

Assessing the relationship between inpatient and outpatient activity: a clinical specialty analysis

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Abstract

General and specialist services in public acute hospital outpatient departments play a key role in the health care system and represent a vital interface between inpatient and community care. Typically outpatient services involve millions of patient visits within a very short time frame and in Victoria alone between 8-10 million outpatient occasions of service are provided each year. Drawing on the first full year of data from the Victorian Ambulatory Classification System (VACS) this paper examines the patterns underlying the distribution of inpatient separations and outpatient encounters at 16 major Victorian public hospitals and assesses the relationship between inpatient and outpatient activity at the clinical specialty level.

Introduction

While the casemix classification of Australian inpatient activity is now relatively routine, the volume and types of hospital outpatient services are only beginning to be measured. This has meant that the relationship between inpatient and outpatient services has rarely been systematically studied across hospitals.

Earlier health policy was based on the assumption that outpatients could be simply equated to inpatients. The Health and Allied Services Advisory Council (HASAC) formula, derived in 1971 and used in health policy subsequently, equated 1.917 non-inpatient visits to one occupied bed-day and 5.753 non-inpatient treatments to one occupied bed-day (Gillett and Solon 1992). Such a broad formula obviously does not account for differences within outpatient services.

The Victorian Ambulatory Classification System (VACS), introduced in Victoria from 1 July 1997, is based on the assumption that outpatient services are not necessarily directly linked to an inpatient admission. Outpatient services are also quite different in terms of resource use. One may also expect that hospitals would configure outpatient services in response to their immediate external environment, such as the number of general practitioners or 24-hour clinics, as well as their inpatient casemix. VACS provides comprehensive data at a specialty level and therefore enables the pattern of outpatient activities, and their relationship to inpatient care, to be assessed in Victoria for the first time.

Clinical specialties provide a meaningful way to link inpatient and outpatient treatments. Within VACS, hospital outpatient clinics are assigned to one of 45 clinical specialties and hospitals are funded on the basis of patient encounters within the clinic. The encounter is defined as one clinic visit, plus all ancillary services (pathology, radiology and pharmacy) provided within the 30 days either side of that clinic visit. The 30-day window has been chosen to encompass the majority of services associated with a particular visit and to enable a reasonable and practical time period for reporting and funding. For reporting purposes, only the clinic visit is reported by hospitals. Encounters are funded on the basis of the cost weight that incorporates the ancillary services.

A cost weight is assigned to each clinical category, which reflects the relativities between specialties. Examples of costs weights used for funding in 1999-2000 are general medicine (1.100), cardiology (1.931), neurosurgery (1.344), plastic surgery (0.712), and obstetrics (0.988) (DHS, 1999). In 1999-2000, the standard case payment is \$109 per weighted encounter.

Method

The analysis of inpatient and outpatient activity is based on 1997/98 data for 16 major metropolitan public hospitals funded by VACS. These hospitals account for approximately 70 per cent of total Victorian acute inpatient activity and include specialist hospitals such as the Royal Women's Hospital, Mercy Public Hospital, Peter MacCallum Cancer Institute, Royal Children's Hospital and the Royal Victorian Eye and Ear Hospital.

Aggregated data at the diagnosis related group (DRG) level for inpatient separations have been used as the primary unit of measure. Casemix adjusted separations, taking into account resource use and length of stay, are also presented in terms of weighted inlier equivalent separations (the fifth version, or WIES5, in 1997/98). This data was then mapped into the Department of Human Services approved standard specialty groupings. In Victoria, a small number of adjustments are made to the original AN-DRG Version 3.1 grouping in recognition of significant cost differences within DRGs. VIC-DRGs include separate DRGs for peritoneal dialysis and haemodialysis, allogenic and autologous bone marrow transplants, and transvascular percutaneous cardiac interventions with and without stents.

The specialty groupings of gastroenterology and neurology comprise only medical DRGs and only a small number of procedural DRGs are included in the specialties of cardiology (pacemakers), respiratory (tracheostomy and lung transplant), and nephrology (kidney transplant). The specialty grouping of oncology/radiology includes all oncology-related DRGs, chemotherapy and radiotherapy and should not be confused with routine diagnostic radiology procedures.

