CENTRE FOR HEALTH PROGRAM EVALUATION

TECHNICAL REPORT 7

The Refinement of Relative Resource Weights for Non-Admitted Patients

Dr Terri Jackson
Senior Research Fellow,
Health Economics Unit, CHPE

Ms Petia Sevil
Health Economist,
Novo Nordisk Pharmaceuticals Pty Ltd
22 Loyalty Road, North Rocks, NSW, 2151

and

Research Associate, Health Economics Unit, CHPE

January 1997

CENTRE PROFILE

The Centre for Health Program Evaluation (previously known as the NHMRC National Centre for Health Program Evaluation) was formed to meet the need for evaluation of health programs and the development of appropriate evaluation methodologies for the Australian context. It seeks to contribute to government policy deliberations and to the national debate on health insurance policy, hospital waiting lists, the cost of new health technologies, the effectiveness of health promotion programs, and many other issues relating to the best use of the nation's health resources.

The Centre consists of two independently funded, but co-located units, which undertake their own work programs, as well as collaborative and multi-disciplinary research and teaching under the new Centre title. The Health Economics Unit, attached to the Faculty of Business and Economics at Monash University, is directed by Professor Jeffrey Richardson. The Program Evaluation Unit is part of the Department of Public Health and Community Medicine at The University of Melbourne and is directed by Associate Professor David Dunt.

PUBLICATIONS

The views expressed in Centre publications are those of the author(s) and do not necessarily reflect the views of the Centre or its sponsors. Readers of publications are encouraged to contact the author(s) with comments, criticisms and suggestions.

A list of the Centre's papers is provided inside the back cover. Further information and copies of the papers may be obtained by contacting:

The Co-ordinator
Centre for Health Program Evaluation
PO Box 477
West Heidelberg Vic 3081, Australia
Telephone + 61 3 9496 4433/4434 **Facsimile** + 61 3 9496 4424
E-mail CHPE@BusEco.monash.edu.au

ACKNOWLEDGMENTS

The Health Economics Unit of the CHPE receives core funding from the Public Health Research and Development Committee of the National Health and Medical Research Council, Monash University, and the Victorian Health Promotion Foundation.

The Program Evaluation Unit of the CHPE receives core funding from the Victorian Health Promotion Foundation and The University of Melbourne.

AUTHORS' ACKNOWLEDGMENTS

The research in this paper was made possible through funding from the Victorian Department of Human Services.

The authors wish to acknowledge the very considerable co-operation and assistance extended by the six hospitals recruited to participate in the 1996 study. Representatives of these hospitals were generous in their contributions of time and of their knowledge of non-admitted patient services. The success of the project was due in no small part to this spirit of collaborative effort.

Thanks go to the Victorian Ambulatory Classification System Advisory Committee (VACSAC) for their continuing support and advice on both research methodology, and financing and information systems.

The authors wish to acknowledge Mr Richard Tate and Ms Kaye Collard for their work on evaluating within hospital accounting structures and the level of implementation of patient level clinical costing systems for outpatients across the sites studied.

Finally we are grateful to colleagues at the Centre for Health Program Evaluation, Dr Michael Montalto, Mr Neil Day, Ms Mande Falko and Ms Joy Yeadon for their advice and support to the Project.

TABLE OF CONTENTS

List of Figures

List of Tables

ABSTRACT

This study reports the development of cost weights for non-admitted patient services in Victorian hospitals based on patient-level cost data from six Victorian hospitals. The Victorian Ambulatory Classification System (VACS) developed by the authors in 1995 attributes related ancillary services to an index clinic visit. The base classification reported here has been adopted by the Victorian Department of Human Services for introduction of an activity-related variable payment system for public hospital outpatient services in 1997/98. Demonstration of the capacity of Victorian hospitals to generate patient and cost information to support a new payment system based on VACS was also an important research objective of the current study.

A purposive sample of seven hospitals was recruited, with hospitals selected on the basis of well developed clinical costing systems; one of the seven was later excluded because data could not be provided. Two months of 1995 activity and related cost data were extracted from each hospital's information system for analysis.

Financial data and allocations of costs to non-admitted patient activities were reasonably consistent across hospitals, and represented accurate estimates of the costs of the services. Particular attention was paid to the problem of costing privatised clinics and ensuring that all costs were attributed to any encounter costed as part of the study.

In contrast to the earlier study, assignment of hospital clinics was undertaken by an expert Clinical Panel, with reference to detailed descriptions of all outpatient activities provided by the hospitals. Recommendations are made to continue this process on an annual basis in order to give flexibility to the classification, and ensure the integrity of clinic assignment.

Data were not available for four of the original 40 VACS categories, but three additional categories were recommended by the Clinical Panel, and a fourth by the Study Team. The final count of categories in this year's version of VACS would be 44 if data were available for all clinical specialties. Cost data from Allied Health and Emergency Departments were again judged to be too unreliable to support extensive analysis, and the Research Team supports the Department of Human Services' decision to continue block funding of these areas until more reliable data for weight setting is available.

The use of the 41 VACS categories for which data were available and recommended in the Interim Report of the project yielded a reduction in variance of 19.8%. This is low, but comparable to the results of other casemix models developed on the basis of individual level data. An alternative model using four additional subgroups, and collapsing two of the original VACS categories, yielded only 8% additional variance reduction, but may make the model more clinically meaningful.

Detailed analysis of the components of the bundled encounter costs was undertaken to provide profiles of the cost of ancillary services for VACS categories. The average cost of pathology, imaging and pharmacy across all patients in each category is reported as well as the 'conditional' average. The latter takes into account only those encounters where the relevant ancillary cost is reported, eg the average cost of pathology for those diabetes encounters where a pathology test was undertaken.

The study also investigated the implication for payment policy of multidisciplinary clinics. The issue touches on larger controversies about the appropriate role of public outpatient clinics which remain to be resolved. Structured discussions in four Melbourne teaching hospitals were organised to gain a better understanding of the way in which multidisciplinary clinics are organised, and the likely hospital responses to alternative payment policy approaches for these complex services. In order to guarantee fairness in payment between hospitals which structure multiple encounters and those which organise single multidisciplinary encounters, counting rules and audit procedures are proposed.

Finally, the Commonwealth's proposed 'Developmental Ambulatory Classification System' is compared with the VACS with particular emphasis on the extent to which new/review patient status improves the explanatory power of the VACS in accounting for total encounter cost. Systems for measurement of differences in staff time for these two categories of encounter type are still not well developed, and thus results must be interpreted with caution. Eighteen of the 31 VACS categories tested showed significant differences in total cost between new and review encounters. When the explanatory power of the classification model using this distinction was tested using PC-Group, however, the split yielded only very small increments in total variance explained. Benefits and problems of collecting patient-specific information and of expanding the classification system are discussed.

1996 Relative Resource Weights for Non-admitted Patients

Context

The Victorian Department of Health & Community Services (now Department of Human Services) commissioned the Centre for Health Program Evaluation in January, 1996, to undertake refinement work on the Victorian Ambulatory Classification System (VACS). This classification system was the result of a 1995 commissioned study, also undertaken by the Centre, to evaluate alternative classification systems against cost data from Victorian hospitals. VACS relies on an episode definition which includes ancillary services (imaging, pathology, pharmacy) ordered or initiated for the clinic visit, in contrast to the more disaggregated "occasions of service" (OOS) reporting used in other states.

This section provides information about the 1996 refinement project, including data quality issues, a description of new processes to enhance the validity of hospital-specific clinic assignment to VACS categories, results of a comparison of the 1996 relative resource weights with those from the 1995 study (Jackson & Sevil 1996), and a comparison of two ways in which paediatric encounters might be assigned under the new classification system.

In addition, it includes information from a sub-study to evaluate classification alternatives for subsequent years, including potential classification splits and aggregations, and discussion of the implications of the study for payment policy.

Sample

The sample of hospitals for the 1996 Non-admitted Patient Study included four of the six sample hospitals providing data for the 1995 study (the Royal Children's Hospital, the Geelong Hospital, Western Hospital and the Royal Melbourne Hospital). Monash Medical Centre, was included this year, after changes to the way in which episodes of care were classified by that hospital's computerised patient information and costing system. A sixth hospital, the Royal Women's Hospital, joined the project for the 1996 study.

The Alfred Group of Hospitals had contributed data to the first study, but was unable to do so in 1996. Both the omission of data from the Alfred and inclusion of data from the two new hospitals have the potential, in such a small sample of hospitals, to make a substantial impact on the relative resource weights and on comparisons with results from the 1995 study.

Two months' data were analysed for each hospital in the current study. It was anticipated that the same two months' data would be provided by all hospitals, however, two did not have sufficient data for the nominated November/December (1995) collection period. Thus the sample for the Royal Children's Hospital (RHC) related to August/September and the Royal Women's Hospital to October/November. While using data from different time periods may well result in differences in casemix across the sample, seasonal factors are not likely to have an effect on the critical variable of interest to the study - cost per encounter.

The data represent all cases with the index clinic visit occurring in the nominated months. Because of the “bundled” nature of the encounter as defined in VACS (and mandated by the Department as the definition of a non-admitted patient encounter), ancillary (diagnostic or pharmacy) services may have been provided in October in anticipation of a November clinic appointment, or January (as follow up to December clinic appointments) reflecting the 30 day “window” on either side of the index visit. Activity levels in the data were reconciled to activity levels reported on the Agency Information Management System (AIMS).

All hospitals except the Royal Melbourne (RMH) were able to redesign their clinical costing systems to reflect this encounter definition. In the case of the RMH, the window used was only the 30 days following the index visit. This may result in some underestimation of associated ancillary services in clinics which concentrate on review appointments where tests are routinely ordered so as to be available at the time of the clinical consultation. However, these pre-clinic tests are thought to represent only a small proportion of total ancillaries.

Assignment of Clinics to the VACS Classes

VACS relies on the assignment of encounters at the clinic level rather than individual assignment of patients. The strength of this feature is that it requires little additional data collection, once the clinical content of the clinic is determined. The major weakness of this approach to classification is that, while most clinics are relatively homogeneous in the types of patients seen, others (particularly General Medicine and General Surgery clinics) are much more heterogeneous.

The system is based on approximately 40 categories which reflect the organisation of medical and allied health services in Australia around clinical specialties. In 1995, each hospitals' nomination of its clinics to the appropriate clinical specialty was reviewed by the Research Team to ensure consistency of assignment across hospitals.

For 1996, a Clinical Panel was convened to assist the Research Team to identify more precisely the clinical content of care provided in each of the hospital clinics in the study sample. Initial assignment by the hospital was evaluated by the Clinical Panel to assess appropriateness and consistency. Some reassignments were made contingent on further analysis of comparative cost data. The Panel also assessed each hospital's suggestions for funding of “Specified Program Grants” weighing the evidence for unique or statewide coverage in each of these nominated programs.

Issues of Data Quality

Tables 1 and 2 summarise information on data files submitted by participating hospitals. More than 172,153 patient case records were reported by the six participating hospitals, totalling $16,034,624. Of these, 26,181 cases (representing $3,470,226) were trimmed from the data on the basis of criteria summarised in Table 3. In total, 145,972 valid clinical encounters across the six hospitals were available for analysis. This represented $12,558,511 of expenditures.

TABLE 1: Two months reported encounters by hospital

	Total Encounters	<$5 Encounters [1]	>$1500 Encounters
The Geelong Hospital	15,394	714	50
Monash Medical Centre	54,965	454	123
Western Hospital[2]	25,452	1,549	0
Royal Melbourne Hospital[3]	21,622	1,968	13
Royal Women's Hospital	16,315	805	13
Royal Children's Hospital	38,405	9	31
Total:	**172,153**	**5,499**	**230**

Notes: [1] <$5 encounters includes cases reported as $0
[2] not including unattributable allied health encounters
[3] no unlinked encounters reported on original file

TABLE 2: Two months reported cost of encounters by hospital ($'s)

	Total Dollars	<$5 Cases	>$1500 Cases
The Geelong Hospital	$2,204,944	$483	$125,220
Monash Medical Centre	$5,297,284	$1,214	$825,097
Western Hospital[1]	$2,172,297	$632	$0
Royal Melbourne Hospital[2]	$1,732,874	$7,239	$31,805
Royal Women's Hospital	$1,526,090	$2,204	$26,481
Royal Children's Hospital	$3,101,135	$26	$629,791
Total:	$16,034,624	$11,798	$1,638,394

Notes: [1] not including unattributable allied health dollars
[2] no unlinked or "dummy" encounters reported

TABLE 3: Summary of data attrition

	Encounters
all cases	172,153
no recorded clinic visit	21,918
encounters eliminated on cost exclusion criteria (<$5 and >$1500)	5,729
number of encounters excluded as a result of Clinical Panel recommendations	31
subsequent elimination of data in consultation with DHS staff regarding specified grants	76

Notes: data attrition elements may overlap

Issues of Cost Data Validity

The use of clinical costing system data in both inpatient and outpatient cost relativity studies is now well documented (Jackson et al 1994, 1995; Jackson & Sevil 1996). However, the nature of these systems as tools for the internal management of hospitals leads inevitably to differences in how various costing issues are addressed. Members of the Research Team from Health Solutions Pty Ltd (Mr Richard Tate and Ms Kaye Collard) conducted a detailed investigation of accounting data sources and costing system allocations, to determine the impact, if any, of these differences on the resulting non-admitted patient cost weights.

Figure 1 summarises the results of this investigation. The figure is divided into two sections: issues of global comparability between accounting systems, and the extent of computerised patient-specific feeder systems (in contrast to cost allocations based on averages across patients).

All study hospitals have moved to full accrual accounting for the period covered by the study data, and most exclude (or were able to exclude for the study) depreciation costs. The inclusion or otherwise of depreciation cost is controversial, but for the present study, exclusion of these costs ensures greater comparability across all participating hospitals. In a single hospital (Geelong) depreciation costs for indirect departments (those not directly involved in patient care, eg., personnel) were not able to be excluded, but these represented less than 4% of total outpatient expenditure, and would not have fallen disproportionately on any area of outpatient care.

The proprietary software package Transition was used in five of the six participating hospitals to generate costs for individual patients. In the sixth hospital (Geelong) the ‘bottom up' processes for allocating indirect costs used in Transition were simulated to develop product costs, and then individual utilisation of various components (products) of care (clinic, pharmacy, imaging and pathology) was measured from patient level data recorded on feeder systems.

FIGURE 1: Cost data validity - hospital comparative

	Geelong	Monash	Royal Children's	Royal Melbourne	Royal Women's	Western
General Ledger	Full Accrual	Full Accrual	Full Accrual	Full Accrual	Full Accrual	Full Accrual
Depreciation	Yes [1]	No	No	No	No	Yes
Transition	Not used for Study	Yes	Yes (Episode Level)	Yes	Yes	Yes
Medical Cost Allocation	Unit Level	Unit Level	Unit Level	Unit Level	Unit Level	Patient Level
Feeder Systems						
• **Pharmacy**	Patient Level	Patient Level	Patient Level	Patient Level	Patient / Clinic Level [2]	Patient Level [3]
• **Pathology**	Patient Level	Episode Level	Patient Level	Patient Level	Patient Level	Patient Level
• **Imaging**	Patient Level	Patient Level	Patient Level	Patient Level	Patient Level	Patient Level
• **Allied Health**	2 only to Patient Level	2 only to Patient Level	Patient Level (majority services)	No	No	Patient Level
• **Emergency Dept.**	Clinic Level	Patient Level [4]	Patient Level	Patient Level	Patient Level	Patient Level
• **Outpatient Attendance System**	Clinic Visit	Episode Level	Episode Level [5]	Clinic Visit	Clinic Visits	Clinic Visit

Notes: [1] depreciation for indirect departments could not be removed from information extracted for the study; represents only 3.0% of total expenditure

[2] patient level for scripted drugs (30%); imprest drugs to clinic level only (70%)

[3] includes Section 100 pharmacy costs; represents 3.4% outpatient expenditure

[4] not directly linked to Transition System

[5] clinic visit level information can be extracted from the attendance system

Figure 1 shows that hospitals are able to track most costs to the individual patient level. The two major exceptions to this are in the allocation of medical and allied health costs. No hospital routinely collects the time professionals spend with individual patients for use in clinical costing. On the whole, hospitals have to rely on one of a number of cruder estimation techniques to allocate doctor / allied health staff salaries and sessional payments. Most of these techniques are sensitive to the staffing intensity of clinics, but not to variations between patients in length of consultation. A proxy for consultation time, however, is the denominator, that is, the number of consultations over which clinic dollars are allocated. When clinics routinely book small numbers to allow longer consultation times, this will be reflected in the average cost.

The simplest of these allocation approaches relies on a judgement call by the head of the clinical unit as to what proportion of time his/her staff devote respectively to inpatient and outpatient activities. This so-called IFRAC (inpatient fraction) is then used to divide total salaries into inpatient and outpatient components, with dollars in each allocated on the basis of an activity

measure such as clinic attendances. This is the predominant method used to allocate allied health salary expenditure in the study hospitals, with the activity measure being unweighted occasion of service counts. For medical units (eg., Oncology and Urology), the IFRAC is typically estimated on the basis of sessions allocated to ward rounds, theatre and outpatient clinics. Three hospitals (Western, the Royal Melbourne and the Royal Children's) have undertaken detailed surveys of medical staff time spent in both inpatient and outpatient settings, to guide these allocations. Nursing salaries are most commonly assigned on a cost per attendance basis, from salaries data pooled to an outpatient cost centre.

Other clinical areas such as pathology and imaging have developed standard products and product costs which are allocated to individual patients on the basis of the number and weight of the products used. All study hospitals are able to make this assignment for imaging services, and all but one for pathology. At Monash Medical Centre, pathology costs are aggregated to the patient episode (30/30 day window) rather than as dated services to the patient.

Pharmacy feeder systems are similar to those for pathology and imaging. In five of the six study hospitals, very high cost drugs which qualify under the Section-100 Commonwealth pharmaceuticals subsidy have been excluded from costs, as these costs are not borne from the hospital's own budget. The Western Hospital was not able to extract these costs from their system, but have identified that they represent only 3.4% of total outpatient pharmacy costs. Because of the nature of these drugs, this may result in slight over estimation of the pharmacy costs for particular VACS. The Royal Women's Hospital was able to attribute pharmacy costs to specific patients for scripted items, but for the 70% of pharmacy costs represented by imprest dispensing, costs were averaged across patients at the clinic level.

The economic issues raised by cost apportionment in the Emergency Department are large and currently unresolved. For example, what is the appropriate proportion of fixed costs to be allocated to maintaining an open door for emergency admissions?; and the marginal cost of non-admitted patients in low activity periods? The risk of serious adverse effects to service availability require that these basic issues be further investigated and analysed before activity-based funding can be contemplated.

