Abstracts for 37th PCSI conference

Québec City, Canada

Contents

WORKSHOP 1: 9:30 – 12:30, Tuesday 9 September 2025 5

WORKSHOP 2: 9:30 – 12:30, Tuesday 9 September 2025 6

WORKSHOP 3: 9:30 – 12:30, Tuesday 9 September 2025 7

WORKSHOP 4: 9:30 – 12:30, Tuesday 9 September 2025 8

WORKSHOP 5: 13:30 – 16:30, Tuesday 9 September 2025 10

WORKSHOP 6: 13:30 – 16:30, Tuesday 9 September 2025 11

WORKSHOP 7: 13:30 – 16:30, Tuesday 9 September 2025 12

WORKSHOP 8: 13:30 – 16:30, Tuesday 9 September 2025 14

Health data use and benchmarking 1 16

Further advances in the recording system for additional public patient treatments. 16

The Need for Change: Too Many Health Systems are Data Rich, Information Poor (DRIP). 17

Outpatient - Establishing Productivity 18

Value-based care - the data to advance the vision 20

Healthcare pricing 21

A proposed typology of policy-driven payment rates for hospital care 21

Measuring and improving care quality 25

High rates of Central Line and Port Infections following Ambulatory CVC Procedures detected by AM-PPC 25

Patient Grouping as a Driver of Value in Health- Case Study: Severe Maternal Morbidity (SMM) 29

Healthcare costing 1 30

A National-Level Patient-Level Costing Model: Overcoming Provider Deficiencies and Driving Healthcare Transformation 30

Health data use and Benchmarking 2 37

Adopting Activity Based Management utilising monthly Activity Based Costing and an Activity Based Budget 37

Integrating Activity and Auditing Metrics to Advance Hospital Performance in Herzegovina-Neretva Canton, Bosnia and Herzegovina 39

Healthcare funding 41

Balancing funding stability and incentivising activity reporting in the transition of Australian community mental health services from block funding to activity based funding 41

Effects of the introduction of HybridDRGs in Germany analysing real-world data 42

Aged and long-term care systems 45

Achieving value and sustainability in aged care pricing and funding 45

Healthcare costing 2 49

Mapping the Future of Patient Level Costing in Canada 49

Population-based funding tools and strategies 1 55
Comparison of Johns Hopkins ACGs and the CIHI Population Grouper for assessing the morbidity and health care utilization of the population of Ontario, Canada 55
AI and automation in clinical coding 60
Australian Clinical Coding Artificial Intelligence (AI) Adoption Guideline 60
Health system forecasting and planning 66
Application of Case-Mix Methodology for Population-Based Physician Workforce Planning in Ontario, Canada 66
Funding Policy Considerations reflecting on Projected Patterns of Illness in Ontario. 67
System implementation 73
Advancements in coding, classification systems, and data quality in Canada 73
Casemix grouping 82
Development an internationally aligned casemix system based on WHO Family of International Classifications 82
Patient Grouping: Converting Data into Actionable Insight using Pure Clinical Categorical Methodologies 82
Clinical coding practices and innovations 85
Case Study: A Hospital in Melbourne, Australia - Benefits of Moving from Retrospective to Concurrent Query/Coding Process 85
Use of AI 89
Stumbling Upon the Black Gorilla: A Lucky Break in Overcoming Healthcare Financing Barriers with AI - A Case Study on Transfusion Funding in Slovenia 89
Using case mix aggregation to understand travel burden for hospital care in Canada 90
Exploring multimorbidity trajectories in the Canadian population. 94
Health service resourcing and economics 98
Analysis of the impact of lesion localization practices on the breast cancer care pathway 98
Comparative Study on the Allocative Efficiency among 5 countries 100
Data-informed care improvement 104
Addressing Global Health Inequities: Improving Data for Social Determinants of Health 104
Enhancing casemix precision 109
Accuracy of DRG Relative Weights Calibration using Machine Learning versus Standard HSRV Methodology 109
Strengthening Dermatological and Infectious Disease Surveillance and Care Delivery in Resource-Limited Settings: Lessons from Nepal 115
Optimizing Patient Care and Resource Allocation Through Electronic Medical Records and Health Insurance Integration in Nepal 116
Improvement of Surgical Hierarchy Criteria in KDRG V4.6 116

Tuesday Morning

WORKSHOP 1: 9:30 – 12:30, Tuesday 9 September 2025

TITLE: Introduction to Casemix

FACILITATORS: Deniza Mazevska – Patient Classification Systems International (PCSI)
Kristiina Kahur – Nordic Casemix Centre
Rachel Zhang – Canadian Institute for Health Information
Koffi Kpelitse – Canadian Institute for Health Information
Joanie Gingras – Canadian Institute for Health Information
Marisela Mainegra Hing – Canadian Institute for Health Information
Angeline Wilcox – Canadian Institute for Health Information

WHO WILL BE INTERESTED?

The workshop is introductory and is aimed at a range of audiences including those using casemix in facilities or at regional/provincial government organizations.

WORKSHOP OBJECTIVES:

To provide

- An introduction to casemix including where it comes from and why it matters.
- Introduce how casemix is used in specific settings and across populations of patients.

WORKSHOP OVERVIEW:

1) Introduction to Casemix.
   This will be a brief overview with an expectation that most conference participants will have a general understanding of casemix. It will include an overview of history of casemix and set the stage on why casemix matters. Examples of what might be covered include:
   - Why casemix matters: How it is used to improve efficiency, equity, and planning.
   - Where it came from: A brief look at how casemix has developed, including in Canada.
   - Overview of costing and quick interactive activity on when to use casemix and when to use cost data.
2) Casemix across different care/ service streams
   This session will be an opportunity to show the breadth of casemix information available. It will help to discuss potential applications of casemix in specific settings and across populations. It will also generate some conversation on how casemix could support bundled payments. Examples of what might be covered:
   - Application of casemix in various settings (e.g. hospital inpatients, population health, long-term care).
   - Opportunity to explore casemix products developed at Canadian Institute of Health Information (CIHI), such as CMG+ and the Pop Grouper.
3) Interactive workshop
   This will be an opportunity to learn how others, both within and outside of Canada, use casemix, and might help attendees identify additional opportunities within their organizations to incorporate casemix. Examples of what might be covered include:
   - A session for sharing experiences across countries and jurisdictions regarding how casemix is currently being used.
   - Q&A or small-group discussion identifying common themes or lessons.

WORKSHOP 2: 9:30 – 12:30, Tuesday 9 September 2025

TITLE: How to Analyze Casemix Data to Inform Risk Adjustment and Payment Policies

FACILITATORS: Conrad Kobel – HealthConsult
Jeff Hatcher – Canadian Institute for Health Information

WHO WILL BE INTERESTED?

This workshop is targeted at casemix office and provider technical staff, researchers, and decision-makers working in payment system design, cost modelling, and risk adjustment.

WORKSHOP OBJECTIVES:

1) Use of analytic methods in the analysis of casemix data
2) Interpretation of analysis results
3) Concepts of risk adjustment of funding payments for provider and patient characteristics.
4) Analysis of hospital costs and practice patterns and variations, taking into account casemix

WORKSHOP OVERVIEW:

This half-day workshop will introduce analysts to the analysis of casemix data to inform payment system design and risk adjustment accounting for provider and patient characteristics, and to inform understanding and managing of a hospital's variations in care practice patterns. The session will consist of presentations on running and interpretation of analytic methods, complemented by hands-on exercises in small groups of participants.

Participants will work with pre-generated analytic outputs from a mock acute-care minimum dataset (MDS). The focus will be on interpreting these outputs rather than the code used to generate the outputs. Through guided exercises, participants will explore the relationships between hospital and patient features and their correlation with cost and quality-of-care measures.

The analysis results will then be discussed in the context of informing payment policy and setting payment prices, and evaluating and managing hospital practice variations.

WORKSHOP 3: 9:30 – 12:30, Tuesday 9 September 2025

TITLE: ICD-11 Coding to Grouping – Going beyond Morbidity and Mortality to I11 Payment

FACILITATORS: Thilo Koepfer – Health Information Systems, Solventum
Mandy Reid – Health Information Systems, Solventum
Michelle Badore – Health Information Systems, Solventum

WHO WILL BE INTERESTED?

This workshop will be of interest to clinical coders and data analysts, payers and reimbursement specialists, policy makers, clinical costing staff, academia, and other interested parties.

WORKSHOP OBJECTIVES:

1) Understand the structure and conventions of ICD-11, including stem codes, extension codes, and post-coordination.
2) Apply ICD-11 coding tools and browsers for accurate morbidity and mortality classification.
3) Explore the transition from coding for statistics to grouping for casemix and payment purposes.
4) Examine how ICD-11 enables greater clinical detail and supports advanced grouping algorithms for reimbursement.
5) Discuss the implications of ICD-11 for health system financing and international data comparability.

WORKSHOP OVERVIEW:

This workshop begins with an overview of ICD history (ICD-10 to ICD-11) and provides a comprehensive exploration of ICD-11, focusing on its application from coding and grouping for morbidity and mortality statistics to its emerging role in payment systems. Participants will gain practical skills in using ICD-11 tools available from the World Health Organization, understand the structural and functional advances over ICD-10, and explore how ICD-11 supports more detailed clinical/administrative data, including future payment models. Review uses cases that more accurately capture the complexity and severity under ICD-11 to support bundled payments, population health, or quality-based reimbursement.

Agenda:

1) Setting the Stage: Why ICD-11
2) Understanding the I11 Concepts
3) Use Cases: From Coding to Payment
4) Benefits and Opportunities
5) Challenges and Transition Considerations
6) Future Outlook

WORKSHOP 4: 9:30 – 12:30, Tuesday 9 September 2025

TITLE: Modernizing Data and Methods from A to Z in Canada

FACILITATORS: Debra Chen – Canadian Institute for Health Information
Koffi Kpelitse – Canadian Institute for Health Information
Micheline Turneau – Canadian Institute for Health Information
Sharon Baker – Canadian Institute for Health Information
Cassandra Linton – Canadian Institute for Health Information
Pierre Léveillé – Canadian Institute for Health Information
Britta Nielsen – Canadian Institute for Health Information

WHO WILL BE INTERESTED?

The expected audience will be a cross-section of Canadian and international participants. The audience will have the opportunity to learn about a broad range of topics related to the data behind Canada's range of casemix products.

WORKSHOP OBJECTIVES:

Opportunity to learn about innovations in Canada, there will be audience participation and opportunities to share experiences and make new connections.

WORKSHOP OVERVIEW:

Agenda:

1) Introduction
2) The Canadian Health System, the role of CIHI, the casemix and costing landscape
3) Innovations in hospital data flow
   CIHI's multi-year Hospital Data Transformation (HDT) initiative which aims to achieve timelier and richer hospital data on a pan-Canadian basis with an overview of key streams of work:
   - A modernized hospital data content standard, under the pan-Canadian Health Data Content Framework, for point-of-care implementation and interoperability advancement.
   - A single, integrated hospital data system that collects timelier data that is fit-for-purpose with flexible data submission options.
   - Accelerated adoption of AI-assisted coding and other automated tools in hospitals that support timely, high-quality data capture and which frees up scarce resources.
   - Exploring what near-time casemix information would be valuable to facilities that could be incorporated into near-time submission of data to CIHI.
4) Innovations in classification systems
   - Modernized classification systems, such as enhancements to ICD-10-CA and CCI.
   - The evolution of ICD-11 and its potential impacts on Canada's healthcare system and its implications for casemix methodologies.
5) Innovations in case mix
   - Exploring what near-time casemix information would be valuable to facilities that could be incorporated into a modernized near-time data submission
6) Costing
   - Engaging stakeholders to create Canada's patient costing roadmap to lay the foundation for expansion and modernization.

Tuesday Afternoon

WORKSHOP 5: 13:30 – 16:30, Tuesday 9 September 2025

TITLE: Harnessing the power of CIHI's Population Grouping Methodology

FACILITATORS: Debra Chen – Canadian Institute for Health Information
Koffi Kpelitse – Canadian Institute for Health Information
Lyn Sibley – Ontario Medical Association
Bin Xu – Canadian Institute for Health Information
Mani Sotoodeh – Canadian Institute for Health Information

WHO WILL BE INTERESTED?

This session will be particularly relevant to casemix analysts, researchers, academia as well as decision-makers as it relates to

- The uses of casemix data for health care planning at the system level.
- Understanding broader population health needs and resource use.
- Using population-related health information to fund family medicine physicians.

WORKSHOP OBJECTIVES:

In this workshop, participants will learn from various examples how CIHI Grouper outputs can be used for multiple purposes, ranging from population health profiling to funding models. Some of the areas that will be explored include:

- System-level resource utilization by types of health conditions.
- Changes in population health over time and impact on resource utilization.
- Patient complexity and funding models.
- Sources of health inequities.

WORKSHOP OVERVIEW:

This workshop will focus on the multiple applications of the Population Grouping Methodology developed by the Canadian Institute for Health Information (CIHI). The Grouper looks at the population over an extended period across multiple healthcare settings and assigns each person in the population a clinical profile that includes health conditions, Health Profile Group (HPG), cost weights, and predicted future use of select health services.

The workshop will start with a quick overview of the methodology and its new features, followed by extensive discussions on some key applications of the methodology using Canadian data.

Handouts will be provided for each application/example and participants will be divided into smaller groups for analyses and discussions.

WORKSHOP 6: 13:30 – 16:30, Tuesday 9 September 2025

TITLE: System wide integration of value-based healthcare – the Australian experience

FACILITATORS: Sarah Neville, Independent Health and Aged Care Pricing Authority and the Commonwealth Fund
Samuel Webster, Independent Health and Aged Care Pricing Authority

WHO WILL BE INTERESTED?

This workshop is designed with hospital managers, casemix experts, decision-makers, researchers, and academics in mind, as it focuses on how value-based healthcare has been implemented in Australia using nationally reported patient indicators for adverse events in hospitals.

WORKSHOP OBJECTIVES:

- Introduce participants to the principles of value-based health care
- Understand the challenges and limitations when implementing system wide value-based health care initiatives
- Learn the basics of the pricing models which underpin the Australian safety and quality adjustments
- Understand the role of benchmarking in value-based health care
- Experience Australia's National Benchmarking Portal (NBP) live.

WORKSHOP OVERVIEW:

The presenters will give an approachable theoretical introduction to value-based healthcare and discuss implementation strategies and limitations. They will walk through the development and implementation of the adjustments Australia has introduced for funding safety and quality for hospital care – specifically, sentinel events, hospital-acquired complications, and avoidable hospital readmissions. They will then show how these funding adjustments have influenced the occurrence of adverse events in Australian public hospitals. Finally, they will also guide participants through how we developed Australia's first publicly available National Benchmarking Portal (NBP) and give a live demonstration of how it can be used.

Participants will be able to follow along with our demonstration of the NBP and will be involved in discussions regarding implementation challenges and solutions for value-based health care funding initiatives.

WORKSHOP 7: 13:30 – 16:30, Tuesday 9 September 2025

TITLE: Outpatients – Improving Productivity and Value for Patients

FACILITATORS: Mark O'Connor - National Productivity Unit, HSE Ireland, PCSI Executive Committee
Winston Piddington – Health Classification and Funding – UAE
Octavian Weiser - Solventum
Naveen Sharma - Solventum
Sandeep Wadhwa - Solventum
Thilo Koepfer - Solventum

WHO WILL BE INTERESTED?

- Staff involved in management, pricing and funding of Outpatient activity.
- Classification of Outpatient services
- Policy makers interested in maximising the productivity of outpatients & improving patient access times.

WORKSHOP OBJECTIVES:

To create and learn from a discussion about.

- How outpatient capacity can be better managed.
- The experiences learned from the Irish sprint project to assess capacity and train hospitals in using the 'Outpatient Clinic Planning Tool.'
- Considerations to include in classifications and pricing.
- The changes needed to achieve better access times for patients.
- The learnings from Abu Dhabi at putting the patient at the centre of healthcare reform.
- The benefits of implementing a full patient-level Outpatient classification system.

WORKSHOP OVERVIEW:

The purpose of the workshop is to look at delivering and measuring outpatient/ambulatory care productivity in a modern healthcare system. The workshop will consider different aspects of this based on three projects from three separate international healthcare systems. The different methodologies have varying levels of implementation complexity and benefit. The workshop will being by introducing the topic of outpatient or ambulatory care and the key challenges in the area.

While a national database for outpatients in Ireland is currently under development, the workshops will first discuss an Irish project on time and activity measurement, and the challenges to performance management in the outpatient area.

The workshop will next discuss the creation of a simple outpatient classification in the UAE named "ADOC – The Abu Dhabi Outpatient Classification". The workshop will describe its development and progress as well as discuss the challenges of implementing the new reimbursement system whilst ensuring we are keeping the patient at the centre of our healthcare reform.

Following this, the workshop will consider the full capture and coding of the outpatients in various health systems via a software-based system. The advantages of this level of detail for reporting and understanding the data will be outlined via a series of case studies

Overall, this workshop will consider different perspectives in the area of outpatient care by presenting the different methodologies. Additionally, some challenges to be discussed in the workshop will be looking at the future of the cohort of care, managing healthcare outcomes and social prescribing.

WORKSHOP 8: 13:30 – 16:30, Tuesday 9 September 2025

TITLE: Patient Level Costing and Patient-Related Outcome Measures: A Winning Combination for Quantifying the Clinical Impact of Care Pathways.

FACILITATORS: Marc Hyndman, PowerSanté/Telstra Health

WHO WILL BE INTERESTED?

This workshop will be of relevance to all healthcare related professions from clinicians, administrators, clinical coders and informatics professionals, as it will provide an overview of Patient Level Costing, Data Analysis principles, PROMs and Care Trajectories using worked examples, case studies and attendee participation.

WORKSHOP OBJECTIVES:

Following attendance at this workshop, participants will have an understanding of patient costing, outcome measurement and data analysis principles particularly:

- Understand the concept of the General Ledger (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
- Understand the patient-level data feeds required and their elements
- Understand the concept of Relative Value Units (RVUs) and their application to Patient Costing
- Understand the concepts of loading, processing and reconciling patient-level and general ledger data.
- Understand the uses of Patient Level Costing data and PROM'S
- Understand the methods for analysing the variability and quality of clinical practices from the Patient Level Costing results
- Understand the methods for analysing Patient Level Costing results to improve financial performance
- Understand the methods for using the Patient Level Data to document best practices and to support value-based management of care and services

WORKSHOP OVERVIEW:

Participants will take an active role in defining the GL and Patient Costing methodologies. Participants, in groups, will be asked to review the case studies and identify sub-optimal performance, the potential reasons for it and initiatives that may be used to overcome the problems. Interactive participation will be encouraged using question-and-answer sessions and workgroups.

Handouts will be provided, and the workshop will assume that participants have an awareness of Patient Costing and Data Analysis principles but little understanding of them.

The preliminary agenda for the three (3) hour sessions is documented below.

13:30 – 14:15	Overview of Patient Level Costing
14:15 – 14:30	Patient Outcomes measurement
14:30 – 14:50	Using the Patient Level Data to effectively manage organisations
14:50 – 15:00	Break
15:00 – 16:15	Data Analysis, Care Pathways, Clinical Variances

16:15 – 16:30 Review and questions

Wednesday Morning

Health data use and benchmarking 1

Further advances in the recording system for additional public patient treatments.

Brian McCarthy [a], Paval Kuriakose [a], Richard Ryan [a], Philip Dunne [a], Joe Hunter [a]

Introduction
In Ireland, the majority of the admissions occur in one of over 50 public hospitals, with a smaller percentage admitted in one of 19 private hospitals. The recent global pandemic exacerbated the ongoing demand and capacity challenges in public hospital provision such as ageing demographics and expanding waiting lists, and necessitated utilisation of private hospital's capacity. The Health Service Executive (HSE) developed the Access to Care system (previously the UAN system) to record, classify and pay for these patients. Funding for these patients came from the HSE and Department of Health.

The Access to Care system continues to be used in Ireland to manage this additional healthcare capacity and to record said activity. The system has broadened to encompass additional outsourcing (from public to private) and insourcing (public to public) initiatives for specific targeted activity. The Access Programme team lead by the Director of Access in the HSE's Access and Integration section manage the different proposals for initiatives (referred to as non-recurrent funding).

This presentation discusses how the Access to Care system has changed to accommodate these new requirements.

Methods
The Access to Care system records patient record level information on referrals to public or private hospitals. For referrals to private hospitals, a parallel system called the HSEclaims is used to submit claims for this activity. Insourced activity is funded using existing public payment systems.

The Access team seek and receive proposals from public hospitals for targeted initiatives to address areas of the public waiting list and to support delivering the annual Waiting List Action Plan & Slaintecare targets. These proposals are evaluated for value for money based on the cost and number of patients. Successful proposals are added to the Access to Care system and linked to private hospitals (as appropriate). Following this, the public hospital refer patients using the Access to Care system. All patients referred as part of the access to care system are issued a unique authorisation number (UAN) which, in the case of private hospitals is also used for payment.

Results
An existing system to record insourced and outsourced activity operated for a number of years with varying levels of success. Ultimately, the system did not provide the necessary level of detail and transparency across all hospitals for the standardised national reporting required to understand the performance of these initiatives.

During 2024, the Access to Care system began replacing the existing system on a phased basis, providing on-demand reports on activity. All new requests for funding in these programs are conditional on the proposing hospital submitting data via the system. The system facilitates manual or batch patient referrals, where the latter option allows the referral of a number of patients at the same time.

The system ensures that referred waiting list patients do not breach the agreed capacity (numbers and cost) and target waiting times of each initative. Where relevant, the private provider can submit a claim for the activity using the system. For all the referrals, the patient details are recorded ensuring

that accidental duplicate referrals do not take place.

Discussion/Conclusions
The Access to Care system has provided a national method of recording public waiting list referrals to private hospitals, and the enhanced reporting has helped the HSE and the Department of Health understand the impact of their funding in this area. The expansion of the system to encompass the existing non-recurrent initiatives enhances its reporting and the understanding of the impact of this funding stream.

In the future, the additional reporting will help frame and shape future non-recurrent initiatives ensuring better value for money for the health service.

[a] Healthcare Pricing Office, HSE, Ireland, Ireland

The Need for Change: Too Many Health Systems are Data Rich, Information Poor (DRIP)

Mike Norton [a], Laia Buigues Pastor [b]

Introduction
Dr. Paul Forte, described the UK NHS as being Data Rich, Information Poor (DRIP) back in 1995. Things have moved on quite a bit since then, but many still feel the ways and means of converting data into information have not kept pace with the exponential increase in our acquisition of data. This picture is complicated by the fact that data structures are often complex and all too often siloed by location, specialty and/or service line.

So how do we turn our data into information and draw actionable insights from that information to improve patient outcomes?

Methods
Solventum Clinical Risk Groups (CRGs) are a clinical categorical methodology for converting clinical data into information, by bringing together clinically coded data (diagnoses, procedures, drug codes, functional and mental health status) from multiple siloes to assign each patient into a single, mutually exclusive category that fully describes their total burden of illness.

When combined with age and gender, CRGs can create clinically homogenous groups that facilitate the step from information to insight and accelerate a healthcare organization's journey to value-based care, specifically by reducing the hurdle of how to identify and measure unwarranted variation across the spectrum of care.

This abstractr looks at the various uses of CRGs by the Health Authority of the Region of Valencia, who initially implementation them in 2008 under the General Pharmaceutical Authority (DGF) and then expanded their use to other bodies belonging to the authority, including the General Health Care Authority.

The Region of Valencia at a glance ...

- 4,9 million inhabitants
- 35 hospitals
- 881 primary care health centres

Results
Significant reduction in pharmaceutical spends:
A reduction of 6,5% was achieved in pharmaceutical spend associated with the prescription of medication at pharmacies; this represents a positive impact in financial terms.

Improvement in clinical management:
Health care professionals witnessed an improvement in clinical management resulting in more efficient care focused on the needs of each patient group.

Improvement in financial management and the assignment of human resources:
The identification of areas of greatest demand for medical care, supported the more efficient assignment of human resources and thus optimised operating costs.

Support in decision making:
CRGs aid clinical decision making leading to a better informed and more customised levels of care.

The drafting of key indicators:
CRGs were used to develop key performance indicators, providing a solid foundation for continuous improvements.

Identification of at-risk populations:
Populations with particular pathologies can be more effectively identified for more focussed prescription management, supporting a more proactive management of those populations.

Conclusions
Health systems need to move away from patient management on a case-by-case or disease-by-disease basis and adopt a patient-centric approach to care.

Taking a whole-person, clinical categorical approach to measuring a patient's burden of illness supports the more efficient management of resources, reduces clinical outliers and promotes value-based care.

[a] Solventum, United Kingdom
[b] Generalitat Valenciana, Spain

Outpatient - Establishing Productivity

Mark O'Connor [a], Niamh Barrett [a], Martina Behan [a], Gary O'Callaghan [a], Gavin O'Callaghan [a], Mary Coghlan [a], Edel Smith [a], Jessica Polykarpou [a]

Introduction
Ireland, similar to other countries, is trying to solve 'The Productivity Puzzle'. Increased financial and staffing resources are being allocated to healthcare without similar increases in activity. To investigate this 'Puzzle' Ireland's Health Service Executive established a National Productivity Unit in June 2024. Its first area of focus was Outpatient Productivity with the deliverable of introducing service level productivity measures that would in

- Increases in the average numbers of outpatient appointments
- An 'Outpatient Toolkit' that can be deployed across all hospitals and specialties
- Compliance with waiting time targets
- Reduction in the number and percentage of Did Not Attends and Could Not Attends

Detail
Visits to 10 hospitals to observe an outpatient clinic in a high volume specialty were arranged. A consistent process was followed with

- A 'Site Visit Flatpack' was sent to each hospital in advance
- Stakeholder interviews with local observations on:
  - People
  - Process
  - Technology and infrastructure
- Process review
- On-site observation study to document the 'As Is' operation of each clinic
- Data collection and analysis of on-site observations
- Follow up meetings to discuss finding and results

Results
A return visit was made to each hospital to present findings and discuss the results. Feedback based on the observations was given on:

- Variance between planned and actual attendances
- New to return appointments
- Scheduled time versus actual time
- The physical environment/number of rooms
- Staffing resources available
- Staffing and room downtime
- Consultant utilisation - does the consultant see patients or float between rooms supporting junior doctors
- Average time per patient

A Strategic Outpatient Toolkit is currently a work in progress and will be finalised by the time of the conference. This toolkit will identify the 'To Be' operating model for OPD with measures at each stage in the outpatient journey where outpatient demand can be managed and capacity be better utilised to ensure patients are seen within the mandated times.

Conclusions
There are multiple steps along the outpatient pathway where the steps below can improve the relationship between demand and capacity.

- Demand management
- Supporting clinical decisions
- Greater awareness of conditions and the appropriate treatment pathways that are available.
- Alternative virtual care pathways
- Better workflow of clinics.
- Strategies to reduce DNA/CNAs and unnecessary follow up attendances

The feedback communication with each site and Strategic Toolkit look at the entire pathway with suggested improvements that will result in reduced demand, increased and better managed capacity and a more efficient pathway with shorter patient waiting times. The PCSI presentation will detail the entire OPD Productivity process.

[a] National Productivity Unit, HSE, Ireland , Ireland

Value-based care - the data to advance the vision

Erin Cook [a], Ani Galstyan [a]

Introduction
Quebec's healthcare system faces significant challenges, including prolonged surgical wait times, staff shortages, and rising costs, which will only intensify with an aging population. To address these issues, we must re-envision care delivery with a focus on value for patients. A key priority in value-based healthcare is improving surgical quality to enhance patient outcomes and quality of life, while reducing the costs associated with prolonged hospital stays, repeated surgeries, and readmissions. Standardized outcomes, transparently reported and accessible to clinicians, are essential for improving care quality, patient outcomes, and enabling informed decision-making at all levels of healthcare delivery.

In recent years, various dashboards have been developed across local and regional levels to support decision-making based on operational, financial, quality, and structural indicators. However, these tools often fail to measure health outcomes for different conditions and specific patient populations while linking total costs with care pathways and their variations, which is critical for the transition to value-based care.

Methods
The concept of health value creation relies on two fundamental elements: organizing care around the patient's medical condition across the entire care cycle, called an integrated practice unit, and using standardized outcome, quality, and cost measures. In collaboration with a BI supplier, we developed a Power BI portal that not only analyses and compares quality of care indicators but also captures patient-reported health outcomes and the actual costs per care pathway. A key feature of the portal is tracking compliance with Enhanced Recovery After Surgery (ERAS) best practices, which play a crucial role in reducing complications and shortening recovery times, thus lowering costs while improving patient outcomes. The portal integrates data from various platforms and systems, such as the National Surgical Quality Improvement Program (NSQIP), Nosokos, Encare, and the International Consortium for Health Outcomes Measurement (ICHOM), linking outcome measures with the total cost of the care cycle using the provincial costing tool CPSS-PPM, providing valuable clinical insights.

Results
The implementation of the Power BI platform has already led to significant improvements in care quality. It enabled the identification of clinical interventions that enhance processes and yield high-value care. A notable success was a targeted initiative to reduce unnecessary blood transfusions in orthopedic surgery, identified through the platform. This initiative resulted in the following outcomes:

- An 80.5% annual reduction in unnecessary blood transfusions, leading to fewer complications and risks.
- A 55% reduction in postoperative complications, resulting in shorter hospital stays and improved health outcomes.
- A decrease of 2 days in the average length of hospital stay, increasing bed availability.
- Financial savings of approximately $700,000 annually due to increased bed availability.

These results led to the decision to initiate a larger, organization-wide patient blood management program.

Discussion/Conclusions
This initiative demonstrates how data-driven, clinical improvements can reduce healthcare system costs and improve patient access to care. The value-based approach, supported by robust IT infrastructure, has deepened our understanding of care quality and patient outcomes. It underscores

the importance of integrating data and adopting evidence-based practices to improve healthcare efficiency and patient satisfaction, while highlighting the need for ongoing collaboration across healthcare sectors.

[a] Centre intégré universitaire de santé et services sociaux Centre-Ouest-de-l'ìle-de-Montréal, Canada, Canada

Healthcare pricing

A proposed typology of policy-driven payment rates for hospital care

Stephen Duckett [a]

Introduction
With the increased use of quasi-market mechanisms in health care, with activity-based funding the best example, there is an increased use of payment rates or 'prices' to send signals to providers about a range of issues of interest to policy makers, beyond simply improving system (technical) efficiency. In particular, payment rates, which were originally simply based on the pre-existing average, or perhaps adjusted downwards to achieve expenditure reductions, now often have an additional normative element about a range of other issues, most often safety of care. This paper is primarily theoretical, that is, it advances a framework for thinking about policy-driven adjustment of payment rates.

