INTERNATIONAL SOCIETY FOR PHARMACOECONOMICS AND OUTCOMES RESEARCH
ISPOR NEW ZEALAND CHAPTER

ISPOR (NZ) NEWS ● ISSUE 3, 2018

PUTTING THE COST INTO COST-EFFECTIVENESS

ISPOR (NZ) Workshop, 17 October 2018, "Front + Centre", Wellington

Our third issue of ISPOR (NZ) NEWS for 2018 provides an overview of the recent ISPOR (NZ) hosted workshop on October 17, 2018, at "Front + Centre", Wellington.

The workshop responded to ISPOR members' requests for practical, applicable information for application in health technology assessment. Five main speakers provided just that, presenting on a range of subjects aligned with the workshop's emphasis on cost aspects of economic analysis.

For the first time, the ISPOR workshop provided the opportunity for students to present a summary of progress or findings from research relevant to ISPOR (NZ). We were delighted to hear from three students and former students. The audience included New Zealand based experts working throughout the country either operating independently or working in a wide variety of roles, including in District Health Boards (DHBs), PHARMAC, ACC, universities and the pharmaceutical industry.

This newsletter presents an overview of each presentation, or brief details where publication is pending. Slides for a selection of papers are available from the IPSOR (NZ) website at **http://www.ispor.org.nz/**.

SAVE THE DATE: ISPOR (NZ) AGM, 10 APRIL 2019

The 2019 ISPOR AGM will be held on **Wednesday 10 April** at Auckland City Hospital.

We are working to finalise the programme of presentations relevant to those interested in health technology economics and outcomes research, and will announce further details in due course.

We welcome offers of presentations. There will also be a section for current or recent students to give brief talks on their work. Contact us at **ispornewzealand@gmail.com**.

Morning tea and lunch will be served, offering attendees the opportunity to make valuable professional connections. **Save the date** to be sure you don't miss out on this opportunity.

BUT WHERE DO THE DATA COME FROM?

In the opening presentation, **Andrew Wooding**, Clinical Coding Training and Quality Coordinator at Auckland DHB, presented an overview of the complex system used to code inpatient data for inclusion in the National Minimum Dataset (NMDS). Patient records provide the source information from which ICD-10-AM and ACHI classifications for diseases and procedures are assigned and DRG (diagnosis-related group) codes are derived.

The NMDS provides a rich data source which benefits from the single Health Care User identifier (HCU; commonly referred to as the NHI or national health identifier), a long history of data (back to 1948) and the ability to edit codes to allow comprehensive description, for example specifying the detail of how an accident happened. Because of the complexity in ICD-10 coding, Andrew advises those obtaining data from NMDS to request an edited code description to clarify cases that are included.

Documentation for coding comes from any health professional adding data to the clinical record. These data are

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held locally before coding and addition to the NMDS. Coding involves analysis of the record of care to assign one (or more) of 23,000 specific ICD-10-AM/ACHI codes. The codeset for an event is put through a Grouper and an Australian Refined DRG (AR-DRG) code is calculated. These DRG codes are used for reporting and for funding, with hospital revenue calculated based on WIES (Weighted Inlier Equivalent Separations). See Figure 1.

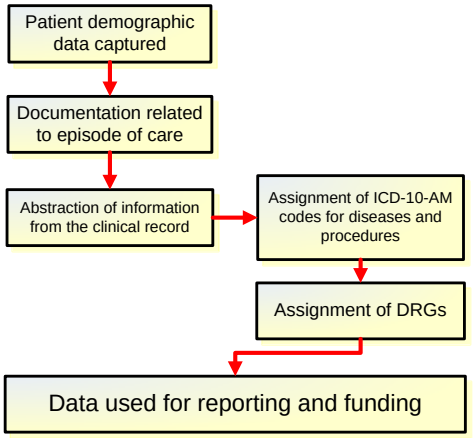

Figure 1: From documentation to data

Coding applies to any inpatient event where the patient receives three hours or more assessment/treatment (excluding waiting time and triage) or a general anaesthetic. 'Assessment/treatment' refers to "clinical assessment, treatment, therapy, advice, diagnostic or investigatory procedures from a nurse or doctor or other health professional, and may include observation". Other specific events, such as a patient dying, being born or delivered, are also coded.

Publicly-funded healthcare events meeting these criteria are coded, including those which take place in a private setting. There is no legal requirement for privately-funded inpatient events to be coded although some trust-funded hospitals will code events. An estimated 10% of inpatient events are missing from the NMDS because of uncoded private hospital work.

