

Maternity packages of care

Descriptive analysis of the maternity care of women giving birth in six Victorian hospitals



Maternity packages of care

Descriptive analysis of the maternity care
of women giving birth in six Victorian hospitals

Published by the Metropolitan Health and Aged Care Services Division
Victorian Government Department of Human Services, Melbourne, Victoria

© Copyright State of Victoria, Department of Human Services, 2004

This publication is copyright. No part may be reproduced by any process except
in accordance with the provisions of the *Copyright Act 1968*.

This document may be downloaded from the Department of Human Services
web site at: www.health.vic.gov.au/maternitycare

Authorised by the State Government of Victoria, 555 Collins Street, Melbourne.

(041207)

Contents

1 Introduction	1
2 Data source, extraction and validation	2
2.1 Application of episode time windows and sample characteristics	3
2.2 Patterns of inpatient and outpatient care for birth episodes	4
2.3 Issues not investigated in this report	14
3 Conclusions	16
Appendix 1	18
Appendix 2	19
References	20

1 Introduction

This report was undertaken by Dr Terri Jackson for the Metropolitan Health and Aged Care Services Division of the Department of Human Services, Victoria to evaluate the capacity of existing data systems to support a payment system for maternity care based on extended episodes (or packages of care). This report describes the birth episodes over two years and the complexities and policy issues that would need to be considered if any maternity package of care were introduced. The conclusions of this report show that the provision of maternity care depends on a number of medical and economic factors and a simple “bundling” was not possible at this stage. The report with its detailed analyses is being released to the field as general information, as it provides useful insight into the provision of maternity care, as much as the issues in “bundling” care for funding. The policy goals were to encourage participating hospitals to practice evidence based care and achieve greater continuity of care for patients, and more rationality in the use of antenatal and post-natal care resources.

Payment policy designed to support these goals would need to take into account the validity of current data collections, particularly the validity of additional variables which would be required as modifiers to the existing DRG payment system, the degree of variation in current treatment patterns (homogeneity of potential ‘products’ and stoploss or outlier policies for abnormally high cost episodes), the extent of patient movement across maternity care providers (hospitals or networks), and the frequency with which patients move between the public and private sectors during the course of a pregnancy. Each of these factors will impact on the design of an episode payment for maternity care.

Only standard VAED variables were available for analysis, thus it was not possible to explain patterns in the data attributable to specific providers, programs or models of maternity care.

This report provides a summary of analysis done on a dataset of 41,375 inpatient separations and 237,920 matched outpatient encounters for individuals recorded as treated in designated maternity DRGs (see Appendix 1) in designated hospitals (see Table 1 below) from 1 July 2000 to 5 July 2001. A total of 27,371 individual inpatients were included in the data extracted, with total inpatient costs of \$89.6 mil. Only 22,301 of the admitted patients were recorded as having outpatient care, for a total of \$18.6 mil.

2 Data source, extraction and validation

Data were extracted from the annual collection of cost data (the Victorian Cost Weight Study) for the five Victorian public hospitals with well - developed clinical costing systems and a large maternity workload. These hospitals include Monash Medical Centre, Royal Women's Hospital, Dandenong Hospital, Moorabbin Hospital and Bendigo Health Care Group. A sixth general hospital (St Vincent's) contributed data on intercurrent care and intensive care for patients otherwise treated in these five hospitals. For inpatient maternity care, 22 DRGs (AR - DRG 4.2; see Appendix 1 for extraction criteria) were identified as comprising the bulk of maternity episodes, including six non - obstetric DRGs which contributed only 42 cases.

All outpatient episodes coded to the Victorian Ambulatory Classification System (VACS) and matching an inpatient record on both hospital and patient unit record number were extracted for the relevant financial years. This was used to construct a 39 - week maternity 'window' of care around each inpatient episode comprising a 37 - week period before and a three - week period including and following any admission. The prenatal period encompasses the theoretical period from diagnosis of pregnancy to the conclusion of a 40 - week pregnancy.

Births were defined, using a previously developed DHS algorithm as separations:

- (a) coded in any diagnostic field with an obstetric diagnosis (range O000 - O998)
- (b) not including a specified range of non - birth DRGs (Appendix 1); and
- (c) coded with an 'Outcome of Delivery' code (Z37*).

There were 24,702 birth episodes identified in this 24 - month sample using this method. A review of coding anomalies identified 16 cases where an apparent 'birth' was recorded (outcome of delivery code present - Criterion 3) in the absence of one of the other two criteria. Coding on these cases was evaluated and only eight were determined to be valid cases (see Appendix 2). One additional case met all three criteria, but on examination was clearly post - partum care and classed to DRG O61Z. It was subsequently added to the list of ineligible obstetric DRGs in Criterion 2 for the purpose of this study (see Appendix 2).

Reinstating the eight cases of coding error, and removing an ineligible case in DRG O61Z resulted in a total of 24,709 births for analysis here. Recommendations for amended coding standards for current funding policy arising out of this data validation appear as Appendix 2.

The Department of Human Services definition excluded some 90 cases of apparent 'births' in the nine birth DRGs (defined in Appendix 1), 28 of these being unplanned deliveries outside hospital (Z39.03), and 4 being post - natal care after planned deliveries outside hospital (Z39.02). Sequencing of codes for post-natal admissions explained most of the rest. As any 'birth' episode in these cases did not entail the use of resources in the admitting hospital, none of these cases has been analysed in the current report.