Methods
It is proposed that policy driven payment rates could be classified both by their objective that is whether it's primarily about technical efficiency or allocative efficiency, and their target - whether it is primarily about changing the behaviour of a single institution such as a hospital, or whether it is also about changing behaviour across institutions.

Conclusions
The paper concludes with some of the considerations to be taken your account in setting policy-driven payment rates

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A review of data capture, costing and pricing for virtual care in Australian public hospitals: Insights and challenges

Julia Conway [a], Raj Verma [b], Emily Ryan [b], Deniza Mazevska [b], Jim Pearse [b]

Introduction
Australia's Independent Health and Aged Care Pricing Authority (IHACPA) undertakes an ongoing program of work to ensure that hospital costing, classification, and pricing evolve in line with changing models of care and the shifting cost profiles of healthcare delivery. The rapid expansion of virtual care since the onset of the COVID-19 pandemic has highlighted significant variations in service delivery and data reporting for virtual care services. To address these challenges, IHACPA commissioned a review to examine the role of virtual models of care in the health system, with a

focus on their activity, costs, and integration into national pricing and funding.

Methods
The review combined multiple approaches to assess virtual models of care, establishing a comprehensive evidence base on the current state of these models. It involved an analysis of national and state/territory-level hospital definitions and data collections to examine how virtual care is recorded. Additionally, consultations and workshops were held with approximately 140 stakeholders, including representatives from government agencies, health departments, local health networks, health services, industry, and international experts. The review also drew on findings from peer-reviewed and grey literature on how virtual models are being defined and represented in data collection, classification, costing, pricing and funding across different health care systems.

Results
A key finding of this review was that all identified virtual models of care are included in national pricing, either through activity-based or block funding. However, while most virtual care models are captured within existing activity and cost data collections, they are not always explicitly identified under current reporting specifications. Furthermore, there is inconsistent allocation of the costs associated with virtual care in national costing.

These findings have highlighted a need to develop an appropriate definition and taxonomy to support improved visibility of virtual care in data collections, which would support a range of benchmarking and monitoring functions over time, including for safety and quality monitoring. There is also a need to drive improved costing practices in health services to ensure service innovations can be better reflected in classifications and pricing model refinements over time.

Discussion/Conclusions
The review findings demonstrated the importance of designing flexible casemix classifications that can adapt to changes in care delivery over time. Ultimately, rapid changes in virtual care delivery were generally able to be accommodated within existing funding systems without intervention. However, the review demonstrated the demand for casemix classifications to support functions such as safety and quality monitoring and increasing transparency over service delivery models. Agreed definitions will be critical to drive the consistency required to enable these outcomes.

This review also underlined the importance of high-quality clinical costing frameworks as critical in ensuring costing practices and allocations reflect service innovations. However, it has highlighted the ongoing trade-offs faced by health systems in managing the burden of data collection, and the granularity of costing, classification and pricing, with overall resource constraints. It is likely that advances in the efficiency of activity and cost data collection will become increasingly important into the future given these trade-offs.

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Improving outcomes and quality of care in Oncology through Patient-Based Funding in Quebec

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Introduction
With $61.9 billion allocated in 2024-2025, Quebec's universal public healthcare system accounts for 41.9% of ministerial spending, underscoring its central role in the province's policy priorities.[1] The healthcare system includes over 140 hospitals organized under integrated public institutions, and

mobilizes around 595,000 workers, accounting for more than 13.6% of the provincial workforce.[2] To improve both efficiency and value, Quebec has introduced a new funding model, the Patient-Based Funding (PBF), inspired by Value-Based Health Care (VBHC). This model aims to better align healthcare expenditures with quality of care and patient outcomes. This study examines the early impacts of the PBF in radiation oncology, focusing on performance, care quality, and system value.

Methods
The PBF model in radiation oncology was implemented from in 2015 across the majority healthcare facilities in Quebec. Designated to improve efficiency and value, this model links funding more directly to service volumes, care complexity, and outcomes. This analysis draws on nearly a decade of data, allowing for a longitudinal evaluation of FAP's impact on multiple dimensions of system performance. Key indicators include cost efficiency, productivity, the adoption of advanced technologies, notably Intensity-Modulated Radiation Therapy (IMRT) and access to care assessed through a set of performance-based variables.

Results
Nearly a decade after its implementation, the PBF model in radiation oncology has improved efficiency, access, and technology adoption while reducing treatment costs through better resources and salary management. Productivity has increased, with more care delivered using stable or reduced resources. A major shift toward advanced techniques like IMRT has replaced outdated 2D approaches. Ten-year data show sustained improvements in breast cancer care quality and lower per-patient treatment costs. Standardized clinical pathways and improved care coordination have enhanced outcomes, patient experience, and cost-effectiveness, as reflected in higher productivity and greater use of advanced planning techniques.

Discussion
Advancing understanding of the impact of the Patient-Based Funding model in radiation oncology is critical for improving the planning and delivery of cancer treatments across diverse clinical contexts. iBy integrating validated clinical data with robust performance indicators, the PBF model enables more accurate forecasting of future needs, optimal resource allocation and informed support for strategic decision-making. This proactive, evidence-based approach fosters improved clinical outcomes, while ensuring cost containment and sustained improvements in the quality of care.

Certain limitations remain, including inter-institutional variability, potential effects on equity of access, classification of diagnoses and the challenges of uniformly adopting best practices. These issues need to be addressed in order to improve the model and ensure its sustainability.

Topics: Connecting funding with patient outcomes and quality of care

Key Words: Patient-centered funding, health value, quality of care, oncology, funding reform, clinical performance, breast cancer, VBHC, Quebec, Cost Efficiency, FAP, PBF

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The use of investigative technology in the emergency department and it's impact on resource use.

Angeline Wilcox [a], Tina Li [a], Karen Horne [a]

Introduction

The emergency department (ED) within a hospital provides care to patients, focusing particularly on urgent and traumatic care. In this setting, the use of investigative technology (IT) such as magnetic resonance imaging (MRI), computer axial tomography (CAT), and/or X-rays are critical to the diagnosis and treatment. Among the services provided in the ED setting, these IT services can significantly increase resources use.

Since 2018, the CACS grouping logic was expanded to include NACRS level 2 reporting. Unlike level 3 ambulatory care reporting, level 2 does not report the full ICD-10-CA diagnosis nor CCI intervention codes but provides the opportunity to submit a smaller sub-set of these codes. However, most facilities reporting level 2 data often do not include any intervention reporting. The purpose of this work is to estimate how this lack of investigative technology reporting influences resources estimates.

Methods

In this analysis, the past 4 years of NACRS data grouped to CACS 2025 were explored with a focus on key differences between level 2 and level 3 reporting of interventions. The level 3 data was analysed to identify the prevalence and relative resource contribution of investigative technology in unscheduled ED CACS groups. The Canadian Patient Cost data was further explored to identify the reported average costs associated with IT, as well as the variations in costs that are observed.

Results

An analysis of Level 3 ambulatory data indicates that nearly all IT reporting originates from unscheduled ED visits and spans all ED CACS cells, highlighting the significance of IT in the ED setting. More than 42% of Level 3 unscheduled ED cases report at least one IT. In contrast, Level 2 data show virtually no IT reporting, which results in lower RIWs for these cases, and introduces a bias when using case mix indicators from these cases.

For CPCD unscheduled ED data, IT reporting was, on average, higher at 48%, with IT cases costing more than double the costs of non-IT cases. The cost increase varies significantly by IT type-nuclear IT procedures were nearly four times more expensive, whereas x-rays increased costs by just over 50%.

Conclusions

Investigative technology are a critical component of ED services where they are used extensively. Many CACS groups have a significant portion of cases weights adjusted for investigative technology, and these cost adjustments are often as large as the CACS cost themselves. It is estimated that without critical IT intervention data in level 2 reporting, resource weights are significantly under-estimated, and any use of RIW with level 2 NACRS submissions needs to take this RIW limitation into consideration.

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Measuring and improving care quality

High rates of Central Line and Port Infections following Ambulatory CVC Procedures detected by AM-PPC

Ajay Perumbeti [a], Dana Casey [a], Sandeep Wadhwa [a], Elizabeth Mccullough [a]

Introduction
Outpatient central venous catheter (CVC) procedures are shifting to ambulatory settings to deliver outpatient and home infusion therapies, with cost benefits, patient convenience, and reduced risk of hospital acquired conditions (HAC). Post-procedure, CVC can have complications including line dysfunction, thrombosis, and life-threatening risk of central line-associated bloodstream infections (CLABSIs) (Becera-Bolanos, Nature, 2025). Solventum Ambulatory Potentially Preventable Conditions (AM-PPC) is a risk adjusted clinical categorical model focused on measuring and benchmarking complications following outpatient procedures. This includes a focus on hospital admissions and Emergency Room visits. We evaluate CVC complications post-ambulatory procedure with AM-PPC in the Medicare population.

Methods
Analysis was done with CMS Medicare FFS facility claims for CY 2019-2022. Data was processed with Solventum AM-PPC v1.1 clinical classification software. AM-PPC groups procedures into procedure groups (PSG) and complications into complication groups. For individual procedures, complications are measured up to 30 days post procedure and categorized by encounter type including emergency department (ED) visits that did not result in admission, inpatient admissions (IP), and outpatient visits (OP). Analysis tools were Python v3.7.9 with Visual Studio Code v1.96.3 and Microsoft Excel v2411. We performed a sub-analysis for CVC procedures focused on PSG for CVC with external hubs including Peripherally Inserted Central lines (CL), and CVC with hubs below the skin (Port). We further analysed Sepsis and other Severe Infection (SOSI) AM-PPC complication group as representative of CLABSI and CVC infection.

Results
CL accounted for 197,169 procedures with 12% of those CL replacement. Ports accounted for 343,118 procedures with 1% of those Port replacement. CL and Ports had complications numbers that qualified them in the top 10 PSGs with the most complications (CL: 9155, Port: 10383). It was notable that CL had a substantially higher complication rate than ports (CL: 9.66%, Port: 5.16%). Distribution of total complications by location was not dramatically different for CL (ED: 6566, IP: 12480, OP: 16283) compared to Port (ED: 4302, IP: 13354, OP: 14033). SOSI was the most common AM-PPC complication group and accounted for 29% of all complications for CL and Port. The proportion of SOSI events in the ED was comparable for CL and Port (CL: 3.8%, Port: 4.3%). SOSI was most often IP (CL: 7028, Port: 9537). CL had considerably more SOSI as OP (IP: 76.8%, OP: 19.5%) compared to Ports (Inpatient: 91.9%, Outpatient: 3.9%).

Discussion/Conclusions
We demonstrate with Solventum AM-PPC, that ambulatory CVC procedures have frequent complications including potential life-threatening SOSI. Although CL and Ports both have high rates of SOSI, the almost doubled rate in CL may reflect challenges with care of central lines with external hubs that can be challenging to maintain due to exposure to outside environment and frequent access. The analysis emphasizes the value of precision monitoring of ambulatory procedure complications for identifying concerning outcome trends. This facilitates local efforts to prioritize problems, perform corrective interventions, and measure results to drive patient safety and healthcare value. For CL and

Ports, this may involve a myriad of local strategies focused on infection control, patient education, home care and remote monitoring, and patient selection and education.

[a] Solventum, United States

Improving and utilising coded sepsis data - clinical audit and coding quality.

Jacqui Curley [a]

Introduction
In Ireland, activity for admitted acute care in public hospitals is coded using the 12th edition of ICD-10-AM, ACHI & ACS and the national system for this data collection is called the Hospital In-Patient Enquiry (HIPE) system. The Healthcare Pricing Office (HPO) manages the national HIPE data system. Since 2010 the National Clinical Programme for Sepsis has utilised coded data in their annual report and also more recently to inform sampling for clinical audits. The HPO and the Sepsis Programme also collaborate on areas including sepsis classification, clinical education, coder education and documentation issues. The sepsis programme are now performing clinical audits on compliance with sepsis clinical care pathways and most recently this has expanded to include patients who potentially have sepsis (infection with organ dysfunction) but do not have a diagnosis of sepsis recorded. Using coded data, the sepsis programme wanted to identify patients who may potentially have had sepsis but did not record a diagnosis of sepsis. There are four separate audits to be performed

1. adults in acute hospitals,
2. adults non-acute hospitals
3. paediatric (excluding neonates)
4. maternity.

Methods
There is close collaboration on sepsis data and on the requirements for each audit are specified. For each of the 4 groups listed above, the sepsis audits have expanded to include two categories of patients for review;

1. Sepsis Diagnosed:
   Those patients that had sepsis or septic shock coded- to ensure correct pathways were followed for sepsis patients

   and

2. Potential sepsis:
   Those patients who may have had sepsis but where sepsis was not coded - to identify if correct pathways were followed in the identification and diagnosis of sepsis or septic shock. Cases with organ failure AND an infection are included.

- HPO communicate with coding teams in hospitals regarding the audits and how reports are to be run.
- Sepsis Leads in each region liaise with Coding departments in each hospital to retrieve sample cases
- Sepsis leads perform clinical audit
- Relevant findings feedback locally and inform annual sepsis report.

Results
The approach has identified relevant cases for inclusion in the audits and the sepsis programme have refined their specifications over the years. Ongoing development has been needed in both the specifications to identify the cases and in the instructions for running the reports locally. All HIPE departments have the same reporting software which enables a standardised approach. The audits have ensured ongoing collaboration in sepsis coding and reporting at hospital level.

Discussion/Conclusions
This collaboration has fostered increased clinical engagement with activity data in the area of sepsis. While these audits focus on clinical care, the use of activity data as a resource brings increased clinical appreciation of the role of coders and the challenges with documentation. Sepsis cases are clinically complex and having a sepsis resource available for coding queries at local, and at national level, has been a significant development through this work. This work raises awareness amongst coders of the direct impact their work has on patient care and the importance of quality coding and clinical collaboration.

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Utilizing Artificial Intelligence (AI) to Monitor the Quality of Infection Therapy: Integrating CaseMix and Clinical Data to Enhance Care Quality

Michael Wilke [a], Harald Kuhlmann [a], Markus Rathmayer [a]

Introduction
CaseMix data is widely employed to develop specific quality indicators for monitoring healthcare quality. In Australia, the Hospital-acquired Complications (HAC) system is established, while Germany utilizes the Inpatient Quality Indicator (IQI) classification, with similar systems implemented in nearly every country that employs CaseMix for activity-based funding.

Despite these methodologies, certain questions necessitate additional clinical data. A critical area is Antimicrobial Stewardship (AMS), given that microbial resistance poses a global threat and the rational use of antibiotics is essential. Infectious disease (ID) specialists remain scarce in hospitals, and current AMS programs typically rely on cumulative analyses of antibiotic prescriptions, complemented by ward rounds. However, cumulative analyses do not provide insights into the specific infections for which drugs were prescribed, and ward rounds are time-consuming and lack broader applicability across wards, departments, or hospitals.

Our current research focuses on integrating CaseMix data, clinical information, and medication data using AI to enhance prescription quality. We have initiated a pilot project with a hospital in Germany.

Methods
We utilize CaseMix data to extract information on infections and bacteria, as well as resistance patterns, through the Infection Grouper (IMR). After grouping patients by IMR, each patient is associated with one or more infection episodes. Next, we link laboratory and antibiotic prescription data to these infection episodes. Using AI (ChatGPT), we convert local therapy guidelines into machine-readable formats.

Subsequently, we conduct an algorithmic analysis of all prescriptions to assess whether treatments are guideline-compliant and appropriate. Typical quality indicators include:

- Timely initiation of therapy (within 1-8 hours after admission)
- Guideline-adherent initial therapy (correct substance, dosage, and application)
- Consideration of microbiology results

- Appropriate duration of therapy

Results
This approach enables us to analyze specific infections, such as Community-Acquired Pneumonia (CAP), using an extensive dataset. We gain insights into length of stay, patient outcomes, and other economic results relative to the quality of antibiotic prescriptions. Furthermore, we can evaluate whether the antibiotic treatments align with guidelines.

The picture shows an overview:

Evaluation of Antimicrobial Stewardship and Infection Management

Type of infection	Cases	Therapy completely correct	Initial Therapy not correct	No combi- nation	Begin too late (> 8 hours from adm)
Community acquired Pneumonia (CAP)	345	105	240	233	87
	345	105	240	233	87

The integration of AI allows for the adaptation of the system to local guidelines.

Discussion/Conclusions
To our knowledge, this is the first tool that combines CaseMix and clinical data for infection analysis. Each hospital has distinct therapy guidelines, often tailored to local resistance patterns. By leveraging AI to process these guidelines and convert them into machine-readable tables, we facilitate the adaptation of analytics to local practices across different hospitals.

Preliminary comparisons with patient records indicate a high validity of the automatically generated assessments. However, validation of AI-generated results on a larger cohort by trained ID specialists is still required.

We created an analysis screen to assess results on a patient level:

In conclusion, the use of AI-generated assessments in infection management has the potential to deliver comprehensive results swiftly, thus conserving valuable clinician time.

[a] inspiring-health GmbH, Germany

Patient Grouping as a Driver of Value in Health- Case Study: Severe Maternal Morbidity (SMM)

Catherine Stemper [a], Catherine Brett [b]

Introduction
Mississippi, with one of the United States' highest maternal mortality rates, is taking proactive steps to manage its Medicaid maternal population. Recognizing that generalized geographic data often overlooks critical insights, the state is implementing targeted strategies to provide high quality perinatal care. Despite significant investments in technology and maternal health services, Mississippi's persistently high maternal mortality rate underscores the need for a deeper understanding of maternal morbidities and associated risk factors.

Methods
The cross-functional team, guided by the Mississippi Department of Medicaid, focused efforts to pinpoint SMM population cohorts using patient classification methodologies, exploring the development of predictive case management techniques, managed care performance metrics, and incentive strategies aimed at fostering high quality results. SMM population cohort research also explored social, racial, lifestyle, and geographic factors contributing to maternal health outcomes.

Results
This research has led to the development of innovative initiatives, including a risk score tool to assess postpartum risk of severe morbidity and mortality for statewide implementation. This tool, informed by observed outcome measures and delivery trends within Mississippi's Medicaid-financed population, aims to identify perinatal beneficiaries at risk of experiencing severe maternal morbidity (SMM) events. With Medicaid responsible for 57% of deliveries (Births Financed by Medicaid | KFF) in Mississippi, such proactive measures are crucial in combating maternal mortality and improving maternal health outcomes.

Discussion/Conclusions

1. Approaches in integrating clinical expertise with preventable morbidity outcome measures to identify cohorts of perinatal women at risk of complications.
2. Lessons learned in developing risk profiles and establishing evidence-based protocols for post-partum care.
3. Considerations for implementing strategies to advance managed care plan accountability metrics for maternal morbidity.
4. Evaluating actionable performance metrics for hospitals and providers

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Healthcare costing 1

A National-Level Patient-Level Costing Model: Overcoming Provider Deficiencies and Driving Healthcare Transformation

Hefin Jones [a], Maram Alrowisan [a]

Accurate cost measurement is critical for improving efficiency, ensuring sustainability, and setting appropriate pricing structures. However, relying solely on individual provider cost submissions introduces significant deficiencies in an immature costing environment. A national-level patient-level costing (PLC) exercise offers a transformative approach by providing comprehensive, standardized, and granular cost data. This model generates **national average cost**, **national efficient cost**, and **national efficient price**, supporting healthcare transformation.

Addressing Deficiencies in Provider Cost Submissions

Cost submissions from individual providers often suffer from:

1. **Data Inconsistency** - Providers have different data maturity.
2. **Lack of Granularity** - Cost submissions suffer from lack of supporting implant and device data.
3. **Limited Benchmarking** - Without a centralized system, providers struggle to compare costs effectively.

The national PLC model overcomes these challenges by standardizing data structures and removing input unit weight volatility providing a more precise and transparent picture of healthcare expenditure. Validated patient-level feeds are augmented into the model providing further granularity.

Generating National Average Cost (NAC)

The model establishes a reliable NAC for all services and treatments, serving as a key reference point for:

- **Comparative Analysis** - Providers assess their costs relative to national benchmarks.
- **Resource Allocation** - Ability to make evidence-based funding decisions.
- **Identifying Cost Drivers** - A detailed cost breakdown uncovers inefficiencies and opportunities for cost reduction.

The NAC provides a foundation for financial planning, ensuring providers operate within sustainable financial parameters.

Estimating Efficiency Gaps

The NAC generates high-level indicators of efficiency including:

- **Length of Stay by peer group**
- **Casemix-adjusted non-pay consumption**
- **Remoteness-adjusted clinical productivity**

Establishing National Efficient Cost

After identifying efficiency deltas the model calculates the NEC, which reflects the cost of delivering care in the most resource-efficient manner while maintaining quality. This is achieved by:

- **Analyzing High-Performing Providers** - Identifying delivery of high-quality care at lower costs.
- **Standardizing Best Practices** - Encouraging the adoption of cost-effective care models.
- **Reducing Variability** - Aligning cost structures across regions and providers.

By benchmarking against efficient providers, healthcare systems can drive improvements in cost efficiency while maintaining or enhancing care quality.

Determining National Efficient Price (NEP)

The NEP is essential for setting appropriate reimbursement levels, particularly in value-based healthcare models. The model supports price setting by:

- **Ensuring Fair Compensation** - Aligning payments with actual costs to prevent underfunding or overcompensation.
- **Encouraging Cost Control** - Incentivizing providers to adopt efficiency-driven care models.
- **Supporting Payment Reforms** - Enabling the transition to outcome-based reimbursement structures.

By using PLC-derived NEP, the payment system is designed to promote sustainability and high-value care delivery.

Enabling Healthcare Transformation

The national PLC calculation facilitates healthcare transformation by:

1. **Driving Policy and Investment Decisions** - more effective resource allocation based on real utilization data.
2. **Enhancing Transparency and Accountability** - Standardized reporting builds trust among stakeholders.
3. **Improving Healthcare Affordability** - efficiency leads to lower healthcare expenditure.
4. **Supporting Innovation and Best Practices** - Data-driven insights drive process improvements and care innovations.

Ultimately, the national PLC model provides a foundation for a more efficient, fair, and sustainable healthcare system, ensuring that financial decisions support high-quality patient care.

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Australia's National Hospital Cost Data Collection (NHCDC) - 25 years in the making

Iman Mehdi [a]

Introduction
The Independent Health and Aged Care Pricing Authority (IHACPA) undertakes the National Hospital Cost Data Collection (NHCDC) annually to collect public hospital costing data from states and territories. IHACPA progresses the NHCDC through data validation, quality assurance checks, and public reporting to allow benchmarking and to ensure the data is robust and fit for the purpose for developing the national efficient price.

Background
The NHCDC commenced in 1997 (Round 1) as a voluntary data collection resulting from

collaboration between Commonwealth and state and territory governments. The purpose of the collection was to provide data for the Australian Refined Diagnosis Related Groups (AR-DRG) classification development and to allow for the comparison of public hospital costs across the country. Participation was supported by funding from the Commonwealth provided to each state and territory. Over time, cost data has evolved from being cost-modelled, which determined the average cost of each AR-DRG at a hospital, to patient-level costing. This patient-level approach uses data regarding individual patients' consumption of resources to determine a cost for each episode of care. The collection has expanded from being focused on admitted acute activity to capturing cost information for a full range of hospital products.

In 2025, IHACPA is collecting data from the financial year 2023-24, marking the 28th year of collection. The NHCDC aims to accurately record the cost and mix of resources used to deliver patient care. Public hospital data is prepared by hospitals and local hospital networks. Costs are allocated to line items and cost centres, which are then mapped to cost buckets. These cost buckets describe the type or location of the service provided.

Improvements/Challenges
IHACPA undertakes a variety of activities to ensure that NHCDC data is fit for purpose and includes relevant costs and patient activity. Key activities include:

- Developing the Australian Hospital Patient Costing Standards (AHPCS), which provides a framework to guide costing practitioners in allocating all in-scope costs to hospital activities consistently.
- Conducting an Independent Financial Reviews (IFR) which assesses the quality of NHCDC data, ensuring adherence to AHPCS and inclusion of appropriate costs and patient activity.
- Managing tools like the NHCDC Dashboard which enhances the efficiency and timeliness for the delivery of the QA reports, while the Data Portal enables jurisdictions to upload and check their data files efficiently before final submission.

Key issues include the complexity of future focus areas such as mental health, virtual care, and the development and implementation of the AHPCS to ensure consistency and best practices in hospital product costing. The allocation of costs in the NHCDC varies across jurisdictions due to several factors. Each state and territory in Australia has its own healthcare system structures, funding mechanisms, and accounting practices, which contribute to these variations.

Discussion
The NHCDC process, involving data collection, validation, quality assurance, and reporting, plays a vital role in benchmarking and identifying changes in patient activity and costs across the healthcare sector.

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Casemix Costing in Ireland- Uses beyond ABF

Mary Phelan [a]

Introduction
In Ireland the National Collection of Casemix Costs is the responsibility of the Healthcare Pricing Office (HPO) which form one of the pillars of the National Finance and Procurement Division of the Health Service Executive. The collection of costs is done using two methodologies, excel based Specialty Costing for 44 acute hospitals and Patient Level Costing for a limited number of key price setters. Although the foremost reasons for collecting the costs are Activity Based Funding and DRG price setting, in recent years, the HPO has increasingly been called on to provide costs and data for

service planning, cost analysis and support the budget setting process. To a large extent this is a result of 'traditional' finance divisions concentrating mainly on financial accounting, management accounting such as monthly reporting, budget v actual and cost containment without a focus on what patients and services are consuming resources as a granular level as happens with casemix costing. The traditional systems in use do not routinely allocate overheads back the service that consumes them whereas specialty costing preforms this function. It also endeavours to allocate the costs of all ancillary services consumed as part of a patient encounter back to the patients who consume them.

Methods
The specialty costs collected to determine the ABF value and overall split by patient type were extensively re-engineered to focus costs by patient type at general ledger expenditure category level. It focused on identifying marginal costs, on analysing trends in cost per case and on calculating the funding required for additional activity.

Results
The cost of additional activity was used to enhance the traditional budget setting process as Ireland currently uses ABF as a retrospective benchmarking and adjustment process rather than setting budgets solely using ABF. It showed how casemix costing can support finance divisions when bidding for additional funding for new service initiatives and increased activity. It also shed a light on how a national patient level cost collection would hold valuable information that could support not just ABF and price setting but financial planning and analysis. It has highlighted the usefulness of cost data patient and patient type level for evaluation the cost effectiveness of treatment and pathways of care. It also allowed for focus to be placed on the inherent productivity in a reducing cost per case during a time of price increases and inflationary pressures.

Discussion/Conclusions
Discussion on how reframing the conversion from budget versus actual in traditional finance to what patient care costs and how does this moves over time can support funding and planning decisions for service providers and bring traditional finance and casemix closer together and show how rather than competing for resources the areas should be working together. Casemix and costing methodologies should be seen as important tools in bringing disparate sections of finance together to ensure that healthcare funding distributed based on the complexity of care required and the cost of that care rather than based on historical budgets.

[a] Healthcare Pricing Office, Ireland

From Patient-level Costing to Value-based Healthcare: International Learnings and Montreal Jewish General Hospital Experience

Serge Boulard [a], Ron Tanenbaum [b]

Introduction
The implementation of patient-level costing across the continuum of care is fundamental to any hope of changing the current management paradigms of the public healthcare system. The use of results allows for greater transparency in resource allocation and improvements in the organization of care and services. Such costing efforts lay the foundation needed for the assessment of care pathways and outcomes measurement, which in turn enable value analysis. After presenting some international learnings from PROM implementations, the vision and experience of the Montreal Jewish General Hospital will be discussed.

Methods

Figure 1 - Overview of value-based healthcare[1]

To start this journey towards value-based healthcare management, it is paramount for any health facility to know the costs of their activities, services and episodes of care. It is also essential to consider the different care pathways across the continuum of services, in the community, on the front line or in hospital and post-hospital settings.

The Montreal Jewish General Hospital was part of the Quebec provincial implementation of a healthcare costing solution in 2017-2018. Since then, the facility built an interesting database of costing data covering several years, data that is now linked to form care pathways. This allows them to gain an excellent understanding of the cost factor at the denominator of the equation in Figure 1.

By themselves, the care pathway and clinical practice variability analysis available through patient-level costing already offer system improvement possibilities.

Figure 2 - international PROMs deployments

The next step to go further is to measure health outcomes for patients across different care pathways. Building on the various international experiences and initiatives, the Jewish General Hospital implements a PROMs collection process for some targeted care pathways. The outcome factor at the numerator of the equation in Figure 1 then becomes visible. From a strict clinical point of view, the various questionnaires offered to patients are already vectors of change among clinicians. They drive the adjustment of treatment plans, allowing a better connection between needs and services.

The combination of the two factors (costs and outcomes) in a coherent, relevant and revealing business intelligence system allows the organization to move to higher levels of analysis in the

[1] Implementation plan for value-based healthcare in NSW WC and CTP schemes (website)

orchestration of their care and services and to access the concept of value.

Results

Far from being purely financial initiatives, the case costing and outcome measurements implementations include a wide variety of clinical data, creating a rich source of integrated information about quality of care and patient experience and results. The resulting information is then used to understand patients' clinical outcomes, support the implementation of integrated practice units and provide medical leadership with the tools and metrics to foster best practices and evaluate care variability, all of which act as the keystones to value-based healthcare.

These elements complement the analysis of care pathways and allow clinicians to become aware of the financial impacts of their practice.
The Jewish General Hospital is already demonstrating objective results to clinicians and managers and is doing so with a sound change management approach.

Conclusions

This presentation, from an establishment perspective, aims to demonstrate that case costing implementation, when incorporating a wide variety of clinical sources about the whole population and all health missions and outcomes measurement implementation, provide a wealth of information about quality of care and patient outcomes that can inform managers and clinicians to promote better decision making.

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Wednesday Afternoon

Health data use and Benchmarking 2

Adopting Activity Based Management utilising monthly Activity Based Costing and an Activity Based Budget.

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Introduction
Traditional financial variance analysis against a budget often leads to variance commentaries that identify what the amount is but don't explain why the variance occurred. The problem with a traditional budget is that often there is no activity budget connected to the financial budget. By building an Activity Based Budget we then have a benchmark to compare to for both Activity and Cost and we are better able to hold management and clinicians accountable to the agreed budget.

Methods
A pilot project in Australia was launched to build an Activity Budget for the coming year based on Activity Based Costing (ABC) data from the previous year. Utilisation rates and costs were used along with inflation assumptions. The budget year's patient volumes were modelled using growth rates expected of the health service population and intervention rates. Phasing of the budget activity was made by utilising historic summer / winter trends.

The Activity Based Budget calculated budgeted costs and activities by month for each direct patient care department and for each major patient episode grouping (Specialty, DRG, Outpatient Specialist Attendance) to provide the organisation with one budget for measuring both Costs and Activity performance for each cost centre and specialty.