Andrew highlighted the responsibility of each clinician to provide, complete, timely, legible and specific data emphasising that "if it's not documented, it didn't happen". However, it is significant that the record is not written for the coder but for clinical record and referral. Thus, coders are responsible for gleaning the critical information needed to correctly code from these clinical notes.

Critically, the code assigned as the Principal Diagnosis (PDx) refers to the underlying cause or event that brought the patient to hospital, yet this may not be the diagnosis that takes the bulk of clinical attention and creates associated costs. The example raised by Andrew was that of a patient attending hospital for bunion treatment who suffers from and is treated for a stroke on site. The bunion will still be identified as the PDx.

Additional diagnoses can be coded and arise in two "flavours": comorbidities (that co-exist with the principal diagnosis) and complications (that arise during the episode of admitted patient care). Additional diagnoses are coded if they affect patient management by requiring commencement, alteration or adjustment of therapeutic treatment, diagnostic procedures and/or increased clinical care and/or monitoring.

Andrew reviewed several cases to demonstrate the application of relevant information from the record to identify principal and additional diagnoses and principal procedures to determine the applicable DRG. One specific case of a patient admitted with headache and the process of applying information from the record to use principal diagnoses, procedures and comorbidities to identify the relevant DRG is shown in Table 1 (the costweights and WIES are based on the 2018/19 Casemix document).

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Table 1: Using PDx, procedures and comorbidities to identify DRG

Timeline of events in hospital included in patient record	*Principal diagnosis (PDx) based on information to that point*	*Additional diagnosis (ADx) based on information to that point*	*Principal procedure [PProc]*	*Identified AR-DRG*	*Hospital revenue (associated WIES)*
Patient admitted with headache (receiving three hours or more of assessment/treatment)	R51 *Headache*	-	-	B77Z – Headache	$2,024.63 (0.4350)
Subdural haemorrhage identified in CT scan	I62.0 *Subdural haemorrhage*	-	-	B70C – Stroke w/o cat/sev CC (catastrophic or severe complications)	$4,930.89 (0.9729)
Subdural haemorrhage drained	-	-	39600-00 *Drainage of ICH*	B02C – Craniotomy w/o cat/sev CC	$19,787.15 (3.9042)
Physio attended for hemiplegia (co-morbidity)	-	G81.9 *Hemiplegia*	-	B02B – Craniotomy w Sev CC	$32,567.22 (6.4277)
Slow-K prescribed for low potassium identified in lab result (co-morbidity)	-	E87.6 *Hypokalaemia*	-	B02A – Craniotomy w Cat CC	$37,865.42 (7.4713)

A core requirement of coders is consistency and structures in place to achieve national consistency include a New Zealand Coding Committee. Overcoding can be an issue and training is applied widely. New Zealand applies the rules from the Australian Coding Standards (ACS) for ICD-10-AM (available as part of the full set of coding manuals), which also typically provide the framework against which coding is audited.

Funding for New Zealand DHBs

New Zealand uses population based funding for its 20 DHBs. The national casemix system forms the basis for purchasing inpatient hospital services, using relative weighting by DRG and a casemix unit price, set each year. Casemix based funding provides medical, surgical, obstetric and neonatal inpatient services and accounts for between 28 and 29% of all DHB funding. Other services such as outpatient, emergency department, mental health, rehabilitation, disability support and health of older people are funded by a different method.

The casemix system comprises:

1. Clinical coding classification, using the International Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) and the Australian Classification of Health Interventions (ACHI) 8th. The Australian Coding Standards (ACS) guide coding conventions, providing guidelines for identifying eligible and ineligible diagnoses and procedures.
2. The Australian Refined Diagnosis Related Groups (AR-DRG version 7.0), adapted to the coding classification, for use in New Zealand.
3. Cost weights, weighted inlier equivalent separations (WIES) adapted to the AR-DRGs used, to provide consistency in payment for clinically similar services and resource consumption.
4. The Casemix Framework Document (CFD) specifies which events in the National Minimum Data Set (NMDS) are casemix funded.
5. The NZ Ministry of Health Common Counting Standards and Purchase Unit dictionary define care in alignment with coding for costing.

Non-casemix consumption (eg, non-admitted contacts such as ultrasound scans, antenatal, or health professional services) purchase units and their respective costs can be sourced from Purchase unit prices 2018–19 from National Costing Collection and Pricing Programme (NCCP).

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STRENGTHENING DECISION MAKING USING LOCAL DATA: A CASE STUDY

Anita Fitzgerald is a Scientific Research Consultant for the Northern Region Clinical Practice Committee (NZ).

The committee assesses new technologies (including medicines, medical devices, diagnostic tests and services) and produces hospital-based health technology assessments in response to the need for time-critical, evidence-based decision-making within the hospital.