Only 15 births were classed to non - obstetric DRGs, including four to the 'intensive care' DRG, A06Z *Tracheostomy Any Age, Any Condition*, and 11 others to error DRGs (DRGs 901Z, 902Z and 962Z).

Of the 16,666 non - birth separations, most were related to prenatal care DRGs. Some non - birth separations represented other, intercurrent hospital care for women identified as having at least one obstetric admission, but it should be noted that no attempt has been made to identify all intercurrent, non - obstetric hospital care, and the cases extracted incidentally with the obstetric data represent an unknown proportion of this care.

Inpatient and outpatient datasets were examined to identify variables outside plausible ranges. These included age, length of stay, total cost, and date ranges. Only total cost was found to have implausible values on the file. Although normal practice would be to eliminate cases with implausible values, for this study the counts of services used are as informative as total costs. Thus a decision was taken to preserve as many separations and encounters as possible. For cases with recorded costs less than \$100, the median cost of the DRG or VACS group across valid cases was substituted for this missing data.

The sample was compared with the statewide reporting of perinatal statistics (Riley & Halliday, 2001) for the same period on key variables including:

- (a) mean maternal age (29.0 years compared with 29.8 years for Victoria)
- (b) proportion of public birth separations (67.7 compared with 69.6 for Victoria)
- (c) caesarean section rate (21.1% compared with 22.8% for Victoria).

2.1 Application of episode time windows and sample characteristics

In order to analyse patterns of care relating to various maternity episodes, a 'window' of care was calculated for each birth, using the admission date of the birth separation as the proxy for actual date of birth, which is not recorded. The beginning of the prenatal care period for the birth was then calculated as being 37 weeks (259 days) prior, and the end of the post-natal period being three weeks (21 days) after the separation date of the birth admission.

One year of births was selected to yield 12,504 cases, which had a full 40 - week window available, beginning with births on 22 March, 2000 and finishing with births on 27 March 2001. The corresponding dates for outpatient encounters for these patients were 7 July 2000 to 26 May 2001. All inpatient and outpatient records were then evaluated against the individualised window period for each patient, with 18,477 inpatient separations and 79,019 outpatient encounters selected as occurring within the birth window.

Records for the 23 patients with a second birth admission less than 37 weeks after a first were examined to establish plausibility of each. Ten of these were judged to be coding errors. Using information from the ICD-10-AM coding, one of the two 'birth' separations was recoded as a non-birth. This reduced the number of births for analysis to 12,494 (12,468 patients with a single birth; 13 patients with two valid births).

Table 1 shows characteristics of the sampled inpatient and outpatient encounters by hospital. More than half the cases in this sample entail care at the Royal Women's Hospital (RWH), the largest provider of maternity care in Victoria. The high proportion of public patients in the sample in part reflects this high proportion of public care at RWH.

Table 1: Summary of sample characteristics by hospital

	IP seps	OP enc	Total cases	Birth seps	OP: births	Non- birth seps	Nbirth: birth	% Public seps	% Public birth seps
MMC	4,167	18,687	22,854	2,719	6.87	1,448	0.53	67.5%	70.9%
RWH	8,770	40,535	49,305	5,225	7.76	3,545	0.68	97.1%	96.5%
DH	2,769	3,081	5,850	2,291	1.34	478	0.21	70.4%	73.0%
Moorabbin H	1,266	6,184	7,450	1,124	5.50	142	0.13	69.7%	71.9%
SVH	3	2	5	1	2.00	2	2.00	33.3%	0%
Bend H	1,502	10,530	12,032	1108	9.50	394	0.36	66.4%	71.0%
Total	18,477	79,019	97,496	12,468	6.34	6,009	0.48		82.1%

The five cases treated at St Vincent's Hospital were investigated for coding anomalies, given the absence of maternity care in the hospital. Two patients appear to have sought intercurrent outpatient care at the hospital (one in the prenatal period and one in the post-natal period); two were transferred for post-natal inpatient care, and one gave birth after having been transferred to SVH for treatment in the intensive care unit. All five cases were retained in the data.

The data show considerable variation in the number of outpatient encounters per birth, ranging from 1.3 to 9.5. Although Dandenong Hospital (DH) has roughly the average proportion of public patients, the low average number of outpatient encounters suggests that antenatal and post-natal outpatient care may be shared with private general practitioners. Such arrangements have been instituted both formally and informally in most maternity hospitals, with little documentation available on the proportions of patients participating in privatised care and/or the extent of private provision of their care.

The relatively high ratios of other non-birth separations at RWH and MMC reflect the tertiary referral nature of these hospitals' caseloads, in contrast to the lower ratios at DH and Bendigo.

2.2 Patterns of inpatient and outpatient care for birth episodes

Tables 2 - 6 report a number of measures of inpatient and outpatient care for the 12,468 patients with a single birth episode in the period. While the findings for births in the DRGs with very small numbers of cases (formal error DRGs 901Z, 902Z, the tracheostomy DRG A06Z and the *antenatal* DRGs where badly coded separations result in recorded births O62Z, O64Z and O65B) are interesting, the numbers are too small to rely on the statistical properties of measures reported. For this reason, analysis will focus on the main DRG series for Caesarean and vaginal deliveries.

Table 3 shows that the DRG hierarchies in each of these series are maintained for most measures of resource use. The number of inpatient separations in the birth window, and mean inpatient costs per patient both show the expected hierarchy. What is perhaps surprising is that this hierarchy is also reflected in the number of OP encounters and thus the mean cost of OP care (Table 4). Obviously the diagnoses and procedures recorded for

the birth episode reflect underlying complications or comorbidities, which affect use of health services over the course of the pregnancy and birth.