Results
The CostPro Scenario Modelling Tool was used to compare actual costs against the budget and to produce a complete variance analysis by automating the calculations of the variances associated with ABM (price, volume and mix). Visualisation of department and specialty performance and then working with senior management is underway to gauge whether the system can be used to replace general ledger budget v actual reporting and/or complement it. The system was able to quantify the variance to budget and categorise the overall variance into 5 variances:

- New Activity not planned for in the budget,
- Increases / decreases in the volume of episodes,
- Changes to the patient casemix that was planned for in the budget,
- Increases / decreases to the required inputs associated with each episode, and
- Increases / decreases to the cost per unit of input costs (eg wards, radiology, path)

Discussion
Activity Based Management (ABM) used with Activity Based Costing (ABC) is a means to identifying and reducing cost drivers through better use of resources. Whilst traditional budget variance reporting is now 30+ years old, the health sector needs an innovation to move the monthly reporting cycle towards ABM and to use technology to handle the complex calculations of the variances at every Specialty / DRG combination. The CostPro Scenario Modelling Tool was able to handle the calculations and produce meaningful reports that has helped management and clinicians to understand why cost variances have occurred to the budget.

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Advancements in international benchmarking, predictive forecasts and data quality

Alison Allen [a], Victoria Hirst [b], Ashleigh Mills [b], Lachlan Rudd [b], Stephen Badham [b]

Introduction
Predictive analytics is revolutionising healthcare. Breakthroughs in generative AI have significantly reduced the time to deliver high-quality forecast models. Hospitals and healthcare providers can leverage these insights to anticipate patient deterioration, optimise staffing, reduce readmission rates, and improve operational efficiency.

Health Roundtable is a members group of around 180 hospitals across Australia and New Zealand who share their clinical coded data for benchmarking and improvement activities. A recent enhancement to the Health Roundtable data analytics and benchmarking platform, brought predictive forecasts to key safety and quality indicators in 2025.

Methods
In phase 1, Beamtree has developed 11 distinct models that drive the initial high-level forecasts across all 188 hospitals. This approach shares the same foundation behind advanced AI systems like ChatGPT and Gemini. First, the model is trained on broad trends and seasonal patterns derived from five years of historical data across all HRT hospitals. It is then fine-tuned to incorporate each hospital's unique characteristics, ensuring forecasts capture local nuances. Finally, indicators that exhibit similar behaviours are grouped together, with a specialised model created for each group to provide more accurate, context-specific predictions.

Results
Predictive forecasts combined with benchmarking provide a comprehensive overview of the current state of healthcare and future trend assessment, providing the general direction an indicator will fall without any intervention.

Predictions can be readily used in three ways. Firstly, to draw focus on emerging safety and quality issues; whereas traditional benchmarking approaches exclusively identify retrospective issues. Secondly, to set targets for new safety and quality improvement initiatives; beating set targets gives statistical confidence of an initiative's efficacy. Finally, forecasts can be used to scenario test emerging safety and quality strategies, to ensure robustness towards likely future states.

Result Graphs will be provided in presentation

Discussion
The advancement of predictive forecasts plays a vital role in improving data utility. Health service planners can now interpret key future trends. This proactive approach not only improves patient outcomes but also reduces future costs and enhances the quality of care, by more readily identifying emerging issues. As data-driven healthcare continues to evolve, predictive analytics is becoming an essential tool for informed decision-making and better patient management and future planning.

Topics: Innovations in case-mix, data and technology.

Key Words: Clinical Coding, Benchmarking, Data Analytics, Predictive Analytics, AI

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Integrating Activity and Auditing Metrics to Advance Hospital Performance in Herzegovina-Neretva Canton, Bosnia and Herzegovina

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Introduction

Although the DRG patient classification system was introduced as a hospital payment method over 40 years ago, health systems worldwide continue to struggle with achieving its intended objectives: enhancing transparency, improving resource use efficiency, and improving the quality of care. It has become apparent therefore, that implementing the DRG system as a hospital payment model presents technological and change management challenges, which are often underestimated at the outset of DRG adoption.

Countries in the region have encountered significant challenges in implementing the Australian Refined DRG (AR-DRG) classification system. These difficulties stem primarily from limited technical expertise and capacity, shortcomings in governance, and a lack of awareness of the system's full potential.

Importantly, however, the foremost prerequisite for realizing the full potential of the DRG classification system is the accurate reporting of hospital activity data and ensuring that each episode of care is properly coded in accordance with AR-DRG coding rules.

Our paper has two main objectives. First, to outline the approach used by the Health Insurance Fund of the Herzegovina- Neretva Canton (HIF/HNC), in Bosnia and Herzegovina to effectively measure hospital activity by auditing 30% of inpatient episodes of care each month. Second, to highlight the most common coding errors found in secondary and tertiary hospitals in the Canton.

Methods

The Herzegovina-Neretva County has three public acute hospitals contracted by HIF/HNC: general hospital Konjic (88 beds), Cantonal hospital "Dr. Safet Mujic" (198 beds) and University Clinical Hospital Mostar (793 beds). The inpatient payment model is based on AR-DRG v.5.2. which contains 665 groups and utilizes ICD 10-AM for the coding of diagnosis and Australian Classifications of Health Interventions for the coding procedures.

Each month, from 2023 to 2024, approximately 600 episodes of care were audited. These cases were selected by the HIF/HNC's hospital contracting department and reviewed by external auditors.

Audit was performed to determine the level of compliance to Australian and local coding standards. Data were submitted to external auditors as an excel file containing the input and output DRG Grouper data for the selected cases together with respective discharge letters in PDF formats. Data are anonymized and all other procedures in accordance with GDPR were followed.

Each month, audit results were submitted to the HIF/HNC within six working days of receiving the case data, with feedback provided to both the HIF/HNC and hospitals. Over the two-year period, the audit findings were:

a) Case complexity - annually, for the General hospital 95% of cases were deemed to be coded accurately, for the Cantonal hospital coding accuracy was between 85-90% and for the University hospital 80-85%.

b) Cases types - across all hospitals, coding issues were more frequently observed in medical DRGs than in surgical DRGs.

c) Regular feedback - dedicated workshops that focused on common coding issues are an effective

tool not only for enhancing coding accuracy but also for improving the quality of clinical documentation on which coding relies.

Conclusions
To the best of our knowledge, HIF/HNC's comprehensive DRG coding audit approach, designed to support the accuracy of hospital activity measurement, is unique in the region.

Acknowledging deficiencies in DRG coding and auditing expertise, and demonstrating a commitment to addressing them, is the first step for health authorities in building the technical capacity necessary for the accurate measurement of DRG activity data.

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Development of a standardized tool for visualizing information on new cancer cases for health and social services institutions in Quebec

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Introduction
All new cases of cancer diagnosed or treated in health and social services institutions in Quebec are entered into local cancer registries (RLC) with the software "Oncology Data Archiving and Registry System" (SARDO).

In addition to serving as a basis for the creation of the Quebec Cancer Registry (RQC), the RLCs must also meet the local cancer information needs of institutions.

Objective
Develop a tool to extract and present data from CDRs.

Methods
1. Determine the content: Through a collaborative approach, the information necessary for the management of the provision of cancer care and services has been identified by the NCPC and validated by RQC registrars.
2. Find the tool: An analysis of the information and needs was conducted by the SARDO team.
3. Develop the tool: The development of the visual was carried out in collaboration with SARDO and the MSSS. Power BI software was selected to develop the dynamic dashboards (ToB). The assembly in Power BI of the previously chosen information as well as the choice of visual aspect, including the types of figures, filters, available breakdowns and key performance indicators to be highlighted, were carried out in collaboration with the SARDO and MSSS teams.
4. Validate the tool: A pre-test was then conducted in three institutions to determine if the tool met the needs. A survey was also submitted to facility managers on the current use of CBR data and the value of the tool.

Results
The information retained by the NCPC and the Registrars was divided into two sections: the status of data entry in the CBRs and information on new cases diagnosed and/or treated at the institution. The proposed ToB consists of 75 figures spread over 29 thematic sheets. The implementation of filters makes it possible to produce several cross-referencing of data. Tree analyses make it possible to personalise patients' analyses and treatments according to their stage at diagnosis. The pre-test made it possible to collect comments from three institutions and to readjust the tool before its official

deployment.

Prior to the roll-out of the ToB, managers felt that they did not have enough information on cancer to guide their decision-making (6/10). The majority of managers reported using CLR data only a few times a year (54%), while 16% never used it. Almost 90% of managers felt that the ToB would facilitate the use of LAN data. The ToBs were presented to the managers of the establishments at the beginning of November 2024 and the official deployment for all RLCs took place on 25 November 2024.

Discussion/Conclusions
The general impression suggests that ToBs are very well received in institutions, both by oncology managers and registrars. Improvements are continuously being made to better meet needs and a satisfaction survey is planned for the fall of 2025 for this purpose. Work is underway to adapt the ToB to provincial data.

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Healthcare funding

Balancing funding stability and incentivising activity reporting in the transition of Australian community mental health services from block funding to activity based funding

Julia Conway [a], Mireille Regan Gomm [a]

Introduction
Australia's Independent Health and Aged Care Pricing Authority (IHACPA) is working towards implementation of activity-based funding (ABF) for community mental health services delivered in Australian public hospitals. Currently these services are block funded and the transition to ABF will improve the transparency of over $3.5 billion in funding.

A key policy challenge arising during this transition has been funding risk. Some health services were at risk of funding disruption upon implementation of ABF due to activity reporting shortfalls. This is partially due to Australian states and territories having limited success in achieving high quality data collection for all the community mental health care activities subject to block funding. Alongside strategies to improve reporting, IHACPA developed an innovative pricing approach to provide funding stability. The approach sought to mitigate risk while still incentivising productivity and improved reporting practices.

Methods
IHACPA undertook data analysis and consultation with stakeholders to understand local challenges and factors influencing the different funding outcomes under block funding and ABF. IHACPA then analysed the legislative and policy context to identify feasible approaches and establish policy principles to underpin the design of the pricing model. This focused on clearly defining the objectives

and desired outcomes of the model while balancing the risks and incentives such models create. After policy principles were agreed with stakeholders, the pricing model was designed in compliance with the principles. Working versions of the model were provided to stakeholders to facilitate understanding and enable modelling of local impacts.

Results
IHACPA designed a composite block funding and ABF pricing model to achieve the key policy principles of establishing a safety net while simultaneously incentivising activity reporting. Under this model, health services receive ABF for all reported community mental health care activity. To support funding stability, states and territories also receive block funding for residual funding gaps based on a prospectively determined amount. Critically, this block funding reduces, but at a lower rate than total funding increases through a dampening factor. This builds in an incentive to maximise activity reporting.

This model is also designed for funding of community mental health services to be efficient and sustainable. The dampening factor will ensure health services do not receive more funding under the composite model than under the existing block funding approach, except where justified through activity reporting.

Discussion/Conclusions
This project has demonstrated the value in policy-led pricing design. Establishing clear policy principles and objectives provided a structured approach to technical design. Gaining stakeholder agreement of principles also facilitated improved acceptance of the resulting model.

More broadly, the transition to ABF has highlighted important considerations for health systems when implementing a new funding system. Where resource limitations exist, it remains challenging to drive accurate data reporting when it is not yet used for funding purposes. Innovative approaches blending funding model structures may facilitate steps towards transparency, while mitigating risks to funding flows and associated service delivery for health services.

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Effects of the introduction of HybridDRGs in Germany analysing real-world data

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Introduction
In 2025, the German Diagnosis Related Group (DRG) system underwent significant changes with the introduction of Hybrid-DRGs, which shifted several inpatient procedures to the outpatient sector. This study aims to evaluate the economic effects of these changes in the field of gastroenterology, using real-world data from 2023. Specifically, it focuses on procedures like endoscopic biopsy, endosonography, and endoscopic retrograde cholangiopancreatography (ERCP), which were moved to Hybrid-DRGs. Two Hybrid-DRGs were introduced within the base DRG H41: H41N (from H41D) with a reimbursement of €1,641.24, and H41M (from H41F) with €1,380.29.

Methods
Data from the German Society of Gastroenterology's (DGVS) DRG project were analyzed, covering 39 hospitals. Using a transition grouper, the data from 2023 were projected into the 2025 reimbursement structure [1].

Results
The results show that of the 4,515 day cases in H41, 1,863 cases (41%) remain within the existing inpatient DRGs, while 2,652 cases (59%) are moved to Hybrid-DRGs. Among these, 592 cases (19%) shift from H41D to H41N, and 2,058 cases (46%) transition from H41E to H41M. A comparison of the 2024 and 2025 reimbursement rates shows a 7.3% reduction in reimbursement for these transferred cases.

Before the legislation changes, the DGVS approached the German Institute for Hospital Remuneration (InEK) with recommendations based on their data analysis [2]. One major request was to exclude cases involving self-expanding stents and related additional charges from the Hybrid-DRGs, which were adopted. However, a suggestion to continue offering ERCP with papillotomy as an inpatient procedure due to higher complication rates was not accepted.

Discussion/Conclusions
In conclusion, the introduction of Hybrid-DRGs in gastroenterology is expected to result in a 7.3% reduction in reimbursement for cases that shift from traditional inpatient DRGs to Hybrid-DRGs in 2025. Despite this, the redistribution and upgrading of standard DRGs will lead to a total increase of 5.6% in the reimbursement for gastroenterology in 2025. This increase compensates for the reduction caused by the Hybrid-DRG shift. Without the real-world data from the DGVS's DRG project, this analysis of the economic impact could not have been conducted. The study highlights the importance of data-driven approaches in assessing healthcare policy changes, especially when transitioning from inpatient to outpatient models.

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Designing block funding arrangements within an activity-based system for community mental health: lessons from Australia to reduce financial risk for rural and specialised services.

Mireille Regan Gomm [a], Julia Conway [a]

Introduction
Australia's National Health Reform Agreement requires public hospitals to be funded on an activity basis except where it is neither practicable nor appropriate. In transitioning community mental health care services from block funding to activity based funding (ABF), it was recognised that some services may face high financial risks under the new funding model. Such risks may occur for services that face high volatility in activity and where local costs deviate significantly from the national average. The Independent Health and Aged Care Pricing Authority (IHACPA) identified a need to support equity and access and address such risks by sustaining block funding for some service types and populations. This paper outlines steps taken to develop criteria for services to retain block-

funding that are nationally consistent and do not create undue incentives to change care delivery or reporting practices.

Methods
IHACPA undertook analysis of activity reporting to understand service delivery patterns and structures, finding these varied significantly across states and territories. To facilitate development of nationally applicable and consistent criteria, IHACPA established policy principles to guide decision-making and short-listed block funding options by assessing feasibility and simplicity of implementation alongside ABF. In this context, IHACPA identified trends in community mental health care activity and expenditure data. To assess appropriateness for ABF, the ABF pricing model performance in predicting the cost of community mental health care was tested. Related analysis included investigating the variations in service delivery structures across Australia and economies of scale in an ABF environment.

Results
Key policy principles developed by IHACPA to underpin block funding of community mental health services focused on equity of access across Australia and the ability of services to achieve economies of scale. Analysis of community mental health care expenditure and activity data determined two block funding categories as currently inappropriate for ABF based on those policy principles: rural local hospital networks delivering a low volume of community mental health services; and standalone establishments delivering specialised forensic services. For both categories, the community mental health pricing model for ABF performs comparatively worse than for other community mental health services.

Analysis showed that the activity profile and service delivery model of community mental health was different to other types of care delivered in rural health areas. This indicated that IHACPA's existing block funding criteria for low volume rural hospitals and standalone facilities was inappropriate. A new set of criteria was developed for community mental health care in a nationally consistent, transparent way with thresholds that account for population and service distribution.

Discussion/Conclusions
The transition of community mental health care to ABF presents the largest funding mechanism change to public hospitals in Australia since ABF was introduced in 2012. While ABF is appropriate and practicable for most services, it may not be appropriate for universal application. When designing block funding arrangements, it is important to consider the service delivery patterns, risks and policy objectives specific to the service types, so that block funding can be implemented in an effective, fair, evidence-based and consistent manner.

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KSA Value-Based Payment Models Journey: Design to Implementation

Neha Taneja [a], Maram Alrowisan [a]

Introduction
The Kingdom of Saudi Arabia (KSA) is implementing a **comprehensive transformation** of its public healthcare system to establish an **integrated, beneficiary-centered, value-based model** that provides **health coverage to 20 million beneficiaries**. Supported by a **USD 50-60 billion budget**, this transformation aims **to deliver value and ensure financial sustainability** in the public health sector. There are two aspects of this transformation: structural change in healthcare provision, purchase and delivery, and financial transformation with the move towards value-based payment models

Methods
The session will provide an in-depth understanding of structural changes and the transition from traditional input-based budgeting to value-based budgeting models, with risk-adjusted capitation (RAC) as the primary payment model for accountable care organisations (ACOs) and the reasoning behind selecting this payment model. It will cover the requirements to successfully achieve this transformation, including:

- Data governance and infrastructure
- Capabilities in terms of clinical coding, clinical costing and actuaries to drive funding calculations based on the chosen payment model
- Performance monitoring, reporting, and risk management framework to ensure transparency, accountability and financial sustainability.

Results
A phased approach to implement these changes will be illustrated to move the public health sector to the target value-based model state.

Discussion/Conclusions
This transformation is expected to improve population health outcomes and financial sustainability through

- Estimating healthcare budgets are linked to healthcare needs and outcomes.
- Identifying, quantifying and closing efficiency gaps.
- Enhanced provider autonomy and accountability, linking payments to drive performance metrics and care outcomes.

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Aged and long-term care systems

Achieving value and sustainability in aged care pricing and funding

Cindy Feng [a], Rachel Hauenschild [a]

Introduction
Under the National Health Reform Act 2011, the Independent Health and Aged Care Pricing Authority (IHACPA) is charged with providing independent and evidence-based pricing and costing advice to the Australian Government across the health care and aged care sectors.

In 2022, funding for residential aged care underwent significant reform, transitioning from claims-based funding to activity based funding (ABF) under the Australian National Aged Care Classification (AN-ACC). ABF for residential aged care drives efficiency, transparency and sustainability to improve the value of the public investment in aged care.

Methods
IHACPA's approach to developing pricing advice to inform AN-ACC funding is consultative, transparent, data-driven and informed by the actual costs of care delivery, placing residents at the centre of care.

Consultation and engagement with the aged care sector, coupled with tailored cost collections, is vital to IHACPA's work. Annual public consultation is the primary mechanism for stakeholders to provide input into the development of the pricing framework, which sets out IHACPA's policy approach, methodology and principles governing its residential aged care pricing advice. Annual cost collections provide IHACPA with a better understanding of the resources and costs associated with delivering aged care services, encompassing clinical and non-clinical information.

The AN-ACC funding model has 2 main components:

- the AN-ACC subsidy, based on individual care needs
- the base care tariff (BCT), based on characteristics of the residential aged care service.

BCT categories provide more equitable funding to residential aged care providers, particularly in rural and remote locations, and for Indigenous and homeless specialist services.

IHACPA's pricing advice to government pertains to the AN-ACC funding model and includes the recommended AN-ACC price and price weights for each AN-ACC class and BCT category, measured in national weighted activity units (NWAU).

Results
Developing prices for a future funding year based on historical data represents a significant challenge. IHACPA develops the recommended AN-ACC price based on the average cost per NWAU from 3 financial years prior (which is the most recently available aged care financial data), adjusted to account for known cost increases, then indexed to estimate the cost of delivering residential aged care services for the upcoming funding year. The recommended AN-ACC price weights for each AN-ACC class and BCT category are based on the relative costs of care as measured through IHACPA's cost collections.

Previous aged care funding relied on the Wage Cost Index 9 (WCI-9) indexation method that was not tailored to a specific sector, however, IHACPA's annual pricing advice to government is informed by aged care sector specific indexes and the actual costs of delivering care.

Discussion/Conclusions
While IHACPA's remit in aged care pertains to the provision of expert pricing and costing advice to government and does not extend to price setting, this advice to government facilitates equity in pricing and promotion of safe high quality care that better recognises resident complexity and variations in the costs of delivering care.

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Capturing the variation in resident care costs in the Australian Aged Care system

James Chen [a]

Introduction
The Australian National Aged Care Classification (AN-ACC) funding model, introduced in late 2022, classifies residential aged care residents based on the findings of the 2018 Resource Utilisation Costing Study (RUCS). AN-ACC identifies staff utilisation per resident as the primary driver of cost differences between residents. Cost collections using beacon technology, allows for a better understanding of resident cost differences, ensuring that pricing accurately reflects the actual cost of care. This model aims to provide a more equitable and transparent funding system that aligns with the

varying needs of aged care residents

Methods
The Independent Health and Aged Care Pricing Authority (IHACPA) has completed their first Residential Aged Care Costing Study 2023 and is in the process of finalising their second Residential Aged Care Cost Collection 2024. For both, IHACPA used wireless beacon technology to capture care time for residents and identify the types of staff delivering care. This technology aimed to reduce the burden on staff compared to traditional time capture methods, which often involve manual logging and can be time-consuming. A small sample of facilities underwent additional observation to assess how staff utilised their time when not in direct contact with residents, referred to as indirect care time.

The captured time was mapped to financial statements submitted by each facility. Labour costs were allocated to residents based on the captured contact time, ensuring that the costs reflect the actual care provided. The allocation of remaining labour costs was done according to the results of the additional observation study. Shared costs, such as administration, were allocated towards care, accommodation, and hotel services. These costs were then assigned to residents based on their occupied bed days (for care and hotel services) and registered bed days (for accommodation).

Results
The beacon technology provided reliable measurements of resource utilisation across residents, offering a detailed view of how care resources are distributed. The results showed variation in care resource requirements across different AN-ACC end classes, highlighting the diverse needs of aged care residents. Cost variations were noted compared to the 2018 RUCS study, however subsequent policy changes such as mandatory care minutes have been introduced, and the AN-ACC funding model has since been implemented.

Discussion/Conclusions
Technology-based time capture provides resource utilisation data that reflects the needs of residents with varying care requirements. This data is crucial for developing a funding model that accurately reflects the cost of care, ensuring that resources are allocated efficiently. Further investigations are needed to understand resource utilisation for indirect care time and how it integrates into costing systems. Understanding these activities is essential for accurate cost allocation.

In conclusion, the AN-ACC funding model, supported by advanced data collection technologies, represents a significant step forward in the classification and funding of Australian aged care services. By providing a more accurate and transparent view of care costs, this model helps ensure that aged care residents receive the appropriate level of care based on their individual needs.

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Recent staffing and quality indicator trends in Canadian long-term care

Gregory Feng [a], Andrew McCabe [a], Margaret Mousseau [a], Lauren Clow [a], Norma Hall [a], Cathy Hyunh [a], Laura Salter [a], Chantal Couris [a]

Introduction
Nearly 190,000 people are living in a Canadian long-term care (LTC) home, a number that continues to increase. As older adults (85+) are one of the fastest growing age groups in Canada, it is projected that LTC capacity must double within the next decade to meet the increasing demand. Already facing staffing constraints prior to the COVID-19 pandemic, the LTC sector is under pressure to adjust to the changing environment. Knowing that working conditions strongly influence the conditions of care for residents, this analysis describes recent trends in (1) staffing, (2) staffing hours, and (3) quality indicators to explore the current state of Canadian LTC at a macro level.

Methods
Counts and proportions of healthcare providers working in LTC was obtained from CIHI's Health Workforce Database (HWDB, 2014-2023). Totals and median per organization for worked hours (i.e., regular, overtime), purchased hours (i.e., from private agencies), and benefit hours (i.e., sick leave) were obtained from the CIHI's Canadian Management Information System Database (CMDB, 2018-2023). Risk-adjusted quality indicator rates (worsened physical functioning, potentially inappropriate use of antipsychotics, falls in the past 30 days, worsened behavioural symptoms, unexplained weight loss, restraint use) were obtained from CIHI's Continuing Care Reporting System and Integrated interRAI Reporting System (CCRS and IRRS, 2014-2023). Trends were examined using visual inspection.

Results
In 2023, an estimated 13.6% (50,216 healthcare providers) of the health workforce in the HWDB was employed primarily in LTC. Nevertheless, in many professions the number and proportion working in LTC is declining (e.g., among licensed practical nurses, a 6.1% decline from 35,622 in 2021 to 33,459 in 2023 was observed). Data on staffing hours in 2023 suggests that the number of regular worked hours has surpassed pre-pandemic levels for the first time (43.3M or 22,208 full-time equivalents [FTEs]), while overtime (3.8M or 1,967 FTEs), purchased (2.9M or 1,408 FTEs), and sick hours (2.7M or 1,408 FTEs) have remained elevated. Although most quality indicators have remained stable or changed slightly, risk-adjusted rates of potentially inappropriate use of antipsychotic medications have increased in recent years (i.e., from 20.2% in 2019 to 24.3% in 2023).

Discussion/Conclusions
As the demand for LTC increases, declining numbers of providers working in LTC underscores the importance of recruitment and retention efforts. Particularly considering heightened reliance on overtime and purchased hours in place of full-time positions and regular worked hours, which can be costly and unsustainable. Continued efforts to prevent and address potentially inappropriate use of antipsychotic medications in long-term care is warranted. Further data, particularly among the LTC workforce (e.g., personal support workers), is needed to better understand the impacts of staffing on LTC quality.

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What we know about the cost of a standard day in long term care in Canada

Helen Wei-Randall [a], Lauren Clow [a]

Introduction
With Canada's aging population, the long-term care sector represents a critical component in ensuring a sustainable health care system. To fill information gaps on reporting of health spending in this sector, Canadian Institute for Health Information (CIHI) has developed the Cost of a Standard Day in Long Term Care indicator to measure the relative cost-efficiency of an organization's ability to provide services to long-term care residents.

Methods
This indicator compares an organization's total resident care expenses with the number of resident days, while considering resident complexity. The result is the average cost per day to care for a standard resident. This indicator leverages data from two sources. The expenses and resident days of each organization are from CIHI's financial database - The Canadian MIS Database (CMDB). The CMI information used to adjust resident complexity is from CIHI's clinical databases - The Continuing Care Reporting System (CCRS) and The Integrated interRAI Reporting System (IRRS).

The five-year (2019-2023) results are calculated by facilities, regions, and provinces in Canada.

Results
The results show geographic variations in the average cost per day to care for a resident in long term care, as well as an overall increase for all jurisdictions in Canada over the five years. Please note that the period includes COVID years; special funding and/or change in resident volume may all play a role. When breaking the total cost (the numerator) into two parts, the health component accounts for two thirds of the total cost and most of this cost is for direct nursing care; the non-health component accounts for the other one third of the total cost and the cost is split between accommodation/hospitality and administration. Although distribution of the cost components remains similar, the accommodation/hospitality portion shows the most increase over time.

Discussion/Conclusions
The session will offer participants a better understanding of how the full cost of caring for a resident is determined, what types of expenses are used, how a resident's clinical complexity is reflected in the indicator. The session will also help participants gain insight into how long-term care costs vary in Canada and how the Canadian healthcare system is performing; they can also learn the ways to monitor changes within the organization over time and identify best practices across peer organizations.

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Healthcare costing 2

Mapping the Future of Patient Level Costing in Canada

Audrey Kim [a], Pierre Léveillé [a]

Introduction
With increased adoption of value-based funding, it is crucial to understand the costs associated with specific types of patients. Patient level costing (PLC) is powerful in determining these individual costs and building CMGs, and Canada is at the forefront of developing methodology and promoting PLC adoption in facilities across the country. The Patient Costing Roadmap was developed by a core group of national and jurisdictional representatives and aims to map and prioritize key milestones. These milestones will seek to increase the adoption and use of PLC across the country, highlight how PLC and case- mix can be used to drive and improve quality of care in conjunction with and beyond funding, and promote the investment into artificial intelligence and other innovations that can ease the burden of PLC data collection and use.

Methods
A survey was developed and sent to individuals who were deemed to be collectors, developers, users, or experts in patient level costing. Responses were received from 43 individuals from 14 organizations across Canada and follow-up interviews were conducted with 16 of these individuals. Results were brought to a national meeting where items were discussed in terms of responsibility and prioritization of short- medium- and long-term goals.

Results
Results were categorized into four thematic priorities. It was agreed that to increase the funding and

investment in PLC, the profile and value of PLC needs to be highlighted in various parts of the healthcare system across the country. Secondly, the breadth, depth, and quality of data must be enhanced to extend beyond acute care (which is where the majority of PLC data currently is collected). Thirdly, with increased focus on interoperability and updating of information systems, this is an opportune time to lean into innovations that will eventually ease the burden of data collection, reporting and analysis. Finally, the national meeting highlighted the need to share training tools, case studies, and education tools between jurisdictions to mutually support the case for PLC.

Discussion/Conclusions
PLC integrates clinical, financial and statistical data and allows for precise and comprehensive cost and value analysis. It allows for in-depth analysis of patient groups and case mixes as well as more accurate modelling of patient journeys across the healthcare system. However, with the limited number of PLC experts in the country, there is a need to strategically move to bring PLC to the forefront of the conversation through the aforementioned strategies.

[a] CIHI, Canada

Province-wide implementation of patient-level costing: Saskatchewan Improving Value in Healthcare Project.

Serge Boulard [a], Christian Pepin [b]

Introduction
The implementation of patient-level costing across the continuum of care, at the provincial level, is fundamental to any hope of changing the current management paradigms of the public healthcare system. The use of results allows for greater transparency in resource allocation and improvements in the organization of care and services. The cost calculation lays the foundation for the analysis of care pathways to enable value analyses. After presenting the Quebec province experience in previous PCSI conferences, here is the example of the province of Saskatchewan in Canada.

Methods
A positive proof of concept, carried out in 2022, convinced the decision-makers of the Saskatchewan's MoH to launch a process to implement patient-level costing for the entire province covering the entire population and care and service providers financed by a public envelope. Eventually, the whole continuum of care - hospital, community service, rehabilitation, long-term care, primary care, fee-for-service medical activities, etc. - will be integrated.

The MoH wanted to draw inspiration from the approach of the province of Quebec and improve it, going further in the concepts of value-based healthcare and integration of CIHI costing standards into the model.

The presentation will cover the main phases of this 3 years project, the key outcomes, as well as the overall approach and strategy.

Far from being a purely financial initiative, the case costing implementation includes a wide variety of clinical data, creating a rich source of information about quality of care and patient outcomes. The resulting information is used to understand patients' clinical outcomes, support the implementation of integrated practice units and provide medical leadership with the tools and metrics to support best practices in care variability, laying the foundation to value-based healthcare.

Results
Financial and clinical data standardization is fundamental in patient-level costing, to ensure that the results are fully comparable across establishments.

A provincial costing result database covering three financial years in the acute care facilities is now available. Primary and community care and physicians' compensation are yet to be included in the model to be able to see full trajectories of care.

A benchmarking portal is available and disseminated to medical stakeholders and managers to start initiatives to improve practices and services as well as to improve cost/data results.