Anita shared details of one of the Committee's current projects regarding an antibiotic-eluting envelope intended to reduce infection rates associated with implantable cardiac devices. Published evidence was scarce but the Committee was able to obtain local hospital data for patients who had received an implantable device over a defined period and made recommendations about the use of the envelopes to the Northern Region DHBs based on this data.

Despite limitations of the published evidence, this project highlighted the usefulness of local data in hospital-based decision making.

PREPARING FOR THE SCAVENGER HUNTER: THE EPIDEMIOLOGICAL BASE FOR A COST –OF-ILLNESS STUDY

Richard Milne is a private consultant in health technology assessment and Associate Professor in the School of Pharmacy at the University of Auckland. He provided an overview of the epidemiological base for a current study of the cost of illness of multiple myeloma in New Zealand, being undertaken for Myeloma New Zealand by Health Outcomes Associates Ltd.

(The cost generation process for the study is covered in the presentation by the "scavenger hunter" Matt Boyd, see page 6).

The following national datasets ("Big Data") were used to inform this study, linked at patient level by the national healthcare user (HCU) identifier (National Health Index, NHI):

- New Zealand Cancer Register (ICD10 C90: limited to 2004-2016 as there had been a change in descriptive diagnosis in 2003)
- New Zealand Mortality Register
- National Minimum Dataset (NMDS)
- National Pharmaceutical Collection
- Department of Internal Affairs Collection.

Richard noted that, because of the large number of drugs used in myeloma, the epidemiological section of the study focuses on two novel treatments, which are combined with older treatments.

Multiple myeloma ranked 13th in cancer registrations in New Zealand (2011–2013) with estimated prevalence in 2018 of at least 2500 (60% male). Richard reviewed several aspects of the epidemiology of multiple myeloma, the causal basis of which remains poorly understood. For example, there has been dramatic growth in multiple myeloma annual registrations over 14 years, which is maintained after age standardisation (myeloma is age-dependent and predominantly a disease of the elderly). Yet the mortality rate has remained stable since 2004, indicating improved management.

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Incidence rates vary by DHB of domicile, with higher rates in those DHBs with higher proportions of individuals in the more deprived sections of the population, compared to the national average. Further analyses across each of four cancer network regions in New Zealand continue to show quite large variations in incidence across regions.

Incidence rates vary by ethnic groups: the overall age standardised incidence rate in the period 2012-2016 was 5.19 per 100,000 but it was higher in Pacific (10.13) and Maori (7.19) populations and lower in Asian populations (3.51). Ethnicity also had a marked effect on survival of younger individuals, but this effect was not evident for those aged over 70 years (Figure 2). Further analysis suggests deprivation as one of the underlying causes of this, possibly impacting on uptake of specific novel treatments. Analysis of overall survival by deprivation quintile shows that those from domicile areas with higher deprivation scores had poorer survival (Figure 3).

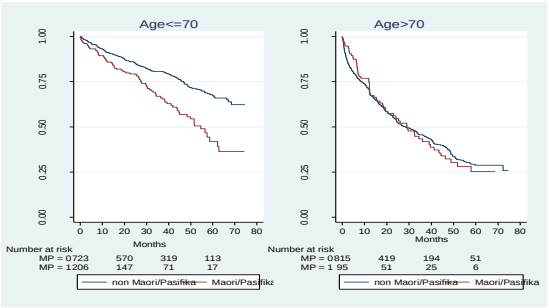

Figure 2: Effect of ethnicity on survival

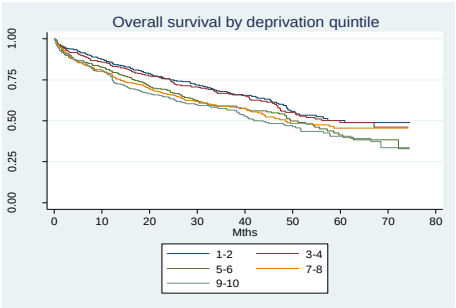

Figure 3: Overall survival by deprivation quintile

The two funded novel therapies for multiple myeloma in New Zealand are autologous stem cell transplant and the proteasome inhibitor, bortezomib. There are marked regional differences in rates of use, for example 17% of patients in Midland region received neither treatment compared with 28% in Central region.

There has been a substantial improvement in survival since bortezomib was funded in 2011, especially for individuals over 70 years of age (Figure 4) and the impact on survival was dose dependent (Figure 5).

Multivariate analysis confirmed that while deprivation is a key prognostic factor in survival, ethnicity is not, confirming that it is deprivation associated with ethnicity that affects disease and prognosis. Use of the two novel therapies has the highest impact on prognosis, yet uptake of treatment, while significant, could be improved. Age at registration is a prognostic factor. Critically, region is a significant prognostic factor, with individuals in Northern region faring better than others, although the reasons remain unclear.

