clinically related potentially preventable readmissions

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Potentially Preventable Readmissions in Madrid

**Introduction:** Readmissions are an important quality of care problem and an important cost to the region. In Madrid the current official definition before this study was any urgent readmission that occurs within 30 days in the same major Diagnostic Category in same hospital. We evaluate here an alternate method on all public 2009 Madrilenian acute care hospitalizations within all public hospitals.

**Methods:** Potentially Preventable Readmissions (PPR) methodology from 3M Inc. enables to identify readmissions who have a clinical relationship with the previous initial admission within a given interval of time and is identified only if the subsequent episode may be preventable. Then, readmission chains are created, namely initial admissions followed by readmissions that are in same time interval (either 15 or 30 days) and are clinically linked and not planned (transfers to another acute care facility). The All Patient Refined DRG (APR DRG) classification served as the granular unit in the matrix to link initial admission to following readmission as clinically relevant or not. Out of the close to 98,000 possible combinations, less than 24,000 are deemed associated clinically by an expert group of clinicians who helped build the logic of the system.

**Results:** First, 10.3% of 482,240 discharges were discarded: of these, 5% were related to HIV infections, 59% to malignant cancers (not all cancers discharges were excluded), 21% for neonates admissions, 15% other exclusions, and 1% due to discharges against medical advice. Within an interval of 30 days for readmissions within same hospital, of the remaining 431123 discharges (89.4% after exclusions out), 91% were not followed by a readmission, 4.2% initiated a chain, and 5.2% could be considered as Potentially Preventable Readmissions (PPR): 18,136 such chains resulted in 22,254 readmissions for an average of 1,23 PPRs per chain. 84.3% of these readmissions chains had only one readmission, 11.9% had 2 PPRs, 2.5% had 3 PPRs.
Overall, the percentage of PPRs reduces from 4.7% of all discharges to 3.2% for time interval 30 days and 15 days. The PPR rate for 30 days interval increases from 4.7% if only within same hospital to 5.2% across hospitals.

Table 1 documents, for 30 days interval and across hospital, by Major Diagnostic Category (MDC) the most frequent initial admissions, as well the PPRs. The clinical relationship/reason for the subsequent readmission is also identified for the sub-total (85.4% of total) of PPRs due to a medical problem (rather than a surgical issue): readmission for a medical stay (as opposed to surgical stay); PPR because of continuation or recurrence of a previous episode, 32.8%; medical complication from a previous admission, 24.4%; sensitive conditions that could have been taken care by an ambulatory encounter rather than a readmission as defined by AHRQ standards, 16.6%; worsening of another chronic problem, 11.7%. Of the sub-total of PPRs that are rather linked to a surgical episode (9.6% of total), 5.5% are due to a surgical process with a continuation or recurrence of a previous episode; and 3.5% are due to a complication of a previous surgical episode. Finally, 5.5% of total of PPRs are linked to a mental health problem or substance abuse. Table 2 provides the distribution of the most frequent PPRs (out of total of 222 PPRs) for one initial DRG (Cardiac Insufficiency) for one hospital. The number of excess days translates into 513 beds. These results are available for each clinical service of each hospital.

Conclusions: Potentially Preventable Readmissions (PPR) enables to identify hospitals, clinical services and processes where the readmission rate is superior to what might be expected.

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A costing study of neonatal intensive care for newborn infants with birth weight between 500 – 1500 grams.

Background: Premature birth and extremely low birth-weight (ELBW) is a well recognised financial burden on health care in the developed world. In this era of increasing healthcare costs, the role of economic evaluations has become increasingly important. The purpose of this study was to investigate whether the total cost estimate of care provided for newborn infants, with birth weight between 500 – 1500 grams remains reliable, when the cost components of gross costing were replaced by cost components of microcosting and accurately calculate the cost of extremely low birth weight infants (ELBW), in neonatal intensive care in a tertiary care teaching hospital. Secondly the objective of this study was to determine if current levels of funding accurately reflect the costs incurred in providing care for these infants by comparing current funding calculated using Diagnostic Related Groups and a microcosting approach.
Study’s Aim: The aims of the study are to

(a) Investigate whether the total cost estimate of newborn infants, with birth weight between 500 and 1500 grams remains reliable, when the cost components of gross costing were replaced by cost components of microcosting.

Accurately calculate the cost of caring for very low birth weight infants, in the neonatal intensive care unit in a tertiary referral teaching hospital.

Assess the feasibility of microcosting for use in a neonatal population

Research Method: A quantitative design was chosen for the purpose of undertaking this study and a non-experimental, retrospective design was used. A random sample of infants was selected under three birth weight categories (500g - 1,000g, 1,001g to 1,250g and 1,251g to 1,500g). The main source of data was the individual patient healthcare records. A template was devised to capture all the interventions undertaken and each one was individually costed.

Results: A vast amount of data was collected and analysed. Microcosting assigns higher overall costs to the care of infants in two of the three birth weight categories used (500g to 1,000 g and 1,001g to 1,250g). Diagnostic related group (DRG) reimbursement is greater than overall microcosting for infants in the 1,251g to 1,500g birth weight category. However, the overall costs attributable to caring for infants in these groups increase with the lowering of the birth weight category. The intensity of care required (intensive, high dependency or special care) and the length of stay have the greatest impact on costs. Therefore, by applying a bottom up approach to costing, more reliable total cost estimates can be ascertained.

Conclusion: Microcosting is more reliable and reflective of actual costs than the current system of gross costing. There was an overall difference of 11.09% between the gross costing and microcosting methods applied to the infants in the study. The historical funding basis is inadequate. The feasibility of microcosting care for very low birth weight infants is possible and worthwhile. A form of prospective, activity based payments and casemix funding is the recommended financing method of very low birth weight infants.

Diagnoses-Related Procedure Bundles in Outpatient Care – Results from a Research Project Using Secondary Data

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 we considered procedure bundles can be identified using the methods described above. To a large 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.