Emergency department attendances are generally well documented, but the complexity of allocating costs to the different product lines (inpatient/outpatient) of these departments has resulted in a number of different approaches. All study hospitals are able to separately identify admitted patients, and these have been excluded from the current study. Five hospitals carry the Emergency Department costs of admitted patients into the clinical costing system record for the inpatient stay. One hospital (Royal Women's Hospital) uses a time-based allocation method, and three hospitals (Royal Melbourne, Royal Children's and Western Hospitals) use triage categories to weight non-admitted patient episodes. The RCH adds severity and diagnostic information to the weighting scheme.

Public, Private and Privatised Clinics

It must be recognised that hospitals in Victoria have employed a number of revenue-raising techniques to maintain or expand outpatient services in recent years. The question arose in the prior year's study, and also during meetings of the Victorian Ambulatory Classification System Advisory Committee (VACSAC) about whether the clinical costing system data for clinics with less than full public funding should be included in the study, and on what basis.

The Study Team argued strongly that the largest possible sample from each hospital should be available for analysis in order to reduce any category's reliance on data from a single hospital. It was argued that the study could be blind to revenue sources (leaving payment policy questions to the Department) so long as all costs within clinics could be identified and appropriately attributed.

With VACSAC endorsement, a two-stage validation was undertaken. The first entailed negotiation with each hospital as to which clinics would be included in the data base, with particular attention to whether missing costs (eg., clinician salaries, privatised pathology) could be retrieved from other data systems and included to reflect the total encounter cost.

The second stage entailed examination of the data to ensure that data fields where data were expected (direct medical cost for medical clinics, for example) contained data, and that remaining records submitted (eg., unlinked ancillary services, “buckets” of unattributed ancillary costs) could not be traced back to identifiable patients or clinics.

Three hospitals recorded no expenditure or revenue from private or privatised clinics. A fourth was able to quarantine both revenue and expenditure from its three hospital-managed private clinics. At a fifth hospital, private patients and costs were excluded from the data, but some small public subsidies of private clinic operation (indirect overheads not attributed to private clinics) remained in cost apportionments, slightly overestimating costs of public patients.

In the sixth hospital, complex revenue arrangements to Special Purpose Accounts and facility charges which may not cover full costs of private patients raised serious issues of data validity. Formal steps have been taken to recover an appropriate proportion of utility and overhead costs, and a rental/facilities charge is made for all mixed public/private and privatised clinics. So far as the researchers were able to establish, all patient costs submitted for the study, whether public or private patients, are based on full data: that is, when private patients are included, their full costs of medical and ancillary services are recorded.

Some 1057 encounters (<1% of the entire data set) were found to have no direct medical cost recorded. Because these were scattered across hospitals and VACS categories, and plausible explanations could be found for at least some patients in these clinics having no direct medical contact, these cases were not excluded from the analysis. It is possible that they represent encounters where the direct medical cost was part of a privatised financial arrangement, but the pattern across hospitals suggests that this is not the case.

Changes to VACS Categories

A Clinical Panel identified the need for three new categories in the VACS. These were Developmental Neurological Disability clinics (VACS 115) to take account of a range of clinical

activities principally for children and adults with complex developmental disabilities; Vascular services (VACS 208) reassigned from either Cardiovascular and Thoracic Surgery (VACS 202) or General Surgery (VACS 201), with VACS 202 renamed Cardiothoracic; and Preadmission clinics (VACS 209). The Study Team identified a fourth needed category, that for Psych Related (now VACS 350) outpatient services provided in the Department's acute health funding program 306, for example, the management of post-natal depression.

The Clinical Panel also identified substantial overlap between Haematology (VACS 107) and Oncology (VACS 110) clinics in the study hospitals, reassigning most clinics to the latter category. As the only services remaining in Haematology were ones nominated for a Specified Grant, no cost data were available for non-oncological haematology encounters in the study hospitals.

The category Orthopaedic applications (VACS 311) had no valid cases represented in the 1996 study hospitals' data. This could be a result of the decision to separately identify allied health services (rather than "bundling" them to the index clinic visit as was done in the 1995 study). As DHS has announced a policy to continue to block fund allied health services, these were separately identified in the 1996 data; it may be that VACS 311 services have been reclassified by hospitals to their respective generic allied health disciplines. Also there were no valid cases reported for Optometry (VACS 603).

Weights are not reported this year for "freestanding" ancillary services, that is, services not provided in the context of hospital management of the primary condition through an outpatient clinic. Some descriptive data are presented in the data quality assessment, but hospitals were not consistent in their reporting of these costs for the study, because they will not be funded on the basis of the VACS.

Thirty three final categories have been recommended for modelled funding in the 1996/97 financial year, with further work needed on data quality for both Emergency Department and Allied Health encounters. In addition, statistical analysis has identified four potential new categories which might be split off from current VACS and considered for funding in the 1997/98 financial year, and one VACS category which might be collapsed into existing categories. The results of this analysis are detailed below under the section *Should VACS be Further Split or Further Collapsed?.*

Treatment of Paediatric Cases

Results of the study were analysed using two different treatments of paediatric cases. The first was recommended by the VACSAC, and assigns paediatric clinics to their appropriate VACS category on the basis of the medical or surgical specialty. Thus, paediatric allergy visits are grouped with adult Allergy visits in VACS 102. The treatment in this way will be termed "distributed paediatric", that is, distributed across all medical and surgical specialties. The second approach is that used in the 1995 study, which grouped all medically-managed paediatric clinics (VACS 101 through VACS 209) to two categories: VACS 501 Paediatric Surgical, and VACS 502 Paediatric Medical. This will be termed the "collapsed paediatric" system. Thus in both systems, paediatric cases in VACS 310 through to VACS 609 are not distinguished.

Comparison of 1996 “distributed” versus “collapsed” Paediatric Weights

When paediatric clinics are grouped to either VACS 501 or VACS 502, Allied Health, Surgical, and Obstetric and Gynaecological, weights remain largely unchanged. The largest effects are on adult medical weights, which consistently increase in weight when this classification is employed. The only exception is Endocrinology (VACS 105), where the relative weight falls when paediatric cases are regrouped to the paediatric categories.

Weights for the newly defined Paediatric Surgical (VACS 501) and Paediatric Medical (VACS 502) categories are both reduced when all paediatric cases are assigned to them; for surgical clinics by a factor of two.

Comparison of 1995 and 1996 (distributed paediatric) Weights

Table 4 *1996 VACS relative resource weights* provides an overview of the relative weights from the current study when paediatric clinics are assigned by medical specialty rather than being collapsed to two paediatric groups.

In the current study, “medical” VACS categories are less variable than in 1995, while “surgical” and “obstetrics and gynaecology” are more variable. The CV is high (>1.0) for 18 of this year's 41 categories, compared to the finding in 1995 that over half of the VACS categories had CVs this large or greater. It is important to note, however, that of the 34 categories which will be used for funding policy in financial year 1997, only 11 have this degree of variability. The Department's policy of funding Emergency Departments and Allied Health Services (with highly variable costs) on the basis of fixed grants leaves a higher proportion of VACS categories with acceptable levels of variability. Moreover, the RSEM measures for all VACS groups are well below most of those reported for DRGs in the inpatient relative resource weights studies in 1994 and 1995.

Table 11 *Comparative average weights and relative resource weights 1995/1996* Appendix 2 provides a comparison of weights from the current year's study with those from the 1995 study. Resource homogeneity of the classes is assessed with reference to the Coefficient of Variation (CV) and the Relative Standard Error of the Mean (RSEM). The first gives a straightforward ratio of the mean and standard deviation; the second incorporates an adjustment for sample size, reflecting the fact that the measure of central tendency is more robust, the larger the sample size.

TABLE 4: 1996 VACS relative resource weights

VACS	Description	N of Cases	Mean Cost $	CV	RSEM	Weight
101	General Medicine	4699	86.91	1.12	.016	1.01
102	Allergy	777	124.25	.68	.024	1.44
103	Cardiology	1237	207.98	.56	.016	2.42
104	Diabetes	1284	106.16	.57	.016	1.23
105	Endocrinology	1725	123.74	.92	.022	1.44
106	Gastroenterology	1339	124.42	.88	.024	1.45
107	Haematology[1]	0	-	-	-	n/a
108	Nephrology	1939	297.98	.99	.023	3.46
109	Neurology	860	85.39	.66	.022	.99
110	Oncology	2882	155.36	.91	.017	1.81
111	Respiratory	1044	132.46	.57	.018	1.54
112	Rheumatology	1164	142.41	.64	.019	1.66
113	Dermatology	1560	83.77	1.37	.035	.97
114	Infectious Diseases	693	200.56	1.01	.038	2.33
115	Developmental Neurological Disability	500	214.73	.49	.022	2.50
201	General Surgery	4037	93.85	1.12	.018	1.09
202	Cardiothoracic	295	224.62	.48	.028	2.61
203	Neurosurgery	776	68.81	1.07	.038	.80
204	Ophthalmology	3081	53.30	.98	.018	.62
205	Ear, Nose and Throat	3009	50.87	1.75	.032	.59
206	Plastic Surgery	3661	72.03	.71	.012	.84
207	Urology	2355	109.34	1.03	.021	1.27
208	Vascular	691	91.80	.79	.030	1.07
209	Preadmission	1053	129.49	1.33	.040	1.51
301	Dental	1707	92.32	.79	.019	1.07
310	Orthopaedics	6876	73.88	.78	.009	.86
311	Orthopaedic Applications[2]	0	-	-	-	n/a
350	Psych related (306)	126	177.35	1.37	.122	2.06
401	Family Planning	841	90.88	.71	.025	1.06
402	Obstetrics	12887	92.10	1.28	.011	1.07
403	Gynaecology	7032	84.15	1.32	.016	.98
501	Paediatric Surgical	337	112.39	.60	.032	1.31
502	Paediatric Medical	790	161.05	.62	.022	1.87
550	Emergency Medicine	34624	124.17	1.07	.006	1.44
601	Audiology	305	50.69	.52	.030	.59
602	Nutrition	734	60.03	2.04	.075	.70
603	Optometry[2]	0	-	-	-	n/a
604	Occupational Therapy	2474	46.27	1.15	.023	.54
605	Physiotherapy	14252	12.27	1.65	.014	.14

VACS	Description	N of Cases	Mean Cost $	CV	RSEM	Weight
606	Podiatry	884	34.66	.94	.032	.40
607	Speech Pathology	1656	48.50	1.39	.034	.56
608	Social Work	11213	16.25	1.54	.015	.19
609	Other Allied Health	8573	36.60	1.57	.017	.43

Notes: n = 145,792; total mean cost $86.03;

[1] all clinical haematology cases in study data reassigned to Oncology or specified grants;

[2] no information available for the 1996 study period.

Changes to the study's sample for 1996 (with the inclusion of Monash Medical Centre and the Royal Women's Hospital, and lack of data from the Alfred Healthcare Group), and distribution of paediatric cases across clinical specialties, make some instability in the relative resource weights inevitable. This is apparent in the change in relativity for VACS 108 Nephrology whose weight has increased substantially. Other categories to increase in weight include: Respiratory (VACS 111), Infectious Diseases (VACS 114), Obstetrics (VACS 402) and Gynaecology (VACS 403). Increases in the latter two categories are likely to reflect the inclusion of the Royal Women's Hospital and Monash Medical Centre.

The weight for Diabetes (VACS 104) is up, and the weight for Endocrinology (VACS 105) is down compared with last year's study. This is unlikely to reflect "upcoding" of clinics (nor was there evidence of this from individual hospitals' nominations of VACS assignments of their clinics), as the Endocrinology weight was higher in the first year's study.

The weight for the new Cardiothoracic Surgery (VACS 202) classification has increased, probably due to the creation of the new Vascular Services (VACS 208) category, which has a lower average cost than other clinics grouped to the old Cardiovascular and Thoracic category.

Analysis of variance shows that there is minimal overlap for most VACS groups when costs are compared. Notable in the pairs with no statistical difference in total cost were: VACS 401 Family Planning and VACS 403 Gynaecology; and VACS 201 General Surgery and the new VACS 208 Vascular Services. Discussion of the practical effect of these similarities will be taken up below.

The approach which uses 41 VACS accounts for 19.8% of the total variance in the dependent variable (encounter cost) in the whole data set of n=145,972 (F ratio 923.74, $p<0.001$). Given the degree of variance inevitably present in patient-level data, this result is well within the range reported for variance reduction by other casemix classification systems. Further work to improve variance reduction in the model is reported below.

Implications for Payment Policy

Should VACS be Further Collapsed or Further Split?

Casemix systems walk a tightrope between maintaining administrative simplicity and accurately characterising resource use. The former objective is maximised by reducing the number of categories employed, and the latter by increasing the number of categories.

For the project to refine the VACS, statistical analysis of resource homogeneity and the degree to which greater homogeneity could be achieved by varying the number of categories, was undertaken using the statistical package PC-Group (Version 3.01, Malitz & Godbout 1992). This is an interactive program which combines categories of classification variables (eg., clinic type, new/review patients) so as to reduce variability in a continuous variable. Its development was originally sponsored by the U.S. Health Care Financing Administration to establish casemix measures for long-term or nursing home care. It builds on the AUTOGRP approach to classification used by the developers of Diagnosis Related Groups (Mills et al 1976).

The algorithm recommends binary splits to minimise variance in the dependent variable, based on three programmable constraints: the maximum number of subgroups or partitions desired; the minimum number of cases in each subgroup; and the minimum reduction in variance that will be required before any partitioning of a group is accepted. By repeating the analysis it is possible to produce classifications which combine categories of more than one explanatory variable. Although the algorithm will detect groupings that explain substantial amounts of the variance, it will not always detect the globally best classification. The program has the advantage that partitions and combinations are under the control of the investigator, enabling clinical and administrative judgement to influence the final outcome, but potentially reducing the total variance explained for a given set of data.

In the present study, the data were first grouped on the basis of the 41 of 44 clinical specialty categories (from the 1995 VACS study plus Clinical Panel recommendations) which were available in the 1996 data (see explanation above of missing categories). This analysis yielded a reduction in variance of 19.8%. In order to split on the basis of clinic designators, a coding scheme was devised to group identically-named clinics within each VACS category.

Thus, for example, in VACS 110 Oncology, clinics at different hospitals which were labelled as "Haematology" were given a code to distinguish them from "Breast" and generic "Oncology" clinics. This recoding yielded 172 separate sub-clinic types within the 41 VACS.

Each VACS category was then analysed individually to identify further candidate splits based solely on sub-clinic types in the final classification. Criteria were developed to evaluate the recommended splits. These were that:

- the increase in explained variance for the subgroup be at least 20% (because of the smaller impact on reduction in variance for the whole model);
- that the resulting subgroups have at least 100 cases in the data; and
- that the subgroups be clinically meaningful.

Attention was also paid to whether the subgroups came from multiple hospitals (reducing the likelihood of cost differences arising solely because of the hospital in which cases were treated), although this was not an absolute criterion.

For 7 of the VACS categories, PC-Group recommended no further splits. In 15 other categories, the recommended splits resulted in <20% variance reduction and were not further investigated. Subgroup analysis also allowed the identification of a small number of anomalous assignments to VACS which had not been identified by the Clinical Panel, and these are discussed below. Because of data quality problems and the Department's intention to block fund, further investigation of the Allied Health categories (VACS 601 - 609) and VACS 550 Emergency Medicine was not undertaken.

TABLE 5: Proposed splits for VACS Categories

VACS Affected	**Changes Proposed**
108 Nephrology	Separate out *Complex Nephrology/ Renal Failure*[1]
402 Obstetrics	Separate out *Foetal Diagnostic Clinics*[1]
403 Gynaecology	Collapse VACS 401 *Family Planning* to 403
403 Gynaecology	Separate out *Reproductive Medicine*[1]
403 Gynaecology	Separate out *Dysplasia/Colposcopy*[1]
101 General Medicine	Re-assign *Late Effects Haematology* to VACS 110 *Oncology*
206 Plastic Surgery and 301 Dentistry	Assign all *Maxillo-Facial Surgery* to VACS 206 *Plastic Surgery*

Notes: [1] indicates new categories

Of the remaining 19 VACS with candidate subgroups for further evaluation, only 3 met the criterion of clinical meaningfulness. In VACS 108 Nephrology, two high cost subgroups were identified as candidates for splitting the category. The first was a cluster of clinics for patients with renal failure, and the second was a clinic in a single hospital which treated patients with

glomerulonephritis. Compared with the mean of $193 for simpler Nephrology encounters, these more complex cases had a mean cost of $449. The effect of combining both into the original single VACS 108 was to overweight simple cases (mean cost $298) and substantially underweight the more complex cases. In formatting the final model reported below, a separate Complex Nephrology and Renal Failure group has been created.

For VACS 402 Obstetrics, a single split was recommended by PC-Group. This comprised a group of Foetal Diagnostic Clinics which had been discussed at the Clinical Panel as likely to be higher cost than most other obstetric clinics. In the event, encounters in these clinics averaged $491 compared with the remainder of Obstetric encounters, with a mean of $71.

VACS 403 Gynaecology also provoked discussion during the Clinical Panel clinic assignment meetings, because of the cost differences for procedural clinics, in particular, colposcopy. These clinics, together with the closely related Dysplasia clinics, had a mean cost of $179, compared with the mean of $70 for the remainder of gynaecology clinics. A second high cost group identified by the PC-Group analysis was Reproductive Medicine (N=162). These encounters in a single hospital had an average cost of $142, and have been extracted as a second split of VACS 403.

Further changes to the initial VACS categories were suggested by analysis of variance described earlier. This identified Family Planning (VACS 401) as having no significant difference in cost from standard gynaecology clinics, and Vascular Surgery (VACS 208) encounter costs as not statistically different from General Surgery (VACS 201) costs. For the final model, VACS 401 was collapsed into VACS 403, but Vascular Surgery was kept as a separate category on the advice of the Clinical Panel.

Finally, the PC-Group analysis recommended splits which highlighted anomalous clinic assignments to two VACS categories. The first was a clinic termed “Late Effects Haematology” which the Clinical Panel assigned to General Medicine. When cost analysis was undertaken, this clinic was shown to have an average cost of $826 compared to the General Medicine (VACS 101) mean of $87. For the final model, this clinic has been reassigned to Oncology (VACS 110).