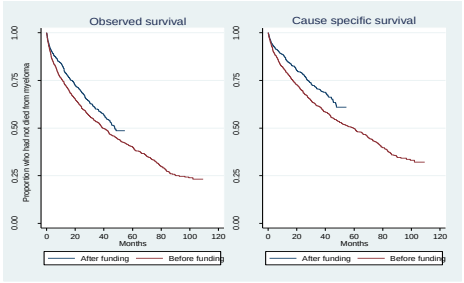

Figure 4: Overall and cause-specific survival before and after bortezomib funding May 2011

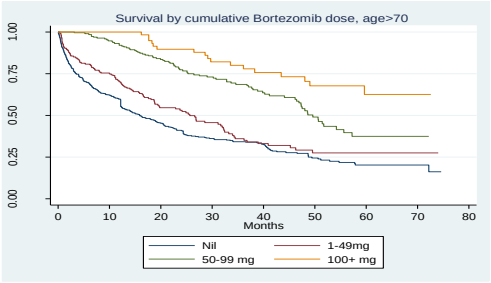

Figure 5: Survival by cumulative bortezomib dose

In summary, age-standardised registrations for multiple myeloma are increasing and five-year survival is poor but improving, probably as a result of stem cell transplant and the proteasome inhibitor bortezomib. Age at diagnosis, socioeconomic deprivation and living south of Auckland region mitigate against survival. Further work is needed to establish causes of regional differences and funding is required for better therapies which are available abroad but not yet funded in New Zealand. This study provides the basis for costing myeloma and its therapies.

PUTTING THE COST INTO COST-EFFECTIVENESS

THE SCAVENGER HUNTER: ONE ANALYST'S EXPERIENCE IN OBTAINING COST-OF-ILLNESS DATA IN NEW ZEALAND

Dr Matt Boyd is a private research contractor and freelance academic who has conducted analyses for the former National Health Committee, Ministry of Health, Health Quality and Safety Commission, and the Burden of Disease Epidemiology, Equity and Cost-Effectiveness (BODE3) Programme.

Matt described processes for obtaining cost data in New Zealand for economic evaluations, cost-of-illness studies, or for other analytical purposes. He also made reference to collating costs for the multiple myeloma study introduced in Richard Milne's presentation (see page 4).

The Integrated Data Infrastructure (IDI) includes a range of health data sets and provides a key start point in New Zealand. However, IDI data quality is variable and some data sets, such as the laboratory claims database, are incomplete. Some but not all datasets include cost data.

Matt gave an overview of approaches for collating costs of inpatient care, outpatient care, primary care, pharmaceuticals, laboratory tests and imaging, including the points that follow. He then presented a series of short case studies and specific approaches and the challenges involved with identifying costs in each.

Inpatient data from the National Minimum Dataset (NMDS) provides cost approximations using case weights, although it offers what Matt described as a somewhat coarse grained analysis.

Outpatient data can be more challenging. The IDI outpatient database shows events but no associated costs. Cost data can be sourced from a range of sources including the PHARMAC cost resource model, the purchase unit price to DHBs and the individual DHB charges to non-residents.

Estimating primary care costs is more straightforward, albeit with the need to use subsidy and/or patient co-payments as required, but it can be difficult to obtain volumes.

PHARMAC data in the IDI has all cost data although included cost components vary. It is important to be familiar with the data dictionary and use the cost variables fit for a particular analysis. The PHARMAC schedule provides list prices for pharmaceuticals but costing pharmaceuticals is complicated by confidential rebates on pharmaceutical costs. Although the total annual rebate figure is estimated at 2.7% of total pharmaceutical spend ($21.2m of $800m in 2015/6), this estimate is of little use in cost estimations for individual items as there are known much higher rebates for specific pharmaceuticals (an average 44% of total spend for those pharmaceuticals with rebates).

Available figures for laboratory tests vary between laboratory sites and need to be analysed to determine included specifics, for example FISH testing (fluorescence in situ hybridisation) for myeloma is performed on enriched plasma cells, incurring a different process charge than "ordinary" FISH.

The laboratory test volume data in IDI is an incomplete record of community lab tests and excludes testing that takes place internally in DHBs, which often represent the more complex tests.

For both imaging and lab tests, a mean cost estimated using charges published online by several providers generally provides a more appropriate estimate than using one individual cited cost. Matt highlighted this approachas a general principle, ie, even after narrowing in on apparent cost, it is important to model that uncertainty, sampling from a distribution to ensure some degree of confidence.