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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-provider integration, patient-centered medical homes, and accountable care organizations. Enablers of similar structural reforms are lacking in South Africa, however, where regulatory rules bar the employment of salaried doctors by hospital networks. Moreover, a looming nation-wide dearth of healthcare professionals diminishes the potential for systemic structural changes to the status quo.
Discovery Health (DH) is the country’s largest private healthcare payer, providing 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 complexity and highest disease burden. 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 service 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 ensures that the patient’s unique needs are carefully and methodically addressed by the service provider’s interdisciplinary care team.

Integrating the family into the care plan is central to ensuring a successful transition to the home. 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 decreased 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.
Each patient counts

Figure 1: Disease Burden Index for CCP members compared to the rest of the DH population

Figure 2: 2010 Average FIM score gains across clinical impairment class

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1143269
Superiority of Guideline-adherent Initial Intravenous Antibiotic Therapy for Hospital-acquired/Ventilator-associated Pneumonia in Regard of Outcome and Costs demonstrated by Routine Casemix and Cost Calculation Data

**Introduction:** Hospital-acquired pneumonia (HAP) often occurring as ventilator-associated pneumonia (VAP) is the most frequent hospital infection in intensive care units (ICU). Early adequate antimicrobial therapy is an essential determinant of clinical outcome. Organizations like the German PEG or ATS/IDSA provide guidelines for the initial calculated treatment in the absence of pathogen identification. We conducted a retrospective chart review for patients with HAP/VAP based on chart reviews, casemix and cost data and assessed whether the initial intravenous antibiotic therapy (IIAT) was adequate according to the PEG guidelines.

**Methods:** We collected data from 5 tertiary care hospitals. Electronic data filtering identified 895 patients with potential HAP/VAP from routine casemix data. After chart review we finally identified 221 patients meeting the definition of HAP/VAP. Primary study endpoints were clinical improvement, survival and length of stay. Secondary endpoints included duration of mechanical ventilation, total costs, costs incurred on the intensive care unit (ICU), costs incurred on general wards and drug costs.

**Results:** We found that 107 patients received adequate initial intravenous antibiotic therapy (IIAT) vs. 114 with inadequate IIAT. Baseline characteristics of both groups revealed no significant differences and good comparability. Clinical improvement was 64% over all patients and 82% (85/104) in the subpopulation with adequate IIAT while only 47% (48/103) inadequately treated patients improved (p < 0.001). The odds ratio of therapeutic success with GA versus NGA treatment was 5.821 (p < 0.001, [95% CI: 2.712-12.497]). Survival was 80% for the total population, 86% in the adequately treated (92/107) and 74% in the inadequately treated subpopulation (p = 0.021). The odds ratio of mortality for GA vs. NGA treatment was 0.565 (p = 0.117, [95% CI: 0.276-1.155]). Adequately treated patients had a significantly shorter length of stay (LOS) (23.9 vs. 28.3 days; p = 0.022), require significantly less hours of mechanical ventilation (175 vs. 274; p = 0.001), incurred lower total costs (EUR 28,033 vs. EUR 36,139, p = 0.006) and lower ICU-related costs (EUR 13,308 vs. EUR 18,666, p = 0.003). The most frequent types of inadequate therapy were monotherapy instead of combination therapy, wrong type of penicillin and wrong type of cephalosporin.

**Conclusions:** Guideline-adherent initial intravenous antibiotic therapy is clinically superior, saves lives and is cheaper than non-guideline adherent therapy. Using a CPRS score can be a useful tool to determine the right choice of initial intravenous antibiotic therapy. The net effect on the German healthcare system per year is estimated at up to 2,042 lives and EUR 125,819,000 saved if guideline-adherent initial therapy for HAP/VAP were established in all German ICUs.

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Estimation of the Cost of Hospital-Acquired Infections in Gastrectomy Patients: An Exploration of Methodology

**Introduction:** Hospital-Acquired Infections (HAIs) result in higher morbidity and mortality in patients, as well as a greater economic burden to patients, providers and payers. Problems associated with these infections are further complicated with the rise of multidrug-resistant pathogens in hospitals. While various interventions have been shown to be effective in reducing infections, limitations in available resources mean that the cost-effectiveness of these interventions must be ensured.

Cost of HAI (COHAI) estimation studies have therefore become increasingly relevant, and this has been reflected in the proliferation in such studies in the past few years. These estimates can be used directly to assess the magnitude of the infection burden, or in downstream applications such as cost-effectiveness analyses of infection control measures. The accuracy of these estimates is of critical importance, as inaccuracies can introduce bias and affect intervention development. However, a review of the existing literature has shown a large degree of variation in COHAI estimation methodologies, ranging from simple comparisons between uninfected and infected patients to the highly complex using various statistical measures.

Different analytical methodologies may result in different COHAI estimates, thereby giving rise to problems of accuracy. The objective of this study was to estimate the additional economic burden associated with HAIs in a large-scale multi-institutional analysis, and to explore the difference in unadjusted and case-mix adjusted COHAI estimates.

**Methods:** We utilized hospital administrative data from the Quality Indicator/ Improvement Project (QIP), which is a program administrated by our department. In this program, member hospitals from all around Japan voluntarily provide their administrative data for analysis. These data include claims data for diagnoses and procedures for each admission, with records of all medications administered on a daily basis.

Our study sample included 14,282 patients with stomach cancer who were discharged from 257 QIP member hospitals from April 2007 to April 2010. Minors below 20 years of age at the point of admission, patients with below eight days and over 90 days of length of hospital stay (LOS), patients who had other surgeries before gastrectomy, and patients who were administered antibiotics before gastrectomy. Hospitals with fewer than 30 cases were also excluded from analysis.

Post-surgical HAIs were identified using a novel method based on antibiotic utilization patterns that we had developed.