Anomalies in the assignment of maxillo-facial surgery were also highlighted. Some clinics had been assigned to the Plastic Surgery VACS (206), and others to Dentistry (VACS 301). The discrepancy was not brought to the attention of the Clinical Panel for resolution, but on cost grounds these have been assigned to VACS 206 in order to maximise variance reduction of the model.

A final model of the original 41 VACS categories minus 401 (collapsed into 403), plus the additional 4 splits (1 in 108, 1 in 402, 2 in 403), and the reassignment of anomalous clinics (a total of 44 final groups), was then tested for variance reduction. The total reduction in variance was 20.6%, only a marginal increase from the 19.8% of the original model. The changes highlighted in the analysis may be advisable on policy and/or clinical grounds, but not on the basis of the statistical improvement in the model.

Conventionally, ambulatory casemix measures are developed using multiple variables (age, procedures, new/review patients) to identify splitting variables which will maximise variance reduction in the total model. In the current dataset, however, neither the recording of procedures nor new/review patient status was judged reliable enough to support policy application. Preliminary analysis of new/review status is reported below. Analysis by age showed paediatric clinics to differ in cost from adult clinics for a number of VACS, but it was not clear whether this was an age effect, or a hospital effect, with paediatric cases concentrated in two study hospitals. All of these variables might be reconsidered using a dataset from a larger sample of hospitals, and when definitions and recording of procedures and new/review status are standardised.

The project specifically did not test "with or without ancillary services" as a splitting variable because of the perverse incentives of introducing such a split into payment policy.

Data Integrity

The VACS has demonstrated a number of the properties required as the basis of an outpatient funding system. It is economical in its data collection requirements, it provides a manageable number of categories consistent with acceptable levels of resource homogeneity and clinical meaningfulness. It has proved reasonably stable over the two studies, despite the inclusion of different hospitals in the two samples.

With any classification-based output funding system, however, the funding authority must ensure that opportunities to manipulate the system are minimised and that systematic misrecording of data is avoided. The Department has circulated to VACSAC a paper outlining proposed Clinical Panel review and audit procedures. These include initial vetting of data to ensure that encounter definition and clinic assignment are reliably recorded. Data reported via the AIMS will be used to monitor activity and cost data items. Finally, the paper canvasses random audit procedures, including medical record review and/or random on-site activity level and coding checks.

VACS is particularly vulnerable to manipulation in two broad areas: initial clinic assignment and disaggregation of the episode. Each of these is taken up below, with recommendations for specific review and audit responses.

Clinic Assignment

If hospitals were left to assign their own clinics to the VACS, or to modify clinic assignment when clinical practice changed, even slightly, the possibility of gaming such assignment would be apparent. The method of clinic assignment adopted for this study should form the basis for ongoing monitoring of how hospitals report their clinic activity. To ensure the integrity of clinic assignment, and consistency across hospitals, we propose that members of the Clinical Panel meet once per year to review and endorse or reclassify hospitals' interim assignments of newly instituted clinics to the VACS. Continuity in the membership of this panel would be highly desirable.

The Clinical Panel expressed concern about potential "gaming" of clinic assignments, and about hospital closure of specialised clinics with costs above the mean for their VACS. To monitor such

changes in volume, it was felt that the Clinical Panel should be provided with an annual report on movement in volume of services by VACS code for all hospitals, with the aim of identifying volume increases which may be attributable to reclassification of previous activities to higher weighted VACS categories. A Panel like the one convened for this project could assist the Department in distinguishing volume changes attributable to service developments (eg., transfer of infectious disease services) from those which may have a funding system motivation.

Disaggregation of the Episode

A second potential problem with a "bundled" encounter definition such as that used in the VACS, would arise if hospitals could successfully "unbundle" ancillary services from the clinic visit. If separate funding of free-standing ancillary services, that is, pathology / radiology / pharmacy services not associated with a clinic visit, were available, hospitals could claim the bundled payment (weighted for current ancillary use) and an additional amount for each ancillary service. The Department's decision not to fund ancillary services on a throughput basis will go some way toward discouraging hospitals from seeking separate payment for these different components of the total episode which the VACS characterises. But any hospital ambulatory system funded by a state government will be vulnerable to cost shifting onto other payers - either patients or the CMBS - until definitive payment and audit rules are agreed between the Commonwealth and the States. Comparison of individual hospital profiles of ancillary services against the ancillary profiles reported here would give the Department some indication of areas where cost shifting might be further investigated.

Another issue of disaggregation is that highlighted in the discussion of multidisciplinary clinics. To ensure that like services are compared with and funded as like, we recommend that hospitals record a separate encounter for each health professional with whom the patient had a ***booked appointment***. This proposal has the advantage that it can be audited by the Department through random extracts from appointment system data bases. A disadvantage however, is that ad hoc and informal consultation with a second health professional in the atmosphere of the multidisciplinary clinic may be under counted.

To allow hospitals to systematically record such unbooked consultations, however, would provide considerable scope for all hospitals to artificially structure clinics so that two or more episodes would be counted for patients on the slightest pretext of informal consultation, and regardless of the clinical appropriateness of multiple consultation. Requiring hospitals to demonstrate booked appointments is still open to such manipulations, but goes some way toward systematising the collection of data in this relatively undocumented area.

Patient-level data submitted in support of payment claims could be analysed to monitor the rate of multiple consultation by hospital by VACS to identify changes in recording practice, and these could also be submitted to the Clinical Panel on an annual basis for review of the clinical or organisational rationale which might underpin any changes in the profile of multiple consultations.

Recommendations

On the basis of the investigations undertaken for this project, the researchers recommend:

1. That the relative resource weights reported here for VACS 101 - VACS 502 be the basis of budget modelling for the 1996/97 Financial Year.
2. That paediatric encounters be assigned to their relevant clinical specialties under VACS.
3. That a Clinical Panel be convened annually to review hospital clinic assignment to VACS, and to provide advice on aspects of the audit process.
4. That consideration be given to introducing refinements to VACS categories nominated for changes in this report.
5. That counting of encounters in multidisciplinary clinics take account of each booked appointment entailed in the visit.
6. That, in addition to audit procedures under consideration by the Department, the Clinical Panel be given a role in review of hospital-specific profiles of
    - ancillary services (unbundling);
    - clinic volumes (manipulation of clinic assignment); and
    - multiple same-day consultations.

Ancillary Service Profiles

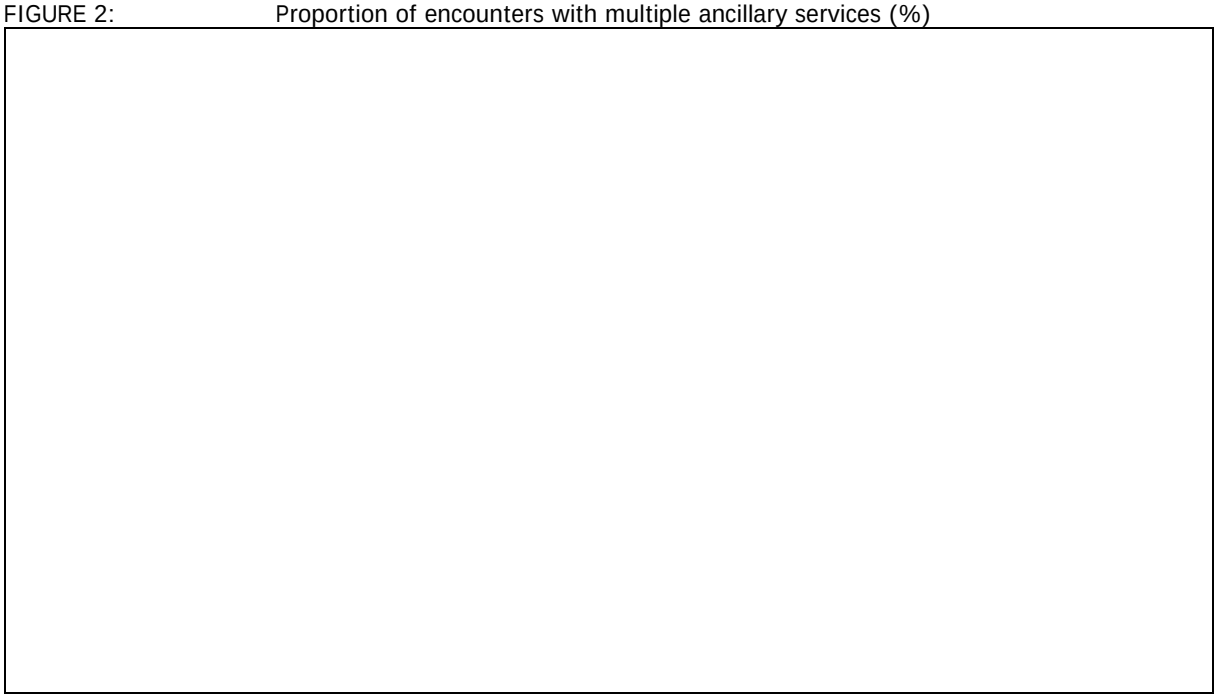
Introduction

Of the 145,972 encounters analysed as part of the 1996 resource weight study, 108,230 encounters, or 74.2%, were reported as a clinic visit with no associated ancillary costs. The average cost of these encounters was $55 across all VACS categories. 28,526 encounters (19.5%) were reported as having one associated ancillary service (pathology, imaging and/or pharmacy) bundled to the clinic visit. The average cost for encounters with one ancillary component across all VACS categories was $149. A further 8273 encounters (5.7%) reported two ancillary services with an average encounter cost of $248. Finally 943 (0.6%) of all encounters had all three ancillary service types bundled to the clinic visit, and these encounters had an average cost of $329. The relationship of clinic visits to ancillary services is illustrated in Figure 2 *Proportion of encounters with multiple ancillary services*.

It is important to note here that the way in which costs are aggregated to the index clinic visit means that an ancillary service does not correspond to an occasion of service. An ancillary service may include one or more diagnostic tests, or prescribed drugs. All ancillary service costs which relate to the clinic visit and which occur in the specified 30 day window either side of the clinic visit are recorded as one record. The cost of ancillary components for the specified period are then bundled together to form the encounter cost.

Analyses were undertaken to get a picture of the impact of ancillary costs on the average cost of encounters across each VACS category and it is our hope that the analysis will provide information for clinicians and managers regarding typical patterns of ancillary use in the six study hospitals. While these are in no sense validated benchmarks of technical efficiency, they provide the starting point for further discussion of the frequency and intensity of prescription and test ordering in the hospital outpatient department.

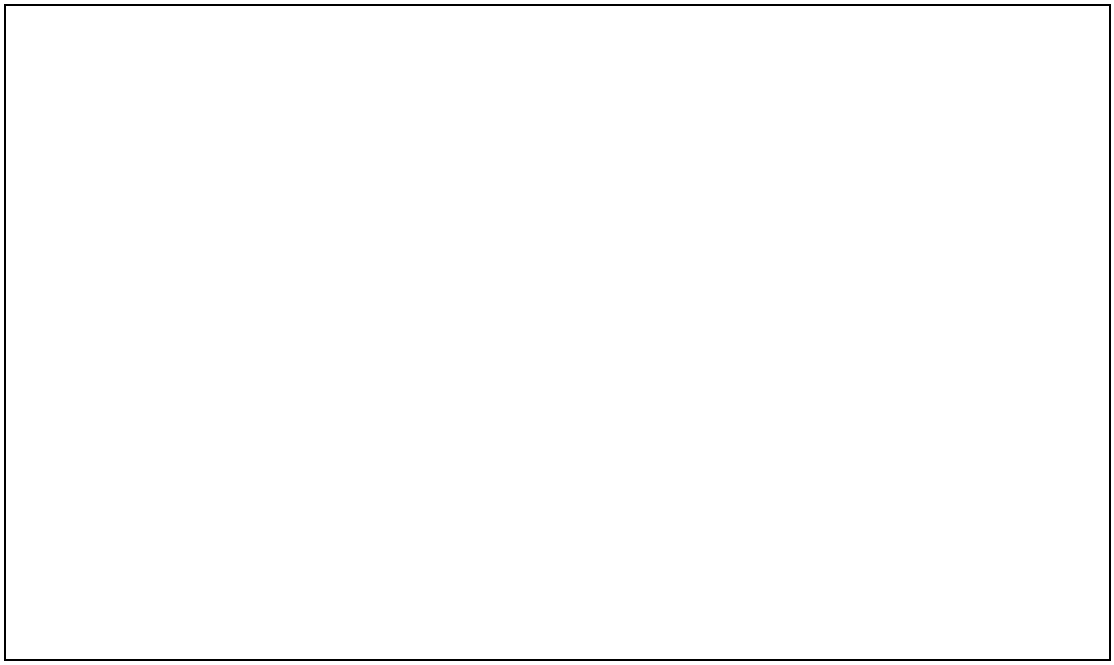
FIGURE 2: Proportion of encounters with multiple ancillary services (%)



Results

The number of cases recorded on the data base in the 1996 NAPS is illustrated in Figure 3 *Summary of encounters and ancillary services*.

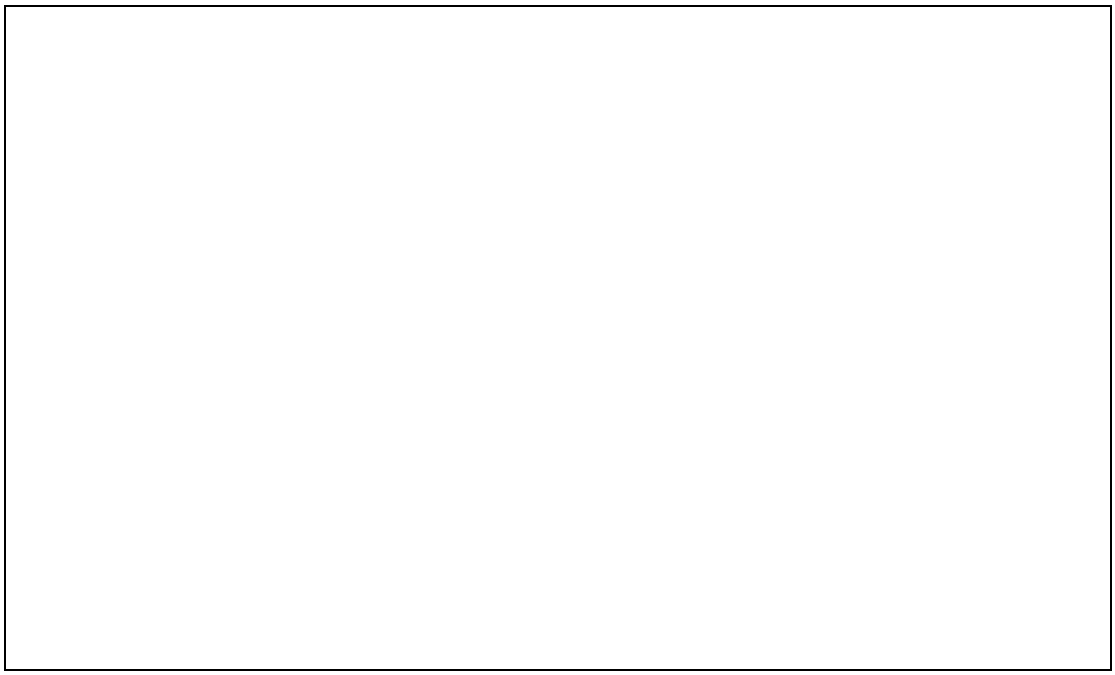
FIGURE 3: Summary of encounters and ancillary services



At least one pharmacy service was reported in 15.5% of all encounters compared to pathology services which were reported in 9.9% of all encounters across all VACS, and imaging services which were reported in only 7.3% of all encounters.

The average encounter cost across all Victorian Ambulatory Classification System (VACS) categories is $86 and ancillary costs represent 21.6% of total costs across all encounters. On average, ancillary services will cost $19 per encounter, and Figure 4 *Average encounter cost by component costs* illustrates the average cost of each ancillary type across all categories.

FIGURE 4: Average encounter cost by component costs ($'s)

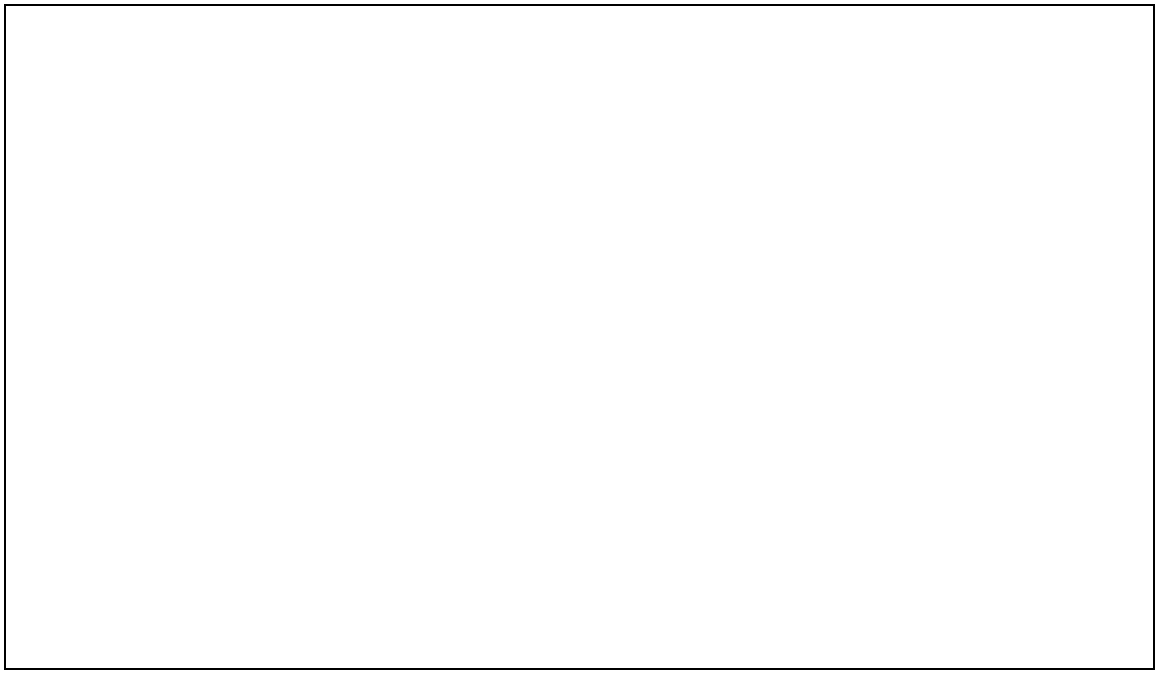


The data show some differences in the average cost for each VACS category. Similarly there are differences in the average cost of the ancillary service types contributing to the average encounter cost across each of the VACS categories analysed. Figure 9 *VACS categories by average cost per encounter by component cost* illustrates the relative average cost of encounters in each VACS category, and the contribution of ancillary services to those costs.