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Private health care costs may need to be accounted for, for example in cost-of-illness analyses. Private health care costs account for about 20% of total health expenditure (2007 data). Thus, in lieu of determining all private costs, a simple calculation can be used to estimate total health expenditure from public health care costs.

Process findings of interest from estimating costs for the cost-of-illness study for multiple myeloma, which is pending publication, emphasised issues with excluded items and the importance of double checking data.

At one New Zealand hospital it is standard practice for all new myeloma patients to have a full body MRI and this may become standard practice. Multi-body-region MRI undertaken in private radiology practice can exceed $3000 in New Zealand but will not be included in the IDI.

Additional non-laboratory diagnostic tests undertaken in the community may not be captured by NMDS or NNPAC (National Non-Admitted Patient Collection). Tests such as echocardiography or lung-function testing will add upwards of $300 per investigation.

Matt also identified additional laboratory costs that have not been counted. For example, the cost per patient of a FISH analysis (assuming three probes) is approximately $1500. If patients eligible for stem cell transplant (usually those under 70 years of age) routinely have such analysis, perhaps through a DHB internal hospital laboratory, then this could add up to $300,000 if half of newly diagnosed patients are tested.

A breast cancer costing case study highlighted that bottom up costing tends to result in a lower than real cost, typically because of the risk of missed elements such as overheads or consumables. Bottom up costing for infusions to treat anaemia using PHARMAC's 2015 cost resource manual prices produced an estimate of $1011 compared with the 2008–9 national average purchase unit cost for oncology blood transfusion of $1109.

Matt highlighted the very real benefit that could arise from a New Zealand Health System Costs Wiki operating as a collaborative community website which could be used to add and collate costs that exist across multiple sources (for example as illustrated in Figure 6).

A study that Matt recently completed for the Australian organisation Community and Patient Preference Research concluded that we need more cost-effectiveness studies on real-world data, but in order to do these studies efficiently, we need better data repositories for costs and outcomes.

Figure 6: Optional format for a New Zealand Health System Cost WIki

Matt closed with the following summary points:

- Don't believe everything you find or are told
- Have an idea of what you expect the numbers to be and explore any discrepancies
- Seek multiple sources and either select a fit for purpose figure or take a mean
- If resources allow, model uncertainty which is often quite high
- Preserve working for future projects, possibly with a Wiki.

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ECONOMIC ANALYSIS OF NEONATAL HYPOGLYCAEMIA

Dr Matt Glasgow is a medically-trained doctor with a background in health informatics and clinical decision support system design, currently undertaking PhD research at the Liggins Institute, University of Auckland. Working within the LiFePATH group, Matt is performing economic analyses related to the management of neonatal hypoglycaemia (NH), high blood sugars that can affect newborn babies shortly after birth.

NH is a common metabolic condition affects to 15% of babies overall, with much higher rates in in some at-risk groups, for example up to 50% in babies of diabetic mothers, and 66% in preterm infants.

NH can have severe lifelong consequences including epilepsy, cerebral palsy, or learning difficulties, yet is easily treated at relatively low cost. If identified early and treated to maintain blood glucose above 2.6 mmol/L, there is no association with neurodevelopment at two years of age.

Matt's research is in the form of a series of analyses examining burden of NH and costs and utilities associated with aspects of its management within both short-term time horizons and patient's lifetime.

The first two completed analyses used incidence data for at-risk infants extracted from the raw data from the Sugar Babies Study. This 2013 study showed that dextrose gel treatment (when compared to placebo) is well-tolerated and results in fewer instances of treatment failure and fewer NICU admissions for hypoglycaemia.

The first case examined cot-side screening of at-risk infants.[1] Using incidence data from the Sugar Babies Study to establish required test numbers, Matt completed a bottom-up analysis to establish costs of consumables and staff time associated with non-enzymatic glucometers (which require that abnormal results are laboratory verified) and enzymatic glucometers based on a glucose oxidase reaction (which, while more expensive, can directly inform management without re-testing).

Assuming that non-enzymatic glucometer testing is accurate and that all low non-enzymatic test results are confirmed by laboratory testing, there is a difference in costs which is small but enough to justify use of the upgraded glucometer (costs of NZ$86.94 and NZ$97.08 per infant screened for enzymatic glucometer and non-enzymatic glucometer with laboratory confirmation, respectively).

The subsequent analysis of costs for dextrose gel for treating NH used the Sugar Babies Study data to model proportions of at-risk infants and estimated costs for consumables and staff time.[2] Base case analysis showed a cost difference of $1,314 per patient in favour of initial treatment with dextrose gel (cost of $6,863 for a single patient with NH for the dextrose gel arm, compared with $8,178 if that patient were initially treated with standard care/increased feeding only). The proportion of infants admitted to NICU and length of stay accounted for the majority of difference in costs.