COHAI was measured in Japanese Yen, and converted to US Dollars using Purchasing Power Parities. We compared COHAI estimates produced using a simple comparison (with no case-mix adjustments), with those produced using regression analysis (which take patient case-mix variations into account). These estimates were produced for the entire sample, as well as at the hospital level.
The regression model utilized COHAI as the dependent variable, and independent variables of age, sex, comorbidities upon admission, type of gastrectomy, pre-surgical length of stay, and surgery duration.

**Results:** After exclusions, the final sample size was 12,255 patients from 151 hospitals. Post-surgical HAI incidence was measured at 27.6%, with an inter-hospital range of 4.1% to 48.4%.

Simple unadjusted COHAI estimates had a mean of US$13,479 for uninfected patients and US$17,555 for infected patients. Therefore, an HAI was associated with an increase of US$4,076 per patient.

When patient case-mix was adjusted, the COHAI estimates had a mean of US$14,442 for uninfected patients and US$17,415 for infected patients. Therefore, an HAI was associated with an increase of US$2,973 per patient.

**Conclusions:** This study first produced a COHAI estimate of post-surgical estimates in gastrectomy patients on a large-scale multi-institutional analysis using administrative data in Japan. We have quantified the cost of these infections after adjusting for intrinsic variations in patient case-mix, which can support the decision-making process in infection control measure development. Furthermore, we have also quantified the COHAI at the hospital level, which can be given as feedback to each participating hospital in order to evaluate their performance in the context of other hospitals.

The results show that failure to adjust for variations in patient case-mix produced a very different COHAI estimate, which produces misleading results. The unadjusted COHAI estimates showed an overestimation of US$1,103 on average per patient, which can affect downstream decision-making and result in the overutilization of resources for infection control. This emphasizes the need for analysts to account for patient case-mix variations, as well as utilizing appropriate methodologies to estimate COHAI.

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A Look at the Use of the Japanese Administrative Database and the Geographical Information System in the Management of Disaster Medicine and Regional Medical Care Planning.

**Introduction:** On March 11, 2011, the enormous magnitude of the earthquake and the associated tsunami attacking the Tohoku and Kanto regions severely stressed the Japanese system of public welfare. The disaster disrupted the electricity and water supply to the people living in Tohoku. The medical care delivery system was one of the most damaged, calling on the commitment of human resources from all over the world.
Critical care could not be delivered adequately without electric power to provide direct support to the cardiac, respiratory and renal systems of some patients, jeopardizing their survival. Physicians and policy-makers were responsible for transporting them to the appropriate nearby hospitals that were still able to manage such case-mixes and to respond to the unexpected burden imposed by these transfers.

To process such interventions without any delay in future disasters, policy-makers need to maintain awareness of the critical care resources available among hospitals in their geographic area. In addition, they need to be able to predict the incremental burdens in the event that one or more hospitals are subject to the disaster, obliged to stop critical care delivery, and required to transfer their patients to other nearby hospitals. In such situations, the administrative database and the geographical information system (GIS) are promising tools for contributing to these predictions, particularly when the database contains the patient postal code and the date or quantity of medical care items.

We explored the feasibility of using the Japanese administrative database for medical care planning in response to a disaster. In this study, assuming that on the day of October xx, 2010, the use of critical care devices for ventilation (VENT) was interrupted, we measured the impact on the critical care burden of the nearby hospitals that would be expected to receive the critical care patients from the hospitals involved in the disaster.

**Methods:** Using the Japanese administrative database in 2010 from July to December including 3,181,847 hospitalized patients among 952 hospitals that voluntarily participated in our research, we analyzed VENT administered in Iwate, Miyagi and Fukushima prefectures on October xx, 2010. These three prefectures were so heavily harmed that the number of victims and missing people was very high. We quantified the maximum daily volume of VENT during the 6 study months and calculated the maximum affordable capacity for the number of VENT. We also estimated the VENT volume administered on October xx.

Using the GIS, we measured the straight line distances (SLDs; Km) between the hospitals and identified the hospitals most adjacent to those damaged in the three prefectures. Supposing that VENT patients were transferred to the closest hospitals, we measured the increase in numbers of VENT patients and the operating rate (%) out of the maximum affordable number of VENT. The averaged SLD between hospitals and patient postal codes was compared before and after the simulated disaster. The additional number of VENT patients received from adjacent hospitals and the additional average SLD (Km) per patient were also examined for every hospital most adjacent to the damaged hospitals.
Each patient counts

Results: There were 39,802 patients admitted across 11 hospitals in Iwate, 52,185 patients across 13 hospitals in Miyagi, and 58,422 patients across 17 hospitals in Fukushima during the 6 study months. On October xx, 3,300 patients were cared for in Iwate, 4,480 in Miyagi and 5,437 in Fukushima. Eleven hospitals administered 31 VENT in Iwate, 11 hospitals 64 in Miyagi, and 13 hospitals 89 in Fukushima.

The 9 hospitals most adjacent to the 35 ones providing VENT in the five prefectures were identified and the SLD between 41 combinations among those hospitals ranged from 27.4 km to 129.6 km. During the 6 study months, these 9 hospitals supplied at maximum one to 18 ventilation care devices.

The increased number of VENT ranged from 1 to 65 and the VENT operating rate from 89% to 2,200%. Six hospitals were beyond the affordable number of VENT that could be delivered.

Conclusions: We estimated the critical care burden caused by the simulated disaster and identified 9 hospitals that would suffer the most directly and indirectly. The methodology of this study can be applied to the other critical care or to determine the efficient medical care plan.

Each policy-maker will count by determining the most appropriate hospitals with the human resources and the associated critical care devices to optimize the quality of critical care in case of hospital incapacitation. Each patient will also count by recognizing which hospitals are utilizing medical resources most efficiently.

The administrative database with the aid of the GIS can contribute to disaster management and medical care planning in this way.