The range of resource use for most measures is wide. At least one patient was admitted 42 times in the birth window, more than once per week over this 40-week period. Similarly, several patients had more than one outpatient encounter per week, ranging from the 909 patients who recorded no outpatient encounters, to the single patient with 59 outpatient encounters. These high outlier cases influence the mean count of OP encounters in each DRG class. In general, the number of OP encounters is not highly correlated with the number of IP separations; same day separations for the patients with high IP counts seem to substitute for OP encounters for these patients. Table 2 shows, however, that when analysis is limited to the patients with 1–6 IP separations and less than 20 OP encounters (91.1% of all births), there is a weak positive correlation ($R=.161$) between IP and OP counts.

Table 2: Mean outpatient encounters by number of IP separations (<7 IP and < 20 OP patients only)

N of Seps	N of Patients	Sum of OP Enc	Mean	SD
1	8,000	48,751	6.09	4.633
2	2,224	16,720	7.52	4.806
3	725	5,839	8.05	4.699
4	243	2,133	8.78	4.887
5	117	971	8.30	4.617
6	48	466	9.71	5.090
Total	11,357	74,880	6.59	4.746

Table 3 shows that the average cost of inpatient care across all patients in all DRGs was \$3,499. No estimate of the costs of the birth separation is reported here because interhospital transfers result in the care for this event being spread over more than one ‘separation’ and rates and patterns of transfer have not been analysed. Patients in the least complex of the vaginal delivery DRGs (O60D) averaged \$2,391 for inpatient care, while their counterparts having Caesarean deliveries (O01D) averaged \$4,716.

Unsurprisingly, births in DRG A06Z Tracheostomy any age, any condition entail the highest costs of care, with a mean of \$71,752 for all inpatient care for the three patients classed to this DRG. An additional 10 patients were recorded as requiring at least 16 hours of ICU care (range: 16–425 hours). Fifteen more patients recorded some costs incurred in the ICU, so potentially 28 of the total sample were treated for some period in an ICU.

Overall, 84.1 percent ($n=81,188$) of all services were provided in the prenatal period (PP) (separation date < birthdate). With birth separations representing 12.9 percent ($n=12,468$) of services in the birth window, only 3.0 percent of services ($n=2841$) were provided in the three-week post-natal period examined here.

Of the 6,009 non-birth separations in the birth window, 93.1 percent were grouped to three 'antenatal' DRGs: O64Z False Labour (n=1,320), O65A Other Antenatal Admission with Severe Complicating Diagnoses (n= 1,689), and O65B Other Antenatal Admission with Moderate/No Complicating Diagnoses (n= 2,586).

One third of these separations were intended as 'sameday' admissions (34.3%), but 75.9 percent had a length of stay of one (that is sameday admissions and admissions with only an overnight stay). While these separations were coded to 161 different principal diagnoses, 92.3 percent of these cases were in the obstetrics range of ICD-10-AM. The majority of cases (85.3%) were recorded as 'Maternity' cases, and almost equal numbers of admissions recorded as 'elective' and 'emergency' (7.4% and 7.3% respectively). Further investigation found no consistent pattern of antenatal admissions in terms of: procedures undertaken, patterns of costs, use of costly (Section 100) drugs, hospital in the home admissions, or hospital providing care.

Table 5 shows that length of stay measures also reflect the DRG hierarchy, with the average length of stay (ALOS) for the birth separation and the average length of stay for all separations in the birth window ordered from most complex to least complex DRG. This is also true for length of stay in non-birth separations, the proportion of patients with a non-birth separation, and proportions and ALOS for recorded prenatal days, as shown in Table 6.

Table 3: Public/private status and count and cost data for inpatient care by ARDRG