Data from the VACS was compiled and a mapping process undertaken to match the inpatient specialty groupings with the VACS clinical categories. The VACS categories of general medicine, allergy and infectious diseases all mapped to the inpatient specialty of "General Medicine". Inpatient specialties that could not be matched with VACS categories, such as renal dialysis (13% of total separations), rehabilitation (less than 1% of total separations) and neonatology (5% of total separations) were excluded from this analysis. Similarly, outpatient categories which could not be mapped directly to an inpatient specialty, such as pre-admission (5% of total encounters); dermatology (2%); developmental neurological disability (less than 1%); and pediatrics (less than 1%) were also excluded. Under the VACS definitions, pediatric cases are recorded under the relevant clinical specialty, rather than under the pediatric medical/surgical clinical categories that are used for pediatric-specific clinics. A further exclusion was psychiatry, which comprises about 1 per cent of total separations and less than 1 per cent of total encounters.

Only public patients are funded through VACS so separate analyses are also given for public patients only. The absence of information on "private" outpatients limits the scope of the analysis but is unlikely to alter the major conclusions.

Hospital outpatient service profiles

The range and volume of public outpatient services, as mapped to the inpatient specialty groupings, provided in 1997/98 at the large Victorian public hospitals are presented in Table 1(a) for general hospitals and Table 1(b) for specialist hospitals.

The large teaching hospitals (Alfred Hospital, Austin and Repatriation Medical Centre, Royal Melbourne Hospital, St Vincent's Hospital, Western Hospital) provide a wide range of outpatient services, with the smaller teaching hospitals providing a more limited range of services (Box Hill Hospital, Dandenong Hospital, Frankston Hospital, Northern Hospital).

Table 1(a): Distribution of public VACS encounters in general hospitals, 1997/98

Specialty	Royal Melbourne Hospital	Monash Medical Centre	A&RMC	Alfred Hospital	Western Hospital	St Vincent's Hospital	Geelong Hospital	Box Hill Hospital	Northern Hospital	Frankston Hospital	Dandenong Hospital
Obstetrics	-	37.8	-	-	10.1	-	23.6	36.6	5.6	34.2	33.8
General Surgery	14.2	0.1	9.9	7.4	1.2	6.2	14.2	11.9	23.8	17.5	-
Gastroenterology	3.6	1.4	2.7	6.1	2.4	11.8	-	-	-	-	-
Cardiology	4.7	1.3	4.3	1.3	1.2	7.2	2.4	-	-	-	-
Oncology/Radiology	4.1	4.1	3.3	7.2	2.3	9.8	10.0	4.2	-	8.9	-
Respiratory	1.0	-	5.7	2.7	1.9	1.9	-	-	-	-	-
General Medicine	10.6	5.6	8.2	11.7	8.4	12.3	1.7	-	5.6	14.0	-
Orthopaedics	12.3	3.0	16.9	12.0	15.1	5.7	15.5	30.5	33.5	-	64.9
Neurology	2.6	0.4	3.3	4.7	1.4	3.6	-	-	2.3	-	-
Hematology	-	0.6	2.9	3.5	-	2.9	-	-	-	-	-
ENT	2.1	5.3	3.4	5.4	3.3	3.2	5.5	-	0.4	-	-
Gynecology	-	5.5	0.3	-	26.4	-	5.3	6.8	1.0	1.6	-
Urology	3.8	3.4	9.2	3.6	3.4	4.6	4.6	6.0	7.1	-	-
Ophthalmology	5.3	3.8	8.1	5.3	-	0.6	5.2	-	2.7	5.0	-
Plastics	7.1	4.8	6.0	4.8	12.2	8.2	3.8	0.4	9.0	17.2	1.3
Nephrology	8.8	6.2	1.3	7.7	1.9	4.0	-	-	1.5	-	-
Endocrinology	7.2	7.6	2.4	4.6	3.1	6.7	6.6	2.8	-	1.5	-
Vascular	1.9	1.7	2.9	2.7	2.7	3.3	-	-	4.7	-	-
Cardiothoracic	0.2	1.6	1.2	1.7	0.4	0.7	0.3	0.8	2.1	-	-
Neurosurgery	3.1	1.6	-	2.5	1.4	2.4	0.3	-	-	-	-
Rheumatology	5.5	1.9	4.8	3.6	1.2	4.2	-	-	-	-	-
Dental	2.2	2.5	2.6	1.4	-	0.7	0.8	-	0.7	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of encounters	83,492	79,997	72,918	72,508	66,284	57,318	44,901	27,279	21,263	11,677	10,200