Are you a student with a recent PhD submission or degree graduation?

If you have just submitted a PhD or graduated from a Bachelor/Masters/PhD in a research area relevant to IPSOR (NZ), we would be delighted to publish a short summary of up to 300 words outlining your work in our newsletter.

Please email your name, the degree, title of your thesis and date of submission/graduation to ispornewzealand@gmail.com.

This opportunity is limited to current ISPOR (NZ) members.

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A series of sensitivity analyses were used to test the impact of various realistic scenarios in the base case, varying parameters such as the caesarean section rate and the primary pricing components (refer Table 2). NICU cost per day had the greatest contribution to the overall cost difference between the modelled patient groups. Dextrose gel remained cost saving in all scenarios, even when NICU daily costs were reduced well below the range expected for management in that venue.

The next stage in analyses is to examine the cost-utility of dextrose gel for preventing NH, and will include modelling of the proportions of complications and combinations of complications in infants expected amongst those who do or do not experience NH.

Costs will be based on systematic review of annual direct medical costs per patient and utilities will be drawn from published catalogues of utilities for chronic childhood conditions. Key challenges include paucity of data, heterogeneity of methodologies and the range of parameters for comorbid conditions.

Table 2: Cost analysis of dextrose gel for treating NH: results of base case and sensitivity analyses

Scenario	Dextrose Gel (SD)	Placebo (SD)	Difference (SD)
Base case	$6,863 ($345)	$8,178 ($411)	**$1,314** ($535)
Caesarean section rate reduced to 20%	$6,125 ($317)	$7,713 ($431)	**$1,587** ($538)
Dextrose gel dose cost reduced to $1.29 Maximum doses per container	$6,803 ($347)	$8,156 ($406)	**$1,352** ($539)
Dextrose gel dose cost increased to $86 Single dose per container	$6,974 ($347)	$8,178 ($408)	**$1,204** ($539)
NICU cost per day decreased to $1,100	$5,798 ($229)	$6,464 ($254)	**$665** ($344)
NICU cost per day increased to $3,200	$7,767 ($460)	$9,698 ($568)	**$1,931** ($725)

Once these are overcome and the cost-utility of NH prophylaxis is known, Matt will continue with the latter parts of his PhD research, identifying knowledge and information gaps and establishing the cost-utility of implementing new guidelines incorporating revised practice.

Publication:

1. Glasgow MJ, Harding JE, Edlin R. Cost Analysis of Cot-Side Screening Methods for Neonatal Hypoglycaemia. Neonatology. 2018;114:155–162.
2. Glasgow MJ, Harding JE, Edlin R. Cost Analysis of Treating Neonatal Hypoglycemia with Dextrose Gel. J Pediatr. 2018 Jul;198:151–155.

THE COST-EFFECTIVENESS OF FIXED-DOSE COMBINATIONS FOR PREVENTATIVE CARDIOVASCULAR PHARMACOTHERAPY

Tal Sharrock is a health economist at PHARMAC. She presented the findings of her public health master's thesis completed with the BODE3 research group at the University of Otago in Wellington. Her thesis investigated the cost-effectiveness of a two-agent, multi-risk factor, fixed-dose combination pharmaceutical compared to the equivalent monotherapies as a primary preventive measure for cardiovascular disease (CVD) in New Zealand.

Non-adherence to pharmaceuticals is multi-factorial and can be influenced by several factors including doctor-patient relationship, patient age and education, perceived need for treatment and pill burden. Large pill burden is a noted issue in CVD with people routinely on three to five pharmaceuticals for CVD alone. Many have even higher pill burdens due to the pharmaceutical management of co-existing comorbidities. Fixed-dose combinations provide one strategy to reduce large pill burden.

Combining two or more pharmaceuticals into a single fixed-dose combination in this way can address evident issues of non-adherence to CVD pharmaceutical regimens and ensure the intended positive impact of the pharmaceuticals is realised. Achieving better risk factor control has the potential to improve the health of individuals and produce health system savings through a reduction in CVD events.

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Tal's thesis considered the cost-effectiveness of a fixed-dose combination of amlodipine and atorvastatin (FDC AA) compared with amlodipine and atorvastatin monotherapy (A+A) in reducing the incidence of CVD in New Zealand men aged 60-64 years who were alive in 2011 without prevalent CVD and not currently taking CVD pharmaceuticals. The multi-state lifetable model used was adapted from an existing BODE3 model. As part of the model adaptation, the population was stratified by absolute CVD risk to allow the cost-effectiveness by CVD risk to be determined. See Table 3.