It is important to note that averaging across encounters provides an overview. However, average cost by VACS does not measure the total impact of ancillary use on hospital resources, because the volume of cases in each category is not taken into account. This issue is taken up below under Dollar-Volume Cost Impact.

Secondly, even in VACS categories with high use of specific ancillary services, at most, only half of the clinic visits entail such additional services. Further analysis of encounters which, entail the use of a specific ancillary service is also described below (that is where an ancillary service is actually provided).

FIGURE 5: VACS categories by average cost per encounter by component cost



Note: not including Emergency services, Obstetrics or VACS with no recorded costs

Nine of the VACS categories represent allied health specialties and not surprisingly very few ancillary services have been reported. This is because allied health professionals cannot ordinarily order tests or pharmaceuticals for patients, rather, this is the domain of the managing or attending medical practitioner. For this reason allied health VACS categories (and those VACS with no recorded visits) have been excluded from further discussion under this section.

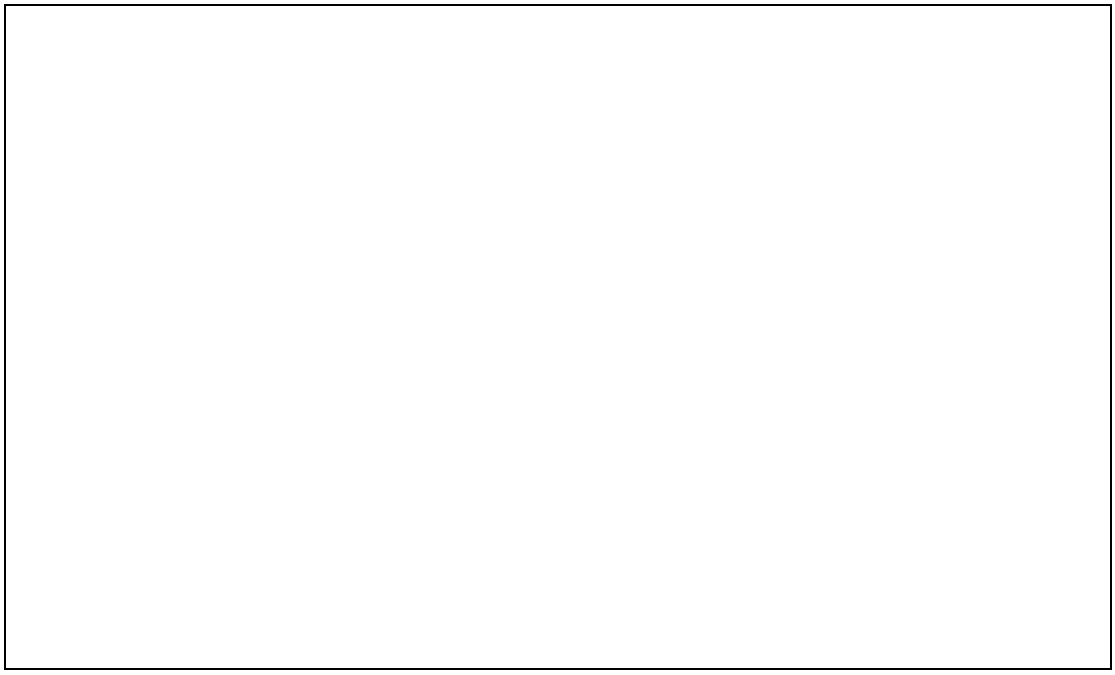
The total average ancillary cost ranged from $71 for Infectious Diseases (VACS 114) to as little as $5 for Allergy (VACS 102).

Nephrology (VACS 108) recorded the highest average encounter cost across all VACS categories. While this category has a costly consultative component on average ($249), it was also found to have a high proportion of ancillary services, particularly pharmacy. Almost one third of the average encounter costs for VACS 114 Infectious Diseases and VACS 110 Oncology could be attributed to ancillary services. The data show that on average $24 of pathology services, $14 of pathology, and $13 of pharmacy services were attributed to the Oncology encounter. The remaining $105 reflects the average cost of the Oncology clinic visit itself.

In contrast, the average cost of ancillary services for a number of categories is relatively small. For example Dental (VACS 301) cost $9 in ancillary services on average. The average ancillary cost is approximately one tenth of the total average cost of the encounter, with the remaining costs attributed to the clinic visit. VACS 401 Gynaecology had relatively high costs on average for both pathology ($26) and pharmacy ($34). In relation to the average encounter cost of $201, ancillary services contributed approximately one third for this category. VACS 202 Cardiothoracic had the highest average imaging cost ($27) per encounter, however the average cost of

pathology and pharmacy services was relatively low ($3). A full summary of component costs for each VACS category can be found in Table 10 *1996 VACS relative resource weights and average component costs.*

FIGURE 6: VACS categories by dollar volume by component cost ($'000)



Note: not including Emergency services, Obstetrics or VACS with no recorded costs

Dollar - Volume Cost Impact

As noted earlier, when average cost is weighted by total volume (n of cases) a slightly different picture emerges. Emergency Medicine recorded the highest dollar volume in the sample ($4,229,158) and the highest amount of imaging ($578,524), followed by VACS 402 Obstetrics ($1,186,894). The latter category also recorded the highest dollar volume of pathology ($311,011). Nephrology (VACS 108) recorded the highest dollar volume of pharmacy ($54,753). Figure 6 *VACS categories by dollar volume by component cost* illustrates this information on dollar volumes aggregated across all VACS with the exception of the high volume Emergency and Obstetrics categories.

Encounters Which Actually Recorded Ancillary Services

To gain a better understanding of the relationship between clinic visits and ancillary services, further analyses were undertaken (for VACS 101 - 502) using the condition that an ancillary service was provided as part of the treatment process. This is particularly important in terms of clinical management, as it provides a more accurate picture of the clinical process underlying the average cost reported earlier. Thus, encounter costs for each category are identified for encounters which actually had any pathology or any imaging or any pharmacy costs recorded.

One should bear in mind that some proportion of each subset had multiple ancillary services recorded.

The following discussion highlights some of the findings of the analysis, with a full summary in Table 6 *Actual component costs for VACS 101 - 502.*

For each component service type the average cost of the clinic visit was estimated on the condition that an ancillary service (for the specific component) had actually been provided. Also reported are the number of services for each component and the proportion of total encounters across each VACS category recording the specific component. Using the same method the average cost of the ancillary type was also calculated.

The Obstetrics category (VACS 402) provides an interesting case study on the additional information which component-actual data provides. The mean encounter cost, when all encounters are analysed is $92, made up of $60 clinic consultation, $8 imaging, $24 pathology and slightly less than $1 in pharmacy.

Only 9.7% of encounters, however, entailed any imaging. When these cases are examined, the average imaging cost increased to $81, and the total encounter is more than twice as costly ($241). A higher proportion of obstetric encounters recorded pathology services (28%), but again, the average cost of the pathology services themselves ($85) and the total encounter cost ($165) is much higher than the mean cost would suggest where all visits (whether or not an ancillary service was actually provided) are included.

Pharmacy costs in obstetrics are an interesting contrast to this pattern, a difference attributable to the fact that nearly 50% of encounters recorded pharmacy costs and even the conditional average cost of pharmacy is still small. Thus, while the average pharmacy cost for encounters which include a pharmacy service is nearly double the all-encounters mean ($2), the average encounter cost for these cases is not much different from the all-case mean, raising it from $92 to $108.

Allergy (VACS 102) recorded very few ancillary services across the 777 encounters analysed, with <1% of encounters recording pathology or imaging and <4% recording pharmacy. The average encounter cost ($124) was virtually unchanged whether pathology services were delivered or not. The data show that the contribution of pathology services (on average) to the average cost of the encounter is very small ($1), in comparison to the average cost of imaging services of $64, if indeed the service was delivered.

Nephrology (VACS 108) had the highest average encounter cost across all VACS ($298), and on the condition that an ancillary service was provided, Nephrology clinics consistently show, on average, the highest encounter costs across all VACS (clinic visits: with pathology services $416; with imaging services $459; and with pharmacy services $514).

The pattern across VACS categories is largely predictable, with a high proportion of pathology performed in Obstetric / Gynaecological VACS (401 - 403), in Diabetes (VACS 104), and Oncology (VACS 110). Imaging is most commonly used in encounters for Cardiothoracic (VACS 202), Orthopaedics (VACS 310), and in Preadmission clinics (VACS 209). Nearly 83% of

Psychiatric-related acute-health services encounters (VACS 350) entail pharmacy costs. Pharmacy costs are also recorded in high proportions of encounters in Cardiology (VACS 103), Dermatology (VACS 113), Infectious Diseases (VACS 114), Preadmission clinics (VACS 209), and the three Obs/Gynae VACS (401 - 403).

TABLE 6: Actual component costs for VACS 101 - 502[1]

				if the encounter actually recorded any pathology services				if the encounter actually recorded any imaging services				if the encounter actually recorded any pharmacy services			
VACS	description	total encounters	mean encounter cost	mean total cost	mean pathology cost	n of pathology	% of total cases	mean total cost	mean imaging cost	n of imaging	% of total cases	mean total cost	mean pharmacy cost	n of pharmacy	% of total n cases
101	General Medicine	4699	86.91	181.66	73.53	319	6.79	239.56	136.55	162	3.45	210.07	83.44	199	4.23
102	Allergy	777	124.25	120.47	61.33	7	.90	355.84	114.05	5	.64	246.32	103.68	31	3.99
103	Cardiology	1237	207.98	311.40	33.91	43	3.48	418.17	169.21	48	3.88	187.46	16.30	476	38.48
104	Diabetes	1284	106.16	126.66	58.86	287	22.35	293.92	172.65	23	1.79	170.09	46.34	33	2.57
105	Endocrinology	1725	123.74	221.95	119.33	333	19.30	198.50	97.16	90	5.22	89.15	22.80	621	36.00
106	Gastroenterology	1339	124.42	205.94	84.63	182	13.59	259.19	142.57	83	6.20	245.02	138.96	128	9.56
108	Nephrology	1939	297.96	416.47	58.84	443	22.85	459.08	126.60	113	5.83	513.66	173.82	315	16.25
109	Neurology	860	85.39	184.28	90.52	28	3.26	242.23	157.28	28	3.26	170.30	90.11	25	2.91
110	Oncology	2882	155.36	217.75	71.46	960	33.31	313.42	190.84	215	7.46	211.51	54.69	665	23.07
111	Respiratory	1044	132.46	200.73	76.84	47	4.50	236.81	109.36	63	6.03	177.58	67.98	91	8.72
112	Rheumatology	1164	142.41	199.85	43.83	127	10.91	274.45	142.20	114	9.79	190.98	68.23	113	9.71
113	Dermatology	1560	83.77	190.76	101.39	185	11.86	187.21	108.24	15	.96	133.66	66.46	541	34.68
114	Infectious Diseases	693	200.56	218.83	106.19	168	24.24	256.38	104.40	72	10.39	289.77	105.51	223	32.18
115	Developmental Neurological Disability	500	214.73	355.62	51.17	26	5.20	371.61	100.23	30	6.00	331.70	79.12	25	5.00
201	General Surgery	4037	93.85	194.53	53.38	218	5.40	282.58	199.54	343	8.50	160.07	82.09	277	6.86
202	Cardiothoracic	295	224.62	369.02	49.11	20	6.78	325.12	111.67	72	24.41	265.61	38.75	22	7.46
203	Neurosurgery	778	68.81	188.30	44.57	20	2.58	207.00	138.75	75	9.66	136.30	40.07	13	1.68
204	Ophthalmology	3081	53.30	158.07	93.17	47	1.53	342.59	263.86	18	.58	157.44	78.69	104	3.38
205	Ear, Nose and Throat	3009	50.67	180.51	92.10	75	2.49	356.38	286.76	83	2.76	110.86	39.29	172	5.72
206	Plastic Surgery	3661	72.03	191.47	70.05	41	1.12	162.02	87.34	164	4.48	132.40	59.91	119	3.25
207	Urology	2355	109.34	189.95	73.67	332	14.10	260.52	182.75	310	13.16	174.31	36.64	451	19.15
208	Vascular	691	91.80	168.86	44.65	28	4.05	230.94	143.74	73	10.56	146.87	35.69	38	5.50
209	Preadmission	1053	129.49	324.87	61.30	230	21.84	325.34	103.27	232	22.03	69.21	2.53	486	46.15
301	Dental	1707	92.32	205.06	80.72	58	3.40	216.49	95.89	66	3.87	258.57	133.23	38	2.23
310	Orthopaedics	5876	73.88	164.60	45.74	91	1.32	144.33	89.90	1688	24.55	131.43	42.35	154	2.24
350	Psych related (306)	126	177.36	81.41	26.67	5	3.97	97.36	48.58	2	1.59	72.22	8.05	104	82.54
401	Family Planning	841	90.88	160.82	98.15	252	29.96	159.49	69.17	21	2.50	95.56	3.91	616	73.25
402	Obstetrics	12887	92.10	165.47	85.05	3657	28.38	241.20	81.34	1251	9.71	108.60	1.82	6425	49.86
403	Gynaecology	7032	84.15	159.58	78.69	1316	18.71	178.29	89.37	267	3.80	99.90	5.85	2960	42.09
501	Paediatric Surgical	337	112.39	262.50	56.10	10	2.97	283.05	142.42	19	5.64	152.56	56.17	2	.59
502	Paediatric Medical	790	161.05	231.08	37.64	55	6.96	258.40	132.35	48	6.08	173.67	7.19	189	23.92

Notes: [1] all clinical haematology cases in study data reassigned to Oncology or Specified Grants.

Multidisciplinary Clinics

In our Technical Report (No. 6) *Development of Relative Resource Weights for Non-admitted Patients* (Jackson & Sevil 1996), we commented on the problems which multidisciplinary clinics present to a throughput-based funding system. In the context of the Department's proposal to fund hospital outpatient services on an output basis from July 1997, and the Metropolitan Hospitals Planning Board's endorsement of continuing public provision of multidisciplinary clinics (O'Connell & Sharwood 1996, Metropolitan Hospitals Planning Board 1995), the team was funded to investigate the phenomenon of multidisciplinary clinics and report to the Department on funding options.

Block funding for outpatient services (the current funding basis for Victorian hospitals), provides few incentives (or disincentives) for hospitals to organise clinics on a multidisciplinary basis. Counting rules for occasions of service (OOS) restrict multiple counting of such visits, the definition of an OOS being a contact with a 'functional unit' of the hospital (Health and Community Services 1995), although this definition could still be used to justify separate counting of, eg., a contact with medical practitioners in the Endocrinology unit of the hospital, and a contact with a nutritionist from the Dietetics unit in the adjoining consultation room.

When payment incentives are attached to activity measures, however, the definition must be more rigorous, and the rates of payment must be based on an agreed common measure of resource use. Multidisciplinary clinics present problems on both these dimensions. In inpatient care, all activities undertaken on behalf of the patient are considered to be counted and covered in a single admission characterised by the DRG.

Outpatient care, precisely because patients are 'ambulatory', can be disaggregated into multiple visits, even when there is a high level of consensus about the appropriate constituents of patient care. In many areas of hospital outpatient activity, such a consensus about optimal care processes does not exist, making comparisons across hospitals (and measurement of resources used) difficult. In the face of new counting rules and differential payment relativities, hospitals face substantial incentives to change the way in which clinics are organised and/or reported.

This section details findings from a review of the medical literature on the rationale for multidisciplinary approaches to outpatient services, and from a small series of focus groups convened in four Melbourne hospitals to consider issues of funding policy for multidisciplinary clinics.

Study Approach

Published articles indexed on Medline from 1991 were reviewed using search criteria identifying outpatient or ambulatory services and the term 'multidisciplinary'. An overview of relevant papers is provided below.

In addition, meetings with staff of four hospitals were arranged to discuss the issue of multidisciplinary clinics and alternative funding models: two hospitals were selected which have deliberately organised their outpatient clinics to facilitate inter- and multidisciplinary consultation (both of which were involved in the 1996 NAP Study). In addition, two hospitals were selected, neither from the NAPS sample, which have a mixture of single and multi-disciplinary clinics. Efforts were made to involve a range of medical specialists and allied health professionals; wide representation was achieved in three of the four hospital focus groups. Consulting four to ten key hospital staff at each hospital, we led a focussed discussion of:

- the philosophy which underpins this form of clinic organisation;
- the range of clinic types encompassed (that is, the different definitions of 'multidisciplinary' which may exist);
- The 'investment' which different professional groups or clinical specialties may have in single vs multidisciplinary clinic organisation; and
- the impact of the current block funding system and likely effects of alternatives, including casemix funding.

The purpose of the study was not to be able to report on a representative sample of hospitals or clinicians, but rather, to better understand the clinical and other reasons hospitals might organise multidisciplinary clinics, to investigate the range of services currently provided with some claim to multidisciplinary status, and to involve clinicians and administrators in a discussion of the incentives inherent in alternative funding models.

Literature Review

A recent paper by Schipper and Dick (1995), in *The Lancet* makes a persuasive case for the multidisciplinary clinic in the care of patients with complex medical problems. The authors note that 'compassion is often lacking in the traditional model of medical care. . . when the patient is progressively fragmented while coursing from one specialist to another,' yet, 'for complex problems, the knowledge base and treatment mix are too broad and labile for one person to encompass.' Stressing the importance of formulating a comprehensive plan amongst a range of specialists (medical, nursing, psychosocial and spiritual), they conclude that 'The multidisciplinary clinic provides a model wherein if one person cannot encompass all, one integrated team can'.

The international medical literature reveals two broad groupings of studies undertaken with a focus on multidisciplinary practice in outpatient settings. The first are studies which demonstrate (or hypothesise) patient-level clinical improvements attributable to a multidisciplinary model of

patient care, and the second relate to indirect and/or organisational benefits of this form of outpatient service. It is notable that studies of multidisciplinary care reviewed here deal primarily with services for patients with chronic health problems, or complex psycho-social problems with a medical component. The largest number of papers were published in nursing journals, with a marked emphasis on nurse practitioner roles.

Multidisciplinary teams have been shown to improve clinical outcomes when compared with usual care in reducing LDL cholesterol levels (Shaffer & Wexler 1995), in dealing with nonorganic failure-to-thrive syndrome in children (Bithoney et al 1991), in reducing the rate of lower limb amputations amongst renal transplant patients (Foster et al 1995), in improving treatment outcomes for non-healing leg ulcers (Steed et al 1993), and for chronic pain, especially non-surgically-treated lower back pain, (Tyre, Walworth & Tyre 1994). Sufficient clinical trials of multidisciplinary care in pain management were available for a meta-analytic review of the outcomes for this form of care (Flor, Fydrich & Turk 1992).