Source: Department of Human Services

The major services by volume in the general hospitals are obstetrics, general medicine, general surgery and orthopaedics. Services at the major specialist hospitals reflect their specialty areas. For example, obstetrics and gynecology account for approximately 90 per cent of all services provided at the two major maternity hospitals (Mercy Public Hospital and the Royal Women's Hospital). 96 per cent of all services at the Royal Victorian Eye and Ear Hospital are accounted for by the two specialties of ophthalmology and ear, nose and throat. Monash Medical Centre is notable for its high proportion of obstetric cases. However, when these cases are excluded, the profile at the Monash Medical Centre is similar to other general hospitals. The pattern of services provided at the Royal Children's Hospital and the apparent lack of spread of services at Dandenong Hospital and Frankston Hospital may reflect differences between public and private provision.

Table 1(b): Distribution of public VACS encounters in specialist hospitals, 1997/98

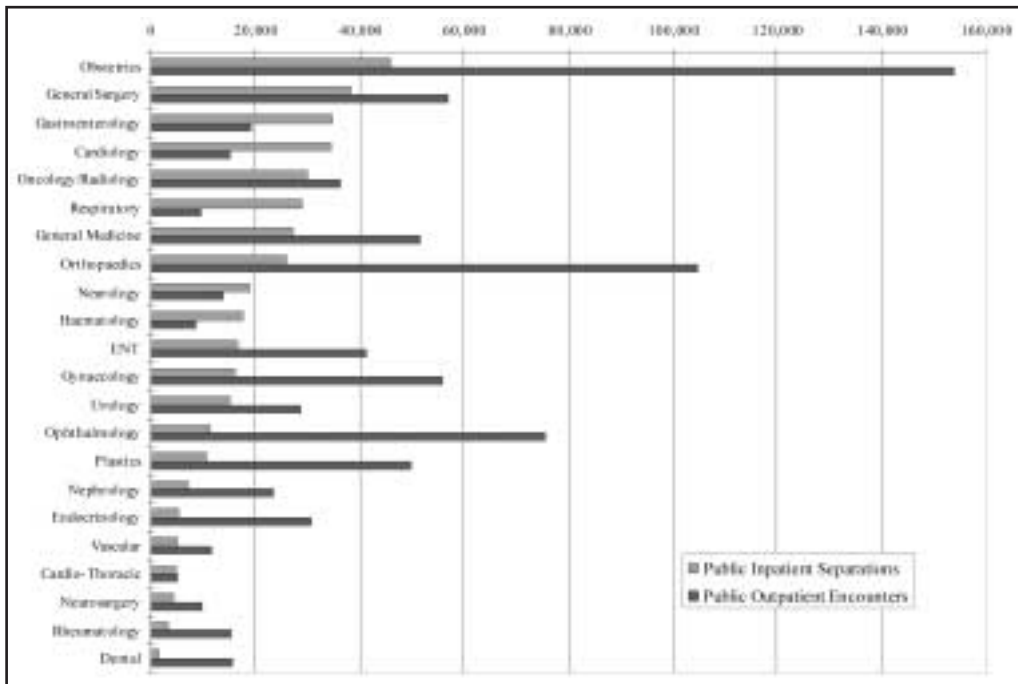
Specialty	Royal Women's Hospital	Royal Victorian Eye & Ear Hospital	Royal Children's Hospital	Mercy Public Hospital	Peter MacCallum Cancer Institute
Obstetrics	62.0	-	-	78.3	-
General Surgery	0.6	-	2.9	-	10.9
Gastroenterology	-	-	-	-	-
Cardiology	-	-	-	-	0.3
Oncology/Radiology	2.4	0.2	-	3.5	20.8
Respiratory	-	-	0.3	-	1.4
General Medicine	2.8	1.2	6.4	2.5	0.6
Orthopaedics	-	-	44.3	-	0.5
Neurology	-	-	1.0	-	-
Hematology	-	2.0	-	-	10.1
ENT	-	19.0	16.0	-	-
Gynecology	26.7	-	-	13.8	0.7
Urology	1.9	-	1.4	1.9	0.3
Ophthalmology	-	77.5	2.8	-	0.4
Plastics	-	-	10.5	-	42.9
Nephrology	-	-	-	-	-
Endocrinology	3.5	-	-	-	3.4
Vascular	-	-	-	-	-
Cardiothoracic	-	-	-	-	-
Neurosurgery	-	-	2.6	-	1.6
Rheumatology	-	-	-	-	-
Dental	-	-	11.8	-	6.2
Total	100.0	100.0	100.0	100.0	100.0
No. of encounters	86,263	67,277	56,961	39,396	17,594