DRG	N of or births	% Public or birth Sep	Mean			5th			95th			Mean PP cost per patient	SD	Median	5th Pctile	95th Pctile	Range
			IP Seps	SD	Median	Pctile	Pctile	Pctile	Range								
901Z Extensive OR Proc Unrelated to PDx	5	60.0%	1.2	0.45	1	1	1	1	1	1	1-2	\$10,172	\$6,321	\$9,674	\$2,470	—	\$2,470 - \$17,193
902Z Non - extensive OR Proc Unrelated to PDx	1	100.0%	1	—	1	1	1	1	1	1	—	\$4,766	—	—	—	—	—
A06Z Tracheostomy any age, any condition	3	66.7%	1	0	1	1	1	1	1	1	—	\$71,752	\$48,255	\$94,146	\$16,368	—	\$16,368 - \$104,741
<hr/>																	
O01A Caesarean Del W Mult Comp Dx 1+ Sev	539	83.5%	1.91	1.57	1	1	1	1	5	5	1-17	\$9,109	\$7,653	\$7,196	\$2,794	\$23,964	\$434 - \$69,574
O01B Caesarean Del W Sev Complic Dx	552	82.8%	1.76	1.34	1	1	1	1	5	5	1-10	\$5,988	\$4,070	\$5,064	\$2,283	\$13,115	\$548 - \$34,573
O01C Caesarean Del W Mod Complic Dx	195	90.8%	1.48	0.9	1	1	1	1	3	3	1-6	\$5,290	\$2,256	\$5,060	\$2,345	\$8,721	\$498 - \$20,911
O01D Caesarean Del W/O Complic Dx	1,351	83.1%	1.44	0.92	1	1	1	1	3	3	1-12	\$4,716	\$3,215	\$4,333	\$1,840	\$7,977	\$345 - \$87,061
<hr/>																	
O02Z Vaginal Del W Complic OR Proc	33	87.9%	1.24	0.56	1	1	1	1	3	3	1-3	\$4,216	\$2,501	\$3,778	\$822	\$9,233	\$613 - \$9,597
O60A Vaginal Del W Mult Complic Dx, 1+ Sev	697	85.1%	2	2.14	1	1	1	1	5	5	1-42	\$5,602	\$4,866	\$4,204	\$1,341	\$14,096	\$375 - \$41,383
O60B Vaginal Del W Sev Complic Dx	1,580	80.8%	1.66	1.12	1	1	1	1	4	4	1-12	\$3,342	\$2,545	\$2,820	\$937	\$7,253	\$143 - \$33,281
O60C Vaginal Del W Mod Complic Dx	715	82.7%	1.36	0.74	1	1	1	1	3	3	1-7	\$2,997	\$1,681	\$2,802	\$1,034	\$5,848	\$177 - \$20,125
O60D Vaginal Del W/O Complic Dx	6,791	81.5%	1.35	0.84	1	1	1	1	3	3	1-19	\$2,391	\$1,457	\$2,128	\$752	\$4,740	\$128 - \$26,371
<hr/>																	
O62Z Threatened Abortion	1	0.0%	3	—	3	3	3	3	3	3	—	\$2,021	—	—	—	—	—
O64Z False Labour	4	75.0%	2	1.41	1.5	1	1	1	—	—	1-4	\$6,843	\$5,038	\$6,831	\$2,267	—	\$2,267 - \$11,441
O65B Oth Antenatal W Mod/No Complic Dx	1	100.0%	1	—	1	1	1	1	1	1	—	\$2,243	—	\$2,243	\$2,243	\$2,243	—
Total sample	12,468	82.1%	1.48	1.08	1	1	1	1	3	3	1-42	\$3,499	\$3,500	\$2,712	\$905	\$8,165	\$128 - \$104,741

Table 5: Length of stay for birth separations and for all separations by ARDRG

DRG	N of births	ALOS for birth sep				Range of LOS for birth seps				% 1-Day birth seps	ALOS for all seps in birth window				Range of total days for seps in birth window			
		SD	Median	5th Pctile	95th Pctile	SD	Median	5th Pctile	95th Pctile		SD	Median	5th Pctile	95th Pctile	SD	Median	5th Pctile	95th Pctile
901Z Extensive OR Proc Unrelated to PDx	5	14.40	13.61	8	5	—	5 - 38	0.0%	14.60	14.05	8	5	—	5 - 39				
902Z Non-extensive OR Proc Unrelated to PDx	1	5.00	—	5	—	—	—	0.0%	5.00	—	5	—	5					
A06Z Tracheostomy any age, any condition	3	13.67	5.86	16	7	—	7 - 18	0.0%	13.67	5.86	16	7	—	7 - 18				
O01A Cesarean Del W Mult Comp Dx 1+ Sev	539	9.79	10.60	6	4	28	1 - 87	0.4%	12.75	13.58	8	4	47	1 - 97				
O01B Cesarean Del W Sev Complic Dx	552	6.32	5.98	5	3	12	1 - 81	0.7%	7.90	7.71	6	4	19	1 - 86				
O01C Cesarean Del W Mod Complic Dx	195	5.09	1.42	5	4	7	2 - 13	0.0%	5.91	2.59	5	4	11	2 - 19				
O01D Cesarean Del W/O Complic Dx	1,351	4.82	2.08	5	3	7	1 - 47	0.0%	5.58	3.31	5	3	10	1 - 56				
O02Z Vaginal Del W Complic OR Proc	33	4.85	5.76	4	1	17	1 - 35	9.1%	5.12	5.76	4	1	17	1 - 35				
O60A Vaginal Del W Mult Complic Dx, 1+ Sev	697	5.97	5.29	4	2	14	1 - 52	4.3%	8.36	8.71	6	2	22	1 - 84				
O60B Vaginal Del W Sev Complic Dx	1,580	3.78	2.87	3	1	7	1 - 66	10.1%	4.87	4.30	4	1	11	1 - 76				
O60C Vaginal Del W Mod Complic Dx	715	3.37	1.42	3	1	6	1 - 18	7.1%	3.92	2.38	4	1	7	1 - 36				
O60D Vaginal Del W/O Complic Dx	6,791	2.78	1.28	3	1	5	1 - 17	16.6%	3.28	2.23	3	1	6	1 - 60				
O62Z Threatened Abortion	1	2.00	—	—	—	—	—	0.0%	4.00	—	—	—	—	4				
O64Z False Labour	4	12.75	12.82	10	2	—	2 - 29	0.0%	14.00	13.14	12.5	2	—	2 - 29				
O65B Oth Antenatal W Mod/No Complic Dx	1	3.00	—	3	—	—	—	0.0%	3.00	—	3	—	—	3				
Total sample	12,468	3.85	3.69	3	1	8	1 - 87	11.1%	4.72	5.20	4	1	11	1 - 97				

Table 6: Length of stay for non-birth separations in the birth episode and for recorded prenatal days by ARDRG