Beyond the patient-level data required for costing, the possibility of integrating descriptive patient-level data into the model (incidents, accidents, complications, infections, comorbidities, diseases acquired during hospitalization, etc.) so the impact of the quality elements of practices in terms of costs can be quantified.

These elements complement the analysis of care trajectories and allow clinicians to become aware of the financial impacts of their practice.

Conclusions
This presentation wants to demonstrate that case costing implementation, when incorporating a wide variety of clinical sources about the whole population and all health missions, provides a wealth of information about quality of care and patient outcomes that can inform managers and clinicians and support better decision making. The Saskatchewan province is in the middle of a wonderful journey through healthcare improvement.

[a] PowerSanté/Telstra Health, Canada
[b] Telestra, Canada

Supporting patient care across provincial/territorial boundaries in Canada with patient cost data

Catherine Yu [a], Britta Nielsen [a]

Introduction
Each year, Canadians receive healthcare outside their home province or territory, resulting in approximately 350,000 ambulatory visits, 45,000 hospital stays, and over $1 billion in healthcare spending. Interprovincial hospital billing ensures Canadians can access healthcare services nationwide without out-of-pocket costs, in alignment with the Canada Health Act.

To support fair compensation between jurisdictions, interprovincial billing rates are calculated using Canada's patient-level cost data, primarily from the Canadian Patient Cost Database (CPCD), alongside financial, operational, clinical, and case mix data. These datasets enhance billing models and processes to adapt to evolving healthcare needs.

In the early 2000s, the Canadian Institute for Health Information (CIHI) introduced activity-based, patient-level costing methodologies built on the Canadian MIS (Management Information System) Standards. This enabled hospitals to report expenses at the functional-centre level for each hospital stay and outpatient visit, contributing to the development of CIHI's Canadian Patient Cost Database (CPCD).

Methods
The CPCD has been instrumental in creating and refining interprovincial billing methodologies for various healthcare services, for example, organ transplants, outpatient visits, well newborns and PET-CT scans. The rates are based on the average per-day cost, calculated by dividing actual full costs by service activities.

Organ transplant rates: The transplant day's cost is calculated as a block rate using CPCD data, while hospital-specific inpatient per-diem rates from CIHI's Canadian MIS Database (CMDB) apply to the remaining days of hospitalization.

Outpatient visit rates: These rates are generated by integrating data from CPCD, CIHI's National Ambulatory Care Reporting System (NACRS) and CACS (Comprehensive Ambulatory Classification System) grouping methodology. Visits are categorized into one of eight billing service code groups based on CACS intervention or group. Rates are calculated using three years of costed records. Day surgery rates are further divided into low, medium and high-cost categories.

Well newborn rate: The newborn rate is generated by dividing the average cost per day from CPCD by the total hospital length of stay, sourced from CIHI's Discharge Abstract Database (DAD). Well newborns are defined using Case Mix Group (CMG) methodology.

PET-CT scan rate: The indirect costs are derived from CPCD while the direct cost is calculated using the PET-CT functional center in CMDB.

Results
National interprovincial billing rates are calculated annually and approved by Health Canada using CPCD and other relevant databases. Comparisons between model-generated compensation and actual hospital costs help validate rate accuracy and fairness.

Discussion
The effectiveness of interprovincial billing rates depends on the availability and quality of patient-level cost data. However, the scope and completeness of patient costing data in Canada vary by province and territory. Expanding data coverage and improving cost reporting would enhance rate accuracy, better reflect special care needs, and accommodate smaller patient populations. Additionally, broader data collection would enable hospitals to implement more sophisticated billing models and extend interprovincial billing to a wider range of healthcare services and settings.

[a] Canadian Institute for Health Information, Canada

Estimating Costs to Patient Groups in Absence of Patient Costing

Audrey Kim [a], Pierre Léveillé [a], Britta Nielsen [a]

Introduction
With increased adoption of value-based funding, it is crucial to understand costs associated with specific types of patients. While patient level costing is powerful in determining these individual costs, in its absence, it is possible to use aggregate data to estimate costs for service recipient categories (e.g. Inpatient, Client Hospital, Resident) and types (e.g. Inpatient - Acute, Resident - Mental Health). This paper describes the Service Recipient Costing Allocation (SRCA) methodology that estimates the costs of twenty different service recipient and types.

Methods
Financial and clinical data is reported according to the Canadian Management Information Systems (MIS) standards and is used to estimate the expenses allocated to a particular type of patient for each functional centre in each facility across Canada.

The expenses are allocated according to a defined methodology for functional centre groupings that have similar costs and clinical activity. In each of the areas, various models and allocation methodologies were evaluated and developed alongside standards experts who helped determine how

real-world activity could inform the final methodology. The Canadian Patient Costing Database (CPCD) was also used to inform weights used in some of the allocation methodologies. Finally, the cost allocation estimations were compared to the results of existing indicators including the Cost of a Standard Hospital Stay (CSHS) to test for comparability the impact of methodological changes on indicator results.

Results

In every functional area, workload is the preferred method of allocation. Workload was deemed reasonable within limits based on the minimum wage and a rate of $500/hour used commonly in other financial efficiency indicators. In cases where workload was not reported or deemed unreasonable, service activity statistics were used.

In Nursing Inpatient Services and Ambulatory Care Services, multivariate regressions were used to determine the weight of costs allocated to visits and inpatient days and then allocated to service recipient cost pools based on the service recipient reporting in each statistic. Operating Room / Post-Anesthetic Recovery Room expenses were allocated using surgical and post-anesthetic recovery room visits with a heavier weight given to inpatient surgeries over day surgeries as informed by data from the CPCD. To allow for the high variability in costs per service activity within Diagnostics & Therapeutics, the statistics were used to directly allocate costs to include costs that would have been excluded through regressions. Community Care Services were also allocated directly with service activity statistics.

Discussion/Conclusions

With allocation of costs to more specific service recipient types, the SRCA creates the building blocks that will allow for future analysis and development of indicators to determine costs of specific types of patients. Compared to other existing methodologies of cost allocation that tend to examine one patient/service recipient category or type, the SRCA allows the estimation of expenses related to many different service recipient categories and types at once. The methodology is also one of the first methodologies that is flexible enough to be applied to both the hospital and non-hospital settings which will help get a better sense of the costs associated with the whole patient trajectory.

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Thursday Morning

Population-based funding tools and strategies 1

Comparison of Johns Hopkins ACGs and the CIHI Population Grouper for assessing the morbidity and health care utilization of the population of Ontario, Canada

Lyn Sibley [a], Yin Li [a], Jasmin Kantarevic [b], Richard Glazier [c]

Introduction
There are two different approaches for measuring patient morbidity that are in common use in Ontario: Johns Hopkins Adjusted Clinical Groups (JH ACGs) and the Canadian Institute for Health Information (CIHI) Population Grouper. The JH ACGs have been used extensively in research applications in Ontario, while the CIHI Population Grouper has been used more commonly for program planning and evaluation, and payment applications. Little is known about how the measures from these two grouping methodologies compare with one another.

The objective of this research is to compare how well measures from the JH ACGs and CIHI Population Grouper are able to identify chronic conditions, predict concurrent health care utilization, and predict health care costs for the population of Ontario.

Methods
The analysis used data for the population of Ontario for fiscal year 2022 (April 1, 2022 to March 31, 2023). Both groupers were run on two years of administrative diagnostic data (FY 2022 and 2021) from physician encounters, hospital admissions, and emergency department visits. The CIHI grouper also included diagnoses for mental health inpatient admissions and long-term care assessments.

The specificity and sensitivity of identifying chronic conditions was evaluated by comparing 9 different chronic conditions recorded in disease registries and the Institute for Clinical Evaluative Sciences with Expanded Diagnostic Clusters from the JH ACGs and Health Conditions from the CIHI Grouper.

The ability of each tool to predict health care utilization (primary care and specialist physician encounters, emergency department visits, and hospital admissions) and costs (primary care and total) was evaluated by comparing the correlation between the outcomes and the JH ACG resource intensity weights (RIWs) and resource utilization bands, and the CIHI grouper RIWs and quintile groups of RIWs.

Results
Initial analysis using a beta version of the CIHI grouper found that the CIHI grouper had greater specificity in identifying chronic conditions and predicted a higher proportion of total costs compared to the ACG measures. Both measures performed equally well at predicting health care utilization and both under-predicted high-cost users. This analysis will be updated using the most recent version of the CIHI population grouper.

Discussion/Conclusions
The CIHI population grouper was developed using data from Ontario, along with other Canadian provinces, and includes more sources of administrative diagnostic data than the JH ACGs. This could account for its improved performance in identifying chronic conditions and predicting health care costs. Other factors to consider when selecting a case-mix grouping methodology are ease of use,

interpretability of results, cost, and adaptability to available data.

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Developing and Improving Predictive Models of the Risk of Health Utilisation and Future Healthcare expenditures: National Recalibrations and new markers

Stephen Sutch [a], Klaus Lemke [a], Harriet Martyn [b]

Introduction
Several models predict the risk of hospitalization and healthcare expenditures from general and insured populations. These models are used for various purposes, including screening patients for Case Management Programs, Disease Management Programs, organizational profiling, and assessing financial risk. The importance of locally calibrated models has been previously discussed, along with the use of primary care and community data. Social determinants of health (SDoH) and behavioural and routine health measurement data are also crucial but often underutilized in predictive models.

Methods
The predictive models were derived using patient-level data, with classification of diagnostic, pharmaceutical, and historic utilization data, using the Johns Hopkins ACG System to reduce variables and provide measures of multimorbidity. Logistic and Linear Regressions were used to produce models on outcomes such as hospitalization within 12/6 months, emergency/unplanned hospitalization within 12 months, and healthcare expenditures in the preceding 12 months. Alternative modelling methods, including non-negative models and Lasso Regression, Random Forests, Gradient Boosting Models were also explored. Validation of models is essential to test accuracy, efficacy, and bias.

Results
Results will be shown from multiple general populations. Intermediate classifications were updated in the process of redeployment of models. Both changes in existing classifications and the addition of new variables, such as Social Need, Patient Need and behavioural. Although the original models generalise well to other populations, the recalibrated models using local data produce better performance.

Discussion
Comprehensive person-based records are important for such models, especially with health policy oriented towards integrated care. Local recalibration ensures models are relevant to the population they will be applied to and provide better performance than the original models. Traditional modelling techniques like logistic and linear regression can efficiently create these models and provide good face validity for local users, but alternative models are being explored. Casemix classifications reduce data complexity and provide robust measures of key constructs like multimorbidity.

There is increased interest in recognizing earlier and emerging risk for more preventative methods, such as chronic disease self-management programs. Emerging data from Electronic Health Records (EHR), Personal Health Records (PHR), and Social Care and behavioural data are expected to provide greater insight into populations with the highest need.

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Population Health Segmentation and Stratification: Applications of Patient Need Groups (PNGs)

Stephen Sutch [a], Harriet Martyn [b], James Barrett [c], Paul Molyneux [c]

Introduction
Population segmentation is an analytical technique used to understand populations and match clinical need with appropriately resourced interventions and resources. A segmentation-driven approach facilitates improved delivery of health services and allows for more nuanced tracking of outcomes.

Risk stratification differs from segmentation in that it identifies people at high risk of a certain event or high health care costs. In other words, risk stratification ranks individuals within a population based on degree of need, whereas segmentation groups individuals within that population based on what that health need actually is.

This paper will discuss the recent applications of segmentation and stratification, and examples of how the ACG based Patient Need Groups (PNGs) and predictive risk models are being used.

Methods
The development of PNGs considered 3 constructs: Population Segments (PNGs); Care Modifiers; and Risk Stratification. The PNG methodology uses morbidity markers already available in the ACG System. Patients are assigned to one of eleven mutually exclusive population segments based on the individual's range of morbidities, conditions, and care needs. Each segment can optionally be further subdivided by using "Care modifiers", which identify individual traits with opportunities for intervention (for example poor care coordination). Finally, each segment can optionally be subdivided into risk strata e.g. low, medium, and high risk of high total cost in the following year, which enables prioritization of individuals.

Results
(1) Transforming Patient Care through Digital Triage and Segmentation (UK)

Brookside Surgery in the UK significantly improved patient access, care continuity and outcomes by implementing an innovative non-clinician triage model that utilizes digital tools including the Johns Hopkins ACG System.

(2) Using Segmentation Methodology to Optimize Patient Outcomes in Primary Care

PNG segmentation tool is helping to reshape the day-to-day operations at Kumar Medical Centre in the UK by optimizing scheduling and enhancing patient outcomes. Prioritising QOF by need (the PNG they are assigned to) means offering appointments for more complex patients earlier in the year. The main aim is to optimise care for complex patients' prior to winter.

(3) Using PNGs to Understand Urgent Care Demand in the UK - Integrated Care Board

Frimley Health and Care Integrated Care Board (Frimley ICB) and Frimley Health Foundation Trust (FHFT) worked with clinical leads from both primary and secondary care to develop a common framework for understanding urgent care holistically. The framework uses PNGs and segmentation methodology to tackle the challenge in a novel and intuitive way.

Discussion
Segmentation using PNGs provide an overview of the healthcare needs of a population which can help inform the design of care models for the population. The approach aggregates existing markers and population characteristics associated with complex and high-risk patient groups, in a comprehensive population health view. Risk stratification within segments provides a way of prioritising patients for intervention when resources are limited. The approach is modifiable for national or specific populations needs, so provides the ability to analyse care need and utilisation in vulnerable populations, while ensuring a comprehensive representation of the whole population.

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The impact of the POP-Grouper reference period on the results of the segmentation of clinical profiles from clinical-administrative data from Quebec.

Elhadji Malick Ndao [a], Mamadou Diop [a], Mike Benigeri [a], Jean-Luc Kaboré [a], Isabelle Samson [a]

Introduction
The effective organization of health services is based on a precise and up-to-date segmentation of the clinical profiles of the population. For example, the Canadian Institute for Health Information's (CIHI) POP-Grouper was adapted to Quebec data as a tool for model adjustments and service utilization projections. However, the results of segmentation are highly dependent on the reference period for the identification of health conditions. A longer period of time allows for more conditions to be captured, although some, such as acute conditions, may no longer reflect the patient's clinical profile for a given year. This study aims to evaluate the impact of the reference period on segmentation in order to determine the best approach to obtain an accurate representation of clinical profiles.

Methods
The POP-Grouper tool classifies individuals according to their diagnoses recorded in the clinical-administrative databases, into 226 conditions and 16 clinical categories.

The study compares segmentations over several periods, for example one year versus three years. The analysis is based on measures of concordance and variation based on performance models including new learning techniques, in order to assess compliance in terms of sensitivity and specificity. The results will be used to determine the reference period that maximizes the robustness and accuracy of

the segmentation.

In addition, expert opinions will be collected to validate the relevance of the selected periods and to explore the combined use of two distinct periods. This process aims to ensure that segmentation is clinically relevant and suitable for different uses.

Results
The POP-Grouper application on the Quebec population estimated at 8.8 million in 2023-2024 reveals that the use of a reference period of one year, rather than three years, significantly increases the number of people classified as non-users of care or users of care without a condition, from 2.2 to 4.5 million people. This change from a one-year period to three years mainly impacts individuals with chronic conditions, indicating that the use of a longer period would allow for better identification of chronic conditions.

However, by moving from a three-year period to one year, a significant proportion of people in certain categories, such as newborns and obstetrics, are reclassified as non-users or users without affection (29%) or acute (26%), which better reflects the annual number of births. Similarly, 42% of people with acute conditions become non-users or users without affection, suggesting that a three-year period would overestimate these conditions.

Discussion/Conclusions
These results show that the choice of the reference period has a major impact on the results of the segmentation based on clinical-administrative data. A long period facilitates the identification of chronic conditions, while a short period limits the overestimation of acute conditions. Finding the optimal method is essential to ensure relevant segmentation adapted to a good assessment of the health needs of populations. In addition, the reliability and completeness of the diagnoses in the databases are other issues to be considered.

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Application of the Canadian Grouping Methodology to Assess Population Use of Primary Care Services: A Planning Support Tool.

Hélène Plé [a], Mamadou Diop [a], Claire Imbaud [a], Mike Benigeri [a], Philippe Lachance [b], Isabelle Samson [a]

Introduction
Populational responsibility aims to assume the obligation to maintain and improve the health and well-being of the population of a given territory. At the local level, network managers therefore need to be equipped to adequately plan the service offer, taking into account the characteristics and health status of their population. With this in mind, The National Institute for Excellence in health and social services (INESSS) produces local portraits of the use of front-line services based on a segmentation by health profiles based on the Grouper population grouping methodology developed by the Canadian Institute for Health Information (CIHI).

Methods
The study includes all persons covered by the public health insurance plan of the Quebec in 2022-2023. Based on clinical-administrative data, first-line visits are defined as:

- family medicine visits by family physicians (MDFs) or primary care nurse practitioners (PHCNPs);
- priority P4-P5 medical visits in the emergency department with return home, which are likely to be covered by family medicine.

The number of visits during the year is reported based on population demographics, registration with an MDF, and health profiles developed using the Grouper methodology. This methodology, adapted to the clinical-administrative banks of Quebec, determines the presence of different health conditions for each individual based on the diagnoses recorded over the previous 3 years. It distributes policyholders into 16 categories of health profiles, grouped into 4 main segments. From this information, metering models are developed to predict the use of 1st line services.

Results
The results [INESSS, 2024] show that 1 in 4 people, or about 2.1 million individuals, is not registered with an MDF and that of these, nearly 0.5 million have major or moderate health problems listed by Grouper. In total, 17.6 million visits were made in the 1st line by the population, i.e. an average of 2 visits per person. 40% of these visits are made by people who are said to be 'healthy' according to the segmentation taken from Grouper. The average number of visits to an MDF or emergency department varies greatly depending on the health profile of the individuals (from 1 to 4 visits annually) and their registration with an MDF (2.5 visits for registered individuals versus 0.8 for non-registrants). A model, built from the use of people registered with an MDF, was built to evaluate the services required to serve the entire population at an equivalent level. The annual number of visits to the 1st line would then increase from 17.6 to 19.6 million visits, i.e. 11% more visits.

Discussion/Conclusions
The dissemination of these results makes it possible to enlighten decision-makers on the use of 1st line services with regard to the state of health of its population. The Ministry of Health and Social Services (MSSS) aims to use this work to support proactive planning of services and staff at the local level.

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AI and automation in clinical coding

Australian Clinical Coding Artificial Intelligence (AI) Adoption Guideline

Sallyanne Wissmann [a]

Introduction
AI technologies have the potential to improve clinical documentation integrity, produce autonomous coding, conduct clinical coding auditing, and support the management of health information. In an environment of clinical documentation complexity, variation and volume; clinical classification, funding and reporting complexity; human expertise; legislation and standards compliance; privacy and security considerations; risk management; ethics; safety; and quality and efficiency drivers, navigating the path of AI adoption is not straightforward.

A national taskforce established by the Health Information Management Association of Australia (HIMAA) consisted of professional association, government, researchers, public sector, private sector, software vendors, clinical coding professionals and clinical governance experts have authored the Australian Clinical Coding AI Adoption Guideline which is due for release by June 2025.

Methods
The Guideline was developed through undertaking an environmental scan of published and grey literature and the collective expertise of the Taskforce. In February 2025 the Guideline will be released for public consultation to inform the final published version.

Results
The Guideline provides guidance to healthcare organisations, the clinical coding workforce, software companies, users of coded data, educators, and government agencies, on a principle-based approach to adopting AI technologies related to the clinical coding process.

In the Australian context of clinical coding and classification licencing, where ICD-10-AM/ACHI and the Australian Coding Standards are used for inpatient morbidity coding, this Guideline identifies the current use cases for clinical coding automation with artificial intelligence while highlighting current known limitations of AI in clinical coding and acknowledging that AI technologies have and will continue to evolve.

A number of important considerations relating to governance, risk management, privacy and security, ethical and safe use, quality improvement, collaboration and partnership, and human expertise outlined in the Guideline is anticipated to guide the responsible, ethical, and effective use of AI in the production of clinical coded data in accordance with classification and compliance requirements.

Discussion/Conclusions
With international applicability, the publication of the Australian Clinical Coding AI Adoption Guideline is the foundation for harnessing the expertise and learning of the digital health and clinical coding communities as they collaborate to support the adoption of AI for the production of accurate, timely and compliant clinical coded data in Australia and around the world.

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Computer-Assisted Coding and Documentation in a Large Hospital in Milan, Italy

Daniele Alberio [a], Valentina Errico [a], Ferdinando Cananzi [a], Stefano Aliberti [a], Ornella Leoncini [a]

Introduction
In 2024, a hospital conducted a project aimed at enhancing the quality of clinical data coding through the development and deployment of a solution based on natural language processing (NLP). The project focused on training the technology using semantic analysis of the hospital's clinical documentation, enabling it to provide higher-quality coding performance for medical records.

Methods
The project began with a proof of concept (POC) based on NLP technology, processing 2,387 discharge letters to extract additional diagnosis and procedure codes. It culminated in more accurate Electronic Health Records (EHRs), aligned with local coding standards. The POC took place in two phases. The initial phase involved an in-depth analysis of the hospital's clinical documentation to identify key semantic patterns and terminologies relevant to the coding process. Leveraging advanced NLP technology, the solution was iteratively trained to understand and interpret clinical data with high precision. This phase concluded when the system's performance metrics, specifically precision and sensitivity, met acceptable thresholds, ensuring the solution's reliability and readiness for operational use. In the second phase, the trained solution was deployed across three departments. During this phase, further training continued, supported by feedback from clinicians and coders.

Results
Baseline results were measured by comparing the codes registered in the medical records to those in the clinical documentation. The most significant result from the NLP technology, which was unexpected by the hospital, was the improvement in coding quality by extracting a consistent number of missing principal diagnosis and procedure codes from the medical records. Another notable advancement was the improvement in NLP performance, facilitated by the review of semantic rules by coders and clinicians. Their feedback played a crucial role in refining the solution, enabling it to adapt to specific workflows and address nuances in the hospital's documentation practices. The implementation process also included user training sessions to familiarize staff with the tool's features and ensure its seamless integration into existing workflows. The software served as a decision-support system, providing real-time coding suggestions and flagging potential errors or inconsistencies in the coding of discharge letters.

Discussion/Conclusions
The efficiency and accuracy of coding can significantly benefit from incorporating natural language processing (NLP) technology into the workflow. Even in hospitals with high perceived and observed quality of coding, there are still areas for improvement. This project highlights the importance of tailoring technological innovations to meet the specific needs of healthcare providers, ensuring practical usability and measurable outcomes. Looking ahead, the scalability of the solution offers opportunities for broader adoption. In 2025, a new phase will be launched to extend the NLP technology across additional departments, further contributing to the standardization and quality of clinical data coding. This phase will also trigger up-to-date regional coding edits, warnings, and measure the impact on professional time, case-mix index, and reimbursements.

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Developing an autonomous coding solution: Canada, UK and Australia - results across three ICD versions

Cheryl McCullagh [a], Steve Badham [a], Jennifer Nobbs [b], Alison Allen [b], Jodi McMullen [c]

Introduction
In recent years efforts have been made to automate clinical coding to ease the burden of clinical and administrative tasks and improve documentation and collection standardisation. In 2024, Beamtree (an Australian provider of coding quality and AI solutions) presented its work in partnership with healthcare services in Australia, New Zealand and the UK to deliver a Proof of Concept for transparent and auditable autonomous coding, retrospectively coding records.

In 2025, Beamtree has worked with providers in three countries to jointly develop and implement a Minimum Viable Product (MVP) autonomous coding (no-touch) solution, localised for classification systems and coding rules, with results presented here:

- Barwon Health, Australia, ICD-10-AM/ACHI/ACS
- Milton Keynes University Hospital Foundation Trust (MKUH), UK, ICD-10/OPCS-4
- Kingston Health Sciences Centre (KHSC), Canada, ICD-10-CA/CCS

Methods
The MVP will be built on an AI 'expert learning system', RippleDown. RippleDown is a curated AI expert system (a multi-pass interference engine) which supports subject matter experts (clinical coders) to safely apply expertise at scale to deliver operational, workforce, financial and reporting efficiencies while improving data quality. The coding rules will be built by local experts in partnership with the hospital Coding Managers.

The MVP will read patient records from the Electronic Medical Record (EMR) and other systems as required, including scanned records within the EMR using machine learning to automatically extract text and data for further processing. Autonomously coded episodes will then be sent to the local Patient Administration System or reporting system. Coding decisions and outputs will be fully auditable by the hospital Coding Manager.

Results
At all three sites, the aim is to run a live, near-real-time MVP to demonstrate autonomous coding can be implemented without impacting the manual coding workflow and process. Each site will measure general and localised return on investment, including relating to cash-releasing, qualitative, patient safety, sustainability and societal measures.

At MKUH, the project will refine the rules built in 2024 to achieve 95% accuracy (or at least as good as manual coding); expand the ruleset to automate up to 25% of volume; and innovate with machine learning based rule-writing to industrialise rule building and correction. At Barwon Health, the trial will be applied to all oncology admissions, coding as many as possible within six months. At KHSC, 10% of inpatient episodes are expected to be automated in the first few months, with at least 20% within 12 months.

This paper will report on the outcomes of all three projects including the above criteria and feedback from the site Coding Manager.

Discussion/Conclusions
The advancement in autonomous coding is crucial in enhancing the efficiency and accuracy of healthcare data management globally. As healthcare systems increasingly rely on digital solutions, autonomous coding systems can significantly reduce the burden on human coders by automating routine coding tasks, thus minimising errors and improving data quality. This needs to be achieved in a transparent, localised way, trusted and adaptable by local coding teams to realise benefits globally.

Topics
- Innovations in case-mix, data and technology.
- Advancements in coding, classification systems and data quality.
- Artificial intelligence & case-mix: in services

Key Words: Autocoding, Clinical coding, Automation, AI, Machine Learning

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Preparing Coders and Leadership for AI-Driven Medical Coding

Maarten Lambrecht [a], Karen Pien [b]

Introduction
The adoption of AI-driven automated coding is reshaping medical data management, offering increased efficiency, improved coding accuracy, and a solution to coder shortages. However, the success of this transition depends not only on the technology itself but also on how well both coders and hospital leadership adapt to this new reality.

Methods
At the University Hospital of Brussels, we have implemented 360 Encompass, an AI-driven platform that transformed our medical coding processes. The insights presented, are drawn from our firsthand

experiences with the implementation and use of this tool, providing a practical perspective on the impact of AI-tools in medical coding.

Results
For coders, embracing AI requires a shift in mindset and workflow. Building AI literacy is essential to understanding its role as a supportive tool rather than a replacement. Hands-on training, coupled with a structured change management approach, helps coders integrate AI into their daily work while ensuring that human expertise remains central to the process. Ongoing support and performance monitoring further refine the collaboration between AI and coders, leading to a more efficient and reliable system.

At the leadership level, the board plays a crucial role in guiding this transformation. AI in medical coding is not just a technical implementation-it is a strategic shift that impacts hospital revenue, compliance, and workforce dynamics. Leadership must understand the financial and regulatory implications, set realistic expectations about AI's learning curve, and actively support change management initiatives to foster acceptance among coding teams. Clear governance and oversight ensure that AI implementation aligns with broader hospital goals and delivers measurable benefits.

Discussion/Conclusions
This session explores the key factors influencing AI adoption in medical coding, providing a roadmap for coders and leadership to navigate challenges and maximize opportunities. By addressing both the human and technological aspects of this transition, hospitals can successfully integrate AI while maintaining the highest standards of coding quality and accuracy

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The Use of EffectiveCAN with Confidence Levels for Automated ICD-10-CM/PCS Coding of French Hospital Stay Records.

Peter Heirman [a], Maarten Lambrecht [b], Philippe Kolh [a], Ashwin Ittoo [c]

Introduction
Healthcare budgets, particularly in hospitals, are increasingly under pressure. Coupled with the challenge of recruiting, training, and retaining qualified coding staff, there is a growing need for AI-driven solutions to support coding professionals. Currently, no reliable AI-based coding system exists for French medical documents. This study evaluates the application of the Effective Convolutional Attention Network (EffectiveCAN) for the automated coding of French hospital stay records.

Methods
EffectiveCAN is a deep learning model designed for multi-label document classification (MLDC), with a focus on medical code prediction. It employs a deep convolution-based encoder integrating squeeze-and-excitation (SE) networks and residual connections to enhance text representations. Multi-layer attention is applied to extract informative features from different encoding layers, and sum-pooling attention is used for datasets with limited training samples. To improve performance on infrequent labels, the model combines binary cross-entropy loss with focal loss. EffectiveCAN has previously demonstrated strong performance, achieving F1 scores of 67.6% for diagnoses and 65.5% for procedures on Dutch ambulatory hospital stay records.

For this study, the model was trained on a multi-year corpus of de-identified French hospital documents coded by experienced ICD-10-CM/PCS professionals. Patient names were anonymized while preserving eponyms (e.g., "Huntington's disease" remained unchanged, whereas "the disease of our patient Mr. Huntington" was altered to "the disease of our patient Mr. Smith"). The model was

evaluated on its ability to predict the principal diagnosis (ICD-10-CM), main procedure (ICD-10-PCS), and Diagnosis-Related Group (APR-DRG v40, 3M(tm)).

Results
Performance metrics were calculated based on confidence levels assigned by the model. The distribution of hospital stays according to confidence levels was:

- High confidence: 18%
- Medium confidence: 16%
- Low confidence: 65%

The results per Confidence Level are as follows:

Confidence Level	Precision	Recall	F1 Score
High	92%	93%	92%
Medium*	54%	59%	56%
Low	75%	54%	63%

* The Medium Confidence category was affected by several records with missing documentation. If these 'empty' records were excluded, the F1 score for Medium Confidence would improve from 56% to 74%.

When tested on historical data, the overall model performance was:

- Precision: 74.8%
- Recall: 65.9%
- F1 Score: 70.1%

Discussion/Conclusions
While the results are promising, fully autonomous AI-driven coding for all French medical texts remains unattainable at this stage. However, leveraging the model's Confidence Levels allows for selective automation of hospital stays with high certainty, thereby reducing the workload of human coders. Continuous improvements in AI methodologies indicate a positive trajectory, bringing the system closer to reliable automated coding. This study demonstrates that NLP-based AI can successfully assist in coding ambulatory hospital stays, although human oversight remains necessary. Future iterations aim to enhance model accuracy, particularly for cases currently classified under Medium Confidence, further bridging the gap toward trustworthy unsupervised medical coding.

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Health system forecasting and planning

Application of Case-Mix Methodology for Population-Based Physician Workforce Planning in Ontario, Canada

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Introduction
Physician workforce planning is a complex and multi-faceted process that is crucial for improving the efficiency and resilience of the health-care system. Historically, physician workforce modelling has been predominately supply-driven. Using the case-mix classification system available in Canada, the Ontario Medical Association (OMA) developed the Physician Resources Integrated Model (PRIME) to support physician workforce planning with a focus on population health needs.