In addition, while no empirical evidence is presented, a case has been made for the clinical value of multidisciplinary treatment in the following areas: rheumatology (Ryan 1995), children on peritoneal dialysis (Harvey et al 1996), HIV/AIDS (Samet et al 1995; Satterwhite et al 1991), chronic wound care (Ratliff & Rodeheaver 1995), myofascial pain syndrome (Auleciems 1995), breast care (August et al 1993), cancer screening (Johnson et al 1993), and saliva control/drooling (Reddihough, Johnson & Ferguson 1992).

Mechanisms by which improved patient outcomes are achieved are not always well delineated, but in general relate to better patient compliance, better coordination of care (usually attributable to better communication amongst providers of care and more consistency in communication with patients), more attention by providers to quality of life issues (emotional state, sleep patterns, family relationships), and best use of clinical expertise in areas of professional overlap (an example is in the treatment of non-healing wounds where vascular surgeons, dermatologists and plastic surgeons each provide care, but where *combined* expertise may be necessary for optimal recovery for at least some patients).

The papers reviewed also highlight benefits which are not directly related to clinical outcomes. These included increased patient convenience (Ratliff & Rodeheaver 1995; Haig et al 1994), better rate of attendance at clinics (Banahan et al 1994), better training of resident medical officers in both clinical management (Harvey et al 1996; Schipper & Dick 1995) and in communication skills (Nielsen, Kiley & Rosa 1993; Weinsier et al 1991).

Organisational or system benefits claimed for multidisciplinary care included: shorter post-operative inpatient stay (Banahan et al 1994), greater flexibility in staffing (Hollenberg 1996), greater ability to respond to new health challenges (HIV-AIDS), more opportunities for formal quality improvement activities (Cornell & Kitsen 1995), and in at least one study, financial savings to the institution (Hylka 1994). Schipper and Dick (1995) argue that while startup costs for a multidisciplinary approach may be high, 'the end result is efficiency (fewer patient visits over the trajectory of an illness), patient satisfaction, and a culture of comprehensive management, inquiry, and progress'.

Structured Discussions with Hospital Staff

In all but one of the four hospitals where meetings were held, background information was precirculated to participants. These included extracts from the 1995 NAP study, and a covering letter to the hospital laying out the proposed discussion areas. These were organised into the four broad headings noted above. Participants were given an undertaking that the meetings would last only one hour, and the discussion was structured around a more detailed theme sheet (Attachment 1).

After introductions, the researchers briefly summarised the two studies of non-admitted patients undertaken by the Centre for Health Program Evaluation, and the use of the relative resource weights proposed for funding by the Victorian Department of Human Services in 1997. In one of the four meetings, participants chose to focus on broader payment policy questions, with relatively less time spent specifically on issues of multidisciplinary practice.

Philosophy

It was anticipated that participants in the structured discussions would focus on rationale for multidisciplinary clinics similar to those elucidated by Schipper and Dick in *Lancet.* The discussions, however, revealed the ways in which the complex policy environment influences organisational innovation and development, including the nexus between general and specialist medical practitioners and between the public and private sectors.

The way in which clinic structures had developed in hospitals also influenced participants' thinking about the issue. The two hospitals which had deliberately embraced forms of multidisciplinary organisation could articulate more clearly their rationale for doing so. Participants from the other two informant hospitals stressed the more opportunistic basis on which multidisciplinary structures had developed. These included strong professional interests or specific training on the part of allied health staff in a particular medical discipline, relative availability of inpatient and outpatient allied health professionals, and/or identification of new interventions (eg., stomal therapy) which required both medical and allied health components to care.

All groups readily identified patients with complex chronic conditions as the key patient groups for whom multidisciplinary care had advantages, although short-term rehabilitation following surgery, and some forms of screening/diagnosis performed by allied health staff were also noted as requiring the involvement of multiple disciplines. The emphasis on chronic conditions was noted both on grounds of patient convenience and on the greater need for coordination and care planning for these patients.

It became clear that the extent to which hospitals deliberately targeted their outpatient services to particular patient types was one component of the decision to increase the proportion of multidisciplinary clinics. Participants stressed that controversies about the proper role of outpatient clinics (as supplements or complements to private, fee-for-service medical consultations) as well as issues of optimal clinical organisation and patient convenience are important in considering the question.

Targeting

Prior to the introduction of Medicare, outpatient departments were provided using honorary medical officers who provided free specialist medical care for the poor in exchange for the right to admit private patients to the hospital. This was often the only access low income people with chronic or complex conditions had to costly private specialist care.

As allied health disciplines were accepted into the inpatient therapeutic environment, these disciplines were introduced into the outpatient department as well. The introduction of Medibank, and subsequently, Medicare, increased access to specialist medical care, but not to allied health services, and not to medical specialties where bulk-billing rates are low and large co-payments the norm.

Some hospitals have more specifically targeted their services to complement availability of services through the private (Commonwealth-subsidised) sector. Targeting is done on at least two dimensions, represented in Figure 7. In this figure, the vertical dimension represents the balance between assessment and management (A,B), and the horizontal dimension represents whether or not a hospital selectively accepts referrals (C,D).

The first targeting strategy is to assume an assessment and consulting role in support of general practitioners (A). This entails a high proportion of once-only specialist assessments, with referral back to GPs for ongoing management. The second approach (C) is to deflect most referrals to private specialists, in order to focus the effort of the outpatient department on providing care for complex patients whose care could not be managed in the private sector, those who require supports not generally available in private consulting rooms, for example, interpreters.

By contrast, hospitals which continue to offer outpatient services in the traditional (untargeted) way, accept all patients referred for care (D), and continue to take responsibility for ongoing management of chronic conditions (B). Both targeting strategies, and particularly their interaction (Cell AC), have implications for funding policy which are considered below.

FIGURE 7: Strategies for targeting outpatient services

	Primarily Assessment (High % New Patients) **A**	Assessment and Management (High % Review Patients) **B**
Selected Complex Cases **C**	AC	BC
All Referred Cases **D**	AD	BD

Definitions of Multidisciplinary Care

Six models or variants of multidisciplinary care emerged from discussions in the four hospitals. The most common across all hospitals is a clinic providing specialist medical care with one or more allied health professionals rostered to the clinic. Nutritionists, physiotherapists, occupational therapists, speech pathologists, social workers, orthoptists and nurse practitioners were specifically mentioned. The second model is closely related to the first, but with allied health professionals 'on call' from other duties rather than specifically rostered to the clinic.

A third model involves multiple medical specialists rostered to a single clinic, with *ad hoc* cross referral of (or professional consultation regarding) complex cases. Such internal referrals are not structured around a treatment protocol, but are made when judged appropriate by the attending clinician. These multi-medical-disciplinary clinics might also have allied health professionals either rostered or on call as above, a fourth variant.

The fifth model described is organised around standard protocols which ensure that patients at a particular stage of the treatment process see a prescribed set of health professionals, *seriatim*. Thus, new patients to a spina bifida clinic would be booked into the urology clinic and orthopaedic clinic.

The sixth and final model described is the most intensive, with patients (and sometimes family members) involved in a case-conference format consultation with a number of medical and allied health specialists meeting together to discuss issues of clinical management. This model was noted as having developed particularly to provide outpatient care for children with multiple disabilities.

Each of these models implies different counting rules and other regulations if they were to be funded on a throughput basis, and could be predicted to stimulate different organisational responses to casemix funding. These are discussed below under 'Financial Incentives'.

Professional 'Investment' in Multidisciplinary Care

Participants in the four discussion groups generally dismissed the suggestion that support or opposition to multidisciplinary practice styles was related to professional training. Factors such as the nature of the clinical problems encountered were seen to be more influential with individual providers and with sponsoring hospitals in determining the mix of disciplines involved in patient care. For example, the complex needs of children with multiple disabilities, was cited by paediatricians and allied health workers as the principal reason for organising multidisciplinary clinics for such patients. Specific training or a strong interest on the part of an allied health provider in such a particular condition were also cited as motivating factors for the involvement of professionals from a particular discipline. In a number of examples provided, this pattern of multidisciplinary care was acknowledged to be distinctive to a particular clinic or hospital.

Financial Incentives

The final topic raised in discussions with administrators and clinicians was the effect of financial incentives of different payment mechanisms on the provision of multidisciplinary care. Participants were invited to discuss how block or historical funding might have shaped service provision, and how a throughput based funding system might change current arrangements.

Because historical funding has been the norm for most of these professionals' working lives, they were not able to disentangle effects of the funding system from other issues of organisation and management. Most observations about block funding were made in contrast to private fee for service practice. Some participants remarked on funding shortfalls and on the current system's unpredictability in getting access to needed allied health staff. Unpredictability was associated with underfunding of specific disciplines (relative to perceived need), varying emphasis of inpatient and outpatient roles, and allied staff interest in particular clinical conditions and problems.

Other participants favourably compared hospital-based practice to private practice, noting that some patients 'could not be seen' in private practice because they required costly allied health intervention alongside medical management.

Participants' evaluation of casemix-based funding was linked to a number of the issues raised earlier in discussions. These included: the impact of targeting on outpatient services; the counting of encounters when more than one professional group is involved; approaches to auditing of multiple professional encounters, and the types of allied health practitioners who might be separately counted and/or funded.

The first of these issues was a concern raised by hospitals which target their outpatient services about the effect of a payment system which did not reward targeting. They were concerned that an average per case payment (estimated from across hospitals which may or may not target outpatient services) would create incentives on their hospitals to return to provision of untargeted services. They argued that hospitals which target their services to minimise routine management and limit consultations to the assessment role are more costly per case because these cases require both longer consultation times and more associated diagnostic services.

In their view, the more hospitals undertake routine management of uncomplicated patient care, the lower the proportion of these higher-cost assessment encounters in the hospital's casemix, and the more 'profit' available from a undifferentiated per case payment. Some preliminary testing of this hypothesis with data from the 1996 Non-Admitted Patients Study shows that new patients in many clinical specialties are more costly, but these findings are not uniform across all disciplines, and data available for testing is to some extent unreliable (see the Comparison between the VACS and the DACS section below).

The selection of referred patients is argued to be more costly, as one criterion for accepting a referral is a judgement that the patient would be 'too costly' to be adequately managed in private rooms under the Commonwealth Medical Benefits Schedule (CMBS) payment. When patients require multidisciplinary care, especially care involving allied health professionals not covered by

the CMBS, they have a higher average cost than unselected patients. Selection, *per se,* would not lead to higher costs, as it would also be feasible for hospitals to 'select' (or encourage) referrals which they predicted to be lower cost when compared with an 'all-comers' policy.

While it is unlikely that any hospital is a pure type, Figure 7 illustrates the interaction of these factors, with hospitals pursuing the strategy represented by Cell AC incurring the highest costs. Hospitals with a preponderance of Cell BC or Cell AD clinics would incur intermediate costs, and hospitals operating on the historical model of ongoing management of all referred cases (Cell BD) likely to have the lowest average costs.

Resolution of this issue lies beyond the scope of this more limited discussion of payment approaches for multidisciplinary clinics. Ultimately policy must decide how the private fee-for-service and the public specialist outpatient clinics are to be harmonised. Arguments for targeting rest on a notion of the public hospital system as a residualist system, or 'safety net,' for cases too complex or costly for the private system to easily accommodate. The alternative view is that the public system is universalist, and legitimately open to all who choose to use this form of care. The issue is further complicated by debates about whether continuing management of chronic medical conditions is best coordinated by general or specialist practitioners.

Counting of Multiple Encounters

Payment policy for multidisciplinary clinics arises in relation to these issues when clinics deliberately attract the most complex patients and structure their services to provide access to the multiple professionals who may be necessary to their care. This raises the second issue of importance in discussions with the hospitals: how should multiple consultations be counted and reimbursed? Three approaches were identified.

The first is to 'bundle' such services, on the same basis that ancillary diagnostic services in Victorian hospitals are proposed to be bundled. All visits (diagnostic, medical and allied health) within a specified window of time might be bundled for a single payment, or only diagnostic and allied health visits, with a new medical consultative visit establishing a new encounter for payment purposes. This counting rule creates strong incentives for hospitals to designate case managers for each patient and/or organise utilisation review activities to monitor patterns of care for groups of patients. It encourages clinicians to periodically review the resource implications of different patterns of care, against the set price offered for providing the bundled service.

It has the disadvantage, however, that it might discourage the provision of necessary care for complex cases, or encourage hospitals to organise complex care as a series of individual consultations spaced to maximise reimbursement (eg., just beyond the current 30-day payment window). It has the additional disadvantage that it would unfairly penalise hospitals when patients required multiple unrelated medical encounters.

The second approach is to separately count and reimburse each consultative/non-diagnostic encounter. This has the advantage that it does not encourage serial appointments with multiple specialists, and does not penalise hospitals providing multidisciplinary clinics. However, this rule is also vulnerable to gaming, with hospitals artificially organising clinics to provide opportunities

for multiple, marginally-necessary consultations with other specialists, and/or designating current staff (clinic nurses, for example) as separate consultants.

The third approach is the separate counting and reimbursement discussed above, but only for booked appointments. This approach has the advantage of providing documentation of activity which can be more easily audited and verified by funding authorities. It has the disadvantage that it may still be 'gameable' (if hospitals were prepared to distort their booking system to maximise payment). More seriously, it might discourage current 'on call' arrangements used in clinics which are intermittently multidisciplinary, that is, where the decision to refer for some forms of consultation (typically, allied health services), is made on the day of the specialist medical consultation, with on-call staff rearranging other duties to see clinic patients as required.

If the 'booked appointment' approach to counting of encounters were adopted, hospitals which use 'on-call' allied health staff for medical clinics would be likely to reconsider these arrangements. In some cases this would lead to formalised care protocols which specify in advance which types of patients require particular additional consultations. In less well-organised hospitals, the inflexibility of such a system might lead to the withdrawal of particular kinds of allied health care altogether, or additional patient inconvenience, with a return visit arranged in order to meet the requirement for a booked appointment.

In the longer term, it may be possible to identify those patient conditions or clinical specialties where continuing management utilising a hospital-based multidisciplinary team is both clinically and organisationally desirable. In these areas, an episode of care model (Jackson 1996), or continuing case management (such as forms of care developed through the Commonwealth's Coordinated Care Trials) may provide a better basis for funding policy.

Conclusion and Recommendation

Hospitals offer multidisciplinary clinics for a variety of reasons, and with a wide range of definitions of how the term translates into practical clinic organisation. The most frequent rationale for organising multidisciplinary care is to improve both convenience and clinical outcomes for patients with complex conditions requiring ongoing specialist medical care. This has considerable support from the published international literature.

Two important and unresolved policy issues complicate discussion of how hospital-based outpatient multidisciplinary care should best be reimbursed. The first is the relative roles of the public and private sectors, and the second is the respective roles of specialist and general practitioners. A key to both of these is the differential access to subsidised allied health care available through hospital outpatient departments.

A policy of counting multiple *booked appointments* is recommended as the basis for funding policy, in spite of possible adverse hospital responses. Less formal consultative and on-call arrangements may be desirable for optimal patient care, but provide too many opportunities for misrepresentation of the encounter to be supportable for payment policy in the longer term.

ATTACHMENT 1: Theme Sheet for Seminars on Multidisciplinary Clinic (MDC) Payment Policy

Introduction

- Description of current project
- Development of the Victorian Ambulatory Classification System (VACS)
  - Payment window (medical, nursing, diagnostics and drugs)
  - Problems in counting and paying for Multidisciplinary Clinics
    - Currently count as single encounter
    - Hospitals at a disadvantage when MDCs are paid on this basis
  - Four topics for discussion: philosophy, definitions, professional 'investment' and financial incentives.

Philosophy

- What advantages does this kind of organisation have?
- Are there disadvantages?
- Why does your hospital organise clinics in this way?
  - History?
  - Concerns for patient welfare ? (avoiding multiple visits,...)
  - Particular case mix?
  - Current philosophy?
- Should other hospitals place the same emphasis on MDCs as yours?

Definitions

- What does the Hospital mean by MDC?
- What variations exist on MDC?
  - Multi-doctor
  - Medical/Allied Health
  - Role of Nursing
  - Other
- How are they typically organised?

Professional 'Investment' (perspectives of different professional groups)

- Do some professional groups favour or resist MDCs more than others?
- Is it related to:
  - Particular aspects of training?
  - The casemix of patients?
  - 'Territorial' concerns?

Financial Incentives (of different payment mechanisms)

- Does current block/historical funding help or hinder MDCs?
- How do you see casemix-based outpatient funding affecting MDCs?
- How would you prefer to see counting rules determined?

Any Other Issues

Comparison Between the Victorian Ambulatory Classification System and the Developmental Ambulatory Classification System

Introduction

This section of the study was designed to use information from the 1996 Non-admitted Patient Study (NAPS) database to assess how the Commonwealth Department of Health and Family Services' proposed Developmental Ambulatory Classification System (DACS) might perform in explaining costs of ambulatory care provided in Victorian hospitals. As a supplementary project to the 1996 NAP Study, the investigators proposed to collect data which would assist the Department in assessing the usefulness and feasibility of moving toward data requirements consistent with the Commonwealth's DACS.

In 1996, the Commonwealth Department commissioned a research project to test an ambulatory classification system developed by the Australian Clinical Casemix Committee (Commonwealth Department of Human Services and Health, 1995). The DACS Study will test the explanatory power of a number of variables in accounting for the differences in cost of outpatient encounters in a national sample of hospitals. Selection of study hospitals and questionnaire design are currently being undertaken by the consulting firm Deloitte Touche Tohmatsu in order to collect activity and cost data for classification to DACS.

While the final characteristics of the system will be determined by evaluation against cost data from hospitals participating in the study, it potentially differs from the Victorian Ambulatory Classification System (VACS) in a number of important characteristics. The DACS:

- classifies individual patients by diagnosis (rather than the professional discipline of the treating clinician);
- separately counts ancillary services (does not 'bundle');
- splits most classes on new/review status;
- splits most classes on procedure/no procedure;
- distributes allied health encounters across diagnostic categories; and
- will collect information on patient age (with no decision yet taken about how paediatric cases will be classified).