DRG	N of patients with any non-birth sep				% patients with any non-birth sep				Mean days for all non-birth seps				5th 95th Pctile				Range of total days for non-birth seps				N of births with recorded prenatal days				% patients with any recorded prenatal days				Mean prenatal days when reported		Range of reported prenatal days	
	N of births	non-birth sep	any non-birth sep	with any non-birth sep	non-birth sep	any non-birth sep	with any non-birth sep	% non-birth sep	any non-birth sep	with any non-birth sep	Mean days for all non-birth seps	SD	Median	5th Pctile	95th Pctile	Range of total days for non-birth seps	N of births with recorded prenatal days	% patients with any recorded prenatal days	Mean prenatal days when reported	Range of reported prenatal days	N of births with recorded prenatal days	% patients with any recorded prenatal days	Mean prenatal days when reported	Range of reported prenatal days								
901Z Extensive OR Proc Unrelated to PDx	5	1	20.0%	1.00	1.00	1	1	1	1	1	1	1	1	1	1 - 8	1	20.0%	8.00	8	1	20.0%	8.00	8									
902Z Non-extensive OR Proc Unrelated to PDx	1	0	0.0%	—	—	—	—	—	—	—	—	—	—	—	—	0	0.0%	—	—	0	0.0%	—	—									
A06Z Tracheostomy any age, any condition	3	0	0.0%	—	—	—	—	—	—	—	—	—	—	—	—	0	0.0%	—	—	0	0.0%	—	—									
O01A Cesarean Del W Mult Comp Dx 1+ Sev	539	235	43.6%	6.79	10.7	3	1	29	1 - 69	149	27.6%	7.52	1 - 83																			
O01B Cesarean Del W Sev Complic Dx	552	218	39.5%	4.01	6.9	2	1	13	1 - 79	111	20.1%	4.14	1 - 45																			
O01C Cesarean Del W Mod Complic Dx	195	58	29.7%	2.76	3.1	2	1	12.05	1 - 15	29	14.9%	1.66	1 - 9																			
O01D Cesarean Del W/O Complic Dx	1,351	391	28.9%	2.61	4.1	1	1	7.4	1 - 52	144	10.7%	1.48	1 - 18																			
O02Z Vaginal Del W Complic OR Proc	33	6	18.2%	1.50	0.5	1.5	1	.	1 - 2	6	18.2%	1.17	1 - 2																			
O60A Vaginal Del W Mult Complic Dx, 1+ Sev	697	330	47.3%	5.05	8.8	2	1	20	1 - 79	165	23.7%	3.96	1 - 46																			
O60B Vaginal Del W Sev Complic Dx	1,580	606	38.4%	2.84	4.4	2	1	8	1 - 73	283	17.9%	1.78	1 - 62																			
O60C Vaginal Del W Mod Complic Dx	715	183	25.6%	2.16	3.2	1	1	6	1 - 32	93	13.0%	1.18	1 - 3																			
O60D Vaginal Del W/O Complic Dx	6,791	1,621	23.9%	2.11	3.0	1	1	6	1 - 56	599	8.8%	1.11	1 - 14																			
O62Z Threatened Abortion	1	1	100.0%	2.00	—	2	2	2	2	0	0.0%	—	—																			
O64Z False Labour	4	2	50.0%	2.50	2.1	2.5	1	—	1 - 4	0	0.0%	—	—																			
O65B Oth Antenatal W Mod/No Complic Dx	1	0	0.0%	—	—	1	1	1	—	0	0.0%	—	—																			
Total sample	12,468	3,652	29.3%	2.98	5.33	1	1	9	1 - 79	1580	12.7%	2.40	1 - 83																			

Only very small numbers of Caesarean delivery patients were discharged after a one-day stay (Table 5), with higher proportions of these short stays in the vaginal delivery DRGs. The relatively high proportion (9% and 10% respectively) of patients in DRGs O02Z *Vaginal delivery with complicating OR procedure*, and O60B *Vaginal delivery with severe complicating diagnoses* may warrant further investigation to understand the types of secondary diagnoses or transfer arrangements which result in assignment to these otherwise resource-intensive DRGs with higher rates of sameday admissions.

Recording of 'prenatal days' is understood to be patchy, so some caution should be used in interpreting these data from Table 6. Only 12.7 percent of patients had any recorded prenatal days. Of these, 74.8 percent of cases were single day prenatal stays. Only 398 (25.2% of patients with prenatal stays) had recorded multiday stays, but these admissions represented 69 percent of total prenatal days.

In general, the more complex DRGs show a higher proportion of patients with any prenatal days recorded and a higher mean number of these days. The range for prenatal days was from 1 to 83 days, with the more resource-intensive DRGs recording cases with longer prenatal stays. The longest recorded prenatal period that resulted in an uncomplicated vaginal delivery (DRG O60D) was 14 days.

Only a small number of patients (n=105) were classed as high outliers in the birth separation, for a total of 1,489 high outlier days. The longest stay was a patient with 62 high outlier days. The rest (99.2% of the sample) recorded no high outlier days.

The majority of patients in the sample elected to be treated as public patients in the birth separation (Table 3). There is some evidence of risk selection, with the more resource - intensive DRGs showing a higher proportion of public patients. It may well be that private patients who experience complications during the antenatal period are advised (or elect) to give birth as public patients, in order to take advantage of the more sophisticated public facilities for complicated births, and to reduce the burden of co - payments for private treatment when the birth is expected to be complicated. This is partially confirmed by analysis of crossover patterns for public and private inpatient admissions data reported below.