PRIME comprises two key modules. The supply module projects the active physicians in the workforce, while the demand module models the workforce required to meet the population's unique needs. This abstract focuses on the demand module, which aims to identify the current and future demands for physician services in the province of Ontario.

Methods
PRIME mobilizes the best available data related to population health, health services utilization, and the physician workforce. The data sources include a population-based registry, physician billing claims data, and inpatient and outpatient hospital records. All the Ontario residents with health insurance coverage from April 1, 2023 to March 31, 2024 were included in the analysis. The health statuses of Ontario residents were measured using the Canadian Institute for Health Information (CIHI) population grouping methodology. The target service level was established through benchmarking. A linear regression model was employed to estimate the annual number of physician visits required to meet patients' unique needs, based on their demographics, health statuses, and the target level of service. The relative shortages in physician services were identified as the difference between what patients currently receive and what they would have received, as estimated by the model.

Results
The analysis for the fiscal year 2023/24 revealed a substantial service gap of around 8.4 million physician visits to reach the service level of the Ontario average. This shortfall represents approximately 6% of the existing physician workforce. The three physician specialties experiencing the most significant shortages were family medicine, psychiatry, and paediatrics. There was regional variation in current physician shortages. Relative to the Ontario average benchmark level, our estimated gaps ranged between 3% and 16% of the current physician service provision across regions. This gap should be interpreted as an indicator signalling a potential problem that needs to be discussed within a holistic, multifactorial policy framework.

Discussion/Conclusions
We leveraged extensive individual-level data and an established case-mix classification system to model physician service demands. The PRIME model responds to a need for tools that leverage data analysis and visualization to support health system optimization and promote the culture of planning in Canada.

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Funding Policy Considerations reflecting on Projected Patterns of Illness in Ontario.

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Introduction

Ontario's publicly funded hospital system provides care to all residents with minor acute illnesses to complex chronic diseases. An important challenge facing hospitals is financial stability when facing exponential growth in demand for care as the population has grown by 3.2% annually post pandemic and projected over 1 in 5 residents will be over 65 years with growing rates of multimorbidity. Understanding hospital service demand is a critical determinant for current and future funding methodologies which presently is a combination of global, activity-based and bundled care approaches. With a desire to accelerate to more values-based healthcare funding, policy makers need to understand the current and projected burden of chronic diseases and the implications for investment decisions and policies on health care transformation, the labour market, digital and capital infrastructure.

Methods

The approach had three phases:

1. Estimating the current burden of illness in Ontario by analyzing historical trends in 18 conditions from 2002 to 2020. We categorized the population into three morbidity groups: no illness, some illness, and major illness.
2. Projecting Ontario's demographic structure up to 2040 using data from the Ontario Ministry of Finance, considering trends in aging, mortality, and migration.
3. Combining demographic projections with historical chronic disease trends to model the future burden of illness. We provided estimates for overall and annual disease burden, including the number of cases and prevalence of each condition and the number of people in each multimorbidity group.

Results

Our analysis predicts that the number of people in Ontario with major illnesses will rise from 1.8 million (192 per 1,000) in 2020 to an estimated 3.1 million (239 per 1,000) by 2040. By then, approximately 1 in 4 adults over the age of 30 will have a major illness, compared to 1 in 8 in 2002. The number of chronic conditions individuals live with is also expected to increase significantly.

We project that an additional 2 million individuals will have at least one chronic condition by 2040, with conditions like osteoarthritis, diabetes, and cancer seeing the highest increases. The aging population is a key factor in these increases, along with structural and social determinants of health and a rise in chronic disease risk factors.

Multimorbidity

Major illness

Some illness

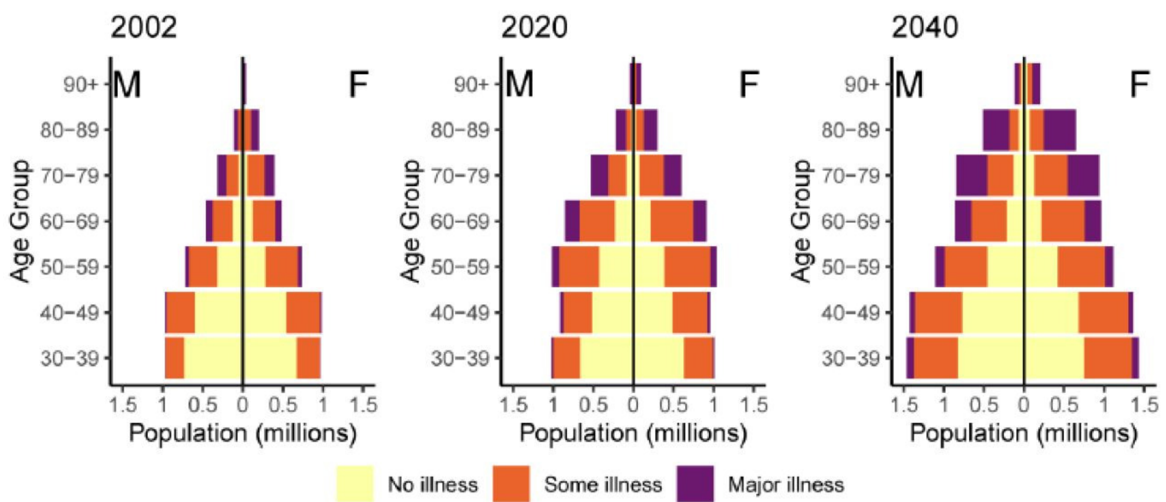
No illness

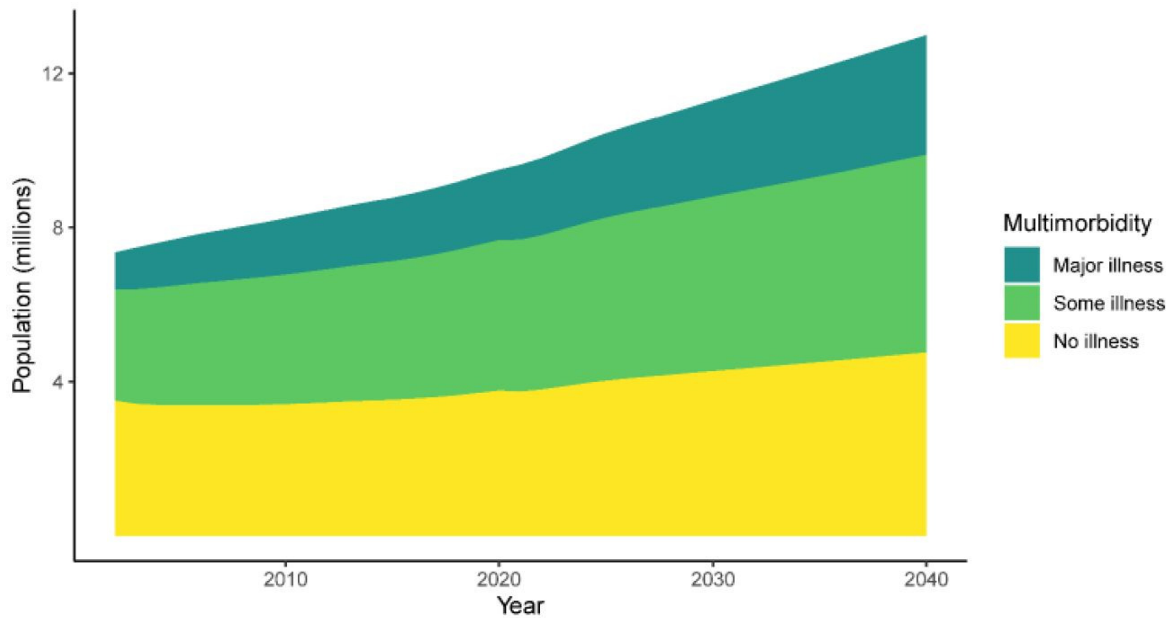
Health care costs

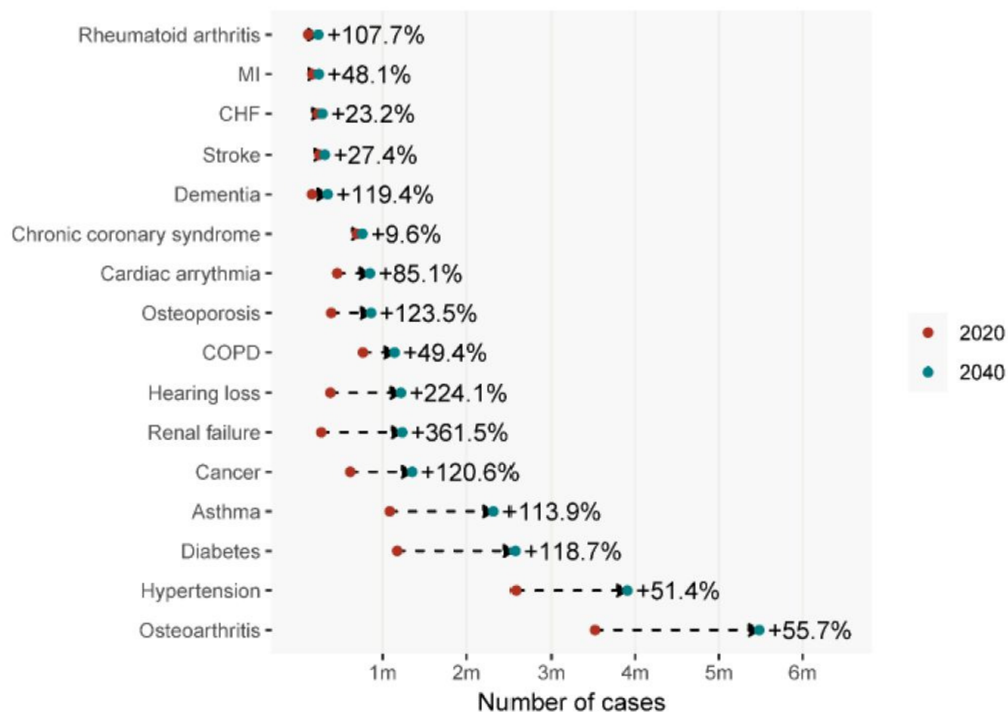
Top 5%

6 to 50%

Bottom 50%







Discussion/Conclusions

With more people living with multiple illnesses, there's an urgent need for comprehensive chronic disease prevention and management. Proper support can enable many chronic diseases to be managed outside hospitals. Investments in prevention, early detection, and continuous treatment can alleviate the hospital system's strain.

We stress the necessity of robust chronic disease prevention strategies, including both population-level approaches and personalized support. Given existing health inequities, the impact of chronic diseases will differ across populations, requiring a focus beyond hospital funding to encompass the entire health system, community care, and the social and structural determinants of health.

No single funding policy will suffice; a combination of short- and long-term strategies is essential to ensure the publicly funded health system can continue to effectively care for its citizens.

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Implementing a new methodology to forecast the hospital activity in France until 2027

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Introduction
The COVID-19 crisis led to a sharp decline in hospital activity. Initially, this decrease was due to the shutdown of certain hospital services during the pandemic, and it was subsequently exacerbated by a shortage of human resources in hospitals. This sudden and significant shift in hospital activity called into question the reliability of pre-crisis forecasting models. As a result, a new long-term forecasting methodology became necessary.

Having a long-term forecasting methodology is useful in order to calibrate a multi-year trajectory of hospital funding.

Methods
The new forecasting model integrates demographic projections with projections of average individual healthcare consumption.

We utilized historical data from the 2013-2023 period, ensuring high granularity by segmenting data as follows:

- Major diagnostic categories,
- Types of care activities (e.g., medicine, outpatient care, surgery, etc.),
- Population subdivisions by 5-year age groups and gender.

For each sub-segment (major diagnostic category × type of care activity × gender and age group), historical data were used to forecast average hospital activity. The forecasting relied on time series analysis, accounting for the years 2020, 2021, and 2022 as level shifts to mitigate the impact of the COVID-19 crisis on the forecasts.

The forecasted average hospital activity per age and gender group was then combined with demographic projections to produce an aggregate hospital activity forecast extending to 2027.

Results
The results of this new forecasting model indicate that by the end of 2024, hospital activity is expected to reach its pre-crisis trend. A notable strength of this methodology is its ability to differentiate forecasts by major diagnostic categories and types of care activities.

For instance :

- For some diagnostic categories, such as eye diseases, the growth rate of hospital activity is predicted to exceed pre-crisis levels significantly.
- Conversely, for other categories, such as nervous system diseases, a persistent gap with pre-crisis trends is expected to remain.

Additionally, the model highlights that nearly two-thirds of the predicted growth in hospital activity is attributable to individuals aged 75 years and older.

Discussion
Although this forecasting methodology relies on demographic data, it is fundamentally a statistical approach. Enhancing the model with expert input on changes in medical practices, variations in care burden, and epidemiological trends could improve its accuracy.

Comparing the projected data for 2024 and 2025 with actual observations will provide insights into the model's precision, allowing its validation for future forecasting efforts.

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Looking to the future
Projecting future hospital activity - Approaches, Challenges and Results

Kevin Ratcliffe [a]

The rise in healthcare demand, and its consequent impact on expenditures, has stimulated interest among policymakers and planners interested in better projecting future healthcare needs to aid the management and organisation of healthcare resources. More accurate projections are expected to allow the healthcare system to adapt and prepare for future challenges. In an environment of constrained budget limited staffing and seeming ever increasing demand; planning to meet future needs is challenging but necessary undertaking.

This presentation describes and approach to projecting future activity level across all major domains of hospital care; Inpatient, Emergency Department and Ambulatory for an island population of 580,000 residents

Three basic factors are utilised to derive the projections; activity changes over the past 7 years, population growth projections, and population aging projections.

To undertake this requires several important conditions to be present.

1. Full enumeration of hospital data for the entire region including care provided outside the jurisdiction and care provided to visitors. These data are at facility level and include all admitted care providers.
2. Sufficient time series data to provide reliability of past activity growth
3. Population projection data both in terms of age incrementation and population increase at level of age sex cohort and local area of residence.
4. Classification schemas covering the entire time series that allow for specific consistent classes with sufficient volumes to allow regression models to achieve reliability.

7 years of historical activity data from all facilities in the jurisdiction were incorporated into the demand/Activity projections process, Activity is projected out 25 years in 5 year segments with annual projections over the initial 5 year projection period.

A facility to model what if scenarios such as creating a new service or altering the services proved by a facility are also able to be modelled for impacts on surrounding services.

This presentation will describe the projections methodology for each of the Care settings as well as enhancements to capture and present cohorts interest such as patients with exceptional burden of disease, elective surgery and other areas of interest. Technical improvements to the projection and

data processes over the years are described. Projected activity includes inpatient episodes/presentations, bed days / LOS and relative utilisation rates.

Data issues will also be discussed along with approaches taken to ensure that data represents a consistent policy setting within the 7 years of the sample data.

This approach to activity projection has been used and continually developed since 2006 and reliability of the process, learnings over time is also described. The development of patient classification over this period has enabled expansion and led to improvement in the ability to reliably model additional services such as Emergency and ambulatory care and increased the value of this tool to assist in health planning.

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Service-Related Groups in Federal Hospital Planning - Opportunities and Challenges

Harald Kuhlmann [a], Michael Wilke [a], Markus Rathmayer [a]

Introduction

Service-related groups are a central element of Germany's hospital reforms, aiming to improve healthcare quality, optimize resource allocation, and foster specialization. Defined largely by procedure coding (OPS), the German service groups aim to enable federal states to align hospital services with quality and structural requirements.

The reforms also target broader objectives, such as transitioning to a remuneration system with a substantial share of provision-based funding covering over 50% of hospital cost and creating future-proof structures. These include reducing inefficient facilities, strengthening mid-sized and municipal hospitals, improving working conditions for healthcare staff, and advancing digital solutions such as electronic patient records (ePA) and telemedicine.

Despite these ambitions, significant challenges persist, particularly for smaller hospitals in rural areas, which face difficulties in meeting quality criteria, ensuring financial stability, and adapting to new digital and operational demands.

Methods

- Regulatory Framework Analysis: Examination of regulations, to assess quality-oriented remuneration and structural mandates.
- Regional Needs Assessment: Geographic analyses to identify disparities in hospital accessibility, service coverage, and regional healthcare demands.
- Stakeholder Perspective: Evaluation from hospital administrators' point of view regarding strategic adaptations to meet reform goals.

Results

- Centralization and Regionalization: The reforms will concentrate specialized services in larger hospitals, improving efficiency and quality but reducing access to care in rural regions.
- Challenges for Smaller Hospitals: Rural facilities might face resource shortages, difficulties meeting staffing mandates, and financial strain. The transition to a differentiated remuneration model, combined with the introduction of provision-based funding, adds complexity, particularly for hospitals unable to meet strict quality standards.

- Personnel Planning: Improved wages and work models aim to address staff shortages, but implementation will be inconsistent, with rural hospitals particularly impacted by workforce challenges.

Discussion/Conclusions
The hospital reforms will make progress in fostering specialization, optimizing resources, and potentially improving care quality. However, challenges remain in achieving regional equity, particularly in rural areas, where smaller hospitals will struggle to meet quality and financial requirements. Centralization will improve efficiency while widening disparities in access, leaving underserved regions at risk of declining healthcare availability.

To address these challenges, strategic planning is essential. Future solutions must include providing targeted support for smaller hospitals, enhancing technology, and allowing greater flexibility in quality criteria for rural facilities. Workforce shortages must be addressed through sustainable recruitment and retention strategies, ensuring improved working conditions and competitive pay.

While significant challenges remain, the reforms can provide a foundation for long-term improvements in Germany's healthcare system. Their success depends on balancing efficiency with equity, ensuring that all regions benefit from high-quality, accessible care.

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System implementation

Advancements in coding, classification systems, and data quality in Canada

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Introduction
In Canada, advancements in coding and classifications, particularly in healthcare, have been evolving to improve data quality and the accuracy of Case Mix Group (CMG) calculations. Initiatives aimed at improving data quality, such as comprehensive data validation processes and training for coders and data analysts, are critical in ensuring the reliability of the information used in CMG calculations. These advancements also facilitate better resource allocation, improved patient outcomes, and support for public health initiatives. Beamtree are a provider of coding quality products that drive continuous improvement in healthcare information - towards safety, quality and efficiency. A recent study took place commissioned by the Pacific Health Services Authority (PHSA) in British Columbia to assess ICD-10-CA/CCS coded data and the data quality outcomes.

Methods
The audit results from PHSA (Provincial Health Services Authority) and Beamtree in Canada have highlighted key areas for improvement in healthcare data management and coder education. These audits typically assess compliance with standards, data quality, and clinical documentation. The findings often lead to recommendations for optimizing resource allocation, enhancing clinical documentation, and improving overall operational efficiency within health systems. The collaboration between PHSA and Beamtree also emphasizes the importance of using data analytics from coded data to inform decision-making and drive continuous improvement in healthcare services. 14 hospitals throughout PHSA and Interior Health were involved in the project. With 1400 inpatient charts

audited, Beamtree was able to create 240 Canadian Indicators that would assist with data quality outcomes moving forward as well as coder education to improve consistency with the Canadian Coding Standards.

Results
The results of the PHSA and Beamtree audits in Canada present a comprehensive overview of the current state of healthcare data management and operational practices. The audits typically evaluate the effectiveness of existing protocols, compliance with healthcare standards, and the quality of data being collected and utilized. Key findings may highlight gaps in data accuracy, inconsistencies in coding practices, and areas where clinical documentation could be optimized. Furthermore, the collaboration between PHSA and Beamtree underscores the critical role of data analytics in driving informed decisions and fostering continuous improvements in healthcare delivery. Recommendations from these audits focus on enhancing training for Coders, implementing robust data validation processes, and leveraging technology to enhance the overall efficiency of healthcare services.

Result Graphs will be provided in presentation

Discussion/Conclusions
The advancement in autonomous coding is crucial in enhancing the efficiency and accuracy of healthcare data management in Canada. As healthcare systems increasingly rely on digital solutions, autonomous coding systems can significantly reduce the burden on human coders by automating routine coding tasks, thus minimizing errors and improving data quality. Canadian coding indicators play a vital role in evaluating the performance of coding practices and ensuring compliance with national standards. Furthermore, continuous coder education is essential to keep coding professionals updated on the latest coding standards, technologies, and best practices, thereby ensuring high-quality data for healthcare analytics and decision-making.

Topics:

- Innovations in case-mix, data and technology.
- Advancements in coding, classification systems, and data quality.

Key Words: Clinical Coding, Coding Audits, Coder Education, Data Quality, AI

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The Need for a National Training Program in Patient-Level Costing

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Patient-level costing (PLC) is essential for healthcare organizations to accurately allocate costs, improve efficiency, and make data-driven decisions. However, without standardized training, inconsistencies in PLC implementation can arise, particularly when multiple vendors are involved. A national training program ensures a consistent level of understanding and quality across all healthcare providers.

A Unique Opportunity: No Equivalent Course Internationally
No comprehensive national or international course currently provides a full curriculum. While short courses exist, they cover only specific aspects rather than a complete, standardized, best-practice approach. The NCCoE has developed a structured PLC training program, setting a global benchmark.

Costing standards are included as a modular component, allowing adaptation to local standards, making the program highly valuable both within KSA and internationally. This flexibility ensures that different healthcare systems can integrate the training without requiring major adjustments.

Ensuring a Consistent Level of Understanding
PLC is complex, involving healthcare finance, data analytics, and costing methodologies. Without standardized training, professionals may have varying levels of knowledge, leading to errors in cost allocation and misinterpretation of data, and ultimately, poor decision-making.

This program provides all healthcare professionals-finance staff, data analysts, and clinicians-with a foundational understanding of:

- The principles of PLC and how it differs from other costing methods
- Data sources used in PLC
- Cost allocation techniques
- Interpretation and use of PLC data for decision-making
- Compliance with national and international costing standards

By creating a standardized knowledge base, this empowers professionals across the healthcare sector to work effectively with PLC data.

Promoting Consistency in PLC Methodology
Without uniform PLC methodologies, cost allocation can vary significantly between hospitals and regions, making benchmarking unreliable and resource allocation inefficient. This also inhibits national-level calculations of average, efficient costs and efficient price.

This program creates a uniform approach making comparisons across providers more meaningful and accurate, and aggregation at a national level more reliable.

Addressing Challenges When Multiple Vendors Are Involved
Many healthcare organizations use different software vendors for PLC, each with unique methodologies, data structures, and reporting formats. These inconsistencies complicate integration, benchmarking, and national cost analysis.

This training program ensures all users understand core PLC principles, reducing discrepancies and enabling better management of multiple vendor solutions. Standardization minimizes variations caused by different vendors, improving data reliability.

Improving Decision-Making and Healthcare Efficiency
Accurate and consistent PLC data helps healthcare organizations make informed decisions on resource allocation, service efficiency, and cost management. This leads to:

- Accurate cost comparisons
- Identification of inefficiencies and cost-saving opportunities
- Stronger justification for funding decisions
- Improved patient care through optimized financial planning

Conclusion
A national PLC training program is essential to ensure a standardized understanding, promote consistency, and eliminate vendor-related discrepancies. As no equivalent course exists internationally, this program fills a critical gap in healthcare costing education.

Its modular design allows for global adaptability, making it applicable worldwide. Standardizing PLC methodologies leads to more accurate cost data, improved financial decision-making, and enhanced

healthcare efficiency. Ultimately, this initiative promotes transparency, sustainability, and better patient care.

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Stakeholder responses to the results of the national cost analysis

Martina Zorko Kodelja [a], Karmen Grom Kenk [b]

Introduction
In 2024, the Health Insurance Institute of Slovenia (HIIS), in cooperation with 11 hospitals (which together perform 70% of all cases), conducted a national cost analysis (NCA). The aim of NCA was to calculate the first Slovenian DRG weights, which will be based on the costs of Slovenian hospitals. These would replace the Australian weights, which have been in use for 20 years. The new weights will determine realistic and comparable DRG prices, as hospitals themselves have repeatedly pointed out the unreality of the existing weights, their underestimation and even the overestimation of some (e.g. orthopedic surgeries).

Methods
The methodology for recording data for calculating DRG weights was prepared in 2021-2023 together with the participating hospitals. The methodology precisely defines the patient-level data, its content and structure. The dataset includes the costs of medicines and materials used, the costs of examinations that hospitals order from external providers, and data on activities performed. In the last 3 years, participating hospitals have received a total of 6.6 million euros for the establishment of patient-based data recording and reporting to HIIS.

In 2023, hospitals began to send patient-level data, which we thoroughly checked and, together with the hospitals corrected errors. Where the data was not of sufficient quality (missing or illogical data), we replaced their values with the average values ??of other hospitals. This ensured that the quality of the corrected/supplemented data was good and suitable for further use - as input for the distribution of costs to individual cases and the calculation of weights.

In the spring of 2024, hospitals provided general ledger data in a pre-agreed cost matrix. We distributed all general ledger costs to individual cases. Part of these costs were provided by hospitals at the patient level, while the remaining costs were allocated to cases based on data on activities performed (e.g. minutes in the OR, hours of mechanical ventilation) or other keys (LOS, number of cases...).

Results
We calculated:

- weights for one-day treatments,
- weights for multi-day treatments,
- upper limit of length of stay (average length of stay for DRG + 2 standard deviations)
- supplement for each day of treatment beyond the upper limit of length of stay.

We believe that in this way the costs of multi-day and very long treatments are covered more fairly and the surpluses of one-day treatments are reduced.

Based on the calculated weights, we also prepared financial simulations for all hospitals, showing the impact of the introduction of Slovenian weights on hospitals' revenues.

Discussion/Conclusions
New weights necessarily and always result in a redistribution of funds between DRG groups and consequently affect hospitals' revenues. The financial consequences of the new weights can be systematically mitigated in several ways, in order to ensure that they do not represent an excessive financial burden for hospitals, e.g. by increasing the program of undervalued hospitals or by gradual balancing over a longer period of time (e.g. 3 years), or possibly with additional financial resources.

Stakeholders expressed concern that the new one-day weights would reduce the share of one-day treatments, as hospitals would keep patients in the hospital overnight in order to receive a higher multi-day weight (despite the corrective measures we proposed).

They point out the (poor) quality of the patient level data - that hospitals do not have well-organized HISs and do not record all cost data (despite the 6.6 million EUR they received for this purpose).

After the results were published, hospitals that did not participate in the national cost analysis also came forward and proved higher costs with their (incomplete) data.

The Institute emphasizes the urgency of introducing the new calculated Slovenian weights in 2025, since:

- the procedure was carried out in full accordance with the procedures regularly implemented by comparable other countries with these systems;
- the data for the first step is of the same quality or even better than in comparable systems;
- Slovenian weights are significantly closer to real Slovenian costs than the 20-year-old Australian weights;
- and only the actual introduction of new weights will be the motivation and compulsion for more detailed and strict monitoring of costs and their optimization in hospitals.

Currently, coordination with the Ministry is still underway regarding the final version of new weights and the date of implementation. I believe that by the conference in September we will be able to report on the actual introduction of the new weights.

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A mobilisation strategy for clinicians with costing data

Sandrine Dupont [a], Philippe Lachapelle [a]

Introduction
Quebec has detailed information on the cost of health and social services provided per patient for more than 5 years now, i.e. the cost per care pathway and services (CPSS). It was implemented nationally as a basis for the implementation of activity-based financing. The CPSS is an important lever for improving the performance of the health and social services network. However, there is a challenge for this tool to become an integral part of the analyses of clinical departments in their management of the organization of services in health and social services institutions.

The departments responsible for the production and operation of the CPSS must adopt a strategy for promoting this information to clinicians. This requires popularizing the concepts of cost of production to a clientele that is not necessarily comfortable with the interpretation and use of costing data. It is also important that this data reflects its reality to obtain their adherence.

Methods

The CHU de Québec – Université Laval has developed a two-pronged strategy for the development of the CPSS.

- Individualized meeting with clinical directors with a presentation adapted to their reality
- Continuous improvement of the CPSS in collaboration with clinicians

A dashboard presenting the data of the clientele admitted by DRG has been set up.

Results

The implementation of activity-based financing in several sectors has been a good opportunity to make clinical departments aware of the importance of knowing their costs in order to be able to compare themselves with the proposed national pricing and to benchmark with comparable institutions. A presentation of the CPSS was integrated into the project team responsible for analyzing the discrepancies between the fees and the expenditures observed.

Within this context, the improvement of the CPSS, the quality of the available data remains an issue, as does the maintenance of costing expertise for the directorate responsible for the production of the CPSS. This adds to the complexity in the mobilisation efforts towards clinicians.

Discussion/Conclusions

Promoting the use of costing data (CPSS) at all levels of governance of a health institution remains a challenge. Clinicians must take ownership of this tool and become partners to improve its quality. There is a balance to be maintained between accuracy and the effort required to produce the information. This balance depends on the ability to properly target gaps in our performance. The quality of the data and the maintenance of costing expertise are the basis for producing a CPSS useful for strategic decision-making in an institution.

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Transforming patient care: automated mapping of hospital patient episodes using process mining with sequential probability analysis

Amanda Ling [a], A Z M Ehtesham Chowdhury [b], Pammy Yeoh [b], Brendon McMullen [c], John Blakey [d]

Introduction

Hospitals seek excellence in the quality of care with efficiency by understanding their activities and the variations within. Quantitatively but effectively representing and comparing complex clinical episodes across a large and diverse patient population is challenging. Usual methods for analysing clinical pathways rely on manual data curation, domain-specific knowledge, and may not adequately capture clinical practice variability. Therefore, there is the potential to develop an automated system to address the above- mentioned challenges for a busy tertiary hospital. This study utilises a novel automated system for mining and mapping versatile patient care services during their episode of care, ultimately assisting in identifying the most efficient, high-quality, and affordable pathways.

Methods

This study utilised a longitudinal dataset of 83251 hospital episodes from 53304 patients discharged from Sir Charles Gairdner Hospital, WA, Australia, over four fiscal years, 2019-23. The data included timestamps for pathology and imaging, theatre interventions, ward, responsible team movements, and selected pharmacy items. R scripts were used for data preprocessing (cleaning, sequencing, and grouping), while Python scripts enabled service mining and pathway mapping. An in-house built process mining algorithm categorised episodes by diagnosis, comorbidity, and complexity, iteratively clustering services based on service pair probability and time difference within each case-mix group.

These clustered services are represented as multidirectional graphs, pruned to identify the most probable patient treatment pathways based on available disease groups and other attributes such as age, gender, admission time, length of stay, comorbidities, and hospital-acquired complications.