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Going From “Unstable” to “Stable” Data

Introduction: The Slovenian healthcare system introduced DRGs already through pilot studies in 2003. Data was collected for the purpose of analysis over the 5-year period into the DRG system.

Methods: We analyzed the DRG system through the obtained data at the Institute of Public Health of Slovenia. We looked at the number of public and private hospitals that adopted the DRG payment system; number of cases and treated patients, and the changes in the value of the weight for the DRG. We also investigated what influence the DRG system had on the length of stay, percentage of cases depending on the type of hospital care (hospitalization, day care, long term care), and the percentage of referrals or discharges.
Results: The results are comparable with the experience of other countries that adopted DRGs. In our case, we notice that the number of acute care cases increased through the five-year period, and parallel so does the number of treated patients. The trend is steadier in terms of identifying the average DRG weight through those 5 years. In terms of the length of stay drops rather quickly between 2003 and 2008; whereas the rate of day care in 2003, 6.70% increases to 10.56% in 2008. When it comes to referrals to other hospitals, data illustrate that there the rate between 2003 and 2008 is rather stable, 2.26% in 2003 and 2.47% in 2008; whereas discharging patients home remains at a constant between 93.92% in 2003, and slightly drops in 2008 to 94.73% of patients, who go directly home.

Conclusions: When introducing DRGs the MoH’s Project on the Health Sector Management who introduced DRGs did envisage these changes in the healthcare system: drop in the length of stay, increased number of cases and treated patients, and most importantly an increase in the rate of day care.

AUTHORS: Irena Zupanc; Anne-Marie Yazbeck (a.m.yazbeck@gmail.com)

Management of Rheumatoid Arthritis Patients in Romania

Introduction: Rheumatoid Arthritis is a chronic disease with long evolution which produces important consequences at the level of patient and society, a disease with several available therapeutic options, but not all of them having the same effects. The therapeutic measures are applied on a long term basis and they are, in most of the time, the result of medical practice guidelines developed at local or international level.

Methods: The authors made a revision of the local and international speciality literature regarding rheumatoid arthritis and studied the legal framework in Romania regarding the medical practice guidelines, therapeutic protocols and treatment reimbursement conditions.

Results: In Romania the management of patient with rheumatoid arthritis is based on several clinical and administrative decisions, reflected into the medical practice guidelines and therapeutic protocols with normative value. Because of high costs, the availability of biologic therapies for the rheumatoid arthritis patients is restricted only to these patients with approved treatment by the public payer, according to specific therapeutic protocols developed by the Ministry of Health and National
Health Insurance House. The limited available financial resources in the social health insurance system create the conditions for waiting lists of the patients with medical recommendation for expensive therapies.

**Conclusions:** The management of patient with rheumatoid arthritis is a complex process related with patient factors, but also with the health system functionality. In Romania, the usage of newly and expensive treatments requires the utilization of some medical practice guidelines and therapeutic protocols which should rely more and more on the effectiveness rather than the efficacy of treatments, considering the fact that clinical data regarding effectiveness of drugs treatments started to be available.

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**(ID: 1152873)**

**Changing the Game in Physician Profiling**

**Introduction:** The SA voluntary private healthcare sector is characterized by systemic cost increases significantly higher than general inflation and economic growth. The costs are largely driven by escalating clinician, pharmaceutical and private hospital costs. In 2009, the overall claims paid out to specialist healthcare providers paid out by the health insurer for which work, Discovery Health, increased by 19.1% when compared to 2008 against a backdrop of 6% general inflation. Discovery Health provides insurance cover to over 2.5 million people.

Physician profiling has emerged as one of the effective levers to control healthcare costs since it makes clear differences in individual doctor practice relative to their peers. This approach requires a method for analyzing physicians’ costs and a classification system for determining which physicians have higher relative costs. Rather than using this tool as a punitive mechanism, we decided to collaborate with healthcare providers, providing them with a platform to participate in the development and improvement of the profiles. This approach not only leads to robust profiling but increases the likelihood of altering provider behaviour.

**Methods:** Three main risk factors used in provider profiles are:

- Discovery Episode Groups (DEGs):

  The Discovery Episode Groups is software technology using proprietary logic to organize claims data about individual patients into diagnostically and chronologically related episodes of care. They are initiated by a health care practitioner when a patient first presents for care and then submits a claim with related diagnosis and procedure codes.
The Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix System, which System clusters patients with similar co-morbidities into groups that have similar resource requirements and clinical characteristics. Mutually exclusive groups of patients are then categorized into six (6) Resource Utilisation Bands (RUBs). A grouped RUB measure is used in profiles with two groups for healthy to moderate users (RUB 0-3) and High & Very High users (RUB 4&5).

Plan option groups are also taken into account as each plan option offers different access to clinical services.

The main measures currently used are admission rate, annual bed days and referred pathology and radiology costs. Attribution rules are used to allocate admissions and referred costs to the provider deemed responsible for the admission or related costs. Judgments on practice efficiency are made based on a ratio of observed to expected costs from the tools discussed above. Profiles are peer-reviewed by a clinical advisory committee from the provider professional organisations before dissemination.

Results: Annual profiles are produced and outlier providers are identified using statistical methods. Our key principle is to direct efforts at potentially remediable utilization patterns, thus outlier individual and/or provider practices are targeted with the intention of changing their behaviour thereby reducing healthcare expenditure. A process is in place involving coaching and mentoring of outliers by influential and respected providers in the different disciplines.

Conclusions: Although it is early days (3 years), evidence of cost containment has been observed. The collaborative effort and transparency in engaging clinicians has established a foundation of trust and a shared responsibility for sustainable healthcare. Efficiency profiling is incomplete without quality measures and these are being incrementally incorporated. This move will assist monitor the quality of care provided to our members and, further unlock more potential utilization of the profiles.