Base case results showed that overall and across all CVD risk strata, switching from A+A to the FDC AA was a cost saving to very cost-effective intervention for the primary prevention of CVD in New Zealand (Table 4). In addition, the base case results demonstrated that the:

- Absolute health gain and cost-savings are greatest in lower CVD risk strata (driven by population size) and decreased as CVD risk increased.
- Health gain per capita was largest in those with the higher CVD (ie, high capacity to benefit) which may provide a rationale to prioritise targeted treatment.
- There are similar per capita health gains between Māori and non-Māori in lower risk strata.

Table 3: Cost analysis of dextrose gel for treating NH: results of base case and sensitivity analyses

CVD risk strata	Non-Māori	Māori
Risk stratum 5: >20% (highest risk)	58	42
Risk stratum 4: >15%, ≤20%	273	162
Risk stratum 3: >10%, ≤15%	1941	739
Risk stratum 2: >5%, ≤10%	20,194	2500
Risk stratum 1: >0%, ≤5% (lowest risk)	37,464	837
Risk strata combined	59,930	4280

A variety of scenario and sensitivity analyses were considered. Two of the major drivers of the cost-effectiveness were efficacy and uptake. Despite this, switching from A+A to FDC AA remained cost-saving.

Further research in other age/sex groups and with other types of CVD FDCs is required to increase the generalisability of these results. The results of this thesis provide strong support for health authorities in high-income countries, such as New Zealand, to consider the availability of FDCs for CVD and the inclusion of such FDCs in CVD prevention guidelines, placing a higher value on reducing pill burden and improving adherence.

Note: The model used is still being updated. This is unlikely to change the results presented in any significant manner.

Table 4: Additional health gain (QALYs), additional cost-offsets (savings) and incremental cost-effectiveness ratio if New Zealand men aged 60-64 years in 2011 switched from A+A to FDC AA – Base case (5-year intervention, life-time horizon, 3% annual discount rate)

Risk Strata: five-year absolute CVD risk	Non-Māori QALYs gained	Māori QALYs gained	QALYs gained (ethnic groupings combined)	Cost-offsets Ethnic groupings combined (NZ$2011 million)	ICER (NZ$ per QALY) All ethnic groups
A. Overall					
Risk Stratum 5: >20%	1.93 (1.17 to 5.05)	1.30 (0.97 to 3.77)	3.23 (1.42 to 7.80)	$-0.009 ($-0.034 to $0.012)	Cost-saving (Cost-saving to$3,940)
Risk Stratum 4: >15%, ≤20%	6.79 (3.80 to 17.8)	3.83 (2.96 to 10.9)	10.6 (4.40 to 26.1)	$-0.049 ($-0.139 to $0.027)	Cost-saving (Cost-saving to $3,570)
Risk Stratum 3: >10%, ≤15%	32.2 (14.2 to 80.0)	12.6 (8.04 to 34.4)	44.7 (15.6 to 105)	$-0.324 ($-0.825 to $0.147)	Cost-saving (Cost-saving to $4,000)
Risk Stratum 2: >5%, ≤10	168 (84.1 to 429)	24.8 (13.6 to 67.6)	193 (81.5 to 474)	$-2.53 ($-6.25 to $0.822)	Cost-saving (Cost-saving to $3,160)
Risk Stratum 1: >0%, ≤5%	163 (74.1 to 404)	4.72 (2.61 to 12.3)	167 (73.0 to 412)	$-3.41 ($-7.63 to $0.535)	Cost-saving (Cost-saving to $2.12)
Risk Strata Combined	76.8 (0 to 636)	9.89 (0 to 49.2)	86.2 (0 to 386)	$-1.24 ($-6.10 to $0.028)	Costs-saving (cost-saving to $3,570)
B. QALYs / 1,000 people & $ per person who received either pharmaceutical regimen at the start of the model (uptake)					
Risk Stratum 5	87.6	68.8	78.1	-$221	–
Risk Stratum 4	67.2	52.5	59.5	-$275	–
Risk Stratum 3	43.7	37.9	41.5	-$301	–
Risk Stratum 2	21.9	22.0	21.9	-$287	–
Risk Stratum 1	11.4	12.5	11.4	-$233	–

Range represents the 95% uncertainty interval (95%UI) of 2000 Monte Carlo simulations per risk stratum
Note: approximately 8% of the 2000 Monte Carlo simulations were excluded from calculations due to the occurrence of negative QALYs. Negative QALYs occurred due to the two pharmaceutical regimens being modelled sequentially and subtracting the respective outputs. Had the regimens been modelled in parallel, negative QALYs would not have been possible QALYs (quality-adjusted life-years): ICER (incremental cost-effectiveness ratio. All numbers rounded to three meaningful digits

PUTTING THE COST INTO COST-EFFECTIVENESS

BARIATRIC SURGERY IN NEW ZEALAND

Monica Garrett is a senior medical student from Auckland University. She is currently working towards her Bachelor of Medical Science with Honours degree. She will return for her final year of medical school in 2019, based at Rotorua Hospital.