With the exclusion of Pre MDC the DACS structure is based on the current inpatient Major Diagnostic Categories (MDCs) (3M Health Information Systems, 1993), and these are referred to as Ambulatory Major Diagnostic categories or AMDCs. Two new MDCs have been defined: AMDC 24 Specific Treatment Modalities and a Post AMDC category. Currently there are 82 DACS categories. All but AMDCs 18, 20 and Post AMDC are split on new and repeat (review) to form 46 of the 82 DACS categories. Twenty AMDCs are split on procedure to form 21 DACS categories. AMDC 10 is split on 3 elements for both diabetes and for other endocrine disorders and the remaining DACS categories relate to specific treatments or diagnostic technologies, some examples of which include HIV visits, MRIs, CT scans, nuclear imaging and stand alone diagnostics.

In most respects, the AMDC structure and the clinical specialty structure of VACS correspond. Attachment 2 demonstrates the degree of comparability. VACS provides no equivalent for AMDCs 15 and 21, as these are almost exclusively dealt with as inpatient admissions. Because of the concentration of radiotherapy services in a small number of Victorian hospitals, the VACS does not currently cover these services. Where the DACS distinguishes within AMDC on new/review status and procedure, the VACS tends to distinguish between medical and surgical treatment within the same diagnostic category (eg., neurology/neurosurgery, cardiology/cardiothoracic and vascular surgery).

The major difference, of course, is that the patient rather than the practitioner is the basis for DACS classification. VACS uses the medical or allied health specialty of the treating clinician, (recorded as the specialty managing the outpatient clinic), to define clinical content of the encounter, while DACS relies on a diagnostic descriptor of the patient's presenting condition. This is most notable in clinics which treat multi-system diseases such as General Medicine (VACS 101) and General Surgery (VACS 201), where the DACS would separately identify the patient's reason for visit according to an MDC.

The DACS approach has both strengths and weaknesses. By classifying each patient, it would support fairer payment to 'generic' clinics such as General Surgery and General Medicine. A wide range of clinical problems are seen in these clinics, particularly in smaller hospitals where the volume of patients in any one subspecialty may not justify the establishment of specific subspecialty clinics. Costs per encounter may vary markedly within such clinics. The VACS is not able to measure such variability, nor does it support differential payment for more costly patients within a clinic.

Such precision, however, comes at a price. Assigning a diagnostic code to each patient imposes a considerably greater data collection burden than is required for the VACS. For VACS, the clinic is assigned to the classification system only once, with each patient attending the clinic automatically recorded to the appropriate category.

Moreover, the additional precision of the classification assumes a high compliance rate amongst clinicians who will be asked to record the information. A study of outpatient clinic costs at Flinders Medical Centre (Michael, Piper & Heard 1994) set out to collect patient-level diagnostic and procedure data, and concluded that 'whilst ... clinicians are prepared to collect very detailed data for relatively short periods of time, it is abundantly clear that clinicians would reject any notion of collecting such data on an ongoing basis' (p 76). To more finely distinguish patient conditions requires a greater degree of clinical judgement in recording the information at the risk of greater inter-rater differences. Low compliance rates and high rates of error will compromise the apparent precision of such a system.

It is sometimes argued that classifying the patient is a purer approach to classification because it does not assume particular therapeutic pathways (surgical versus medical treatment, for example). The argument is that payment policy should not influence treatment decisions even inadvertently, by providing different reimbursement for different treatments. This agnosticism would be most important for clinical services which are genuinely substitutable, although the referred nature of outpatient services means that the referring general practitioner certainly takes into account the nature of the patient's condition in selecting the type of specialist to whom she or he refers.

Moreover, neither the inpatient ANDRG system, nor U.S. ambulatory classification systems, embody this 'pure' approach to classification, making the initial split for most MDCs on the basis of surgical/medical treatment. Although AMDCs under DACS do not split on this basis, in cancer therapy, an area of considerable clinical controversy about complementarity or substitutability of treatments, the DACS provides separate categories for chemotherapy and radiotherapy.

A second difference which may result from the DACS structure is in its treatment of allied health encounters. The research protocol allows for 15 different health disciplines to be recorded. It is not clear to what extent the DACS categories will be further subdivided by discipline, but potentially the classification could entail 879 separate classes on these two axes (taking account of the small number of allied health disciplines which are specific to a single AMDC, eg. audiology). As an example, nutritionists work across most AMDCs, and thus, potentially duplicate the 79 consultative categories. Alternative approaches for the DACS would be to ignore potentially large cost differences between medically managed and allied health encounters (grouping them all to the relevant body system), or to 'bundle' allied health in the same way that diagnostic services are bundled into VACS categories.

From the outset it was acknowledged that purposive collection of patient-level diagnostic information was beyond the scope of the current Victorian project, and that recording of key variables necessary for DACS classification is poor: they are either not routinely recorded, are recorded unreliably, or are recorded using different criteria from clinic to clinic and hospital to hospital. No hospital in the 1996 Victorian study routinely collects information on procedures

performed, although earlier analysis identified procedural clinics which had significantly different costs than their parent clinical specialty, such as colposcopy clinics in gynaecology.

Not all hospitals record new/review status of the encounter, and some of those which do record the information use ‘review' as the default value when information on new/review status is missing. Where hospitals have computerised booking systems the likely impact of collecting additional data on new and review patients for the DACS is minimal, and at most would require a specific program for extraction.

In the absence of key DACS variables, this study has been redesigned to examine the relationship between resource intensity (cost) and new/review status in a subset of hospitals participating in the 1996 NAPS which could provide such information.

New and Review Patients

The distinction between new and review patients is enshrined in the Commonwealth Medical Benefit Schedule (CMBS), where differential payments are made for ‘initial' and ‘subsequent' specialist consultations in a ‘single course of treatment'. The fee relativity between subsequent and initial attendances is approximately 1 to 2. While there is no apparent empirical basis for this relativity, the presumption is that the specialist will spend roughly twice as long with a new patient, who requires more thorough history taking and initial assessment in this visit than in subsequent visits.

The National Ambulatory Casemix Project (NACP) found that new/review status ‘did not prove to be a good resource predictor variable in most ambulatory settings, and also it was difficult to establish a precise and consistent definition of a new patient' (Lagaida & Hindle 1992). In only three final classes (neurology, dietetics and pain clinics) was this variable used to split the class. When staff care costs only were taken into account for these three classes, the relativity between review and new patients ranged from 1.6 to 2.1; but when overheads and consumable costs were added, the relativities narrowed to between 1.3 and 1.8.

Both the NACP and the CMBS count the costs of diagnostic procedures generated by the consultation separately from the costs of the visit itself. When such ancillary costs are ‘bundled' into an all-inclusive encounter, as is the case for the VACS, the strength and direction of any effect of the new patient consultation has not been tested.

For the current study, hospitals were not required to collect new information or modify their costing or booking systems. The most common definition of a new patient in these hospitals refers to the non-admitted patient who has not been treated in the specific outpatient clinic in the preceding twelve months. In some participating hospitals, additional appointment time is scheduled for new patients so that the attending practitioner can establish the clinical history of the patient, in particular with regard to the presenting problem, and this in turn is reflected in the hospital's computerised booking system.

Limitations of the Data

Data available for the 1996 NAP study allow for limited testing of the hypothesis that, within clinical categories, new and review patients generate different costs. Despite these limitations, primarily related to data validity, the exercise is worthwhile for identifying where future research and systems developments lie. As discussed, the effect of most of the identified data limitations is to underestimate differences between new and review encounters, so that if differences are found, they are likely to be able to be replicated in future studies. Where no difference is found, the question remains as to whether this is attributable to problems of cost measurement.

The major problem with analysis of consultation costs below the 'clinic' level (eg., at the patient level) is that few hospitals precisely record the time taken for consultation. In most hospitals, the cost of clinic services is estimated on the basis of some form of averaging (total staff salaries divided by the number of patients or weighted patients seen). Where nursing, allied health or medical salaries are concerned, there will be an underestimation of real resource consumption for new patients to clinics through the averaging of the total cost of salaries over all consultations). Averaging of overhead costs is less of an issue, and ancillary service utilisation is usually tracked at the patient level.

Three approaches are taken by hospitals in order to provide more accurate estimates of any differential between the costs of new and review patients. In the best case, hospitals record actual consultation times by timed intervals; for example, up to 5 minutes; 5 - 15 minutes and so on. It is not clear how closely total clinic staff times reconcile with the sum of these time-block estimates, but recording of time blocks is currently the most precise measurement of staff costs in outpatient clinics, outside a few very sophisticated Emergency Department systems which record actual staff time per patient.

A second approach, as noted earlier, is to differentially book new and review patients; for example, a new visit may be allocated two or three appointment slots and a review case may be allocated only one appointment slot. In estimating per patient costs, clinic costs are divided by the number of appointment slots and assigned back to individual patients. How accurately these cost ratios reflect actual clinical practice is unknown.

A third approach used by sample hospitals is to apply CMBS definitions and relativities to allocate clinic costs, again, with little independent evidence of the underlying relativities approximated by this allocation. It is fair to say that these approaches are analogous to inpatient nursing dependency systems in that they utilise adjusters in preference to crude averaging, but the adjusters themselves may not have been rigorously validated.

While the definition of new and review encounter was quite consistent across the hospitals in the sample, it is important to note that the default for an unrecorded new/review field currently used in most clinical costing system designs is 'review'. Hospitals estimate that misallocation to the default is low. For the 58,387 encounters analysed from the hospitals for this sub-study, only 1% lacked coding of new/review status, but the proportion defaulting to review is unknown.

The cumulative effect of these data problems will be to underestimate differences between new and review consultations. The magnitude of these differences requires further investigation, but is beyond the scope of this study.

Sample

Five of the six study hospitals were able to provide data on new and review encounters. No information on the new/review split from the Royal Melbourne hospital was recorded, and for this reason the RMH's data was eliminated from further analysis. Allied health and emergency encounters have not been analysed. As discussed in the main report the information on these encounters was less reliable than for the encounters which fell into VACS 101 to 502, and thus only thirty-one of the potential forty-three VACS categories were used in the descriptive analysis. In order to estimate the impact of this variable on variance reduction for the model as a whole, all available VACS categories are used in testing, but no splits have been incorporated for the 550-609 VACS range.

Results

The analysis was undertaken in two stages: the first was a descriptive analysis to identify which VACS categories exhibited significant cost differences between the sub-groups of new and review encounters. This was done on both the total cost of the encounter (which includes associated diagnostic and pharmacy costs), and again on only the costs of the clinic portion of the encounter.

The second stage entailed examination of the amount of variance reduction for the VACS system as a whole which could be achieved by splitting relevant clinical categories on the new/review criterion. This analysis was first done on the Department's categories for funding in 1997/98, and again on the VAC system if collapsed and split on the basis of particular clinical sub-specialties identified in the section *Implications for Payment Policy* (pp 12-15).

To test the hypothesis that there is no difference between new encounters and review encounters t-tests for independent samples were undertaken for each VACS category using SPSS for Windows 6.0 (SPSS Inc. 1993).

During the study period valid information was available for 58,387 encounters in five metropolitan teaching hospitals in Victoria. Information was missing for approximately 1% of all encounters in the VACS 101-105 range, and the results show that this was not systematic across any particular hospital. 11,843 (20%) encounters were recorded as new visits to the clinic and there were almost four times as many review encounters 45,959 (79%). The null hypothesis is that there is no difference in the average cost of a new encounter and a review encounter, and our research hypothesis is that new encounters are more costly than review.

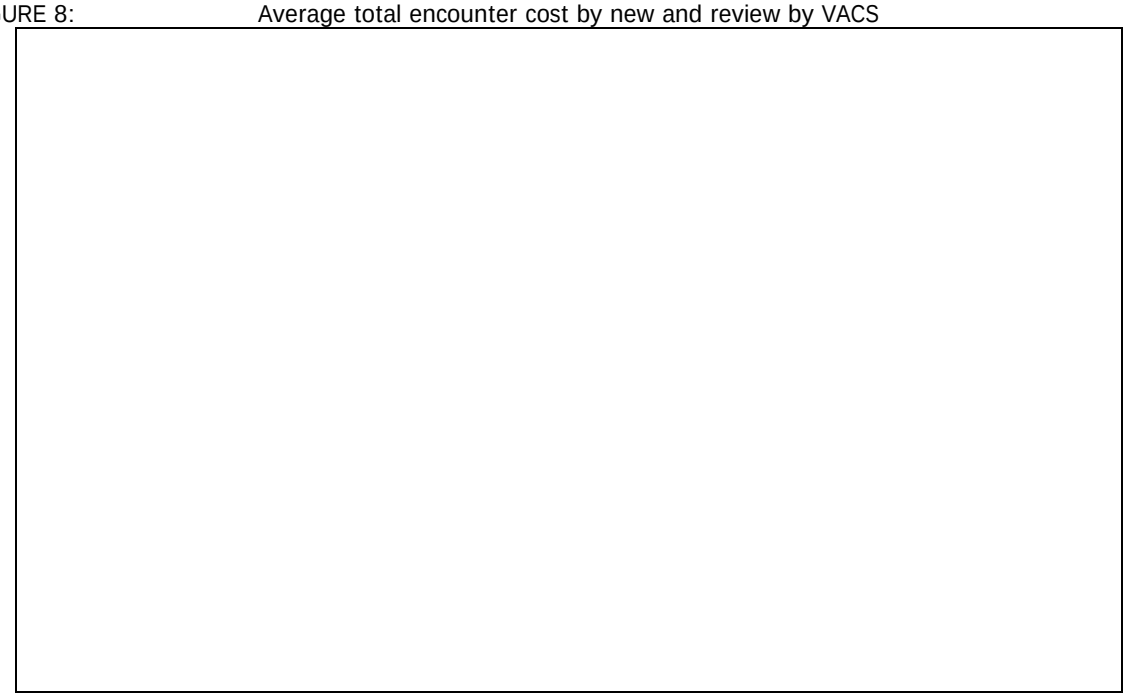
Descriptive Analysis

The average cost of a new patient and the average cost of review patients differed by $35 across all encounters. The data show the mean cost for all new encounters to be $129, compared to a mean cost of $94 for all review encounters.

Figure 8 *Average total encounter cost by new and review by VACS* illustrates the relationship between the average cost of treating new and review patients. The dark bar on the left of each pair represents the total average cost for all new patients for each VACS category being

analysed, and the lighter bar on the right hand side of each pair represents the total mean cost for review encounters.

FIGURE 8: Average total encounter cost by new and review by VACS



The hypothesis that new encounters have higher costs than review encounters is true for more than half the VACS categories tested (18 of 31) as shown in Table 7. In 16 of the 18, the difference was in the hypothesised direction, that is, new encounters were significantly more costly than review encounters. Nephrology and Vascular VACS were the only clinic types to report an average cost for review patients significantly greater than that for new patients.

It is important to note here that the average cost in both the case of new and review patients has been built up using the VACS encounter definition. For patients treated in the outpatient department, each clinic visit is recorded and all ancillary services which can be attributed to that visit and can be tracked over a thirty day period either side of that initial visit, are bundled to generate the encounter cost. For example if a patient visited an outpatient clinic which has been assigned to the Preadmission category, the cost profile would be built around the cost of the consultation (say $159); the related service costs (imaging, pathology and/or pharmacy) would also be attributed to give the encounter cost. In our example, the patient may have one pathology

TABLE 7: Summary of significant differences in the average total cost between new and review encounters by VACS categories

VACS code	Description	Encounters					*Indicates significant Differences (<0.05*) (<0.01**)
		N of new	Percent new (%)	Average total cost new ($)	Average total cost review ($)	Ratio new/ review (review : new) (1 : 1.39)	
101	General Medicine	915	25	104.83	75.65	1.39	**
102	Allergy	11	2	88.02	105.07	0.84	
103	Cardiology	149	19	235.65	220.88	1.07	
104	Diabetes	33	7	153.93	82.22	1.87	**
105	Endocrinology	236	16	139.53	121.76	1.15	
106	Gastroenterology	215	25	117.40	120.01	0.98	
108	Nephrology	153	12	236.39	354.37	0.67	**
109	Neurology	132	24	96.65	81.54	1.19	**
110	Oncology	144	6	234.89	163.89	1.43	**
111	Respiratory	156	17	126.16	113.21	1.11	*
112	Rheumatology	67	17	117.57	122.11	0.96	
113	Dermatology	329	28	95.94	87.86	1.09	
114	Infectious Diseases	112	21	177.89	128.63	1.38	*
115	Developmental Neurological Disability	85	17	221.60	213.33	1.04	
201	General Surgery	509	23	126.18	83.35	1.51	**
202	Cardiothoracic	26	10	277.47	248.61	1.12	
203	Neurosurgery	59	12	115.77	89.83	1.29	
204	Ophthalmology	405	16	56.33	42.38	1.33	**
205	Ear, Nose and Throat	824	32	53.96	47.71	1.13	
206	Plastic Surgery	591	21	68.29	61.03	1.12	**
207	Urology	408	24	137.76	108.82	1.27	**
208	Vascular	93	19	99.13	111.71	0.89	*
209	Preadmission	372	62	220.42	123.10	1.79	**
301	Dental	73	5	160.73	69.80	2.30	**
310	Orthopaedics	1192	23	95.22	70.83	1.34	**
350	Psych related (306)	39	31	180.32	176.03	1.02	
401	Family Planning	206	24	104.09	86.60	1.20	**
402	Obstetrics	2866	23	161.10	72.28	2.23	**
403	Gynaecology	1188	17	140.15	71.79	1.95	**
501	Paediatric Surgical	94	28	104.82	115.33	0.91	
502	Paediatric Medical	161	22	149.66	149.59	1.00	

service (say $26) and one imaging service (say $38). Therefore the encounter cost would be $223 ($159 + $26 + $38). Costing of the next encounter (review in this case) would begin with the next booked appointment.

Results from costing of the clinic-only component (excluding costs of ancillary services) must be interpreted cautiously because of the measurement problems discussed previously. While attempts are made in some of the study hospitals to model differential staff costs between new and review patients, these are based on untested relativities. It is possible that cost differences for some categories may simply reflect the relative contributions of data to the two categories, i.e., a higher cost hospital contributing more cases to the pooled data on new patients

The total average cost ratio for review to new patients ranged from 1 : 2.3 in VACS 301 Dental to as low as 1 : 0.7 for VACS 108 Nephrology as shown in Table 7. The clinic only average showed larger differences in relativities between review and new patients with a ratio of 1 : 2.7 for VACS 104 Diabetes, to 1 : 0.6 for VACS 102 Allergy and these results are shown in Table 8.

Excluding Preadmission (discussed below), new visits to the other VACS categories range between 2% and 32% of all encounters.