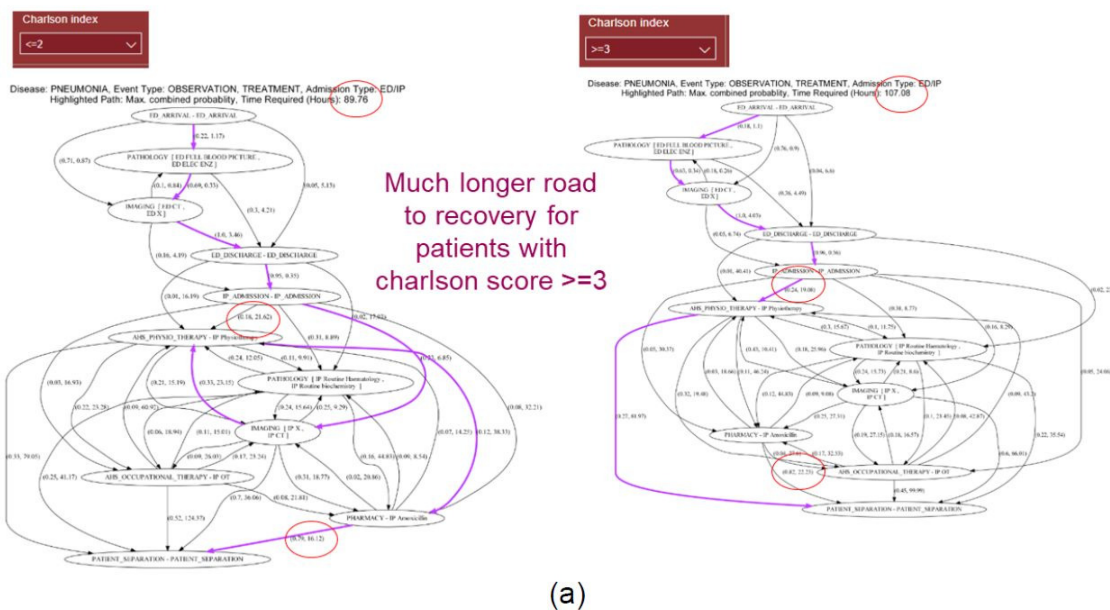
Results

The system initially generates visuals of all available service pairs with numerous connections/paths, providing a granular view of service interactions. Then, it further refines the visual comprising the clusters of these service pairs into larger service groups (e.g., pathology, imaging, ward, emergency), offering a higher-level perspective of patient pathways (Figure 1). This visual map highlights key metrics, including maximum sequential probability, maximum combined probability, and shortest time between service pairs, allowing for identifying common and efficient care sequences. Using the same data modelling architecture, a separate visual also maps patient locations during their episode of care to identify efficient bed utilisation within a high-demand setting.

Discussion/Conclusions

This study demonstrates the feasibility of an automated system for the surrogation and visual mapping of complex patient episode data. The resulting visuals represent service relationships and impact, enabling clinicians and executives to observe clinical pathways, assess the impact of service sequence changes for various disease groups, and subsequently identify the variations in the clinical pathway. By providing data-driven insights into clinical workflows and treatment demand, this approach can support care quality

improvement, resource allocation, clinical decision-making, and cost analysis by patient- reported and post-discharge outcomes. Future research would advance more congruent data presentation to clinicians and managers and integrate this system with electronic health records for other healthcare settings.



(a)

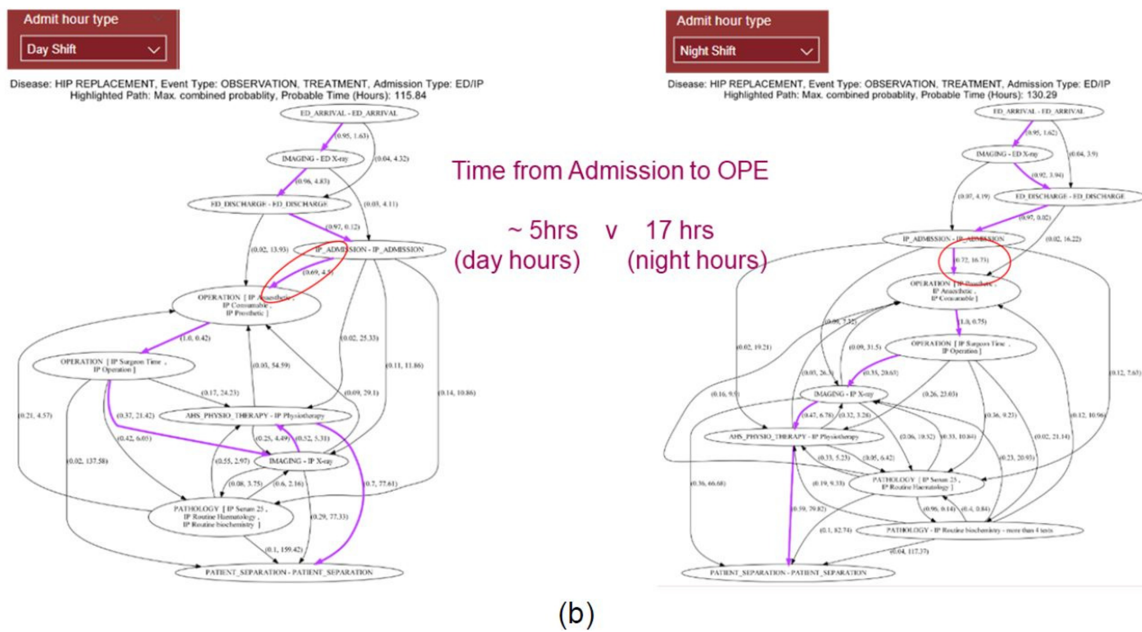


Figure 1: Comparable maps of clinical pathways based on (a) Charlson score and (b) admission hours type. Service pairs have directional pair probability and required time (in hours). The maximum combined pair-probability pathway is highlighted in purple.

Keywords: Automated system, Clinical pathways, Healthcare activity mapping, Hospital costing data, Hospital service optimisation

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Thursday Afternoon

Casemix grouping

Development an internationally aligned casemix system based on WHO Family of International Classifications

Robert Jakob [a], Eva Krpelanova [a], Martti Virtanen [b], Kristiina Kahur [b]

Introduction
Member states have requested WHO to provide a patient classification system for healthcare economic follow-up and reimbursement. This request initiated efforts to develop such a tool. The NordDRG proprietors have agreed with WHO to enable the use and distribution of the NordDRG-based casemix system and tools utilizing WHO classifications.

This abstract outlines the progress and upcoming steps in integrating the NordDRG system with International Classification of Diseases, 11th revision (ICD-11) and International Classification of Health Interventions (ICHI), in collaboration with WHO and other stakeholders.

Methods
Key milestones for developing WHO casemix tool include WHO's initial engagement in 2020 to explore this integration followed by a signed collaborative agreement in 2022. The requirements were that the WHO casemix tool should be based on the WHO classifications ICD-11 and ICHI, all components should be global goods, the tool needs to be adjustable for needs in different member states, and the grouper and maintenance tooling should be available. Soon after signing the contract the mapping of ICHI, NCSP+, ICD-11, and ICD-10+ started.

Results
By September 2024, mapping between ICHI, NCSP+, ICD-11, and ICD-10+ was completed. In October 2024, a WHO-specific version based on NordDRG was developed using NCSP+ and ICD-10+ as backbone classifications, with further testing and validation in progress.

Conclusions
Future actions include delivering NordDRG tools and WHO definition tables, conducting large-scale testing with interested member states, and ultimately transitioning backbone classifications from ICD-10+ to ICD-11 and NCSP+ to ICHI.

This structured approach ensures a smooth transition towards an internationally aligned casemix system, supporting global healthcare classification and reimbursement frameworks.

[a] WHO HQ, Switzerland
[b] Nordic Casemix Centre, Finland

Patient Grouping: Converting Data into Actionable Insight using Pure Clinical Categorical Methodologies

Mike Norton [a], David Gannon [b]

Introduction
There's a tendency in health systems to analyse one problem at a time; this approach is both bad medicine and bad analytics, people with multiple chronic diseases, all interacting with each other, will have clinical presentations and patterns of resource consumption greater than the sum of their

individual diseases. Health systems need a whole-person approach to measuring burden of illness, one that can distinguish between patients who may share the same diagnosis but differ widely in their severity of illness, overall health status, current and projected use of resources and/or their need for more immediate intervention.

Methods
This abstract makes the argument that a pure clinical categorical methodology is best suited to deliver this insight, one that would . . .

- assign individuals based on clinical data alone; diagnoses, procedures, drug codes, functional and mental health status (simple input)
- assign individuals into a single, mutually exclusive category by take a whole-person approach to measuring their burden of illness (not multiple vectors of segmentation around specific diseases)
- derive a patient's severity of illness from a clinical understanding of their disease burden (not derived simply from adding up co-morbidities),
- support a comparison of the types and amounts of services across clinically similar individuals ("apples with apples" comparisons, a foundational requirement for value-based care)
- offer granularity and specificity, with meaningful aggregation (turning the analytical microscope up and down whilst preserving clinical meaning)

Insight
Solventum Clinical Risk Groups (CRG) are a pure clinical categorical model and the breadth of insight these models can deliver may be demonstrated using their real-world application ...

- Better understanding the burden of illness of a population: **Molise, Italy, Florida State**
  Aggregated CRGs enable analysts to step from the macro to the micro with ease whilst maintaining clinical relevance.
- Value Based Care - Casemix Adjusted Capitated Payments: **New York State**
  CRGs enable the fairer reimbursement of care plans based on member burden
- COVID-19: Identification of "at risk" population and PPE distribution: **Valencia, Spain**
  The Region of Valencia used CRGs to prioritize PPE distribution to their "at-risk" populations.
- Chronic Care Management and resource allocation to Primary Health Care Areas: **Catalonia, Spain**
  CRGs are used to identify areas of need and responds with infrastructure and resource investment.
- Reducing Unwarranted Variation in Prescription Costs: **Valencia, Spain**
  CRGs used to implement rational measures of cost containment in pharmaceutical expenditure.
- Clinical Variation within Disease Populations: **Mt Sinai Health System, New York**
  "Not all Diabetics are the same", using CRGs to identify High-Risk Versus High-Opportunity Patients
- Improving Readmission Rates: **North Carolina**
  CRGs identify patients whose risk of readmission, can be reduced through earlier follow-up post discharge.
- Focused Interventions: **New York State**
  Critical reporting of longitudinal CRG variation within populations to drive investigation and/or prioritized intervention.

Conclusions
Unlike opaque and non-clinical statistical models, A pure clinical categorical model creates a

common language for clinicians and administrators to improve health status and advance value based care ay both the individual and population level.

[a] Solventum, United Kingdom
[b] Solventum, United States

Financial Evaluation of Groups for DRG 301 - Hip Joint Replacement

Andre Guigui [a], Camille Francoeur [a], John Fletcher [a], Pierre-Olivier Sylvestre [a]

At the McGill University Hospital Groupe (MUHC), a review of deficit DRGs in relation to the evaluation of clinical performance and the implementation of the new patient-centred funding model (PFF) was undertaken in 2024 to understand the major variations. DRG 301, hip joint replacement, was further developed with a clinical champion and we took a closer look at the medical coding (CCI, ICD-10, DRG).

The champion argued that there was a fundamental difference between hip joint replacement for osteoarthritis, which is more gradual, predictable and simple, and those related to fractures or oncology, where the clientele can be different and much more complex. The MUHC issue, being a trauma centre, also brings a difference and complexity in terms of the grouping of cases.

A literature review shows that most medical infrastructures are paid for per procedure without differentiating the main diagnosis (osteoarthritis/fracture). As a result, the 2 groups are paid in the same way, which makes the funding of the hip fracture group inequitable.

Further research shows that, in version 37 of the APR-DRG, DRG 301 in terms of NIRRU[1], includes 70% of cases of osteoarthritis, and 30% of cases of fractures or oncology. At the MUHC, the evolution of this ratio has led to levels in the order of 50% / 50%, especially since the pandemic has had a major effect on surgical delays for osteoarthritis cases. A comparison with other hospitals in the province shows a higher ratio of fracture cases at the MUHC than the rest of the province. This added complexity makes financial models that rely on NIRRUS for these ratios make us look less efficient.

Further research highlighted the fact that, in version 38 of the APR-DRG, DRG 301 disappears and is replaced by DRG 324-simple joint replacement and DRG 323-complex joint replacement. So this distinction is recognized.

This raises reflections on the complexity of clinical performance evaluation, and the danger of developing financial models that are too static and instead should constantly evolve.

1. Note TH : NIRRU references the Relative resource intensity level , le niveau d'intensité relative des ressources utilisees

[a] McGill University Health Center, Canada

Clinical coding practices and innovations

Case Study: A Hospital in Melbourne, Australia - Benefits of Moving from Retrospective to Concurrent Query/Coding Process

Stephanie Cantin-Smith [a], Kathy Wilton [a]

Introduction
Today's presentation is based on a case study from The Alfred Hospital located in Melbourne, Australia. The Alfred hospital is a large tertiary facility with approximately 120,000 discharges annually, including Same Day episodes of care. In the past, the Coding and Case mix team have been active in pursuing additional hospital revenue through a retrospective coding query process. The retrospective query process resulted in significant revenue results. More recently, following the introduction of computer assisted coding software which provided workflow tools for clinical documentation improvement empowered the facility to introduce a concurrent CDI program. A pilot concurrent program was supported by the hospital executive team and a team of 1.2 FTE. Clinical Documentation Specialists are employed to support the general medicine units in the hospital. These teams also received a consistently high volume of coding queries, primarily focused on clarifying documentation issues. A significant portion of these queries were related to determining the correct principal diagnosis. This highlights the complexity of clinical documentation and the need for ongoing clarification to ensure that diagnoses are accurately recorded, which in turn affects coding and hospital revenue.

Methods
Changing to a concurrent CDS program allowed the facility the ability to have real time knowledge of the hospitals financial position. A concurrent CDS program enables the CDS staff to have real time conversations with providers. CDS working closely with other clinicians allows for a greater understanding of the need for accurate and complete documentation. Clinical documentation is not just about revenue, but also about accurate data capture. The ability to complete coding in a concurrent process enabled coding to be completed on the first pass. The previous retrospective process was time consuming for the coding professional by writing the query, sending to the provider, and then waiting for a response. A concurrent program eliminated the burden of the process allowing for a quicker turn around in coding the visit.

To ensure a successful program a Clinician Engagement process was established. This involved meetings with the Head of Unit where the CDSs presented the findings regarding concurrent queries and also the benefits of real time review.

The CDSs were then invited to attend ward rounds. Prior to attending ward rounds the CDSs reviewed the medical record for each of the concurrent inpatients. This is done once a week and at this time the CDSs will take notes and follow up with the Medical Team directly post the ward round with any queries they may have.

CDSs try to work within the current medical workflows and are generally agile in the way they work. The CDS workflow tool is part of the computer assisted coding product. This workflow has been adapted to suit the Alfred team. Hospital wide education programs for Clinicians were introduced to support the program and it is expected that there will be an ongoing rollout of the program.

Results
Results are still being measured but antedotal evidence would support positive changes with the concurrent program. More results should be available at the time of presentation.

Conclusions
Concurrent CDI program supported by appropriate workflow tools are understood to have greater benefits than retrospective systems.

[a] Solventum, United States

Developing Coding Guidance for Elective Care Surgical Hubs in Ireland

Jacqui Curley [a], Brian McCarthy [b]

Introduction
As with many countries Ireland has waiting lists for many day case and minor procedures. As part of the health care systems response, an elective Surgical Hub is being developed in four healthcare regions. Surgical Hubs will provide elective day case surgery and minor procedures in addition to outpatient clinics. Each Surgical Hub will be under the governance of a major hospital and other hospitals in the region can refer patients to the Surgical Hub. It is envisaged that clinicians from across the region will be able to perform surgery at the Hub.

In Ireland hospital activity data is captured in public hospitals for admitted in patient and daycase activity in a system called the Hospital In-Patient Enquiry (HIPE). The Healthcare Pricing Office manages this system and provides guidance on data collection. The HPO was requested to develop guidance on the coding of data from Surgical Hubs.

Methods
The HPO were invited to develop coding guidance that would support the reporting of HIPE data for the surgical hubs. Initial meetings were held with the project team and also the hospital with responsibility for Surgical Hub. The clinical coding of the data had not been considered in any of the early plans for the new facilities. The HPO identified key areas for consideration and provided guidance on areas including:

- Each Surgical Hub to be identifiable in the HIPE data along with any referring hospitals
- Coding resources must be assigned for the Hub but can be located in the governing hospital.
- Need for clinical coders access to healthcare records for Surgical Hub
- Need for clinical coders to have access to required information e.g. histologies
- Coding overage is the responsibility of the governing hospital
- A HIPE Coding Process flow for surgical hubs was developed.

The importance of documentation and availability of information for accurate coding is critical as patients will only attend as daycases and healthcare records will not be kept in the Surgical Hubs.

Results
The first Surgical Hub opened in February 2025 and activity will be ramped up over the coming months. In this first site there are EHRs which facilitate coding and the need to ensure all relevant information is available such as histologies. The next Surgical Hub, due to open later this year, does not presently have an EHR and decisions around the type and level of documentation for patients having procedures in the Surgical Hub are in progress.

The system set up for data entry and coding of Surgical Hub activity is working well to date although the activity is at small numbers in these early stages.

Discussion/Conclusions
Clinical coders are needed to code and manage the data flow for accurate coding in these new hubs,

the absence of a standard EHR across sites may prove to be a challenge for timely, accurate coding. The HIPE system has a national standardised data entry and reporting system and has been responsive in adapting to this new type of health care facility. As services expand, challenges may arise with coding coverage and specificity. The HPO will look to support the HIPE teams capturing this data and also to review coding quality to ensure activity data is robust for future inclusion in activity based funding.

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[b] Healthcare Pricing Office, HSE, Ireland, Ireland

Development of a Coding Audit Methodology Framework for the Private Health Sector in the Kingdom of Saudi Arabia

Susan Young [a], Wail Yar [a], Fawaz Alomran [a], Thilo Koepfer [b], Anadil Assawi [c]

Introduction
As part of Vision 2030's healthcare transformation goals, the private health sector in Saudi Arabia is implementing new and innovative ways toward more transparency in healthcare financing and provision such as National Platform for Health Information Exchange Services (NPHIES), Saudi Billing System (SBS), Minimum Data Set (MDS) and AR-DRGs. Data quality and specifically coding quality are of critical importance for their success. To assess and improve the correct, compliant and accurate assignment of diagnosis and procedure codes the Council of Health Insurance (CHI) has undertaken the development of a Coding Audit Methodology Framework for the private health sector as one important tool among others to measure and improve coding quality in a fair and transparent way.

Methods
Within 12 months the project team developed 1) recommendations for a standardized governance framework for both admitted inpatient and day cases) and non-admitted services (emergency and outpatient services) 2) a comprehensive toolkit defining a complete internal and external audit process for both admitted and non-admitted care services, and 3) pilot tested the newly developed internal and external audit process with six selected private hospitals.

To achieve the project goals the team reviewed the currently existing guidelines and standards in Saudi Arabia and benchmarked coding audit methodologies and their respective governance of other countries such as Australia, the US, Germany and Abu Dhabi (UAE). In addition, several workshops and consultations were conducted with key stakeholders (hospitals, insurances, regulators etc.). After the definition of the initial audit methodology 6 pilot hospitals were identified according to specific selection criteria and subsequently internal and external audits conducted. The findings of the pilot audits and additional stakeholder workshops informed the final Coding Audit Methodology Framework.

Results
CHI was able to develop a comprehensive coding audit methodology framework both for the admitted and non-admitted care services through the above outlined project. The project team showed that it was possible by combining established tools like desktop research, benchmarking and stakeholder workshops to develop a new and comprehensive coding audit methodology framework aligned to the local needs and supporting the fast- evolving private health sector in Saudi Arabia.

Discussion/Conclusions
Complete, consistent, compliant and accurate coding is an important, if not the most important, element for the transformation of the private health sector towards transparent and fair value-based care principals. Internal and external coding audits are a helpful tool, although not the only ones, to

continuously improve the coding quality. As such it was critical for CHI to develop and test a standard framework to assure consistency and sustainability of coding audits in the private sector. The pilots with selected hospitals helped to improve the understanding and acceptance of such audits and provided an important baseline for future refinements.

[a] Council of Health Insurance, Saudi Arabia
[b] Solventum, United States
[c] Solventum, United Arab Emirates

A Partnership Approach for Developing National Safety, Quality, and Population Health Insights from Coded Data: CNHI, Beamtree, and Lean

Stephen Badham [a], Maimunah Aisuhaibany [b], Jennifer Nobbs [b]

Introduction
As part of the Kingdom of Saudi Arabia's national healthcare reform programme, the Centre for National Health Insurance (CNHI) has undertaken initiatives to enhance healthcare safety, quality, and efficiency through improved coding quality and data insights. This presentation will detail a collaborative effort between CNHI, Beamtree (an Australian provider of coding quality and AI solutions), and Lean (a Saudi healthcare digital transformation company) to implement the Performance Improvement and Coding Quality (PICQ) tool, enabling CNHI to systematically measure and enhance coding quality across the public healthcare sector.

From this foundational national coding assurance and reporting solution, a number of new Business Intelligence (BI) dashboards are being developed to utilize national coding data to provide insights into safety and quality and population health to drive quality improvement.

Methods
The initiative leverages international best practices, adapting Australian indicators from the Independent Health and Aged Care Pricing Authority (IHACPA) and Australian Institute of Health and Welfare (AIHW) to the KSA healthcare environment. These indicators encompass Hospital Acquired Complications (HACs) and Potentially Preventable Hospitalisations (PPHs) to derive safety, quality, and population health metrics that underpin data-driven decision-making in healthcare.

The project adopts a co-design approach for developing national BI dashboards, enabling CNHI to compare and benchmark performance in real-time. By building a foundation of high-quality coded data, these dashboards provide actionable insights to drive value-based healthcare.

Results
Key learnings will be shared on how automated coding assurance tools support national payor functions, prioritise audits, and foster the evolution of patient-centred, data-driven policy decisions. The discussion will highlight how Australian metrics and indicators are being adapted for the KSA context, and how coding data can be utilized for advanced data analytics to provide continuous, real-time performance monitoring to strengthen coding practices and improve national healthcare standards.

Discussion/Conclusions
This partnership exemplifies how technology-driven solutions and robust data governance can enhance patient outcomes, strengthen financial sustainability, and drive quality improvement across healthcare systems.

Topics:

- Innovations in case-mix, data and technology.
- Advancements in coding, classification systems, and data quality.
- Case-mix and costing beyond funding.
- Connecting funding with patient outcomes and quality of care

Key Words: Clinical Coding, Data Quality, Benchmarking, Data Analytics, Safety and Quality, Population Health

[a] Beamtree, Australia
[b] Beamtree, United Kingdom

Use of AI

Stumbling Upon the Black Gorilla: A Lucky Break in Overcoming Healthcare Financing Barriers with AI - A Case Study on Transfusion Funding in Slovenia

Jana Wahl [a], Kevin Ratcliffe [b]

Introduction
Accurate information is critical for equitable and efficient healthcare financing, yet accessing it remains a challenge. This paper explores the role of Artificial Intelligence (AI), particularly conversational agents like ChatGPT, in overcoming barriers to obtaining and validating healthcare financing data. Using Slovenia's transfusion funding policy change as an example, the study highlights how crucial information-despite being readily available-was only accessed after direct inquiry with the creators of the Australian Diagnosis Related Groups (DRG) system. This case underscores the complexity of healthcare financing and inefficiencies in information dissemination.

Methods
This policy update study analyzed transfusion service financing in:

- **Slovenia**, where hospitals bear transfusion costs.
- **Australia**, where the National Blood Transfusion Service (NBTS) is fully government-funded.

Data sources:

- **2021/2022 financial data**, comparing costs and funding structures.
- **General ledger review**, analyzing transactions and blood product consumption at University Medical Center (UKC) Ljubljana.
- **Expert input** mainly from Australia, including added perspectives from Germany and Ireland.
- **AI-assisted analysis**, with ChatGPT supporting data interpretation and insight generation.

Results
In Australia, transfusion services are fully government-funded, with separate financing for immunoglobulins and other therapeutic blood products. In contrast, Slovenian hospitals bear direct costs, leading to financial strain and instability.

Key findings included:

- **Financial burden**: Hospitals face unpredictable and high costs for transfusion services.
- **Lack of transparency**: Monopolistic price setting and vested interests have driven up costs, limiting competition and reducing accountability in transfusion financing.
- **Missed policy solutions**: Instead of adhering to the originally adopted DRG-based financing model, the payer introduced retrospective coding rule changes, perpetuating inconsistencies in transfusion funding and financial inefficiencies.

As a result, we **proposed**:

- **Centralized funding** to relieve hospital financial burdens.
- **Regulated pricing** to ensure fairness and transparency.
- **Stronger oversight** to prevent past irregularities, such as retroactive rule changes and inflated pricing.

These recommendations have since been **partially implemented**, signaling a shift toward a more sustainable model.

Discussion/Conclusions
AI enables precise queries, bridges communication gaps, and provides critical insights into complex healthcare financing issues. The Slovenian case illustrates how AI could streamline decision-making and resource allocation. More broadly, AI's role in healthcare financing can improve equity, efficiency, and international collaboration.

Adding a playful yet meaningful layer, the paper acknowledges Don Hindle, a key figure in Australian DRG development, as a 'shadow' third author. This tribute highlights the lasting influence of expert knowledge in modern healthcare financing challenges-capturing the dynamic dance of interaction between human wisdom and AI.

Ultimately, AI emerges as an essential tool in navigating healthcare financing complexities, driving more informed and equitable policy decisions.

[a] Functional medicine practitioner, Slovenia
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Using case mix aggregation to understand travel burden for hospital care in Canada

Kim Nuernberger [a], Steve Atkinson [a]

Introduction
Travel for hospital care can represent a significant burden for patients, their families and the health system. The burden associated with travel can vary depending on where you live and the type of care you require. This comparative analysis conducted by the Canadian Institute for Health Information (CIHI) examines travel burden for hospital care in Canada with a focus on the unique application of case mix aggregation variables to illustrate how travel burden differs depending on the care provided

and the practitioners providing care.

Methods
A novel 5-point ordinal travel burden scale was developed to provide a more wholistic assessment of relative travel burden for inpatient hospital care in Canada that goes beyond distance alone. CIHI's Discharge Abstract Database (DAD) data for 2018/19 through 2022/23 was used to perform the analysis. Measures included in the scale include travel distance, transportation availability, and patient characteristics. CIHI's Case Mix Group (CMG+) aggregation variables CMG+ Care Level and Provider Service Group were used to understand comparative travel burden patterns with the analysis stratified by geography, including variations by urban and rural locations across Canada.

Results
The results show that 1 in 11 people admitted to hospital have high or very high travel burden - increasing to 1 in 4 hospitalizations for people living in rural/remote areas. Travel burden varies by level of specialization with nearly 15% of patients who receive care associated with the CMG+ Provider Service Group Internal Medicine and Subspecialty having a high or very high travel burden, compared to 4% of patients for the Obstetric and Gynecology Provider Service Group. For patients in rural and remote areas, the percentage having high or very travel burden increases to 42% for Internal Medicine and Subspecialty and 19% for Obstetric and Gynecology.

Discussion/Conclusions
The results provide a new way to look at travel burden and identify opportunities where patients in certain geographic areas or who require specific care may face higher travel burden, identifying opportunities for improvement of local service provision. For health system decision-makers and planners, information about patient travel, can help to inform decisions about service planning, including where to locate sites and services, the implication of changes, and allocation of services to maximize access and sustainability.

[a] Canadian Institute for Health Information, Canada

Towards Curated learning - Analyzing Casemix NordDRG system Expert System using Machine Learning tools

Tapio Pitkäranta [a]

Introduction
The Nordic Diagnosis Related Groups (NordDRG) system is a CaseMix system developed through Nordic expert collaboration over the past four decades. NordDRG plays a crucial role in Nordic healthcare classification and reimbursement.

This study examines NordDRG from a decision-making and machine learning perspective. While traditionally regarded as a structured expert system, the decision tree framework provides new insights into its complexity, efficiency, and optimization potential. In the future, the system could be further developed using both traditional expert collaboration and machine learning.

Methods
We analysed the NordDRG logic specification, including all country variants, and projected the structure as machine learning decision tree models. We defined aggregate metrics to estimate the size and complexity of the decision tree.

We created a user interface capable of dynamically visualizing different levels of decision trees. The system was reconstructed as a decision tree with hierarchical decision paths, and key structural metrics were computed.

Results

On the DRG Logic level the decision tree contains

- Decision tree nodes ~ 58 000, Decision tree leaf nodes ~ 9000 and Average nodes per path from root to leaf node: 6.5

On primary classification level characteristics:

- Diagnosis Features ~ 100 000 and Procedure Features ~ 60 000

When the decision tree was extended to contain also primary classification level the tree extended to contain about 2 000 000 nodes. This can be interpreted that the number of cumulative decisions made during the expert collaboration work is in millions.

Discussion

Viewing NordDRG as a large-scale decision tree provides a way to analyze the outcomes of expert-driven classification system development. However, this perspective also highlights challenges, such as the complexity of maintaining and updating a rule-based model at scale. The cumulative number of decisions in the active decision tree is on the scale of millions of rules. Maintaining and updating such logic requires significant effort and a sustained level of expertise.

Our analysis demonstrates that when represented as a decision tree, NordDRG exhibits characteristics of both an expert system and a machine learning-driven classification model. The hierarchical decision structure reveals redundancies and opportunities for optimization within the system. By interpreting NordDRG as a decision tree, we gain insights into how automated decision-support models could streamline and enhance its classification process.

Conclusions

By analyzing NordDRG through a decision tree framework, we provide a novel perspective on its structure and decision-making logic. Future research should explore how machine learning and expert-based decisions can work together to maintain the decision tree logic. This hybrid machine learning approach could be termed curated learning, where human experts always retain the final verification authority over machines. Such an approach could enhance the efficiency and adaptability of CaseMix systems.

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Friday
Morning

Population-based funding tools and strategies 2

Exploring multimorbidity trajectories in the Canadian population.

Koffi Kpelitse [a], Mani Sotoodeh [a], Debra Chen [a]

Introduction
Multimorbidity, defined as the coexistence of two or more chronic conditions in the same individual, is a public health concern in Canada and internationally, and has been associated with negative health outcomes and increased health care utilization and costs. Understanding how multimorbidity develops over time can help policy makers to develop appropriate preventive and treatment strategies. This study explores different trajectories to multimorbidity in the Canadian population and how these trajectories are associated with healthcare utilization.

Methods
The Canadian Institute for Health Information (CIHI) has recently included in its population grouping methodology (POP Grouper), an output file to identify all the chronic conditions captured in the POP Grouper, including an index date identifying when the condition was first diagnosed.