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The Epidemiology of Cancer from Case Mix System Databases: A Longitudinal Approach

Introduction: The use of French Case Mix databases, apart from financial purposes, has recently been improved since a unique anonymous patient identification number has been created for each inpatient in case mix database. The group for cancer epidemiological observation in the Rhône-Alpes area, (ONC-EPI group) aims to estimate cancer incidence and prevalence especially by using Case Mix data with other data (arising from cancer registries, administrative databases). Improving algorithms for cancer case identification in the Case Mix databases is an essential preliminary stage.
Methods: Remaining difficulties in the use of case mix data for epidemiological purposes are related to a lack of quality of data, especially coding of diagnoses. These errors come from missing or inappropriate codes, or out of keeping with coding rules (causing an over- or under-reporting or inconsistencies in coding over time).

For identify cancer cases, we consider a longitudinal approach based on analysis of database over several years and using the whole information off all patient stays. The chaining over several years allows, by tracing the hospital path of the patient, to detect and correct inaccuracies, errors and missing values, and to set the beginning of the episode of care.

The case identification algorithm is specific of the cancer location. A complex selection process includes several steps:
- The first step of cases selection is based on the national anonymous unique patient identifier.
- The second one consists in retrieving all hospital stays for every case.
- The third step detects inconsistencies in the coding of the primary localization.
- At last, an algorithm based on the ICD-10 code using the hospital admission diagnosis is applied to rule out hospitalization unrelated to cancer.

Results: Results for breast cancer and colorectal cancer are presented showing variations across French regions. A detailed description of the chronology and reasons for hospitalizations is described in order to know which periods show a genuine need for care.

Conclusions: A limitation of this approach is the fact that ambulatory radiotherapy treatments carried out in private for-profit hospitals were not registered in the French case mix databases because of the funding differences between public and private institutions. Furthermore, ambulatory care (visits, hormonotherapy, ambulatory chemotherapy) were not measured by the case mix system.

Subject to adapt the selection algorithm to the national coding rules, the method may be applied to the case mix data in other countries.

AUTHORS: Beatrice Trombert (trombert@univ-st-etienne.fr); O. nc-Epi Group
CIHI’s Tool for Estimating Cost

Objective:
1. Introduce CIHI’s Patient Cost Estimator available on CIHI’s public website
2. Provide an interactive web tool to estimate expected costs per Case Mix Group to facilities that do not do service recipient costing
3. Explain the concepts behind estimating and understanding the costs.

Use CIHI’s Patient Cost Estimator (PCE) to find
1. Estimated average costs by patient group, age group and jurisdiction;
2. Volume by patient group, age group and jurisdiction;
3. Average length of stay by patient group, age group and jurisdiction;
4. Summary reports displaying the most frequently occurring patient groups by jurisdiction and age group; and
5. Summary reports displaying the patient groups incurring the highest and lowest estimated in-hospital average costs by jurisdiction and age group.

The PCE is also available in French. Please note that averages across jurisdictions may not provide comparable results due to differences in care delivery models and labour rates, among other factors.

Methods: It links the patient cost information with the clinical information. It showcases how the financial, patient cost, and clinical information allow us to provide cost estimates at various levels of specificity. In general, PCE presents how to estimate the cost of implementing a new program in a hospital if the actual patient costs incurred in your own facility are not available or appropriate and your facility does not have patient costing systems.

The estimated average cost for services provided to a hospital inpatient is the weighted average generated by multiplying an estimate of hospital expenditure at the jurisdiction level by the average Resource Intensity Weight (RIW) of all cases within a specific patient and age group.

The PCE includes only typical patients—those who have undergone the expected course of treatment.

Top-Down Approach
A traditional approach that uses department-level expenses to calculate an average cost at the facility, jurisdiction and national levels (CIHI’s cost per weighted case, or CPWC).

Bottom-Up Approach
Patient-level costing or activity-based costing in health care is used by some Canadian health care facilities. Costing systems are a way to allocate and distribute departmental expenses to each patient. At CIHI, patient level clinical and cost data are integrated to create RIWs.
The PCE combines both of these accounting approaches to provide the estimated average costs, using the jurisdiction-level CPWCs to bring dollar values to the resource intensity for each patient group.

**Results:** Outcomes, results, lessons learned
1. Estimated average costs per Case Mix Group (CMG) by jurisdiction and age group;
2. Average length of stay by CMG by jurisdiction and age group;
3. Volumes by CMG by jurisdiction and age group;
4. Summary reports displaying the most frequently occurring CMGs by jurisdiction and age group; and
5. Summary reports displaying the CMGs incurring the highest and lowest estimated in-hospital average costs by jurisdiction and age group.

**Conclusions:** We hope the patient cost estimator can be used as a tool to support your planning activities at the facility level, and if you are interested in broader provincial planning, we hope you can use the PCE as a good starting point for discussions about patient costs.

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(ID: 1141532)

Births in Slovenia in 2008; mothers and newborns

**Introduction:** Many cross hospital analysis of patients profiles were carried out since the introduction of DRGs in 2004. Maternity wards called for special attention. Using network analysis find out the description of profiles of births.

**Methods:** For the purpose of this study we extracted DRG case describing births (O01A-O01D and O02Z, O60A-O60C.

**Results:** The main finding is that there is little consistency in terms of the nature and the number of secondary diagnosis. The patient profile is influenced by the hospital in which mothers give birth indicating very low hospital collaboration in terms of the utilization of secondary diagnostic codes.

**Conclusions:** We list the second most common diagnosis overall so that we can provide a list of recommendations: a checklist of most common secondary diagnosis. Better regulatory systems are needed in order to ensure patient safety, quality and validity of data and fairness in financing.

**AUTHORS:** Anne-Marie Yazbeck (a.m.yazbeck@gmail.com); Mojca Omerzu (mojca.omerzu@ivz-rs.si);Dr. Michael Galsworthy (mike.galsworthy@ivz-rs.si)
Health care and drug utilisation pattern in patients categorized by Adjusted Clinical Group at Buddhachinaraj Hospital, Phitsanulok

Introduction: This study was to study patterns of health care and drug utilisation classified by Adjusted Clinical Group (ACG) and to examine variations in drug utilisation at Buddhachinaraj Hospital, Phitsanulok.