Because of the complex patterns of public/private election, it is not possible to characterise a pregnancy or patient as wholly public or private. Using the marker of the admission status of the birth separation, Table 7 compares a number of measures for these two groups of patients.

Patients classed as public patients in the birth separation have slightly more antenatal admissions, and these entail slightly longer lengths of stay than private patients. These factors are reflected in the \$1,300 difference in the mean cost of all inpatient care in the birth window.

What is more surprising is the comparison of outpatient patterns of care. Private patients are assumed to receive their antenatal care in the private 'rooms' of their obstetrician. This explains (to an extent) the difference in the proportion of patients with no recorded public outpatient encounters (5.3% for public patients, 16.2% for private patients). But private patients still average 4.8 public VACS encounters compared to 6.7 for public patients, and they are even more similar when the no-usage group is removed, averaging 5.7 encounters compared with 7.1 for public patients. Changed election to private patient status late in a pregnancy would explain some of this difference, but the data are not able to clarify the

timing of the decision to give birth as a public or private patient. ‘Shared Care’ antenatal arrangements for public patients may also be masking greater differences between the two groups, if the mean for public patients is artificially lowered by patients under GP management.

Table 7: Patterns of care for public and private patients*

	Public patients*	Private patients*
N of cases	10,238	2,230
Mean IP separations	0.52	0.29
Mean LOS in non-birth separations	3.04 days	2.51 days
Mean total cost of IP separations	\$ 3,732	\$ 2,427
% with no recorded OP encounters	5.3%	16.2%
Mean OP encounters	6.7	4.8
Range OP encounters	0 - 59	0 - 36
Mean OP encounters if any OP usage	7.1	5.7
Total cost of OP encounters	\$ 851	\$ 694

*Public/private status of birth separation

2.2.1 Crossover between hospitals in maternity care

A patient seeking maternity care in more than one hospital is not a common event in Victoria. Only 560 patients (4.4% of the sample) were treated in more than one hospital, and only 10 of these in more than 2 hospitals, although treatments in other Victorian hospitals outside the sample have not been studied. Table 8 below shows that the majority of crossovers were between 2 hospitals in the same network (in this sample, Southern Health Care Network, comprising MMC, Moorabbin and Dandenong hospitals, n=518).

Of the ten patients with treatment in three sample hospitals, seven cases entailed consultation/treatment at two of the Southern Network hospitals plus the RWH and three entailed consultation/treatment at all three of the Southern Network hospitals. In total, 39 patients were treated in two or more ‘networks’ of hospitals, representing only 0.3 percent of cases.

Table 8: Breakdown of hospital crossovers for patients treated in two hospitals during the birth window

	RWH	MMC	SVH	Total
Dandenong	11	114		125
Moorabbin	2	404		406
Bendigo	14	4	1	19
Total	27	522	1	550

2.2.2 Crossover between public and private admission status

Under the Health Care Agreement between the Commonwealth and Victoria, patients are permitted to elect to be admitted as either public or private patients. This election of admission status may change from one admission to another. Of the 12,468 patients giving birth in the sample, 79.7 percent had all their inpatient care in the public sector, with 17.8 percent of patients treated wholly as private inpatients, and 2.5 percent receiving inpatient care in both sectors. Table 9 shows the patterns of crossover in public/private inpatient status.

For those patients who had two inpatient admissions with different admission status (n=314), the most common pattern (over half the 'crossover' patients) was a single admission of each type. Slightly more patients had single private admissions with multiple public admissions (n=66) than single public/multiple private (n=42).

Table 9: Number of patients with public/private crossover IP separations

	Public IP Seps	1	2	3	4	5	6	8	9	17	Total
Private	1	171	44	12	6	1	1		2		237
IP	2	27	12	3	1			1			44
Seps	3	6	9	4							19
	4	6	1		1						8
	5	1									1
	6	1									1
	9	-				1					1
	11	1		1							2
	25									1	1
Total		213	66	20	8	2	1	1	2	1	314

No attempt was made to sequence these admissions, but some 300 of the 314 patients with at least one private separation gave birth as public patients, suggesting that one or more private separations (most of which are antenatal) lead to a decision to elect for public status for the birth separation.

Examining the 17.8 percent of patients whose inpatient separations were wholly private, only 357 (2.8% of the whole sample) had no public outpatient encounters. The mean of outpatient encounters for this group of otherwise private patients was 4.77.

2.3 Issues not investigated in this report

Comparison of pregnancies resulting in multiple births and pregnancies of women with substance abuse problems was not possible in the time frame, but these would be obvious variables for analysis if episode of care funding were to be considered.

Understanding patterns of public/private provision of antenatal care would also require information on shared care arrangements in the various hospitals contributing data. Only standard VAED variables were available for analysis, thus it was not possible to explain patterns in the data attributable to specific providers, programs or models of maternity care. Apparent differences in the average number of VACS encounters between hospitals suggest that this may be a factor, which would need further investigation.

A change in payment policy would also have to take account of unanticipated outcomes of pregnancy, in particular, early termination of the birth episode through ectopic pregnancy, or spontaneous or induced abortion. No analyses of these events and their patterns of care were undertaken, but this would have to be completed prior to implementation of any comprehensive 'bundling' of obstetric care.

It was envisaged that an estimate of the outpatient care for these episodes would yield information about the residual numbers of outpatient obstetric encounters (VACS 402) not accounted for in matched data. Unfortunately, the file specification precluded this analysis by extracting only OP encounters matched to the obstetric IP separations, making it impossible to estimate the number of unmatched encounters.