Relationship between inpatient and outpatient activity

The number of public inpatient separations and public outpatient encounters by clinical specialty for the 16 VACS-funded hospitals in 1997/98 are shown in Figure 1. As the VACS data only includes public encounters, the comparison made in Figure 1 is with public inpatients. In all specialty categories public inpatients account for over 72 per cent of all patients treated, and in many categories over 90 per cent of all patients treated. The number of private outpatient encounters is not known.

The top five clinical specialties in terms of public inpatient separations in the sample are obstetrics (11%), general surgery (10%), gastroenterology (9%), cardiology (9%) and oncology/radiology (7%). For public outpatient encounters the top five clinical specialties are obstetrics (18%), orthopedics (13%), ophthalmology (10%), general surgery (7%) and gynecology (7%). The five specialties with the lowest number of public outpatient encounters are cardio-thoracic, hematology, respiratory, neurosurgery and vascular (approximately 1% each).

Figure1: Public Inpatient separations and Outpatient Encounters by DHS Speciality Groups, 16 VACS Hospitals, 1997/98



The relationship between inpatient separations and outpatient encounters was tested. There was only a weak relationship between inpatient separations and outpatient encounters by specialty (Spearman's rank correlation coefficient = 0.377, $p = 0.084$). When the analysis was limited to the predominantly surgical specialties, there was a stronger relationship (Spearman's rank correlation coefficient = 0.714, $p = 0.047$). A similar relationship does not appear to exist for the medical specialties.

The ratio of outpatient encounters to inpatient separations and WIES was calculated for each clinical specialty. The considerable variation in specialties in the ratio of outpatient activity to inpatient activity is shown in Table 2. Clinical specialties have been grouped into three categories according to the ratio of public outpatient encounters to public inpatient separations.

"High" public outpatient activity to inpatient activity as characterised by a ratio of three or more in terms of public encounters to public separations is found for dental, ophthalmology, endocrinology, plastics, rheumatology, orthopaedics, gynecology, nephrology and obstetrics. "Moderate" public outpatient activity to inpatient activity as characterised by a ratio between one and three is found for ear, nose and throat, neurosurgery, vascular, general medicine, urology, general surgery, oncology and cardiothoracic. "Low" public outpatient activity to inpatient activity as characterised by a ratio of less than one is found for neurology, gastroenterology, hematology, cardiology and respiratory.

In some specialty areas, relatively high ratios can be explained by the logical clinical pattern of treatment. In obstetrics, for example, most inpatient episodes are preceded by a series of ante-natal visits. Similarly, for cardiology, the low ratio could be explained by the fact that many patients are admitted through the emergency department, rather than via the outpatient department.

As might be expected, the two measures (separations and WIES) are similar except where the cost weights are relatively high or the numbers comparatively low as seen in the specialties of vascular, cardio-thoracic, neurosurgery and dental. The specialties with the high ratios suggest that the link between the number of outpatient attendances and inpatient episodes is weak because it is likely that in dental, ophthalmology, rheumatology and endocrinology many outpatient attendances are not associated with an inpatient episode.

Table 2: Ratio of inpatient separations to public outpatient encounters by clinical specialty, 1997/98