This 10-year longitudinal study focused on three common chronic conditions (diabetes, cardiovascular disease, and respiratory disease) and people aged 40-75 in 2010. This cohort was followed over a 10-year period, using sequence clustering techniques to create a sequence of disease states and to identify the most common multimorbidity trajectories. POP Grouper outputs will also be linked with hospitalization data and logistic regressions will be used to explore differences in the likelihood of hospitalization between different clusters.

Results
The CIHI POP Grouper allowed us to track chronic conditions longitudinally. With 3 health conditions of interest, we have a total of 8 possible states as well as 2 additional states to account for people that moved out of the province/country or died. The descriptive analyses illustrated the multiple trajectories to comorbidity. The results from the cluster analysis and logistic regressions are still in progress and will be discussed during the presentation.

Conclusions
A better understanding of the different trajectories to multimorbidity and their association with healthcare utilization is of critical importance. This will help policy makers to provide target preventions and interventions and improve the care and services provided.

[a] Canadian Institute for Health Information, Canada

Implementing a new regionally managed funding mechanism: the population endowment.

Alexis Gravel [a], Nathalie Rigollot [a]

Introduction
In recent years, new funding mechanisms have been introduced in France to address challenges faced by the French hospital system in the aftermath of the COVID-19 crisis, such as recruitment difficulties and the increasing healthcare demands of an aging population.

Among these mechanisms, the population endowment is designed to allocate hospital funding based on the health needs of the territories they serve. This approach ensures that the funding for

emergency, rehabilitative, and psychiatric care .is not solely dependent on hospital activity levels. Instead, it also considers the population size and characteristics of the covered territory.

The calculation of the population endowment is managed by regional health agencies, enabling better consideration of local specificities. To support these agencies, national guidelines and methodologies have been established to standardize and facilitate the calculation process.

Methods

The total amount of the population-based endowment is determined at the national level and subsequently allocated to regions. The distribution among regions is based on their population size and other criteria, such as poverty rates and indicators of healthcare provision.

Each regional health agency receives a dedicated budget for the population endowment, which must then be distributed among the hospitals within the region. To achieve this, the population of each municipality is assigned to hospitals based on the proportion of the hospital's activity that originates from those municipalities. Hence, the population of each municipality can be distributed across several hospital.

The population assigned to each hospital is then adjusted using specific indicators computed at the municipality level, such as poverty rates and the proportion of children in the population. This weighted population serves as the basis for distributing the regional endowment among hospitals.

To ensure the acceptability and transparency of the allocation process, the methodology and key criteria are presented to a regional committee. This committee includes representatives from hospitals, physicians, and patient associations, fostering a collaborative approach to decision-making. This committee also deliberates on criteria, worth considering, which could relate to the population's health needs.

Results

A statistical tool was developed and made available to regional health agencies to assist them in allocating the population endowment budget among hospitals.

This tool provides for each hospital a list of municipalities within its designated territory, along with key data at the municipality level, including population size, socio-economic status, and healthcare provision.

The modular design of the tool allows regional health agencies to access a centralized, and easily navigable data source offering a broad and diverse range of variables. At the same time, it maintains the flexibility to select the variables used for weighting the population, which is then applied to distribute the regional population-based fundings.

To ensure the accuracy and relevance of the data, the tool is updated annually, incorporating the most recent information on population demographics and characteristics.

Each regional health agency has the option to use this tool at its discretion.

[a] Agence Technique de l'Information sur l'Hospitalisation, France

Integrated and Personalized Care for Multimorbid Patients: Optimizing Treatment and Funding

Jacob Hofdijk [a], Felix Cillessen [b]

Introduction

Rivierenland, a regional hospital in the Netherlands, is actively collaborating with regional care and cure partners to transition from a competitive to a cooperative healthcare model. This shift aligns with the national policy outlined in the Integrated Care Agreement (IZA), which promotes a person-centered approach and necessitates the development of a fundamental regional care model. Ongoing discussions at various stakeholder levels are focused on facilitating this transformation. Additionally, regional hospitals have committed to playing a proactive role in shifting from an acute-care focus to a comprehensive that supports lifelong health maintenance.

Methods

To drive this transformation, Rivierenland Hospital has adopted a data-driven approach, starting with the application of the Adjusted Clinical Groups (ACG) classification system to measure the burden of disease among its patient population from 2020 to 2024. This initiative has resulted in a risk stratification of hospital-treated patients, using the novel concept of Patient Need Groups (PNG). The approach is inspired by successful models such as Kaiser Permanente's restructuring of care after recognizing that 25% of its patient population required acute care, while 75% had chronic conditions- of which 80% were multimorbid. This insight highlighted the necessity of tailored interventions and optimized resource allocation to manage complex patient needs effectively.

A study has been proposed for funding through the MEDZO program to analyze how the new insights from the Patient Need Groups can be utilized to ignite discussions within the hospital. The goal of this study is to leverage these insights to help the hospital achieve its strategic objectives, fostering informed decision-making and improving care delivery for multimorbid patients.

Methodologically, this research will follow a phased approach, including data analysis, care pathway development, implementation, and iterative optimization. The study will utilize statistical microdata and regional health data to ensure evidence-based decision-making. Implementation efforts will be hospital-focused, ensuring that findings can be scaled and transferred to similar healthcare environments.

Results

The anticipated impact of this initiative includes, improved health outcomes for multimorbid patients, enhanced healthcare efficiency, and reduced hospital admissions through preventive measures and better care coordination. By integrating predictive analytics, patient-centered care, and multidisciplinary collaboration, this study aims to establish a new standard for multimorbidity management within regional healthcare systems.

Discussion/Conclusions

This project has four key objectives: (1) optimizing care coordination for multimorbid patients through tailored care pathways, (2) developing predictive models to identify patients at risk of complex care needs, (3) fostering multidisciplinary collaboration among healthcare professionals across institutions, and (4) evaluating cost-effectiveness and care outcomes to inform sustainable funding models.

By focusing on integrated, personalized approaches, this study seeks to transition healthcare for multimorbid patients from fragmented models to holistic and coordinated care. Building on previous

data stratification research utilizing the ACG methodology, this project can serve as a blueprint for innovative care models tailored to the specific needs of multimorbid patients.

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The Challenge of Multimorbidity: Towards Integrated and Data Driven Care Models: Insights from International Collaborations

Jacob Hofdijk [a], Felix Cillessen [b], Michael Pervan [c], Imtiaz Daniel [d]

Introduction
The rising prevalence of multimorbidity presents significant challenges to healthcare systems worldwide, necessitating a shift from traditional care models to integrated, team-based, and data-driven approaches. Healthcare organizations are leveraging risk stratification and digital health solutions to enhance care delivery, improve patient outcomes, and ensure hospital sustainability. Inspired by successful frameworks such as Kaiser Permanente's model-where 25% of patients required acute care, while 75% had chronic conditions, 80% of whom were multimorbid-driving the transition from specialty care to Kaiser Medical Groups' team-based approach, this study highlights the necessity of tailored interventions and optimized resource allocation.

The Rivierenland Hospital in the Netherlands has undertaken a risk stratification project (2020-2024) using the Johns Hopkins Adjusted Clinical Groups (ACG) classification system and its 11 Patient Need Groups(PNG). This initiative provides insights into multimorbidity levels, facilitating evidence-based discussions among clinicians and hospital management to optimize care strategies.

Methods
A key component of this initiative is an international collaboration between the **Netherlands, Australia, and Ontario, Canada**. This partnership will focus on:

- **Analyzing diagnosis data** from hospital treatments over one calendar year.
- **Applying the ACG classification system and Patient Need Groups** or the POP grouper equivalent to establish a standardized patient stratification methodology.
- **Assessing the scalability and adaptability** of this approach across different healthcare systems.

By developing a **consistent and effective framework** for implementing integrated care pathways, this initiative aims to ensure that **best practices in multimorbidity management** can be successfully adapted and applied across diverse healthcare settings internationally.

Results
Preliminary results indicate improved health outcomes for multimorbid patients, greater efficiency in healthcare delivery, and reduced hospital (re)admissions through preventive interventions and better care coordination. Implementing predictive analytics and patient-centered care models has demonstrated significant potential in setting a new standard for multimorbidity management within regional and international healthcare frameworks. A critical challenge in this endeavor is developing a sustainable funding model that supports both acute care interventions and value-based healthcare financing for low-volume, high-cost multimorbid patients.

Discussion/Conclusions
This study explores international collaboration on multimorbidity management and its impact on hospital operations and funding. Specifically, risk stratification and care redesign approaches will be tested in large community hospitals in Toronto, Ontario, and Australia to assess adaptability across diverse healthcare systems. These findings will inform a multi-hospital study spanning three

countries, aiming to develop scalable models for chronic disease management and hospital sustainability.

To further advance this initiative and stimulate international discussion on this crucial issue, a workshop proposal will be submitted to the PCSI conference. By fostering interdisciplinary and cross-border collaboration, this session aims to contribute to shaping the future of multimorbidity care and integrated healthcare strategies.

This paper examines methodologies, outcomes, and policy implications, offering a roadmap for hospitals transitioning toward data-driven, hybrid care models to address the growing burden of multimorbidity.

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Health service resourcing and economics

Analysis of the impact of lesion localization practices on the breast cancer care pathway

Sandrine Dupont [a], Philippe Lachapelle [b]

Introduction
The Quebec health network currently mainly uses harpoons for the location of non-palpable lesions for breast cancer surgery. In addition to being uncomfortable for patients, these harpoons must be placed on the day of surgery. This is why centers with a high throughput of operations for breast pathologies have turned to radioactive beads that can be put up to 1 week in advance. Given the strict regulations surrounding the management of radioactivity, a solution with magnetic beads or radar location is now increasingly used. However, these technologies are more expensive than the harpoon.

An analysis of the financial impact of this technology on the current care pathway of breast cancer patients undergoing a partial mastectomy aims to demonstrate the economic benefits of introducing this process in Quebec.

Methods
The CHU de Québec – Université Laval analyzed the care pathway of more than 800 patients who underwent a partial mastectomy in the 2021-2022 fiscal year. The data used are those of the cost per care pathway and services (CPSS) which contains the details of all the consumption of services and the related costs, including the services of patients who had to be operated on again (re-excision).

The methodology consists of quantifying avoidable services delivered or efficiency gains based on internationally accepted evidence and comparing potential savings with the additional costs of deliveries.

Results
Here are two examples of savings or efficiency gains.

- The use of technology would reduce the rate of re-excision after a first operation. This rate is around 15%. [MP1][NL(2]
- The locator can be deployed at any time prior to surgery. Radiological and surgical procedures no longer need to be scheduled on the same day, making it easier to plan both the imaging and the operating room[MP3][NL(4]

The services that would no longer be required and the efficiencies outweigh the additional cost of supplies.

Discussion/Conclusions
The development of new health technologies creates pressure on health spending. In the current difficult budgetary context, the impact of the introduction of these technologies must be analysed both from the point of view of added value for the patient and the economic impact. The use of detailed cost information such as the CPSS in Quebec is essential to make the right choices, which are required for the survival of the public health care system.

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The cost of infections after knee replacement: demonstrating the impact for care providers within the CHU de Québec - Université Laval.

Sandrine Dupont [a], Philippe Lachapelle [a]

Introduction
Infection prevention is a crucial issue in the health care system. However, despite the efforts made, many healthcare facilities continue to face significant challenges in infection prevention, starting with hand hygiene. Our analysis aims to shed light on the consequences of the lack of prevention of infections on patients.

Infections can prolong the length of stay of patients, leading to additional complications and an increased burden on hospital resources. In addition, these infections significantly increase the costs of care, both for patients and for healthcare facilities. By presenting data and case studies, our project will demonstrate the importance of strengthening infection control measures to improve patient outcomes and optimize available resources.

The goal of our analysis is to demonstrate to the managers of the CHU de Québec-UL, with local data, the negative impacts and issues related to preventable infections.

Methods
The CHU de Québec – Université Laval analyzed the care pathway of approximately 10 patients who underwent knee replacement surgery that ended in infectious follow-up in the 2022-2023 fiscal year. These are patients followed by the Infection Control Team (IPAC) only. By September 2025, we plan to replicate the analysis on the 2023-2024 data to increase the sample of cases studied.

The data used are first of all, the cost data of the CHU-UL. Subsequently, we expanded our analysis to include cost data from the Capitale-Nationale region (to include home care costs), an estimate of the costs of community pharmacy medication, and an estimate of the costs for physician compensation.

Results
The current literature, which comes mainly from the United States, showed an increase in costs of about $30,000 per patient. The preliminary results of our analyses indicate a cost increase of

approximately $10,000. To that amount, we will add the costs of community pharmacies, the costs of home care and the costs for medical compensation.

Discussion/Conclusions
Our analysis addresses the impact on costs without neglecting the patient experience and the decrease in the resources available to health institutions and the network to meet population-based health needs.

The scope of our analysis was limited to the impact on costs and therefore the effect on the capacity of health facilities and the health system. It is complementary to studies on the impact of secondary infections on the patient experience.

Despite the small number of cases studied, it confirms the observations of similar studies. It supports, with local data, the importance of strengthening infection control measures to improve patient outcomes and optimize available resources.

[a] CHU de Québec-UL, Canada

Comparative Study on the Allocative Efficiency among 5 countries

Euasin Joung [a], Rodigues Jean Marie [b], Insoo Chung [c]

Introduction
Policy makers aim to improve efficiency by ensuring that finances are appropriately allocated for optimal policy outcomes (Palmer et al., 1999). The majority of the efficiency research conducted in the micro dimension, with only a few studies at the macro; national level of the health system (Rahab, 2023). Allocative efficiency (AE) research should be paralleled by research on the other two dimensions to ensure that structural changes and influences within and outside the healthcare environment are taken into account when measuring efficiency. This study aims to increase the framing understanding of trends and determinants of system-level efficiency.

The study is based on the following research question.

How allocative efficiency changed before and after the implementation of the Case- based Funding System (CbFS)?

Methods
The previous analyses of AE tended to examine typological trends and features among OECD countries Their inputs were mainly calculated as health expenditure or utilization, and the output is defined through information on Mortality, life expectancy, or QALYs (Greene, 2004; Leciaf-Roberts, 2004; Afonso & Aubyn, 2005; Bhat, 2005). These studies have contributed to resolve the incompleteness of the macro-level resource allocation in the existing micro-level efficiency analysis. The study covers five countries (Korea, France, UK, Australia, and the US), and the analysis compares the pre- and post-CbFS implementation changes of AE. The inputs are calculated as Activity and Cost dimensions, and the outputs are divided into Quality of Care and Volume divided into two categories: demographic and economic. The demographic category will use the proportion of the population aged over 65 or 14, the economic one will use monetary inflation, GDP Deflator factor and PPP (Purchase Power Parity).

The data would use statistics on Health expenditure, utilisation, service provider resources, and on the Economy and Society from the OECD and WHO. Secondary data at the country level should be used for some proxy variables as well.

Findings
By comparing the AE changes associated with CbFS in five countries with different healthcare environments using a common international index, this study will contribute to inferring the management points of inefficiency at the country level. The international comparison will also be a key reference for generating standards and evidence for efficiency checks and management of resources and finances.

Conclusions
The highlights of this study show that comparing efficiency and identify similarities and differences among countries could be the basis for periodic monitoring of resource and financial efficiency in each country. The study has limitations in that it does not consider all the determinants of AE efficiencies as country-specific institutional influences.

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Lowering the medical data production load in hospitals by challenging the institutional demand

Etienne Joubert [a], Sophie Guéant [a], Fabrice Danjou [a], Joëlle Dubois [a]

Introduction
The data production load on healthcare professionnals has become a sensitive issue in France. The non-stop increasing and in-depth variable demand is one of main cause of this increase. In response to this phenomenon, the nouveaux recueils program has been rolled out at the Technical Agency for Information on Hospital Care (ATIH), with the aim of automating the collection and transmission of hospital health data. The project is structured around eleven major projects, sponsored by the French health ministry. The program has been introduced into the short-term hospitals financing reform project.

In particular, the program aims at conceiving and deploying data management instruments for a foreseen healthcare data governance function. To do so, the ATIH has launched a healthcare data demand mapping project. The goal is to list all the medical information data requested by national healthcare agencies and characterize the datasets and variables.

Methods
Two main tables have been built. The first one aims at listing the datasets requested by the institutions. The second one is a list of every variable requested for each dataset. We identified the volume of variables and datasets demanded, tested whether there are redundant demands and evaluated the volume of data produced directly from patients records. From this first word, we conceived a data production load evaluation method using the Manhattan distance tool. The calculation is based on (1) the distance between the information source software and the data input one, and (2) the volume of necessary operations to transform the medical information in the structured requested data. The database has been gathered into a PowerBI file, which has allowed the ATIH to conceive and build primary scorecards and data demand evaluation tools.

The map and scorecards are still on the build and is on constant evolution and a maintenance process has been introduced within the ATIH.

Results
To date, 141 datasets and 1968 variables have been identified, which are not exhaustive. For each of

these variables, several qualifiers have been identified: requesting institution, healthcare field, scope, level of the variable, frequency of collection, etc. Most datasets are composed of less than 40 variables.

The ATIH sought to qualify the main software source of the variable, with many questions raised as sources are very heterogeneous, due to the degree of complexity of hospital information systems. We also tried to identifiy the critical variables, meaning the variables that are necessary for achieving the goal of dataset (financing, hospitals quality certification mainly). Among the identified variables, 741 are considered critical for the achievement of the dataset objective.

Discussion/Conclusions
The process of listing all datasets and variables implies many unanticipated difficulties such as dealing with the heterogeneity of the data management performance in the requesting institutions and identifying the critical variables in each datasets. These are technical issues that imply coordination and transaction costs. But the implementation of a global data demand management approach remain the main issue of the project.

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Global shift of health care systems towards the ambulatory care

Naveen Sharma [a]

Introduction
The global healthcare landscape is evidently moving towards outpatient and ambulatory care due to technology, patient preferences, and economic factors. According to IMARC Group, the ambulatory services market will be as follows:

Sr. No.	Particular	Market Size
1	Market Size in 2024	$ 4.0 Trillion
2	Market Forecast in 2033	$ 6.5 Trillion
3	Market Growth Rate 2025-2033	5.43%

According to Polaris market research the global ambulatory services market was valued at $2.81 trillion in 2019 and is anticipated to grow at a CAGR of 5.9% to reach $4.28T in 2026

Methodology
Research Objectives:

1. To understand the movement of global health systems towards the outpatient and ambulatory care
2. To discuss the possible strategies to meet the need of landscape changes

Research Questions:

1. To limn the landscape change in health care services in US, Europe and other global health systems
2. To describe the possible reasons for the movement
3. To understand the future Implications of the movement and discuss future strategies

Methods
A structured targeted literature review (TLR) method was employed to find out the relevant

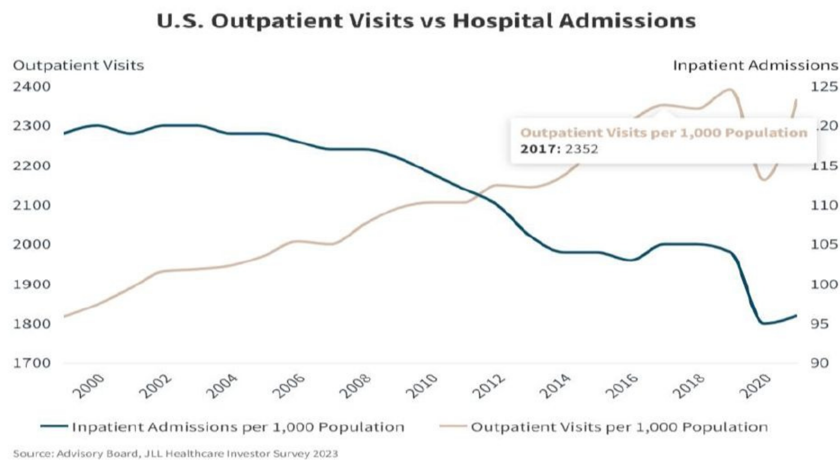
information, which were efficiently gathered while focusing on specific research questions. A systematic approach and grey literature search were utilized that included identifying relevant keywords, utilizing controlled vocabulary, and applying Boolean operators to refine search results.

Results

Change in Landscape:

US scenario:

One third of hospital revenue is gradually transitioning to ambulatory surgery centers, office-based laboratories, and other ambulatory sites. Procedures conducted at physician offices and Hospital outpatient departments is anticipated to increase by 13% and 14% respectively over the next decade



Inpatient admissions are expected to drop by 0.9% over 10 years, conversely outpatient care will grow by over 20%

Scenario in Europe:

The revenue is projected to grow at a rate of 6.58% CAGR (2025-2029). Germany's telemedicine market is expected to grow at 16% CAGR (2024-2029)

Reasons for the movement:

This shift can be attributed to factors such as patient preferences for seamless and high- quality services, advancements in medical technology, a need for value-based care, payers' pressure for cost-effective solutions, cost control, shared ownership between physicians and healthcare institutions, chronic illness management, and an increasing elderly population

Discussion

The following implications can be anticipated in the near future: Increased pressure on primary care and psychotherapy services, shorter wait times, fewer hospital-acquired infections due to reduced hospitalizations, need for more resources, advanced technology, and higher quality in ambulatory settings. Workforce flexibility from other settings to ambulatory settings will be encouraged. Hospitals may employ more physicians and acquire more physician practices to meet revenue targets. Physician- hospital partnerships and several medical specialties, such as endocrinology, will gain prominence

The following strategies can help to combat the above-mentioned implications: Introducing site-neutral payments to lower patient costs and allowing patient freedom, introduction of Enhanced Ambulatory Patient Grouping like specifically designed ambulatory bundling systems, utilizing the tools like Ambulatory Potentially Preventable Complications to reduce potentially preventable

complications, use of value-based care reimbursement methodologies in preventive and primary care, targeting the virtual care and home care services, using AI for better risk prediction and reducing hospitalizations

[a] SOLVENTUM, United States

Data-informed care improvement

Addressing Global Health Inequities: Improving Data for Social Determinants of Health

Michelle Badore [a]

Introduction
According to the World Health Organization, a staggering 30-55% of health outcomes are attributed to SDoH. Contributing to this crisis are broken documentation practices, under-coding, and disparate classification systems across regions that are trying to support those in need. Analysing and improving these factors may not only allow for patient-centered care that meets an individual's social needs but may also inform population-wide approaches to address social needs and reduce the burden of disparities within our patient population. We will differentiate how 12 countries on various continents and with varied complexity of healthcare environments describe the components of health inequities with some historical issues leading to the current landscape, capture the socio-economic issues in documentation, code using different patient classification systems, guidelines, and regulations, and how the data flows downstream to other systems for reporting systems such as patient quality measures and regulatory bodies.

Methods
Using general scientific methods of analysis, synthesis, induction, deduction, comparing, specifying and analogy along with internet research and stakeholder engagement, we looked at how different areas of the globe describe, document, code, assess, and classify the components of health inequities, and some historical issues leading to the current landscape.

Results
We identified significant disparities in health outcomes and access to healthcare across different populations and regions. By focusing on, synthesizing and improving data collection on socio-economic factors, we can progress in addressing global health inequities. The classification and coding of SDoH data helps to quantify community, regional, national, and global needs and drives downstream use for healthcare quality, safety, research, statistical analysis, and decision support systems. Policy updates, synthesization of disparate measurement systems, and a global framework are recommended to solve these global issues.

Discussion/Conclusions
While there are barriers to overcome, similarities in global coding standards can help us measure and monitor health equity outcomes and positive change for the future. This requires leadership from governments, regulators, hospital administration, insurance companies, and medical schools.

Collaboration and learning can create a healthcare paradigm that is equitable and accessible for all. It emphasizes the need to improve clinical documentation, data classification, and collection to address

healthcare inequities.

Acting to prevent and alleviate healthcare inequities before they become complex clinical conditions can help everyone.

Key Words: SDOH, population, health, quality, international, policy, inequity, coding, classification, outcomes, patients

[a] Solventum, IFHIMA, United States

Impact of precise Staging of Acute Kidney Injury and Chronic Kidney Disease on Treatment Outcomes: Observational Study, real world data, ICD-10-GM

Olga Endrich [a], Christos T. Nakas [b], Karen Triep [a], Georg M. Fiedler [c]

Introduction

"Kidney Disease: Improving Global Outcomes" (KDIGO) provides guidelines for identifying the stages of acute kidney injury (AKI) and chronic kidney disease (CKD). The guidelines were introduced into the ICD-10-GM (International Classification of Diseases, German Modification) in 2016 for precise coding. A data-driven rule-based engine was developed to determine KDIGO staging using laboratory values, to then tag the cases with precise ICD-10 GM codes and compare the staging to KD-related keywords in discharge letters.

Methods

Methods: To assess potential differences in outcomes, we compare the patient subgroups with exact KDIGO staging to imprecise or missing staging for all-cause mortality, in-hospital mortality, selection bias and costs by applying Kaplan-Meier analysis and the Cox proportional hazards regression model. We analysed 63,105 in-patient cases from 2016 to 2023 at a tertiary hospital with AKI, CKD and acute-on-chronic KD.

Results

Imprecise and missing CKD staging were associated with an 85% higher risk of all-cause and in-hospital mortality (CI: 1.7 to 2.0 and 1.66 to 2.03, respectively) compared to exact staging for any given disease status; imprecise or missing AKI staging increased in-hospital mortality risk by 56% and 57% (CI: 1.43 to 1.70 and 1.37 to 1.81, respectively) in patients with AKI. Vulnerable groups could be determined.

Discussion/Conclusions

Exact staging is associated with better outcomes in KD management.

Our study provides valuable insight into potential quality and outcome improvements. Considering elderly patients, women and patients with acute-on-chronic KD as the most vulnerable, improving staging might play an essential role in better treatment, amenable mortality and lower costs. To enhance precise staging in clinical practice, focusing on generating high-quality evidence and guidelines, supporting the implementation through leadership and clinical education is needed. Clinician and patient involvement, along with advanced tools for pattern recognition and non-intrusive alert systems, can streamline integration and foster continuous improvement in outcomes.

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Increasing SDoH Data Code Capture Across Healthcare Systems

Tiffany Harman [a], Ajay Perumbeti [a]

Introduction
Social determinants of health (SDoH) are social and economic conditions that account for 50% of health outcomes (U.S. Office of Health Policy, HP-20222-12). Z-codes are a subset of ICD-10-CM diagnosis codes that provide a standardized way to capture SDoH factors affecting health, such as housing instability, food insecurity, education, employment, and social support systems. Solventum's Computer Assisted Coding (CAC) utilizes natural language processing (NLP) to automate identification of SDoH Z-codes from diverse clinical documentation for review by medical coders. CAC has traditionally focused on provider (physician/NP/PA) documentation. We configured CAC on an expanded set of non-physician ancillary medical documentation (e.g. social work, case management, flowsheets) which serve as a data-rich narratives that encapsulate the patient's story. We deployed and monitored the impact of CAC with expanded documentation on SDoH code capture from medical charts at scale across multiple healthcare delivery systems.

Methods
Solventum's CAC NLP was expanded with non-physician ancillary documentation containing health-related social needs assessment inputs. CAC NLP was implemented in Solventum 360e Revenue Cycle Management Software in pilot implementations in 3 healthcare systems. We compared three healthcare systems that used CAC with provider only (Group 1, Standard CAC) to three similarly sized healthcare systems that used CAC with provider and expanded ancillary documentation (Group 2, Expanded CAC). Final claims SDoH codes determined by healthcare delivery system medical coders were analysed for both Groups in Amazon Web Services (AWS) Quicksight. Data aggregated by Group and analysed in Microsoft Excel v.2411.

Results
A total of 44,165 codes submitted by medical coders as final coded (SDoH Code Capture) were analysed. There was a 95% increase in SDoH Code Capture in health care systems with Expanded CAC compared to Standard CAC. In addition, there was a 13% decrease in SDoH Code Capture not identified by expanded CAC and required medical coder CAC independent coding, compared to Standard CAC. The most common Z-code class (Z59) representing Housing & Economic Circumstances. Expanded CAC demonstrated a 118% code capture increase (29,686 codes) compared to Standard CAC.

Discussion/Conclusions
Our real-world implementation of Solventum CAC with expanded documentation demonstrates improved SDoH Code Capture. Post-deployment of Expanded CAC, medical coders reported a reduction in their SDoH identification workload. They also highlighted that it ensured SDoH codes are not missed. We suggest, this type of comprehensive SDoH Code Capture program plays an important role for patient outcomes, resource distribution, and healthcare equity.

[a] Solventum, United States

Case mix measures and resource estimates associated with ALC days in Canada.

Sheril Perry [a], Joanie Gingras [a]

Introduction
What happens when an inpatient is ready for discharge, but their personal circumstances (such as cognitive state, mobility, continence, and/or living situation) do not allow for them to be safely discharged? In the Canadian Discharge Abstract Data (DAD), these extra days of stay are referred to as alternate level of care days or ALC days. The case mix characteristics of these patients provide insight into who these patients are as well as the overall health system requirements. This information was combined with Canadian Patient Cost Data (CPCD) to assess the resources associated with providing these alternate services.

Methods
The past two years of Canada's inpatient hospital data were explored to evaluate the reporting of alternative level of care stays in Canada. A case mix lens was applied to this data to help characterize these cases and identify the sources of ALC reporting and variation in reporting. From there, cluster analysis helped identify the key characteristics of those who require alternate care days, and cost information from the CPCD was used to produce an average ALC per-diem cost value. This value was applied to the data and compared to the overall resource consumption to assess the impact of ALC on resources across Canadian jurisdictions.

Results
While there was a significant variation in ALC reporting across Canada, the patient profiles were relatively consistent. Cluster analysis indicated that the majority of ALC patients are older, frail seniors with cognitive concerns who present with clinical characteristics like higher-acuity long- term care patients. They are most likely to be assigned to case mix groups associated with dementia or trauma, have higher comorbidity levels, but with a lower percent of interventions and intervention factors.

While patients with reported ALC days only represents 7% of those admitted to hospital, these patients tend to stay in hospital approximately five times longer than the average acute inpatient. These longer stays, result in ALC patients occupying approximately one out of every five inpatient hospital beds. And while the care of ALC patients in an inpatient setting is less expensive than non ALC patients, it is still approximately 2 to 3 times more expensive than care provided to similar patients in the LTC setting.

Conclusions
ALC patients are a significant barrier to efficient inpatient hospital management. A small portion of low-acuity patients are occupying acute care beds, impacting acute care bed availability and consuming more resources that would be required to care for the same patient in a long-term care setting.

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Harnessing Casemix Data and Coding Systems: A Tool for Population Health Measurement

Nebras Abu Al Hamayel [a], Sarah Alismail [a], Ahmed Alghamdi [a], Susan E. Young [a], Shabab Alghamdi [a]

Introduction
Population health and disease prevention are essential for improving healthcare value, quality of care,

and efficiency. Population health indicators provide a means to monitor improvements, benchmark and compare across healthcare provider organizations and insurance companies. They also help evaluate interventions and programs, and guide policy development. Yet, comprehensive tools tailored to national or organizational priorities remain scarce. We propose a tool designed to measure population health, customized to address Saudi Arabia's national priority conditions.