2.3.1 Policy implications of findings

Key issues in the design of an 'episode of care' payment system for antenatal care are:

- data validity
- the homogeneity of potential 'products' of bundled maternity care (and any stop-loss or outlier policies required for abnormally high cost episodes)
- the extent to which patients move between maternity care providers (general practitioners, hospitals and/or networks); and
- the likely incentives for patients to elect treatment as public or private patients created by bundling.

Taking each in turn, hospital data in Victoria is very good by international standards. However, there seems to be some variation in the coding practice for the small numbers of deliveries (planned and unplanned), which occur outside hospital. These births, in themselves, would pose a challenge for payment system reform, as the absence of an inpatient separation for the birth, and any ambulance involvement in unplanned out of hospital births would have to be considered.

A second data problem identified is the small number of patients with a second 'birth' occurring less than 37 weeks after the first. In some cases, these may represent very premature deliveries in the second pregnancy, and would need to be further investigated to clarify whether they are coding errors or real events. Design of a payment system would need to develop rules for defining birth windows which took account of the overlap between post-natal care in pregnancy 1 and prenatal care for pregnancy 2.

A third and major data problem is that information on outpatient care in most Victorian hospitals is not identified at the patient level. This would make tracking of 'out of episode' care problematic for other hospital outpatient services in the same way that it is currently problematic to track such care in private general or specialist practice.

There was wide variation in the number of prenatal inpatient episodes and in the count of OP encounters. Some of this was an obvious 'hospital effect,' but much of the variation is likely to be driven by clinical considerations. Identifying criteria for predicting these high-utilisation pregnancies would require more detailed examination of the high-use cases in order to identify criteria that would be difficult to manipulate in a funding environment. This is a similar problem to the 'hours of mechanical ventilation' issue in determining additional funding for cases treated in the ICU, but further work would be required to identify such clinically-relevant criteria.

On the plus side, the analysis demonstrates that there is considerable room for rationalising patterns of outpatient care, and the projects funded under the Maternity Services Enhancement Program to develop protocols for this care could provide clinically-validated models for doing so.

The analysis reported here shows that movement between hospitals during the pregnancy and birth 'window' is largely confined to within network movement for the six campuses investigated here. However protocols similar to those for inpatient transfers would have to be developed when, for whatever reason, responsibility for managing the pregnancy was transferred from one network/hospital to another prior to birth, and existing payment policies on inpatient transfers would also need review in the event of episodic funding.

Finally, issues relating to patient election would need to be considered very carefully. Given that no proposal is being considered to require patients to sign up for an episodic care program, mechanisms would need to be developed to reconcile patient choice of status for every admission with hospital budget targets. A system which resulted in patients 'electing' to be private patients for all but the delivery episode of care, for example, would be very advantageous to the treating hospital, and undermine the incentives of an episode payment.

In the absence of such a once-for-all election, the incentives both to provide continuity of care and to rationalise prenatal outpatient care would be undermined. Hospitals would be tempted to improve their funding situation by encouraging 'episode' patients to seek some of their care with private GPs (as in the existing shared care programs) and/or to elect for private status for any inpatient admission. Privatisation of pre and post-natal care would be an even more attractive proposition for public hospitals funded in this way. Any change in policy to limit election would be likely to require changes to the Health Care Agreement, as election of public or private status with each hospital admission is currently assumed in that agreement.

3 Conclusions

In spite of growing consensus around clinically desirable patterns of care for maternity patients, analysis of this Victorian data shows that practice patterns ‘on the ground’ are quite variable. For the same DRG (as a measure of pregnancy outcome) patterns of care vary between hospitals, but also within hospitals, in ways that are not explainable from the clinical and service data available.

Some of this heterogeneity is specific to the clinical culture of particular maternity units and hospitals, and/or as a response to current funding and payment arrangements. It is undoubtedly the case that some of the heterogeneity is what hospitals and clinicians would term ‘flexibility’, that is, an ability to tailor the maternity episode to the particular circumstances of the pregnant woman and her family.

A payment system designed to reimburse hospitals for an entire maternity episode would face significant challenges:

- clarification of which hospitals may be eligible for episode-funding (for example, only those providing NICU services, those with 24 hr anaesthetic cover, etc.)
- promotion of the benefits of such arrangements to visiting medical staff of affected maternity hospitals
- design of payment rules which fairly compensate hospitals for partial episodes, including:
 - patients who present only late in pregnancy for prenatal care
 - pregnancies which terminate prior to birth
 - formal ‘shared care’ programs
 - medically-required ‘up transfers’ (outside hospital networks) of patients prior to birth
 - intra-partum and post-partum transfers after delivery (that is, modification of existing payment arrangements for transferred inpatients)
 - out-of-hospital births.
- design of separate episode classes for atypical pregnancies (drug-dependent mothers, multiple foetus pregnancies, etc.)
- design of outlier/stop loss thresholds and payment rules for episode outliers
- validation of episode means (outpatient encounters, percentage of patients requiring prenatal or post-natal admission, etc.) against quality/best practice guidelines
- introduction of hospital information systems to identify and track ‘episode-funded’ patients within and across hospitals
- design of audit systems to monitor and penalise hospitals that ‘off-load’ high-resource-use pregnancy episodes (and systems which can distinguish these from ‘late presentations’ at receiving hospitals)
- design of payment rules regarding provision of outpatient (VACS funded) services to private patients (cessation of funding of unlinked VACS obstetric encounters)
- promotion of the benefits of episode-funding to prospective patients and their families

- design of policies to cover patients not covered by episode-funded care (if this option is left open to public patients)
- negotiation with the Commonwealth regarding any changes required to the Health Care Agreement to support the administrative arrangements for a maternity episode of care payment.