VACS 209 Preadmission recorded the highest proportion of new encounters (62%). This finding supports the concept of the role of preadmission clinics. It is likely that in some circumstances patients will have more than one visit to the preadmission clinic to prepare for an operative stay, explaining the incidence of review encounters. In recent years there has been a move toward providing preadmission work-ups for booked preoperative cases in the outpatient department, particularly for less complex admissions. This has led to the evolution of pre admission clinics, and in the larger hospitals preadmission clinics are conducted in most major specialties where surgical procedures are performed. This is due partly due to the development of clinical pathways for surgical treatments and to the better management of clinical resources through a reduction in pre-surgery length of stays (LOS).

In contrast Allergy (VACS 102), Diabetes (VACS 104), Oncology (VACS 110), Cardiothoracic (VACS 202) and Dental (VACS 301) categories all recorded relatively low proportions of new visits. A higher concentration of review visits in the types of specialties described above supports the pattern of care for these types of patients, particularly for chronic and long term conditions such as diabetes and cancer.

When clinic-only costs are taken into account the proportion of new and review patients are unchanged but, a more complex picture of cost relationships emerges. As summarised in Table 8 twenty-one of the 31 categories show significant differences, but not all the original VACS categories are included. For example, Infectious Diseases (VACS 114) and Vascular (VACS 208) no longer show significant differences between new and review patient costs, once ancillary costs are excluded.

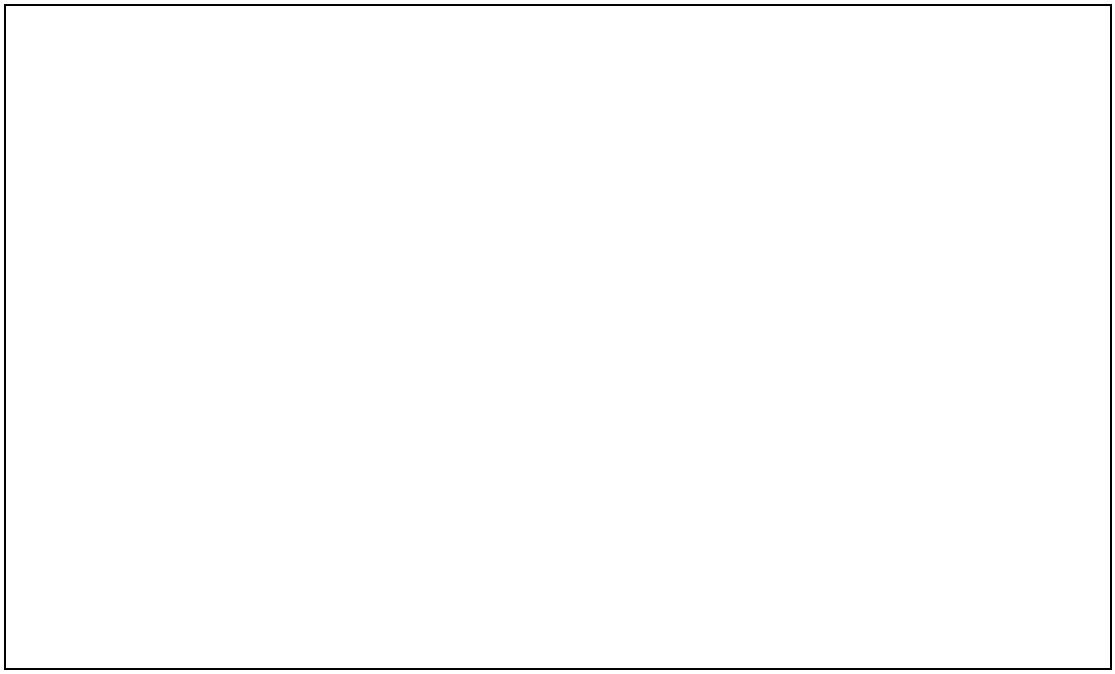
Table 8: Summary of Significant difference in the average *clinic only cost component* between new and review encounters by VACS categories

VACS code	Description	Clinic Only			* Indicates significant differences (<0.05*) (<0.01**)
		Average cost new ($)	Average cost review ($)	Ratio new/review (review : new) (1 : 1.35)	
101	General Medicine	86.91	64.57	1.35	**
102	Allergy	58.93	104.74	0.56	**
103	Cardiology	233.10	214.01	1.09	
104	Diabetes	122.25	46.10	2.65	**
105	Endocrinology	80.16	83.76	0.96	
106	Gastroenterology	86.94	85.71	1.01	
108	Nephrology	206.97	289.01	0.72	**
109	Neurology	80.98	73.62	1.10	**
110	Oncology	144.41	113.08	1.28	**
111	Respiratory	107.03	99.71	1.07	*
112	Rheumatology	63.06	83.80	0.75	*
113	Dermatology	65.01	47.23	1.38	**
114	Infectious Diseases	69.69	70.39	0.99	
115	Developmental Neurological Disability	213.43	199.78	1.07	
201	General Surgery	83.21	54.49	1.53	**
202	Cardiothoracic	211.67	216.84	0.98	
203	Neurosurgery	87.64	71.62	1.22	**
204	Ophthalmology	46.34	36.83	1.26	**
205	Ear, Nose and Throat	41.34	32.93	1.26	**
206	Plastic Surgery	59.64	55.11	1.08	**
207	Urology	78.04	69.60	1.12	**
208	Vascular	89.45	89.49	1.00	
209	Preadmission	159.18	81.43	1.95	**
301	Dental	135.81	61.59	2.21	**
310	Orthopaedics	61.57	48.11	1.28	**
350	Psych related (306)	176.87	165.31	1.07	
401	Family Planning	54.91	57.52	0.95	*
402	Obstetrics	78.70	53.16	1.48	**
403	Gynaecology	99.55	55.42	1.80	**
501	Paediatric Surgical	98.55	103.87	0.95	
502	Paediatric Medical	129.70	138.29	0.94	

Four additional VACS, Allergy (102), Dermatology (113), Neurosurgery (203) and ENT (205) show significant differences, the latter 3 with new encounters more costly than review, and Allergy having more costly review patients. Differences between new and review encounter costs are still significant for Family Planning (401), but the previous cost relationship is reversed, with review clinic costs higher than those for new attendances.

Figure 9 illustrates the relationship of the consultative or visit only component across all VACS by new and review encounters.

FIGURE 9: Average *clinic only* component cost by new and review by VACS



Variance Reduction

For those VACS categories which were found to differ on total cost between new and review patients, further analysis was done to determine the impact of such a split on the total variance reduction of the VACS model. Using the statistical package PC-Group Version 3.01 (Malitz & Godbout 1992), both the original VACS, and the refined VACS (cf. Table 5), were tested to determine the degree to which greater homogeneity could be achieved by splitting nominated categories on new/review status.

The first model, as described in pp. 1-11 of this report, begins with 19.8% variance reduction achieved by classification to the 41 original VACS categories for which data were available in 1996. Classes with significant differences in cost between new and review patients were then split on this variable to estimate the additional variance reduction which would result from such a split. Thresholds were established to ensure that new/review splits result in at least 0.01% variance reduction for the whole model, and result in cell sizes of at least 30 cases in each sub-group in the data set. On these criteria, four candidate splits were not even recommended by PC-Group. These were VACS 104 (Diabetes), 111 (Respiratory Medicine), 114 (Infectious Diseases), and 401 (Family Planning).

Of the other categories found to have significant cost differences between new and review patients, only four made substantial contributions to variance reduction for the model. These were VACS 402 (Obstetrics) which when split would add almost one percent (0.93%) to variance explained in the whole model; VACS 209 (Preadmission), an additional 0.28%; VACS 403 (Gynaecology), an additional 0.26%; and VACS 110 (Oncology), an additional 0.22%. These are summarised in Table 9.

If all fourteen VACS categories meeting minimum criteria were split on new/review, the total variance reduction is 22.27%, an increase of 2.47% on the original model.

If the refined model were adopted which first makes the clinical splits summarised in Table 5, the variance reduction attributable to new/review splitting (2.13%) would be smaller, but the total variance explained is larger, at 24.76%.

Three of the four VACS which resulted in the largest variance reduction in the original model do so in the clinically-refined model: VACS 402 (Obstetrics) at 0.72%; VACS 209 (Preadmission) at 0.28%; and VACS 110 (Oncology) at 0.23%. Once Family Planning (VACS 401) is folded into Gynaecology (VACS 403), and the latter is subdivided to identify Assisted Reproductive Technology (403A), and Colposcopy/Dysplasia (403B) splitting the residual gynaecology category yields only an additional 0.13% variance reduction.

TABLE 9: Summary of VACS categories with large variance reduction for new/review encounter status

VACS code	Description	Original VACS Reduction in total model variance (%)	Refined VACS (with potential clinic-based splits) Reduction in total model variance (%)
110	Oncology	0.22	0.23
209	Preadmission	0.28	0.28
402	Obstetrics	0.93	0.72
403	Gynaecology	0.26	0.13

In summary, although new and review encounters differ significantly in cost for nearly half of the VACS categories tested, the efficiency of using this criterion to achieve greater with-group homogeneity is relatively low. Additional variance reduction would be between 2% and 2.5%, and less if splits in those VACS yielding very small increments were abandoned.

Discussion

There is a longstanding belief that the resources involved in treating new patients in outpatient departments is greater than for treating review patients. This study tested a subset of data from the 1996 Victorian study on Relative Resource Weights for Non-admitted Patients to examine this relationship. The project was undertaken to assist the Victorian Department of Human Services to estimate cost relativities for ambulatory services, and to anticipate the sorts of data feeder system development which the proposed Developmental Ambulatory Classification System (DACS) would require.

The study did not have access to reliable data on procedures performed (beyond the information available from clinic designators such as 'Colposcopy Clinic'), nor specific diagnostic information for General Medicine and General Surgery clinics.

Using data from five of the six hospitals participating in the 1996 Victorian Non-admitted Patients Study, we were able to investigate cost differences between new and review encounters. The study identified 18 of the 31 categories in the Victorian Ambulatory Classification System (VACS) with significantly different costs for new and review encounters, most showing higher costs for new visits. The relativities between these two encounter types ranged from 1 : 2.3 to 1 : 0.7, using 'review' as the base.

When the total cost model was tested using analysis of variance, only 14 of the 18 splits achieved sufficiently large reductions in total variance to warrant a split on variance reduction and/or sample size grounds. For the current VACS, splitting on new/review added 14 classes (54 classes in total), and increased explained variance from 19.8 to 22.3. For the refined VACS (56 total classes) explained variance increased from 22.6 to 24.8 when relevant new and review encounters are distinguished.

This relatively small variance reduction must be considered in the more general context of casemix classification. Classification design attempts to balance a number of competing objectives (Sulvetta 1991). Most frequently cited of these are 'clinical meaning' and 'resource homogeneity'. But a third, and very important criterion is administrative simplicity. This has two aspects: the number of classes used to characterise clinical activity, and the degree to which resources must be diverted from clinical care to data recording (the data recording burden).

The issue of the number of classes is very closely related to resource homogeneity. If every patient case formed its own class, variance reduction would be 100%, that is, the classification would have high resource homogeneity, 'explaining ' all of the variability in the cost data. However, this would make a less than satisfactory basis for a payment system, because all differences in cost would be deemed to be justified, and each class paid at cost. Casemix-based payment rests in part on the hypothesis that at least some of the variability in the cost of clinical services reflects inefficiency in service provision. When like patients are grouped together, those which cost more are seen as a challenge to clinicians and health service managers to address sources of inefficiency.

At the other end of the classification spectrum, the fewer the classes, the more likely it is that unlike cases are grouped together, with ensuing unfairness in payments based on such an undifferentiated classification. The goal of analysis is to achieve a realistic level of variance reduction with a manageable number of classes. With Diagnosis Related Groups, the number of classes for most systems averages around 500, with variance reduction between 25% and 30% reported (McGuire 1993).

For hospital-based ambulatory care, there is not yet consensus on the desirable number of classes. A project at the Flinders Medical Centre tested two U.S. ambulatory classifications, AVGs (with 571 classes) and APGs (with 297), for their performance in characterising Australian clinical practice and costs (Michael, Piper & Heard 1994). Because the focus of the project was not classification development, no detailed reporting of variance reduction analysis is provided. The authors note, however, that each of these models, and a third discussed below, yielded 'between 35% and 40% variance reduction' (p 6). In part, this relatively high proportion of variance explained may reflect the fact that cost data were from only a single hospital, eliminating any variation in cost attributable to differing cost structures and practice styles between hospitals.

The third classification model tested against the 80,000 costed cases in the FMC data base was that devised by the NSW Department of Health (Lagaida & Hindle 1992). The AAC (Australian Ambulatory Classification), with nearly 200 classes (190 of them tested at FMC) was also found to explain between 35% and 40% of variance in the FMC data. In the initial study of 14 hospitals across Australia, the AAC achieved variance reduction of 28.1% for the adult system of 121 classes, and 45.2% for the 78 paediatric classes, with data from only a single paediatric hospital. As was the case in the FMC study, using data from a single hospital undoubtedly increased the explanatory power of the system.

The obvious observation to be made from these findings is that variance reduction is related to the number of classes, but the relationship is not lineal. As the number of classes increases, each additional class explains less additional variation.

Administrative burden is a second consideration in assessing the number of desirable classes. The VACS uses an annual assignment of each hospital clinic to the classification. This process of annual clinical review and assignment of new clinics entails a certain level of administrative burden, but it is a once-off cost rather than one incurred with each patient encounter. To achieve more discrimination in characterising the clinical content of encounters almost inevitably requires additional data collection, as in the DACS or overseas classification models. Both funders and clinicians need to carefully evaluate the achievement of additional reduction in variance against the costs of doing so.

New/review status has conventionally been recorded in outpatient departments, and as such, may not represent a large additional effort to systematically make this data available, moreover, increasing the classification by 13 or 14 classes on significant new/review splits may not stretch the classification beyond useable dimensions. As information technology improves, data collection burden may diminish as a factor in the evaluation of casemix systems, making further refinement desirable. It may also be the case, however, that funders and providers will shift their

attention to ever larger episodes of care, where encounter descriptors such as new/review are less useful.

Conclusion

The DACS shares many features in common with the VACS, but is more ambitious in its attempt to classify on the basis of patient-specific diagnostic and procedure information. What little work has been done in Australia to collect such data suggests that compliance in data recording is a significant problem, but that the use of such information may increase explanation of variance by as much as 10% to 15%.

In terms of refining the VACS system to more closely emulate the DACS, only new/review patient information was available, and provided relatively modest improvements in variance explained. This improvement may be important to the perceived fairness of the payment system, as hospitals reconsider the appropriate role of hospital-based outpatient care. Changes in the proportions of one-off specialist assessment versus ongoing management of chronic conditions may increase the salience of this variable.

ATTACHMENT 2: Comparison of Clinical Descriptors in Two Ambulatory Classification Systems

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
AMDC 1 Diseases and Disorders of the Nervous System DACS 1.01 New visit DACS 1.02 Repeat visit DACS 1.03 Procedure	**VACS 109** Neurology **VACS 203** Neurosurgery **VACS 115** Developmental Neurological Disorders
AMDC 2 Diseases and Disorders of the Eye DACS 2.01 New visit DACS 2.02 Repeat visit DACS 2.03 Procedure	**VACS 204** Ophthalmology **VACS 603** Optometry
AMDC 3 Diseases and Disorders of the Ear, Nose, Mouth and Throat DACS 3.01 New visit DACS 3.02 Repeat visit DACS 3.03 Procedure DACS 3.04 Dental visit	**VACS 205** Ear, Nose and Throat **VACS 601** Audiology **VACS 301** Dental
AMDC 4 Diseases and Disorders of the Respiratory System DACS 4.01 New visit DACS 4.02 Repeat visit DACS 4.03 Procedure	**VACS 111** Respiratory
AMDC 5 Diseases and Disorders of the Circulatory System DACS 5.01 New visit DACS 5.02 Repeat visit DACS 5.03 Procedure	**VACS 103** Cardiology **VACS 202** Cardiothoracic **VACS 208** Vascular

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
AMDC 6 Diseases and Disorders of the Digestive System DACS 6.01 New visit DACS 6.02 Repeat visit DACS 6.03 Procedure	**VACS 106** Gastroenterology
AMDC 7 Diseases and Disorders of the Hepatobiliary System and Pancreas DACS 7.01 New visit DACS 7.02 Repeat visit DACS 7.03 Procedure	
AMDC 8 Diseases and Disorders of the Musculoskeletal and Connective System DACS 8.01 New visit DACS 8.02 Repeat visit DACS 8.03 Procedure	**VACS 112** Rheumatology **VACS 310** Orthopaedics **VACS 311** Orthopaedic Applications
AMDC 9 Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast DACS 9.01 New visit DACS 9.02 Repeat visit DACS 9.03 Procedure	**VACS 113** Dermatology **VACS 206** Plastic Surgery

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
AMDC 10 Endocrine, Nutritional and Metabolic Diseases and Disorders DACS 10.01 Diabetic new visit DACS 10.02 Diabetic repeat visit DACS 10.03 Diabetic procedure DACS 10.04 Other AMDC 10 new visit DACS 10.05 Other AMDC 10 repeat visit DACS 10.06 Other AMDC 10 procedure	**VACS 104** Diabetes **VACS 105** Endocrinology
AMDC 11 Diseases and Disorders of the Kidney and Urinary Tract DACS 11.01 New visit DACS 11.02 Repeat visit DACS 11.03 Procedure	**VACS 108** Nephrology **VACS 207** Urology
AMDC 12 Diseases and Disorders of the Male Reproductive System DACS 12.01 New visit DACS 12.02 Repeat visit DACS 12.03 Procedure	**VACS 207** Urology
AMDC 13 Diseases and Disorders of the Female Reproductive System DACS 13.01 FRS new visit DACS 13.02 FRS repeat visit DACS 13.03 FRS procedure DACS 13.04 Annual gynaecological consultation DACS 13.05 Advanced Reproductive Technology Consultation	**VACS 403** Gynaecology **VACS 401** Family Planning

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
AMDC 14 Pregnancy, Childbirth and the Puerperium DACS 14.01 New visit DACS 14.02 Repeat visit DACS 14.03 Procedure	**VACS 202** Obstetrics
AMDC 15 Newborns and other Neonates with conditions originating in the Perinatal Period (<29 days) DACS 15.01 New visit DACS 15.02 Repeat visit DACS 15.03 Procedure	**Specialty specific assignment of all paediatric encounters**
AMDC 16 Diseases and Disorders of the Blood and Blood Forming Organs and Immunological Disorders DACS 16.01 New visit DACS 16.02 Repeat visit DACS 16.03 Procedure	**VACS 102** Allergy **VACS 107** Haematology **VACS 110** Oncology
AMDC 17 Myeloproliferative Diseases and Disorders and Poorly Differentiated Neoplasms DACS 17.01 New visit DACS 17.02 Repeat visit DACS 17.03 Procedure	**VACS 110** Oncology
AMDC 18 Infectious and Parasitic Diseases DACS 18.01 HIV visit DACS 18.02 Other visit DACS 18.03 Procedure	**VACS 114** Infectious Diseases