Methods: This study employed quantitative and qualitative approaches. For quantitative study, outpatient service electronic database in the fiscal year 2009 was used. Patients were grouped according to their morbidity of illness using ACG version 9.0. Descriptive statistics were employed to present the total cost and total drug cost (Baht/year) and average total cost and total drug cost per person (Baht/person). For qualitative study, an in-depth interview with purposive sampling in providers and patients (diabetes mellitus type 2 and hypertension) was used. The analysis of the text and sentences from the interviews was analyzed to explore factors affecting health care utilisation and patients’ access to drug.

Results: The total cost and drug cost were 616,092,534 Baht/year and 40,147,379 Baht/year, respectively. Average total cost and drug cost per person per year were 3,965.89 Baht and 258.44 Baht, respectively. Patients perceived that medical benefit scheme, severity of disease and their knowledge of disease involved in health care utilization and access to drug. Factors affecting the variation in drug utilisation from health care providers perspective included severity of disease, patients’ age, medical benefit scheme, restriction of prescribing in hospital, and list of essential drugs in hospital.

Conclusions: This study showed pattern of total cost and total drug cost according to morbidity burden by Adjusted Clinical Group. Apart from the morbidity burden, there were other factors that could be affect health care and drug utilisation.

AUTHORS: Dr. Nilawan Upakdee, Naresuan University (nilawanu@nu.ac.th)
Wednesday, October 19

**Pre-Conference Workshops**

**A**
How to Harmonize Classifications of Procedures for Case Mix Applications?
From the Present Situation to the ICHI (International Classification of Health Interventions) Initiative
Jean Marie Rodrigues, PhD, Professor, St. Etienne University
Meeting Room: Ville-Marie A (9th Floor)

**B**
Profiling Devices, Drugs and Implants as an Additional Profile of Case Mix Tools Using GSI
Jacob Hoffk, Implementatie Integratie Bekijsing Chroniche Zieken WVS, Vice President EFMI-MIA, Partner in Casemix
Meeting Room: St-Antoine A (9th Floor)

**C**
Costing Patient Care Services—An Introduction Using Worked Examples
Nigel Mitchell, PowerHealth Solutions
(Start time 10 a.m.)
Meeting Room: Ville-Marie B (9th Floor)

**D**
From Case Mix to Clinical Care
Michael Wilke
Meeting Room: Ville-Marie B (9th Floor)

Lunch Break

**Pre-Conference Workshops**

**E**
Applying Predictive Modelling to Improve the Delivery of Health Care
Karen Kinder, AGC International Bloomberg School of Public Health, Johns Hopkins University
Meeting Room: Ville-Marie A (9th Floor)

**F**
Case-Mix Systems for Non-Acute Populations Across the Continuum of Care: The interRAI Experience
John P. Hirdes, Professor, School of Public Health and Health Systems, University of Waterloo and Brant Fries, President of interRAI, Professor of Health Management and Policy and Research Professor at the University of Michigan
Meeting Room: Ville-Marie B (9th Floor)

**G**
Continuity of Care/Contacts
Jacob Hoffk, Implementatie Integratie Bekijsing Chroniche Zieken WVS, Vice President EFMI-MIA, Partner in Casemix
Meeting Room: St-Antoine A (9th Floor)

**H**
Developing an Activity-Based Funding (ABF) Model for Non-Admitted Patient Services
Joe Scuteri, HealthConsult Pty Ltd, Australia
Meeting Room: Palais (8th Floor)

**Welcome Reception**
Meeting Room: Montreal Ballroom (11th Floor)

**Note:**
All conference presentations are in English, unless otherwise identified by the symbol ♣. Simultaneous interpretation will be available at all sessions denoted with ♣.

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**Thursday, October 20**

**Opening Plenary 1**
Moderator: Dr. Jason Sutherland
Welcome Remarks From
John Wright, President and CEO, CHI
Denis Lalumière, sous-ministre adjoint, Planification, performance et qualité de la santé et des services sociaux du Québec
Poul Erik Hansen, President, PCSI
Keynote Speaker
Dr. Bob Evans, Professor, Department of Economics, University of British Columbia
If You Can’t Measure It, You Can’t Manage It—Are Patient Classification Systems Essential to the Survival of Public Health Insurance?
Fortifications Ballroom—9th Floor

Coffee Break, Posters and Exhibit Viewing
Meeting Room: Montreal Ballroom (11th Floor)

**Concurrent Session 1**

**1-A: Morbidity Burden and Case Mix**
Moderator: Brian Ruff
Meeting Room: Ville-Marie A (9th Floor)

- Profiling High Morbidity Burden in Primary Care: Calibration of a Case-Mix Model, Ran Balcer
- Measuring the Case-Mix of Physician Practices in Primary Care Reform Models in Ontario, Canada, Lyn Sibley
- Analyzing the Emergence of Complex Morbidities: A 30-Year Follow-Up on a Defined Population in Sweden, Lennart Carlsson

**1-B: Health System Planning and Funding**
Moderator: Jack Sutherland
Meeting Room: Ville-Marie B (9th Floor)

- Understanding the Episode of Care for Transplant Patients: Irene Bais
- Planning for ABF as Part of Reforming the Australian Health Care System, Lisa Foder
- Case Mix Funding in Ireland: From Retrospective to Prospective? Progress Since 2010, Brian Donovan

**1-C: International with Ca**
Moderator: Poul Erik Hansen
Meeting Room: Ville-Marie C (9th F)
Romana: Experience Steps in the Inter Case Mix System APEX Program in Romania using Casemix Groupe
Mircea Buga
Feasibility of Implementing Case Mix System APEX Program in Malaysia using Casemix Groupe
Rosminah Mohd. Analysis of the Financial RECURSOS r in Uruguay using Casemix System

**Plenary 2**
Moderator: Darren Gerson
Dr. John Hirdes, Professor and Ontario Home Care Research and Knowledge Exchange (OHCREX), School of Public Health and Health Systems, University of Waterloo and Dr. Brant Fries, President of interRAI, Professor of Health Management and Policy and Research Professor at the University of Michigan
Designing case mix systems for non-acute care: The interRAI Experience. This presentation will examine methodological, conceptual and policy issues related to the development of case mix systems and associated payment systems for non-acute care health settings. It will feature international research by interRAI, a 32-country collaborative network focused on case mix systems for nursing homes, home care and mental health settings.