The 'funding lever' has been shown to have a profound impact on hospital practice in Victoria, however, it is a very blunt instrument. The challenge is to ensure that changes to the funding system for maternity care enhance rather than detract from quality of care and favourable clinical outcomes. Episode funding models would give few tools to maternity hospitals to change the relationship they have with their visiting medical staff. There is a danger that a highly 'gameable' system would distract hospitals from current quality improvement efforts in order to maximise revenue under a new funding model. Long term quality gains may be worth such a period of disruption, but there would have to be a high probability of these longer term gains to justify the losses to the system of such a change.

Appendix 1

DRGs used for initial inpatient data extraction

ARDRG4.2

A06Z	Tracheostomy Any Age, Any Condition
A40Z	ECMO W/O Cardiac Surgery
# 001A	Caesarean Del W Multiple Complicating Diagnoses 1+ Severe
# 001B	Caesarean Delivery W Severe Complicating Diagnoses
# 001C	Caesarean Delivery W Moderate Complicating Diagnoses
# 001D	Caesarean Delivery W/O Complicating Diagnoses
# 002Z	Vaginal Delivery W Complicating OR Procedure
* 003Z	Ectopic Pregnancy
# 060A	Vaginal Delivery W Multiple Complicating Diagnoses,1+ Severe
# 060B	Vaginal Delivery W Severe Complicating Diagnoses
# 060C	Vaginal Delivery W Moderate Complicating Diagnoses
# 060D	Vaginal Delivery no Complicating Diagnosis
* 061Z	Postpartum & Post Abortion W/O O.R. Proc
* 062Z	Threatened Abortion
* 063Z	Abortion no D&C, Aspiration Curette/Hysterotomy
* 064Z	False Labour
* 065A	Other Antenatal Admission W Severe Complicating Diagnoses
* 065B	Other Antenatal W Moderate/No Complicating Diagnoses
Z64B	Other Factors Influencing Health Status <80
901Z	Extensive OR Proc Unrelated to Principal Diagnosis
902Z	Non - Extensive OR Proc Unrelated to Principal Diagnosis
962Z	Unacceptable Obstetric Diagnosis Combination

* Indicates 'non - birth' obstetric DRGs used in the algorithm identifying births in the dataset

Indicates the 9 'birth' DRGs used in case validation

Appendix 2

Implications of finding from data validation for current coding and funding policy

This study relied on identifying births using a definition previously developed by the Department of Human Services (personal communication, Merryn Jaensch and Jenny Shephard). Criteria used for defining a birth are specified in the main report.

Analysis of this data set from 2000–01 revealed a number of coding anomalies which distort the counting of births using this definition, and several flaws in the definition itself.

When trying to estimate the number of births in the VAED, the codes for ‘Out of hospital births’ (Z39.02 and Z39.03) should be included for completeness, even though the birth itself did not occur in a hospital separation.

Coding standards require that out of hospital births be coded as the principal diagnosis for related admissions for post-natal care (personal communication, Carla Arrighini, DHS). This results in the assignment of the admission to DRGO61Z, *Postpartum & Post Abortion W/O O.R. Proc.* However, when post-natal admissions for these patients are wrongly coded with the reason for the post-natal admission (primarily birth complications, problems with breast feeding) as the principal diagnosis, the admission is assigned to a ‘birth DRG’ (see Appendix 1 for relevant DRG codes). Thus similar cases result in different DRG - based payment depending on the order of coding, and some out of hospital births are counted while others are not.

The list of ‘excluded’ obstetric DRGs which comprise Criterion 2 omits O61Z, with the result that one admission in this data set met the other two criteria, and was classed to this postpartum DRG. The definition of birth used in subsequent analysis amended Criterion 2 so that this DRG (and the relevant case) was also excluded.

In the course of validating the birth definition, a number of coding errors also became apparent. Some of the births recorded in obstetric but not ‘birth’ DRGs appear to be coding errors. Live births (Z37.0), for example, are recorded with principal diagnoses which result in assignment to DRGs O65B *Oth Antenatal W Moderate/No Comp Diag*, O64Z *False Labour*, and O62Z *Threatened Abortion*.

Two cases recorded ‘live births’ in pregnancies with durations of <19 completed weeks. It is my understanding that the definition of a birth (in contrast with a spontaneous abortion or stillbirth) is completed pregnancy of 20 or more weeks. If this definition is still current, coding guidelines about these mid-pregnancy losses should be clarified or reinforced.

Finally, investigation of duplicate birth records with implausible timing (second sep too close to represent a second confinement) revealed a number of records of sameday admissions overlapping extended admissions. Apparently, patients were admitted, discharged and readmitted on a single day. WIES values on file suggest that the day admission would be paid on the standard discounted basis, but the extended stay attracted full WIES payment. The extent of double counting of care is unknown, but these cases suggest that data edits might be formulated which would disallow such overlapping dates.

References

Riley M & Halliday J, *Births in Victoria 1999 - 2000*, Perinatal Data Collection Unit, Victorian Government Department of Human Services, Melbourne, 2001 (http://www.dhs.vic.gov.au/phd/perinatal/downloads/annrep_9900.pdf).