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
AMDC 19 Mental Diseases and Disorders DACS 19.01 New visit DACS 19.02 Repeat visit	**VACS 350** Psych related (Program 306)
AMDC 20 Alcohol/Drug and Alcohol/Drug Induced Organic Mental Disorders DACS 20.01 New visit DACS 20.02 Repeat visit	**VACS 350** Psych related (Program 306)
AMDC 21 Injuries, Poisonings and Toxic Effects of Drugs DACS 21.01 Major Injuries DACS 21.02 New visit DACS 21.03 Repeat visit DACS 21.04 Procedure	**INPATIENT**
AMDC 22 Burns DACS 22.01 New visit DACS 22.02 Repeat visit DACS 22.03 Procedure	**VACS 113** Dermatology **VACS 206** Plastic Surgery
AMDC 23 Factors Influencing Health Status and other contacts with Health Services DACS 23.01 New visit DACS 23.02 Repeat visit DACS 23.03 Child Protection DACS 23.04 Patient Education	**Specific Program Funding** **VACS 609** Other Allied Health
AMDC 24 Specific Treatment Modalities DACS 24.01 Push Chemotherapy DACS 24.02 Infusion Chemotherapy DACS 24.03 Radiotherapy visit	**VACS 110** Oncology **Specific Program Funding**

ACCC Developmental Ambulatory Classification System (DACS)	Victorian Ambulatory Classification System (VACS)
Post-AMDC DACS 25.01 MRI DACS 25.02 CT Scan DACS 25.03 Nuclear imaging DACS 25.04 Stand alone diagnostics	**Bundled into encounter**
	no equivalent DACS **VACS 101** General Medicine **VACS 112** Rheumatology **VACS 115** Developmental Neurological Disabilities **VACS 201** General Surgery **VACS 209** Preadmission **VACS 501** Paediatric Surgery **VACS 502** Paediatric Medical **VACS 602** Nutrition **VACS 604** Occupational Therapy **VACS 605** Physiotherapy **VACS 606** Podiatry **VACS 607** Speech Pathology **VACS 608** Social Work **VACS 609** Other Allied Health

REFERENCES

August, DA, Carpenter, LC, Harness, JK, Delosh, T, Cody, RL, Adler, DD, Oberman, H, Wilkins, E, Schottenfeld, D, McNeely, SG et al 1993, 'Benefits of a multidisciplinary approach to breast care', *Journal of Surgical Oncology,* vol 53, no 3, pp 161-167.

Auleciems, LM 1995, 'Myofascial pain syndrome: a multidisciplinary approach', *Nurse Practitioner*, vol 20, no 4, pp 18, 21-22, 24-28.

Banahan, I, Quenby, S, Stewart, H & Farquharson, R 1994, 'Preliminary evaluation of the effectiveness of a preoperative clinic for gynaecological surgery', *British Journal of Hospital Medicine*, vol 52, no 10, pp 535-538.

Bithoney, WG, McJunkin, J, Michalek, J, Snyder, J, Egan, H & Epstein, D 1991, 'The effect of a multidisciplinary team approach on weight gain in nonorganic failure-to-thrive children', *Journal of Developmental and Behavioural Paediatrics*, vol 12, no 4, pp 254-258.

Cornell, KA & Kitsen, J 1995, 'Pursuing quality improvement: a social work perspective', *Advances in Renal Replacement Therapy*, vol 2, no 2, pp 121-126.

Flor, H, Fydrich, T & Turk, DC 1992, 'Efficacy of multidisciplinary pain treatment centres: a meta-analytic review', *Pain*, vol 49, no 2, pp 221-230.

Foster, AV, Snowden, S, Grenfell, A & Watkins, PJ 1995, 'Reduction of gangrene and amputations in diabetic renal transplant patients: the role of a special foot clinic', *Diabetic Medicine*, vol 12, no 7, pp 632-635.

Harvey, E, Secker, D, Braj, B, Picone, G & Balfe, JW 1996, 'The team approach to the management of children on chronic peritoneal dialysis', *Advances in Renal Replacement Therapy*, vol 3, no 1, pp 3-13.

Health and Community Services 1995, *Agency Information Management System: Public Hospital User Manual*, Version 3.0, Acute Health Services Division, Department of Health & Community Services, Victoria.

Hollenberg, CH 1996, 'The effect of health care reform on academic medicine in Canada: Editorial Committee of the Canadian Institute for Academic Medicine', *Canadian Medical Association Journal*, vol 154, no 10, pp 1483-1489.

Hylka, SC 1994, 'Comparative cost analysis of surgical procedures in an ambulatory eye centre', *Nursing Economics,* vol 12, no 1, pp 51-3, 55.

Jackson, T, Tate, R, Henderson, N, Carlin, J & Bayliss-McCulloch, J 1994, *1994 Victorian cost weights: a study of fifteen hospitals' patient-level AN-DRG costs*, Technical Report 4, National Centre for Health Program Evaluation, Melbourne.

Jackson, T 1996, 'A proposal for managed care payment options for patients with chronic conditions', *Australian Health Review*, vol 19, no 1, pp 27-39.

Jackson, T & Sevil, P 1996, The development of relative resource weights for non-admitted patients, Technical Report 6, Centre for Health Program Evaluation, Melbourne.

Johnson, DW, Twidwell, JJ, Henderson, R, Wesson, SK, Fischer, R & Lorenzen, WF 1993, 'A prototype multidisciplinary cancer screening clinic for the military medical facility', *Military Medicine*, vol 158, no 5, pp 345-347.

Lagaida, R & Hindle, D 1992, A casemix classification for hospital-based ambulatory services, A report to the National Ambulatory Casemix Project, State Health Publication IC 92-89, New South Wales Department of Health.

McGuire, TE 1993, 'DRG evolution', in *Diagnosis Related Groups in Europe: Uses and Perspectives*, eds M Casas & M Wiley, Springer-Verlag, Berlin, pp 30-45.

Malitz, D & Godbout, R 1992, *PC-Group User's Guide*, Version 3.01, Austin Data Management Associates, Austin, Texas.

Metropolitan Hospitals Planning Board 1995, *Taking Melbourne's Health Care Networks into the 21st Century*, Phase 2 Report, Health & Community Services, Victoria.

Michael, R, Piper, K & Heard, P 1994, *Ambulatory Encounters Project*, Report to the Commonwealth Department of Health, Housing and Community Services, Flinders Medical Centre, Bedford Park, SA.

Mills, RM, Fetter, RB, Riedel, DC & Averill, R 1976, 'AUTOGRP: an interactive computer system for the analysis of health care data', *Medical Care*, vol 14, pp 603-615.

Nielsen, PE, Kiley, KC & Rosa, C 1993, 'Resident training in a multidisciplinary breast clinic', *Journal of Reproductive Medicine*, vol 38, no 4, pp 278-280.

O'Connell, B & Sharwood, P 1996, 'Ambulatory casemix developments, casemix funding for non-admitted patients', in *Casemix and Change - International Perspectives*, Conference Proceedings, Sydney Convention and Exhibition Centre, 16-18 September, Darling Harbour, Sydney, Australia.

Ratliff, C & Rodeheaver, RG 1995, 'The chronic wound care clinic: one-stop shopping', *Journal of Wound Ostomy and Continence Nursing*, vol 22, no 2, pp 77-80.

Reddihough, D, Johnson, H & Ferguson, E 1992, 'The role of a saliva control clinic in the management of drooling', *Journal of Paediatric Child Health*', vol 28, no 5, pp 395-397.

Ryan, S 1995, 'Rheumatology: sharing care in an outpatient clinic', *Nursing Standard*, vol 10, no 6, pp 23-25.

Samet, JH, Libman, H, LaBelle, C, Steger, K, Lewis, R, Craven, DE & Freedberg KA 1995, 'A model clinic for the initial evaluation and establishment of primary care for persons infected with human immunodeficiency virus', *Archives of Internal Medicine,* vol 155, no 15, pp 1629-1633.

Satterwhite, BE, Settle, JT, Cushnie, PB & Kaplowitz, LG 1991 'Ambulatory care for patients with HIV/AIDS: creating a specialty clinic', *Oncology Nursing Forum*, vol 18, no 3, pp 555-558.

Schafffer, J & Wexler, LF 1995, 'Reducing low-density lipoprotein cholesterol levels in an ambulatory care system: results of a multidisciplinary collaborative practice lipid clinic compared with traditional physician-based care', *Archives of Internal Medicine,* vol 155, no 21, pp 2330-2335.

Schipper, H & Dick, J 1995, 'Herodotus and the multidisciplinary clinic', *Lancet,* vol 346, no 8986, pp 1312-1313.

SPSS Inc. 1993, *SPSS for Windows Base System User's Guide*, Release 6.0, Chicago.

Steed, DL, Edington, H, Moosa, HH & Webster, MW 1993, 'Organization and development of a university multisciplinary wound care clinic', *Surgery*, vol 114, no 4, pp 775-778.

Sulvetta, MB 1991, 'Achieving cost control in the hospital outpatient department', *Health Care Financing Review*, Suppl, pp 95-106.

Tyre, TE, Walworth, DE & Tyre, EM 1994, 'The outcome status of chronic pain patients 4-6 years after multidisciplinary care', *Wisconsin Medical Journal*, vol 93, no 1, pp 9-12.

Weinsier, RL, Boker, JR, Brooks, CM, Kushner, RF, Olson, AK, Mark, DA, St Jeor, ST, Stallings, VA, Winick, M, Heber, D et al 1991, 'Nutrition training in graduate medical (residency) education: a survey of selected training programs', *American Journal of Clinical Nutrition,* vol 6, pp 957-962.

APPENDIX 1

TABLE 10: 1996 VACS relative resource weights and average component costs

VACS	description	n of cases	mean cost	SD of mean cost	CV	RSEM	weight	mean clinic cost	mean imaging cost	mean pathology cost	mean pharmacy cost	total dollars in sample
101	General medicine	4699	86.91	97.44	1.12	.016	1.01	73.67	4.71	4.99	3.53	408,385.52
102	Allergy	777	124.25	83.98	.68	.024	1.44	118.83	.73	.55	4.14	96,539.32
103	Cardiology	1237	207.98	116.87	.56	.016	2.42	193.95	6.57	1.18	6.27	257,268.62
104	Diabetes	1284	106.16	60.34	.57	.016	1.23	88.72	3.09	13.16	1.19	136,303.27
105	Endocrinology	1725	123.74	113.95	.92	.022	1.44	87.43	5.07	23.04	8.21	213,451.62
106	Gastroenterology	1339	124.42	109.74	.88	.024	1.45	90.76	8.84	11.50	13.28	166,597.27
107	Haematology*	0	-	-	-	-	n/a	-	-	-	-	0.00
108	Nephrology	1939	297.98	296.42	.99	.023	3.46	248.94	7.38	13.44	28.24	577,774.36
109	Neurology	860	85.39	56.07	.66	.022	.99	74.71	5.12	2.95	2.62	73,434.67
110	Oncology	2882	155.36	140.92	.91	.017	1.81	104.69	14.24	23.80	12.62	447,759.14
111	Respiratory	1044	132.46	76.08	.57	.018	1.54	116.48	6.60	3.46	5.93	138,292.92
112	Rheumatology	1164	142.41	91.84	.64	.019	1.66	117.07	13.93	4.78	6.62	165,769.69
113	Dermatology	1560	83.77	114.68	1.37	.035	.97	47.66	1.04	12.02	23.05	130,684.30
114	Infectious Diseases	693	200.56	201.98	1.01	.038	2.33	130.07	10.85	25.74	33.92	138,986.56
115	Developmental Neurological Disorder	500	214.73	104.25	.49	.022	2.50	202.10	6.01	2.66	3.96	107,367.30
201	General Surgery	4037	93.85	105.14	1.12	.018	1.09	68.13	16.95	2.88	5.63	378,879.50
202	Cardiothoracic	295	224.62	108.65	.48	.028	2.61	191.14	27.25	3.33	2.89	66,264.27
203	Neurosurgery	776	68.81	73.58	1.07	.038	.80	53.56	13.41	1.15	.67	53,394.51
204	Ophthalmology	3081	53.30	52.32	.98	.018	.62	47.68	1.54	1.42	2.66	164,215.86
205	Ear, Nose and Throat	3009	50.87	88.85	1.75	.032	.59	38.42	7.91	2.30	2.25	153,065.81
206	Plastic Surgery	3661	72.03	51.08	.71	.012	.84	65.03	3.91	.78	1.95	263,689.73
207	Urology	2355	109.34	112.79	1.03	.021	1.27	67.75	24.06	10.39	7.02	257,494.72
208	Vascular	691	91.80	75.51	.79	.030	1.07	72.84	15.18	1.81	1.96	63,433.36
209	Preadmission	1053	129.49	172.66	1.33	.040	1.51	92.13	22.75	13.39	1.17	136,348.86
301	Dental	1707	92.32	72.56	.79	.019	1.07	82.91	3.71	2.74	2.96	157,591.33
310	Orthopaedics	6876	73.88	57.94	.78	.009	.86	50.28	22.07	.61	.95	508,024.08
311	Orthopaedic Applications**	0	-	-	-	-	n/a	-	-	-	-	.00
350	Psych related (306)	126	177.35	242.99	1.37	.122	2.06	168.89	.77	1.06	6.64	22,346.73
401	Family Planning	841	90.88	64.91	.71	.025	1.06	56.88	1.73	29.41	2.87	76,432.62
402	Obstetrics	12887	92.10	118.21	1.28	.011	1.07	59.16	7.90	24.13	.91	1,186,894.23

VACS	description	n of cases	mean cost	SD of mean cost	CV	RSEM	weight	mean clinic cost	mean imaging cost	mean pathology cost	mean pharmacy cost	total dollars in sample
403	Gynaecology	7032	84.15	110.88	1.32	.016	.98	63.57	3.39	14.73	2.46	591,761.80
501	Paediatric Surgical	337	112.39	67.05	.60	.032	1.31	102.38	8.03	1.66	.32	37,876.99
502	Paediatric Medical	790	161.05	99.53	.62	.022	1.87	148.67	8.04	2.62	1.72	127,232.50
550	Emergency Medicine	34624	124.17	132.53	1.07	.006	1.44	97.30	16.71	8.72	1.44	4,299,158.39
601	Audiology	305	50.69	26.61	.52	.030	.59	50.69	.00	.00	.00	15,459.39
602	Nutrition	734	60.03	122.55	2.04	.075	.70	58.17	.54	.56	.77	44,063.45
603	Optometry**	0	-	-	-	-	n/a	-	-	-	-	0.00
604	Occupational Therapy	2474	46.27	53.24	1.15	.023	.54	46.15	.10	.00	.01	114,462.06
605	Physiotherapy	14252	12.27	20.30	1.65	.014	.14	12.25	.02	.00	.01	174,861.73
606	Podiatry	884	34.66	32.55	.94	.032	.40	31.99	1.05	.27	1.32	30,636.31
607	Speech Pathology	1656	48.50	67.58	1.39	.034	.56	48.50	.00	.00	.00	80,309.63
608	Social Work	11213	16.25	25.01	1.54	.015	.19	16.25	.00	.00	.00	182,206.99

Notes: * all clinical haematology cases in study data reassigned to Oncology or Specified Grants

** no information available for the study period

APPENDIX 2

TABLE 11: Comparative average weights and relative resource weights 1995/1996

VACS	Description	1996 Mean Cost $	1996 Weight	1995 Mean Cost $	1995 Weight
101	General Medicine	86.91	1.01	67.68	.66
102	Allergy	124.25	1.44	241.29	2.37
103	Cardiology	207.98	2.42	281.45	2.76
104	Diabetes	106.16	1.23	45.44	.45
105	Endocrinology	123.74	1.44	189.58	1.86
106	Gastroenterology	124.42	1.45	109.15	1.07
107	Haematology*	/	n/a	89.88	.88
108	Nephrology	297.98	3.46	108.04	1.06
109	Neurology	85.39	.99	150.35	1.48
110	Oncology	155.36	1.81	168.12	1.65
111	Respiratory	132.46	1.54	219.25	2.15
112	Rheumatology	142.41	1.66	85.28	.84
113	Dermatology	83.77	.97	122.61	1.20
114	Infectious Diseases	200.56	2.33	197.14	1.94
115	Developmental Neurological Disability	214.73	2.50	/	/
201	General Surgery	93.85	1.09	68.69	.67
202	Cardiothoracic	224.62	2.61	159.01	1.56
203	Neurosurgery	68.81	.80	185.93	1.83
204	Ophthalmology	53.30	.62	105.72	1.04
205	Ear, Nose and Throat	50.87	.59	112.28	1.10
206	Plastic Surgery	72.03	.84	64.44	.64
207	Urology	109.34	1.27	92.85	.91
208	Vascular	91.80	1.07	/	/
209	Preadmission	129.49	1.51	/	/
301	Dental	92.32	1.07	124.26	1.22
310	Orthopaedics	73.88	.86	80.68	.79
311	Orthopaedic applications**	/	/	58.45	.57
350	Psych related (306)	177.35	2.06	/	/
401	Family Planning	90.88	1.06	56.52	.55
402	Obstetrics	92.10	1.07	37.51	.37
403	Gynaecology	84.15	.98	53.12	.52
501	Paediatric Surgical	112.39	1.31	161.28	1.58
502	Paediatric Medical	161.05	1.87	229.31	2.25
550	Emergency Medicine	124.17	1.44	86.67	.85
601	Audiology	50.69	.59	23.81	.23
602	Nutrition	60.03	.70	81.90	.80
603	Optometry**	/	/	/	/
604	Occupational Therapy	46.27	.54	61.86	.61

VACS	Description	1996 Mean Cost $	1996 Weight	1995 Mean Cost $	1995 Weight
605	Physiotherapy	12.27	.14	44.20	.43
606	Podiatry	34.66	.40	73.25	.72
607	Speech Pathology	48.50	.56	50.26	.49
608	Social Work	16.25	.19	34.62	.34
609	Other Allied Health	36.60	.43	67.63	.66

Notes: * all clinical haematology cases in study data reassigned to Oncology or Specified Grants

** no information available for the study period