Methods

The purpose of the tool was to capture population health and subpopulation needs for five priority conditions: diabetes, hypertension, obesity, cardiovascular disease, and smoking. The tool was developed through four sequential steps: 1) Selection of indicator sources, 2) Prioritization of indicators, 3) Indicator specifications, and 4) Indicator coding. Sources had to have published and validated indicators that highlight gaps in care and could be improved upon measurement. We then prioritized the indicators based on prespecified criteria: alignment with the identified priority conditions, presence in >2 sources, and validation by international experts in population health. For each selected indicator, we specified definitions, rationale, inclusion/exclusion criteria, calculation methodology, frequency, clinical setting, and international benchmark referenced from the selected sources. All indicators were then coded using the approved standards for coding, International Classification of Diseases 10th Revision Australian Modification (ICD-10-AM 10th Edition) for diagnoses, Saudi Billing System Version 2 (SBS) for procedures, and the Saudi Food and Drug Administration (SFDA) registration codes for medications. All steps and results were built into a user-friendly format using Excel.

Results

A standardized tool was created, incorporating population health indicators that address priority conditions and mapped across the continuum of care. Eight international sources were used to select an initial set of indicators based on predefined criteria. Out of the 130 long-listed indicators, 25 indicators were prioritized, specified, and coded. The tool was pilot tested with seven healthcare organizations and three insurance companies using the National Platform for Health Insurance Exchange System (NPHIES), demonstrating its feasibility and applicability within Saudi Arabia's private health sector. Of the 25 selected indicators, 12 were successfully implemented in real-world settings. Results of these indicators were visualized in dashboards using Power BI and shared with the pilot sites, tailored to their specific data.

Discussion/Conclusions

This tool offers a comprehensive view of population health, stratified by priority conditions and organizational level. Using casemix data and coding systems ensures a common language across all organizations, facilitating benchmarking and improving population health. Further testing and refinement are needed to improve the tool usability and quality.

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Enhancing casemix precision

Accuracy of DRG Relative Weights Calibration using Machine Learning versus Standard HSRV Methodology

Octavian Weiser [a]

Introduction

The standard methodology for calculating Diagnosis Related Groups (DRG) relative weights is based on the average costs associated with treating patients assigned to each DRG. This methodology involves estimating costs using a national 'cost-to-charge' (CCR) ratio for defined cost centers and standardizing these estimations to account for systematic differences across hospitals, such as geographic variations in wage levels, type of hospital (small, medium, large, teaching, etc.) and costs of living. The relative weight for each DRG is then determined by dividing the average standardized cost for discharges assigned to that DRG by the average standardized cost for all discharges, reflecting the relative resource intensity required for different types of care.

Methods

The "Hospital-Specific Relative Value (HSRV)" methodology tailors the calculation of relative weights, accounting for differences in case-mix between individual hospitals, in an iterative regression. Adjusting the hospital CMIs with newly calculated weights in each iteration is performed until convergence is achieved i.e. variance of CMIs between iterations is minimal. All methodologies employ statistical methods to eliminate LOS and/or financial outliers and adjust for cases that may skew results. With severity of illness systems (APR-DRG, IR-DRG, AR-DRG) monotonicity adjustments of the obtained relative weights are further applied to obtain increasing values with more severe groups of patients within each DRG split by severity of illness.

In a machine-learning (ML) approach using generated data, relativities between DRGs were estimated using raw charges instead of estimated costs, without outlier exclusion. The adjusted R2, variance and sensitivity (AUC) of the relative weights obtained using machine learning were compared with relative weights derived using the HSRV standard methodology.

Results

The study aims at discarding tedious cost/charge collection and validation steps from the legacy methods without significant accuracy loss, when predicting relative weights for inpatient encounter reimbursement.

Discussion/Conclusions

Extensive cost studies are needed to obtain the input data for determining the relative weights using the common methods described above. The calculation may be biased by several factors including the size of the sample, lack of randomization when including available hospital data from an unrepresentative cohort of hospitals, inaccurate assumptions for cost estimates or allocative cost algorithms rather than activity-based alternatives. Using a machine learning approach may reduce the recalibration project duration and may offer qualitatively similar relative weights when compared to the HSRV methodology.

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Clinical Documentation Improvement Framework for the Private Sector in the Kingdom of Saudi Arabia

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Introduction
As part of Vision 2030's healthcare transformation goals, the private health sector in Saudi Arabia is implementing new and innovative ways toward more transparency in healthcare financing and provision such as National Platform for Health Information Exchange Services (NPHIES), Saudi Billing System (SBS), Minimum Data Set (MDS) and AR-DRGs (Australian Refined Diagnosis Related Groups.) The Council of Health Insurance (CHI) has completed several strategic initiatives aimed at understanding and enhancing the quality of clinical documentation and coding in the private sector in a fair and transparent way. The main goals of these projects have been to 1) engage the private health care providers in improving the efficiency and quality of data through accurate and complete documentation and 2) enhance data and quality outcome transparency and allocate resources efficiently to achieve high-quality healthcare.

Methods
CHI completed a comprehensive evaluation of the current state of clinical documentation, in the private sector. This review included onsite interviews, workflow observations, and a clinical documentation improvement (CDI) audit of five hospitals. CHI also completed an international literature review of CDI best practices, guidelines, and a gap analysis against these best practices with the current state. Additionally, insurance claims were reviewed as well as the minimum data set requirements for providers to submit insurance claims to understand which data fields are currently being collected.

Results
A comprehensive Clinical Documentation Improvement framework was created along with an implementation and engagement plan with the private providers. Each of the hospitals that participated in the initial review and audit received custom summary of their results with recommendations. Aggregate results and observations have been shared with the private sector.

Discussion/Conclusions
We will review best practices and lessons learned for how a healthcare regulator, insurer and provider can begin to establish and implement clinical documentation improvement standards in an emerging market.

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Severity determination in French DRGs : towards the experimentation of a new model

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Introduction
In the beginning of 2020, France has started to study potential modifications in the determination of the severity index in both acute and non-acute care DRGs. Several mechanisms had been identified in order to improve the performance and readability of the new model. These improvements had required :

1. The design of new statistical methods specifically adapted to the problem of estimating the severity of diagnoses and their interactions - some of this work has been presented in PCSI 2022
2. The integration of medical knowledge at several key steps of the model,
3. The constant search for a compromise between simplicity, performance and readability

Lots of intensive statistical computations and medical proofreading led to the determination of the new model. Finally, five years after the beginning of the project, a first complete framework is going to be experimented on a national scale. The goal of the talk is to introduce this new framework.

Methods
The new model is based on ICD-10-FR and has two major modifications compared to the current ones (in both acute and non-acute cares).

First it computes a sub-index based on the combination of **all** pathological codes (a sub-list of ICD-10-FR) taking thus into account the multiplicity (as well as the individual severity) of diseases of the patient - instead of only the most severe. Particular attention was given to determining a subset of diagnoses that are not correlated with each other in a stay.

In a second time, the sub-index may be increased in the presence of specific social and environmental factors (based on another ICD-10-FR sub-list), as well as the age of the patient. In the current model, those socio-environmental factors are not properly distinguished from the "pathological" ones, thus mixing two different concepts.

Results
The new model produces strong improvements in the quality of both acute and non-acute care DRGs as measured by R^2. Besides statistical improvements, all stakeholders agree on the fact that the multiplicity of diseases is particularly important, as well as socio-environmental factors.

In fact, the formalization of medical knowledge and its implementation into models bring interpretable and strong results.

Lastly, the optimal number of severity level was questioned. It's a multifactor problem and has not been decided yet by stakeholders.

Conclusions
A new framework for severity determination has been introduced in acute and non-acute care DRGs producing strong improvements and differences with the current ones. Because 1) the economical redistributions of a such new model may be important and 2) its algorithmic complexity is higher, it has been decided to start in the current year a new experimentation before its future deployment. Several tools will allow each hospital to see in real-time the new grouping results besides the current one. These tools, associated with a lot of pedagogy, should allow all stakeholders to better evaluate the consequences, as well as the potential improvements emerging from this new paradigm.

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The LabTNS-CPSS toolkit for updating comorbidity scores refined by chronic conditions

Jean Nikiema [a], Azadeh Bayani [a], Michèle Bally [b]

Introduction

The Charlson and Elixhauser Comorbidity Indices (CCI, ECI) are commonly used for risk adjustments and mortality prediction for many clinical conditions [1,2]. Combining these indices into a single measure that accounts for shared comorbidities was found to be valid for predicting 30-day mortality in a Quebec population-based study [3] Although this work has a rigorous methodology, it has limitations that we aimed to address. First, the ICD-10-CA codes used to define the combined index date back to those proposed by [4] and are no longer contemporary in terms of included medical conditions, comorbidity sub-types, or component codes. Most importantly, this and all previous works on comorbidity indices assume that diagnoses reflect the current health status thereby ignoring the fact that the CCI and ECI are sensitive to the strategy for coding chronic disease. Health records may not reflect that chronic diseases persist over time and must be carried forward across encounters before computing a comorbidity score. We address these two issues by proposing the LabTNS-CPSS toolkit.

Methods

For updating the comorbidity indices we assessed components of the CCI and ECI proposed by Quan (2005) [4] and used in Simard (2018) [3] We updated each comorbidity index using the Canadian Institute for Health Information ICD-10-CA 2022 version. Wherever applicable, ICD-10-CA codes were mapped to all their most granular level to create a list of codes for each comorbidity comprised in the CCI and ECI. We then combined comorbidity categories based on their definition and common ICD codes. Any disagreements in coding or category definitions and assignments were resolved through discussions. For incorporating the chronicity of comorbidities in our new indices, we used the categorization of ICD-10-CM code into (1-Chronic, 0-Non Chronic, and 9-Unknow) provided by the Agency for Healthcare Research and Quality (AHRQ) [5] then created a mapping between the American version of ICD-10 (ICD-10-CM), ICD-10-CA and ICD-11 using SNOMED CT as a support. We further refined the chronic condition indicator by specifying a new category (2-incurable code). We operationalized the LabTNS-CPSS chronic condition indicator by selecting ICD codes categorized as 1 or 2 and assigning them to all consecutive healthcare encounters (if 2-incurable) or for encounters in the following year (if 1-chronic).

Results

We have developed an R package computing the LabTNS-CPSS Charlson and Elixhauser adaptations and their combination. The LabTNS-CPSS Combined Comorbidity Index is composed of 35 categories versus 17 for CCI and 31 for ECI. Compared with the code lists in [3] and [4] the LabTNS-CPSS adaptation has increased the mean number of individual codes by 52 for the ECI and 18 for the CCI.

The LabTNS-CPSS R toolkit is intended for use by researchers and public health practitioners in Canada. Because the CCI, ECI, and combined ECI-CCI score adaptations may be computed for each encounter that captures ICD codes they can assess longitudinal changes in comorbidity burden over time.

Discussion/Conclusions

The LabTNS-CPSS adaptation of the ECI-CCI Combined Comorbidity Index needs to undergo an assessment of its performance for predicting outcomes such as readmissions and length-of-stay.

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Posters

Strengthening Dermatological and Infectious Disease Surveillance and Care Delivery in Resource-Limited Settings: Lessons from Nepal

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Introduction

Nepal's healthcare system faces significant challenges in addressing dermatological and infectious diseases, particularly in remote and underserved areas. Conditions such as scabies, fungal infections, eczema, and cutaneous tuberculosis and neglected tropical diseases are prevalent, exacerbated by poverty, stigma, and limited access to specialized care. This study explores the integration of public health strategies- surveillance, mobile healthcare delivery, and community education-to enhance the diagnosis, treatment, and prevention of dermatological and infectious diseases. The hypothesis posits that combining surveillance with targeted interventions can reduce disease burden and strengthen care systems.

Methods

A mixed-methods approach was employed, integrating quantitative and qualitative data. Epidemiological surveillance involved 230 participants representing diverse socio-economic and geographic backgrounds. Prevalence data on dermatological and infectious diseases were collected through clinical examinations and interviews. Concurrently, barriers to care were assessed through focus group discussions with patients, caregivers, and healthcare workers. Interventions included mobile dermatology clinics, public health education campaigns, and the introduction of telemedicine for follow-up care. Statistical analysesevaluated the impact of interventions on access, adherence, and disease outcomes.

Results

The baseline prevalence of skin infections was 38%, with scabies (15%), fungal infections (12%), and eczema (8%) being the most common conditions. Access to care was significantly lower in remote regions, with 70% of respondents reporting inadequate dermatological services. Post-intervention, the prevalence of untreated skin conditions decreased by 35% ($p < 0.01$), with mobile clinics reaching 1,000 individuals and facilitating the treatment of 800 cases. Telemedicine consultations improved follow-up adherence by 45%, while educational campaigns led to a 30% increase in awareness of hygiene practices. Caregivers and healthcare workers highlighted increased community trust and reduced stigma surrounding dermatological conditions.

Conclusions

This study demonstrates that integrating surveillance systems with innovative public health interventions can effectively address dermatological and infectious diseases in resource-limited settings like Nepal. Mobile clinics and telemedicine emerged as cost- effective solutions to bridge healthcare gaps, while education campaigns addressed stigma and improved health-seeking behavior. These findings provide a replicable model for enhancing care delivery and disease prevention in other low-resource contexts globally. This study offers a roadmap for integrating public health and clinical dermatology approaches, highlighting their role in achieving equitable healthcare and addressing the unmet needs of vulnerable populations.

Keywords: Public health, telemedicine, community, resource poor setting.

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Optimizing Patient Care and Resource Allocation Through Electronic Medical Records and Health Insurance Integration in Nepal

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Introduction

Nepal is transitioning toward digital healthcare with initiatives like the Electronic Medical Records (EMR) system and the National Health Insurance Program (NHIP). This study evaluates how integrating EMRs with NHIP enhances patient classification, resource allocation, and health outcomes in dermatology and infectious diseases. It also explores the role of digital health in addressing healthcare disparities in Nepal's underserved regions.

Methods

A mixed-methods study involved 200 patients enrolled in NHIP. Baseline data on demographics, disease prevalence, and healthcare utilization were collected. Open source EMR systems were piloted to streamline patient HMIS data management, disease tracking, and service delivery. Data analysis included regression models to assess the impact of EMR integration on patient outcomes and NHIP efficiency. Surveys and interviews with healthcare providers explored barriers to implementation and the system's operational readiness.

Results

Initial findings show that integrating EMRs with NHIP reduced errors in claims management by 40% and improved service delivery times by 35% ($p < 0.01$). Dermatologic and infectious disease cases identified and prioritized for treatment increased by 25%, reflecting enhanced disease tracking capabilities. Providers reported better data accessibility and decision-making efficiency. Key barriers included limited technical skills (56% of providers required additional training) and infrastructural challenges such as unreliable electricity in remote areas.

Conclusions

The integration of EMRs with NHIP improves patient classification, resource allocation, and care quality in resource-limited settings. This scalable model can guide Nepal and similar contexts in adopting digital health strategies to enhance universal health coverage. Addressing implementation barriers and building technical capacity are crucial for sustained success. This study aligns with global priorities for digital transformation in healthcare, demonstrating the potential of EMRs in addressing healthcare disparities. It underscores the need for policy and infrastructure investments to ensure equitable and efficient healthcare delivery in developing countries.

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Improvement of Surgical Hierarchy Criteria in KDRG V4.6

Dayoung Yoon [a], Jiyeon Lee [a]

Introduction

In the Korean Diagnosis-Related Groups(KDRG) system, when a patient undergoes multiple surgeries during the same hospitalization period, the final disease group is determined based on a priority ranking. This ranking, referred to as Surgical Hierarchy, is primarily applied to surgical disease groups and is determined within each Major Diagnostic Category(MDC) based on factors such as resource consumption and the clinical characteristics of the procedures. The current Surgical Hierarchy Criteria were last revised in KDRG V4.0(2017) as part of a comprehensive update.

However, there has been a growing demand to reflect recent changes in the healthcare environment since 2021, beginning with a request from the Korean Association of Oral and Maxillofacial Surgeons to adjust certain disease group priorities. Therefore, this study aims to conduct a comprehensive review of the criteria used to determine Surgical Hierarchy Criteria, including standards for data analysis, and reset them accordingly.

Methods
To identify areas for improvement, this study compared the Surgical Hierarchy Criteria used in international patient classification systems such as Australia's AR-DRG V11.0 and the U.S. MS-DRG V40.0 with those in KDRG.

1. **Criteria for Data Analysis**: International systems use mean and median costs before and after excluding outlier cases, or mean costs and length of stay after outlier exclusion. In contrast, KDRG currently uses mean cost and length of stay data without excluding outlier.
2. **Clinical Characteristics of Procedures**: KDRG generally follows international standards but prioritizes laparoscopic surgeries over open surgeries.

This research analyzed changes in Surgical Hierarchy Criteria before and after modifying this criterion and sought expert consultation from clinical specialists and the Patient Classification System Review Committee, composed of experts from relevant medical societies within each MDC.

Results
This analysis found that in 88% of disease groups, the difference in mean treatment costs before and after excluding outlier was within 20%. As a result, it was decided to exclude outlier cases in the analysis to prevent errors in cost evaluation. If the difference exceeded 20%, additional factors such as length of stay were included in further analyses. Laparoscopic surgeries were found to have lower average costs than open surgeries, despite being assigned a higher priority. Therefore, this criterion was removed. Additionally, disease groups with the same surgical procedures but differing based on surgical sites (e.g.,Open paranasal sinus procedures [one sinus, unilateral] / D052 Open paranasal sinus procedures [one sinus, bilateral]) were grouped together, and their priority was determined based on weighted average treatment costs. Based on the revised criteria, 551 out of 710 reviewed disease groups (including surgical and medical procedures disease groups) had their Surgical Hierarchy adjusted. These changes were incorporated into KDRG V4.6, which was updated in January 2024.

Conclusions
By incorporating recent changes in the healthcare environment into KDRG's Surgical Hierarchy Criteria, this study has enhanced the accuracy of patient classification. Additionally, by actively considering both internal and external opinions, this research has improved the reliability of the system. These improvements are expected to enhance the discriminatory power of indicators based on patient classification and ultimately contribute to advancing the quality of healthcare in South Korea.

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Improving the Accuracy of the Patient Classification System through Refinement of Classification Variables

Dayoung Yoon [a], Jiyeon Lee [a]

Introduction
In South Korea, the patient classification system is widely used across various aspects of the healthcare system, including healthcare payment system and claims review. Therefore, to enhance the

accuracy of the patient classification system, periodic monitoring is conducted to review and refine classification criteria. In the Korean Diagnosis-Related Groups(KDRG) system, disease groups are categorized into surgical, medical procedures, and medical. For medical disease groups, the ADRG is primarily determined based on the principal diagnosis code. In the case of the medical disease groups R63(chemotherapy) and R67(radiation therapy), current diagnostic coding guidelines allow the assignment of specific diagnosis codes(Z51.0-2) even when chemotherapy or radiation therapy is not performed due to complications. This raises the need for further classification based on actual treatment implementation. Therefore, this study aims to refine the classification of patients in R63 and R67 disease groups by introducing additional classification variables beyond diagnosis codes.

Methods

This study reviewed the current classification variables of similar disease groups in KDRG V4.6. In the E67 (respiratory neoplasms) disease group, classification variables include not only the principal diagnosis code related to malignant respiratory neoplasms but also additional codes generated using charge codes for radiation therapy, injection fees, and chemotherapy drug codes from the billing claims. Following this approach, This research segmented the R63 and R67 disease groups using classification variables and conducted a resource consumption analysis (T-test, ANOVA, Duncan test).

Results

Currently, the R63 disease group is classified into three subgroups: R631 (with secondary acute leukemia*), R632 (without secondary acute leukemia), and R633 (without secondary acute leukemia, same-day discharge). When further subdividing the disease groups based on procedure codes and additional codes for classification variables, R631 did not meet the minimum case count criteria. Consequently, chemotherapy status was not separated built on the presence of secondary acute leukemia but was instead categorized into a single additional group. Hence, the R63 disease group was classified into four groups, meeting the minimum case count requirement accordingly. The resource consumption analysis revealed significant differences in the average medical costs among the groups, suggesting that further subdivision of the disease groups is feasible. The R67 disease group was subdivided using procedure codes as classification variables, and a resource consumption analysis was conducted. The results met the minimum case count criteria, and the P-value was <0.0001, indicating a significant difference in average medical costs among the groups. This suggests that further subdivision of the disease group is feasible. Additionally, considering the diagnostic coding guidelines, the disease group names were revised to R63 (Chemotherapy-Related Treatment) and R67 (Radiation Therapy-Related Treatment).

* Diagnosis Codes: C91.0, C92.0, C92.4~6/8, C93.0, C94.0, C94.2, C94.4, C95.0

Conclusions

By incorporating clinical case-based coding guidelines for primary diagnosis codes, the discriminative power of the classification variables was enhanced, ensuring greater accuracy in the patient classification system. Additionally, this refinement, which differentiates based on actual treatment status, is expected to have a positive impact on various aspects, including the healthcare payment system and claims review processes.

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Costing app - create your own tool or buy an established IT solution?

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Introduction
In 2021 we began preparing for the national cost analysis in cooperation with hospitals. The aim was to calculate new weights for DRGs that would be based on actual costs in Slovenian hospitals and would reflect Slovenian reality (in Slovenia, we have been using the Australian DRG system and weights for 20 years).

To:

- help control the data we received from hospitals,
- distribute costs per individual case,
- calculate weights,
- and prepare simulations of the impact on hospital revenues,

we wanted to use one of the existing IT solutions.

For this purpose, we researched the market and carried out a public procurement, which unfortunately failed due to the strict requirements of Slovenian legislation. Thus, we entered 2024, when new weights were to be calculated, without IT support, and there was no time left to repeat the procurement. Therefore, we decided to create our own costing application.

Methods
Hospitals sent us data in 2 ways: XML files with data on individual cases, and an Excel file with a general ledger cost matrix.

We used the R programming language to read the data and program the controls.

We exported the control results to Excel so that we could send them back to the hospitals, who, based on the findings of the controls, corrected the data.

We also programmed the entire methodology for cost distribution and weight calculation in R.

The data was then transferred to a BI tool. We use MicroStrategy in our institution.

We used Excel to simulate the impact of the new weights on hospital revenues.

Results
The dashboards in MicroStrategy allow for a detailed overview of costs by individual case, identification and analysis of outliers:

- We identified outliers and, by drilling into the data, determined the reason for it.
- We determined which hospitals were over- or under-coding.
- The calculated data also shows which hospitals are "expensive" in providing their services. We provided this data to the hospitals so they could benchmark.

Discussion/Conclusions
Advantages of such an approach:

- The team working on DRGs gained a lot of knowledge and understanding of the data and the costing methodology when developing the application.
- The costs of developing the application were minimal.

- The learning process of using the application would be the same even with purchased IT solution.
- We plan to further develop the application, as we want to transfer everything we did in Excel to it.

However:

- Our team's knowledge is limited.
- Not all processes are yet automated.
- Established costing SWs contain other functionalities, integrated controls, know-how.
- We do not want to be dependent on one employee who knows how to program in R.

Therefore, we plan to conduct another costing SW market survey when we will be able to evaluate existing solutions with greater knowledge and make an informed decision about further steps.

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Optimizing Healthcare Efficiency through Casemix Driven Machine Learning: A Predictive Model for High-risk Readmissions

Nebras Abu Al Hamayel [a], Sarah Alismail [a], Ahmed Alghamdi [a], Susan E. Young [a], Marija Tepegjozova [a], Shabab Alghamdi [a]

Introduction
Unplanned all cause readmissions not only strain hospital capacity, but also indicate gaps in care coordination and patient management. Leveraging casemix data and machine learning (ML) capabilities offers a promising approach to reduce preventable hospital readmissions, improve healthcare efficiency and improve patient outcomes. This study develops and validates an ML model for the early identification and prediction of patients at risk of readmission and provides methodology to identify hospitals with elevated readmissions rates.

Methods
We used the National Platform for Health and Insurance Exchange Services (NPHIES) claims data as the primary source to identify predictive factors associated with patient and hospital readmission risk. The dataset included approximately 17 million inpatient claims for more than 0.5 M unique patients from 228 hospitals, covering the period between May 2023 and May 2024, excluding potentially planned readmissions. Data preprocessing involved rigorous cleaning procedures to address inconsistencies, duplicates and missing values, with an AI-assisted quality assessment framework employed to rectify inaccuracies in patient demographics and invalid International Classification of Diseases 10th Revision Australian Modification (ICD-10-AM 10th Edition) codes. Feature engineering was performed to extract meaningful historical trends and enhance model performance. Multiple predictive models were developed and assessed, with gradient boosted trees emerging as the optimal model based on key performance metrics. Additionally, based on the expected/observed readmissions ratio, we developed a provider scoring methodology to assess hospital performance.

Results
The model's predictive performance was assessed using multiple evaluation metrics, including overall accuracy, recall, precision, F1-score, and area under the curve of the receiver operating characteristic (AUC-ROC). The best-performing model achieved scores on unseen data of 82.37, 61.18, 12.32, 20.51, and 72.18, respectively. Feature importance analysis, using Shapley Additive Explanations (SHAP), revealed that the top 3 most significant predictors are ICD-10-AM codes, hospital license, and the number of services and procedures provided during the inpatient admission. SHAP analysis also highlighted the interaction effects between length of stay, and number of services provided with

readmission risk, reinforcing the need for patient-specific risk assessment. To evaluate provider performance, a risk-adjusted provider scoring methodology was developed. This approach incorporated patient-level risk factors, including age, gender, principal diagnosis, length of stay, presence of secondary diagnoses, to adjust the expected-to-observed readmissions ratio. Hospitals were ranked based on their risk-adjusted readmission performance, allowing for more equitable benchmarking. A two-sided Poisson test was conducted to assess the statistical significance of deviations in provider performance, confirming meaningful variations in hospital-level readmission rates.

Discussion/Conclusions
This study highlights the role of casemix-driven ML models in identifying high risk factors, such as diagnoses codes and hospital characteristics, in predicting 30-days hospital readmissions. Utilizing flexible ML frameworks, such as gradient boosted trees, overcomes issues such as data imbalance, while having the possibility of having real time data prediction. Further work could explore model performance improvement by integration of comorbidity risks, chronic disease flags, and prior healthcare utilization patterns. Finally, interventions like better discharge planning, care coordination, chronic disease management, and optimizing resources could reduce readmission rates.

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Patient Classification Models, powerful tools in a healthcare emergency. A Data Driven Prioritisation Model for the Distribution of PPE.

Mike Norton [a], L. Gordon Moore [b]

Introduction
How might a health ministry, or health system use existing health information to inform a data-driven prioritisation model in response to a future health care emergency or pandemic (e.g. COVID-26) and how might they bridge the gap between supply and demand for PPE.?

Let's imagine you were in charge of health policy for the nearly five million people in the Valencia Region of Spain and you have only 3.6 million masks available for distribution to the public.

Methods
At the time, published (but commonly not peer reviewed) studies told us that those most at risk of poor prognosis should they contract the disease are older people and those with diabetes, chronic heart, lung, kidney disease and a few other conditions.

Because you have administrative healthcare data you might have chosen to use diagnosis codes to flag everyone with diabetes (for instance), but you're aware that some people with diabetes are relatively healthy and others are desperately ill. In addition to the wide variation in severity of diabetes, you know that a person's total burden of illness (and risk of poor prognosis) is predicted by co-morbidity: the number of chronic conditions, the severity of those conditions, the number of organ systems involved and more.

Another concern would have been that the list of conditions predicting poor prognosis for people who contract COVID-19 was relatively short. If chronic obstructive lung disease puts a person at high risk, what about cystic fibrosis or systemic lupus erythematosus with lung manifestations?

A potentially more elegant framework would include age, a broader list of diagnoses and an indication of hierarchically ranked co-morbidity status. Solventum CRGs are an example of a patient grouping classification/methodology capable of providing this level of information.

Results
The Ministry of Universal Health and Public Health of the Valencian Community resolved on April 15, 2020 to use the 3M CRG methodology to prioritize mask distribution. Using CRGs, the Region of Valencia identified the most vulnerable members of the population, who, if infected, would have been at the highest risk of hospitalization, admission to ICU or in need for mechanical respirator.

That is, all people over 65 years old and those citizens who were under 65 but with one of the following conditions: significant chronic disease in multiple organ systems (CRG Health status 6), dominant chronic disease in three or more organ systems (CRG Health status 7), malignancies underactive treatment (Health status 8) or catastrophic conditions (CRG Health status 9).

Conclusions
This is a good example of using patient grouping to achieve a more scientific prioritization framework in a pandemic. This framework can be applied to PPE distribution, identifying individuals who may choose to extend their social distancing because of their high risk of poor prognosis. It may also be useful for identifying those who should maybe not try to "ride it out" at home if they contract the disease.

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Validation of the translation and mapping of standard procedure classifications from different health systems using the OHDSI Usagi tool

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Introduction
Procedure classifications like the Swiss procedure catalogue CHOP (1) or the German procedure catalogue OPS (2) often contain similar content, but differ on granular level and in hierarchical structure and format. Therefore, translation and / or mapping done either manually or automated is time-consuming and prone to errors. With data interoperability gaining importance in the provision of health care and in international research, supporting tools are essential. The Observational Health Data Sciences and Informatics (OHDSI) team offers the Usagi tool (3) to help in (auto-) mapping codes from a source system into standard terminologies. Source codes (English) are loaded into the Usagi and are connected to standard concepts.

The aim of the study was to test the Usagi term similarity approach as a validation for large datasets of translated and mapped procedure catalogues from different coding systems.

Methods
A representative sample of terms from the CHOP catalogue which had been translated and mapped to terms from the OPS catalogue was loaded into Usagi. The English translation of the Swiss and the corresponding German catalogue entries were automapped by Usagi to the Systematized Nomenclature of Medicine - Clinical Terms (SNOMED CT) (4) concepts as a standard terminology. The agreement of the SNOMED CT identifier pairs (semantic match) was compared and rated (narrower, broader, equivalent, exact).

Results
Rating of the Usagi automapping: 52 of 494 SNOMED CT concept pairs (10.5%) were rated as equal (identical SNOMED CT concept identifier) and 20 of 494 (4.1%) as semantically equivalent (different SNOMED CT concept identifier). 273 (55.3%) concept pairs in total were rated as equal, equivalent, narrower or wider.

User experience and efficiency: sufficient workflow support, efficient automapping and validation

Discussion/Conclusions

The Usagi tool provides the possibility to support content and workflow for automapping and efficient validation. However, with only 55.3% acceptable matches the translated catalogues from different national health systems cannot be sufficiently linked without manual correction.

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