Coffee Break, Posters and Exhibit Viewing
Meeting Room: Montreal Ballroom (11th Floor)

**Concurrent Session 2**

**2-A: Economic Incentives and Case Mix**
Moderator: Dana Burduja
Meeting Room: Ville-Marie A (9th Floor)

- Determining a Threshold Hospital Size for Application of Activity-Based Funding, Joe Scuteri
- Issues in Use of CMS+ for Activity-Based Funding in Canada, Stephen Duckett
- Explaining Variations in the Cost of Patient Care: A Multilevel Analysis Using Canadian Hospital Data, Recep Gezer
- Can Teaching Hospitals Benefit From Casemix System? Outcome of Using DEA to Evaluate Efficiency of Teaching Hospitals in Malaysia, Syed Alijard

**2-B: Classification and Case Mix Incentives**
Moderator: Jiro Okochi
Meeting Room: Ville-Marie B (9th Floor)

- Assessment of the Main International and National Classifications or Terminological Systems of Surgical Procedures Using the CEN/ISO 10258 Standard, Jean Marie Rodrigues
- The Use of Case Mix Data for Identifying Variations in Hospital Care for Elderly Having COPD, Nico Chirac
- The Modern Concept of Sepsis and its Impact on DRG, Olaf Steinmu

**2-C: Ambul and Cas**
Moderator: Kr
Meeting Room: Ville-Marie C (9th F)
A Process for Costing Ambulance Services, Luke van Doon
Redeveloped CARE Group—9th and Evaluation, J
Applying Diagnosis Pharmacy-Based to Predict Pharmacy Use in Spain, T
Local Calibration, J
Research 2010, J
Case-Mix Read for PPR in Patients in Geriatric One-Daniel Peter Herman

**Poster Session**
Poster Viewing and Refreshments
Best Poster Award
Meeting Room: Montreal C&D (11th Floor)
Friday, October 21

Plenary 3 EURODRG Project Presentation
Moderator: Coe Malles
Andrew Street, Professor of Health Economics and Director of the Health Policy team
Centre for Health Economics and Director of the Economics of Social and Health Care
Research Unit (CHEHCRU), National Institute for Health Research
Fortifications Ballroom—9th Floor

PCSI General Assembly Part I—Introduction of Candidates for Election
Fortifications Ballroom—9th Floor

Coffee Break, Posters and Exhibit Viewing
Meeting Room: Montreal Ballroom (11th Floor)

Concurrent Session 3

3-A: Care Quality and Case Mix
Moderator: Jiro Okochi
Meeting Room: Ville-Marie A (9th Floor)
Incremental Costs of Hospital-Acquired Complications in Alberta, Canada, Terri Jackson
Using Hospital Readmission Rates to Track Quality of Care in Public Hospitals in Singapore, Dr. Sharon Chowdhury and Ms. Moo Yit Peng
Health Status and Performance Using Clinical Risk Groups (ACRGs) for the Madrid Region, Marc Berlinguet
First German Hospital Infection Benchmark Based on DRG Routine Data, Michael Wilke

3-B: Refining Case Mix Systems
Moderator: Paul Erik Hansen
Meeting Room: Ville-Marie B (9th Floor)
A Methodology for Developing a Classification of Clinical Specialties: Service-Related Groups (SRGs) and Enhanced Service-Related Groups (ESRGs), Christina Aspiberg
Counting Chronic Diagnoses Is Not Enough: Classifying the Entire Patient Population With a Morbidity Spectrum Measure, Dyll Simpson
Should There Be a Limit for DRG Versions 3 to 5, Supasit Pannarunothai

3-C: Health System Planning and Case Mix
Moderator: Dana Burdaja
Meeting Room: St-Antoine A (9th Floor)
Perceptions of the Case M0 System by Clinicians after the First Year of Implementation in Hong Kong: A Survey, K. H. Lee
Case Mix Innovation: Shifting to Integrated Care, Jan Holck
Can Clinical Pathways Enhance the Implementation of a Case Mix System? A Case Study in a Teaching Hospital in Malaysia, Syd Alipur
How Population-Based Case Mix Has Proven Itself in Canada, Karen Kinder

3-D: Case Mix Systems and Their Use
Moderator: Claude Lemay
Meeting Room: St-Antoine B (9th Floor)
Introduction en douceur à la méthodologie des systèmes dits “Casemix” pour les nouveaux venus à Jean Marie Rodrigues, Université Saint Étienne, CHU, Department of Public Health and Medical Informatics
Utilisation de regroupements d’episode de soins dans le cadre du financement du réseau de la santé et des services sociaux du Québec, Normand Langlais, Directeur de l’allocation des ressources par interim, Ministère de la Santé et des Services sociaux du Québec

Lunch, Posters and Exhibit Viewing
Meeting Room: Montreal Ballroom (11th Floor)

PCSI Featured Abstracts
Moderator: Jason Stuber
Patient Pathway Aggregation—Building on a Firm Foundation, Paula Montell
Analysis of the Variability of Nursing Care by Pathology in a Sample of Nine Belgian Hospitals, Deniza Mazevska
Patient-Level Costing for Projecting Costs With Aging, Dalia Naguera