Specialty	Encounters: Public Separations	Encounters: Public WIES	Encounters: Total Separations	Encounters: Total WIES
High Public Outpatient to Public Inpatient Ratio (> 3)				
Dental	9.86	24.97	7.17	18.13
Ophthalmology (s)	6.72	7.25	5.06	5.48
Endocrinology	5.89	5.09	5.45	4.72
Plastics (s)	4.73	4.44	3.86	3.50
Rheumatology	4.55	6.79	4.13	6.24
Orthopaedics	4.05	2.65	3.47	2.31
Gynecology	3.49	5.35	2.78	4.33
Nephrology	3.36	4.17	3.10	3.77
Obstetrics	3.35	5.50	2.89	4.78
Moderate Public Outpatient to Public Inpatient Ratio (1 - 3)				
ENT (s)	2.49	4.10	2.06	3.40
Neurosurgery (s)	2.32	0.88	1.85	0.72
Vascular (s)	2.27	0.90	2.11	0.84
General Medicine	1.90	2.87	1.76	2.66
Urology (s)	1.88	2.04	1.72	1.86
General Surgery (s)	1.48	1.29	1.28	1.09
Oncology/Radiology	1.21	3.28	1.10	2.96
Cardiothoracic (s)	1.04	0.17	0.94	0.15
Low Public Outpatient to Public Inpatient Ratio (< 1)				
Neurology	0.73	0.74	0.65	0.65
Gastroenterology	0.55	1.05	0.50	0.96
Hematology	0.49	0.69	0.43	0.59
Cardiology	0.44	0.34	0.40	0.32
Respiratory	0.33	0.19	0.31	0.16

Source: Department of Human Services

(s) Indicates surgical specialty.

As mentioned earlier, it would appear that there is a relationship between the ranking of inpatient separations and outpatient encounters for the surgical specialties, while a similar relationship does not appear to exist for the medical specialties. Table 2 shows that the ratios for the medical specialties range from 0.33 for respiratory to 5.89 for endocrinology. In the case of the surgical specialties, the range is not as wide, with all specialties having a ratio greater than 1.

Specialty differences across hospitals were examined as shown in Table 3. The data shows that within-specialty variation is low (Coefficient of Variation < 1) for the majority of specialties. Using data from all 16 hospitals, eight of the 22 specialties had CVs greater than one (oncology/radiology, neurology, gynecology, urology, plastics, cardio-thoracic, neurosurgery and dental). Excluding the specialist hospitals reduces the within-specialty variation to two specialties with CVs greater than one (gynecology and cardio-thoracic).

Table 3: Within-specialty variation for all hospitals and general hospitals, 1997/98

Specialty	All 16 hospitals (CV) ¹	General Hospitals ² (CV)
Dental	2.06	0.78
Ophthalmology	0.73	0.69
Endocrinology	0.66	0.65
Plastics	1.15	0.64
Rheumatology	0.46	0.46
Orthopaedics	0.82	0.35
Gynecology	1.12	1.31
Nephrology	0.58	0.58
Obstetrics	0.64	0.76
ENT	0.63	0.62
Neurosurgery	1.42	0.23
Vascular	0.29	0.29
General Medicine	0.91	0.67
Urology	1.49	0.38
General Surgery	0.68	0.68
Oncology/Radiology	1.47	0.93
Cardiothoracic	1.18	1.18
Neurology	2.08	0.56
Gastroenterology	0.75	0.75
Hematology	0.54	0.64
Cardiology	0.63	0.70
Respiratory	0.74	0.65

Source: Department of Human Services

Notes: 1 CV (Coefficient of Variation) = standard deviation of all ratios divided by mean of all ratios.

2 Excludes 5 specialist hospitals.

This data strongly suggests that the majority of specialty patterns do not differ markedly across hospitals. These ratios therefore must reflect the natural course of the disease or condition, standard treatment patterns and/or the number of general practitioners and private specialists, and the extent to which such patients are seen in private practice.

Conclusion

This analysis represents a first step in understanding the relationship between inpatient and outpatient activity in large public hospitals. It shows that the ratio of inpatient to outpatient services differs with clinical specialty. Moreover, it shows there is consistency across general hospitals, regardless of the size or location of the hospital.

For some inpatient specialties, there appears to be little relationship to outpatient services. In some cases, such as dental services and ophthalmology, this is likely to reflect disease or treatment patterns. In other instances it may reflect the extent of private or community care. Although the ratios were consistent, the specific mix of services differed markedly across hospitals. This probably reflects differential rates of private provision in particular specialties, or a greater reliance on general practice or community care.

Greater elucidation of the relationship between inpatient and outpatient care will occur with further analysis at the individual patient level. Such exploration could identify differences in acute or chronic admissions, patterns for specific inpatient diagnoses or conditions, and demographic differences. It would be of particular interest to determine whether the similarity across hospitals holds for both treatment and demographic factors. There needs to be further work in the gray zone between hospitals and private specialists and general medical practitioners in the community and before one can delineate expected or ideal models of outpatient services.

Footnote

The views and opinions expressed are those of the authors and do not necessarily reflect those of the Department of Human Services.

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