Monica's presentation described her analysis on the provision of bariatric surgery in New Zealand over the last 14 years. This research is pending publication and is provided here in abstract format.

Bariatric surgery in New Zealand: a retrospective analysis of prevalence, post-operative medication changes and cardiovascular risk prediction

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Introduction

Rising obesity rates are contributing to a significant healthcare burden in New Zealand. Bariatric surgery is an effective intervention for facilitating substantial weight loss. We aimed to analyse the annual volume and location of bariatric surgery in New Zealand and outcomes such as mortality, CVD events and alterations in medication utilisation by type of surgery.

Methods

Clinical data from New Zealand national hospital discharge codes for bariatric procedures were recorded for all patients between 1 January 2004 to 31 December 2017. Pharmaceutical data was limited to CVD medications dispensed within six months of the index surgery and at one and five years afterwards. The study dataset included demographic information, hospitalisations and deaths. The statistical software RStudio was used for data analysis.

Provisional results

A total of 9114 patients received their first bariatric procedure within this study period. Bariatric surgery increased, from 34 and 4 procedures (in 2004) to 470 and 614 (in 2015), in public and private sectors respectively. Gastric bypass (GB, n=3986) and sleeve gastrectomy/gastric reduction (SG, n=8599) were the most frequently coded procedures. The majority of publicly funded procedures have been completed by the Auckland region District Health Boards. GB procedures were associated with greater medication reduction, while SG procedures were associated with lower all-cause mortality.

Conclusion

Bariatric surgery is increasing in frequency in New Zealand, with different outcomes between the two most commonly performed types of surgery SG and GB.

Australasian Epidemiological Association News

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PUTTING THE COST INTO COST-EFFECTIVENESS

PHARMAC'S COST RESOURCE MANUAL – AN UPDATE

James Harris, Manager Health Economics at PHARMAC, provided what he described as a "taster" of the latest edition of the PHARMAC Cost Resource Manual. This standardised list of prices and costs for health technology assessments across the New Zealand health sector has just been updated to version 3.0, released this month.

The manual is on the PHARMAC website as a supplement to the Prescription for Pharmacoeconomic Analysis. For the first time, the cost resource manual is presented in HTML to facilitate searching, updates and corrections (available at www.pharmac.govt.nz/cost-resource-manual).The manual is written by PHARMAC for pharmaceutical suppliers, and, as such, is oriented to pharmaceutical costs for publicly funded medicines. James noted, that despite its name, the manual mostly covers prices rather than costs.

James opened with an overview of the *Factors for Consideration*, the value framework which sets out the multiple factors that PHARMAC uses in funding decisions. The balance of the presentation focused on the "Costs and Savings" quadrant of the framework, with details on how to estimate the costs of pharmaceuticals, dispensing, primary care visits, and hospital events.

PHARMAC's assessments take the perspective of the health sector, considering costs to Vote: Health as well as some direct costs to patients, family, whānau and caregivers. James noted that differences in perspectives could lead other funders, such as ACC or private insurers, to make different decisions.

James identified some costs that can be more difficult to establish. For example, there are challenges in estimating a standard cost for a rest home day because of the range of ways which these facilities operate, yet this can be an important cost-offset for conditions that involve lengthy rehabilitation, such as stroke recovery.

James noted the recognised difficulties for applicants identifying pharmaceutical prices net of rebates, suggesting that analyses include list prices as a parameter so that PHARMAC can then apply the confidential rebates.

Some issues and anomalies with prices and costs that ISPOR members may wish to comment on have been put forward by PHARMAC staff, including:

- Inclusion of GST on patient co-payments, given that this is the full out-of-pocket amount that patients pay for services, although GST is excluded on other costs
- An appropriate estimate for overheads on DHB staff salaries
- Inflation adjustments: the current PHARMAC guidelines suggest that inflation be modelled by deflating future pharmaceutical prices, but PHARMAC is now suggesting the option that base cases do not adjust for future inflation.

PHARMAC is open to receiving input on the cost resource manual. Suggestions for enhancements, corrections and updates are welcomed at healtheconomics@pharmac.govt.nz.