Concurrent Session 4

4-A: Economic Incentives and Case Mix II
Moderator: Kristina Karuth
Meeting Room: Ville-Marie A (9th Floor)
Case Mix-Based Economic Incentives That Work, Paul Hanenson
Pay-for-Performance Incentive Program—One-Year Pilot Program, Dr. K. H. Lee
Paying for Quality, Patrick Power

4-B: Long-Term Care and Case Mix
Moderator: Stephen Sutch
Meeting Room: Ville-Marie B (9th Floor)
Aging, Disability and Long-Term Care, Dalila Negueria
Transferring to a New Case Mix Grouper to Fund Long-Term Care Homes in Ontario, Canada, San Adeline Tsui
Using the Adjusted Clinical Groups to Describe Newly Admitted Nursing Home Residents in Stockholm, Gunnar Ljungren
Implementation of Activity-Based Funding for Long-Term Care in Alberta, Stephen Dackett

4-C: Case Mix and Data Quality
Moderator: Michael Wilke
Meeting Room: St-Antoine A (9th Floor)
Auditing the Irish Case Mix Budget Models, Data Negueria
Coding Data Quality for Case Mix Payment: Insights From Two External Audits, Beth Reid
Clinical Documentation Manual Audit, Ken Fan
Data Quality Considerations With Increasing Access and Timeliness of Irish Hospital Activity Data, Deirdre Murphy

4-D: Cost Data and Cost Calculations
Moderator: Darren Gerson
Meeting Room: St-Antoine B (9th Floor)
A Comparison: Estimated Costs Using Case Mix Tools Versus the Canadian Cost Database, Bob Ren
The Australian Hospital Patient Costing Standards and Supporting Quality Framework, Joe Murray
National DRG Cost Weights in Finland, Tapio Pitkäranta
Cost Weights for Activity-Based Funding in Canada—Building Upon What We Have Known, Kevin Murphy

Gala Dinner (Starting at 7:30 p.m.)

Saturday, October 22

Concurrent Session 5

5-A: Health System Planning and Funding II
Moderator: Jean Marie Rodrigues
Meeting Room: Ville-Marie A (9th Floor)
Grouping Patients Across Episodes of Care: Refined Clinical Groups (RCGs), Kevin Yu
Are Clinical and Cost Data One Family During Implementation of Case Mix? Daniel Cireasa
Development and Implementation of DDT: The New Dutch Registration and Invoicing System, Joost Wamers

5-B: Cost Weight Calculations
Moderator: Stephen Sutch
Meeting Room: St-Antoine B (9th Floor)
The UNI-CBG: Development and Deployment of a Real International Open Source Casemix Grouper for Resource Challenged Countries, Syed Alipur
Individual Product Determination in the New Dutch DBC System: How to Make the System Transparent for Its Users, Alexander Rengelink
Levels of Care Methodology to Classify Patients as Tertiary and Non-Tertiary, Yvonne Chetkowitz

Concurrent Session 6

6-A: Innovation in Case Mix Applications
Moderator: Paula Montell
Meeting Room: Ville-Marie A (9th Floor)
Enabling Transparency and System Evaluation With Inpatient Rehabilitation Case Mix, Ian Joiner
Comparative Analysis of Rehabilitation Grouper, Klara Dimitrova
Real-Time Monitoring of Patient Outcome—VLAD, Deacons Yeung

6-B: Health System Planning and Case Mix II
Moderator: Virginia Jordan
Meeting Room: Ville-Marie B (9th Floor)
Episode Grouping and Assessing Appropriateness of Patient Care, Tessa Stave
Collecting Hospital Patient Data in Ireland—The Next Generation, Philip Dunne
Is the Disability Profile Enough: Classifying the Diagnoses Is Not Counting Chronic Disease Classification of (SRGs) and Enhanced Service-Related Groups (ESRGs), Deniza Mazevska

6-C: Cost Weight Calculations
Moderator: Stephen Sutch
Meeting Room: St-Antoine A (9th Floor)
Patient-Level Costing for Thai Diagnosis-Related Group in Thailand: A Micro-Costing Approach, Orathai Chakhachorn
Development of the Australian All Product Costs Process, Karen Chudleigh
Adjusting Non-Standardized Data to Facilitate National Reporting, Shend Perry
Real-Time Cost-Database—An Advantage for DRG-Related and Hospital Budgets, Maria Larsen

Lunch Meeting Room: Montreal Ballroom (11th Floor)

Closing Plenary
(Including an Introduction from the PCSI 2012 host, the PCSI Winter School and PCSI Summer School)
Fortifications Ballroom—9th Floor

Canadian Institute for Health Information
Institut canadien d’information sur la santé
\[ y = X\beta + \varepsilon \]
\[ Q_i + 1.5 \times (Q_i - Q_j) \]
\[ Q_i + 1.5 \times (Q_i - Q_j) \]
\[ y = X\hat{\beta} + \varepsilon \]

Notes
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Each patient counts

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Each patient counts

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Then check this out!

The PCSI 2012 Casemix Winter School:
Design and Implementation of Activity-Based Funding
Dublin, Ireland, March 12–16

(That’s right! It’s on the eve of the St. Patrick’s Festival)

The Winter School provides students with solid and comprehensive expertise in the design, implementation and monitoring of casemix funding mechanisms. Topics include casemix system design, patient-level costing, calculation of cost weights and price setting, setting of activity targets, outlier flagging, exception payments, monitoring and evaluation, analytical techniques and hands-on analysis of data.

Want More Information?
Please visit www.pcsinternational.org

A Few Evaluations From the 2011 School

“Just want to congratulate you on a huge success. The organization was excellent; the people were excellent. Extremely stimulating, very interactive and just loved it . . . Thank you so much for the excellent course. It was truly an amazing experience. Thank you.”

“Overall I found this winter school very useful. It was an intense week but I learned a lot . . .”

“The faculty was amazing. . . . The networking was tremendous and has given us all access to much more knowledge . . .”