

# 6 Types of imaging tests ordered by general practitioners

## 6.1 Distribution of imaging tests ordered by Medicare Benefits Schedule groups

Table 6.1 provides a breakdown of the imaging tests ordered in terms of the five major groups used in the Medicare Benefits Schedule (MBS). Within each group the most frequent test types are listed.

- Column 1 gives an indication of the variance among GPs by providing the percentage of GPs who ordered at least one of this test type.
- Column 2 provides the number of test orders for that group or type of test.
- Column 3 gives the relative frequency (per cent) of the test within the MBS group.
- Column 4 gives an indication of the relative frequency of the group or type of imaging test in relation to the total imaging tests ordered.
- The next two columns provide the 95% confidence interval surrounding the estimate in Column 4.
- The last column gives the relative standard error (RSE) of the estimate.

### Diagnostic radiology

Diagnostic radiology tests numbered 5,042 and accounted for the majority of imaging tests ordered (63.7%). At least one of these tests was ordered by 96.1% of the GPs. The six tests most often ordered from this group made up half of all diagnostic radiology orders. These included chest x-rays (21.0); plain x-rays of the knee (7.9%); mammograms (7.2%); and plain x-rays of the lumbosacral region (5.3%), the ankle (4.2%) and the shoulder (4.2%).

The relative standard errors indicated that the estimates of the frequency of diagnostic imaging test orders overall are highly reliable and that those for the frequency of orders for chest x-ray, knee x-ray and mammography are quite reliable. The remaining estimates are statistically unreliable.

**Table 6.1: Distribution of imaging tests ordered by MBS groups**

<b>Imaging group (MBS)</b>	<b>Per cent of all GPs (n=1,047)</b>	<b>Number orders</b>	<b>Per cent of MBS group</b>	<b>Per cent of all imaging orders (n=7,919)</b>	<b>95% LCL</b>	<b>95% UCL</b>	<b>RSE</b>
<b>Diagnostic radiology</b>	<b>96.1</b>	<b>5,042</b>	<b>100.0</b>	<b>63.7</b>	<b>62.0</b>	<b>65.1</b>	<b>1</b>
X-ray; chest	55.6	1,057	21.0	13.3	12.1	14.6	5
X-ray; knee	29.6	400	7.9	5.1	3.7	6.5	14
Mammography	27.6	365	7.2	4.6	3.0	6.2	17
X-ray; lumbosacral	17.6	266	5.3	3.4	1.1	5.6	34
X-ray; ankle	16.2	214	4.2	2.7	1.0	4.4	32
X-ray; shoulder	16.8	211	4.2	2.7	0.9	4.4	34
X-ray; foot/feet	15.8	191	3.8	2.4	0.7	4.1	37
X-ray; hip	15.1	168	3.8	2.1	0.1	4.1	48
X-ray; wrist	14.0	164	3.3	2.1	0.2	4	47
X-ray; spine; lumbar	9.5	139	2.8	1.8	0.0	5.3	100
X-ray; cervical	11.5	131	2.6	1.7	0	3.8	68
X-ray; hand	10.7	122	2.4	1.5	0	3.8	75
X-ray; finger(s)/thumb	11.5	114	2.3	1.4	0	3.5	73
Imaging other	5.5	107	2.1	1.4	0	10.9	100
X-ray; spinal	7.7	98	1.9	1.2	0	3.8	100
X-ray; abdomen	8.1	97	1.9	1.2	0	3.8	100
Test; bone densitometry	9.0	95	1.9	1.2	0	3.8	100
X-ray; neck	7.2	94	1.9	1.2	0	4.5	100
Scan; bone(s)	7.0	76	1.5	1.0	0	4.1	100
X-ray; elbow	6.6	73	1.4	0.9	0	3.2	100
Pyelogram; intravenous	4.8	70	1.4	0.9	0	4.7	100
X-ray; thoracic	5.7	65	1.3	0.8	0	3.5	100
X-ray; sinus	4.5	51	1.0	0.7	0	4	100
Barium meal	3.3	51	1.0	0.6	0	4.8	100
X-ray; ribs	4.1	47	0.9	0.6	0	4	100
X-ray; toe(s)	3.5	40	0.8	0.5	0	4.2	100
X-ray; heel	3.1	39	0.8	0.5	0	5.5	100
Barium enema	3.2	36	0.7	0.5	0	4.6	100
X-ray; pelvis	3.5	36	0.7	0.5	0	3.5	100
<i>Sub-total</i>	<i>..</i>	<i>4,617</i>	<i>91.6</i>	<i>..</i>	<i>..</i>	<i>..</i>	

*(continued)*

**Table 6.1 (continued): Distribution of imaging tests ordered by Australian MBS groups**

Imaging group (MBS)	Per cent of all GPs (n=1,047)	Number orders	Per cent of MBS group	Per cent of all imaging orders (n=7,919)	95% LCL	95% UCL	RSE
<b>Ultrasound</b>	<b>78.5</b>	<b>2,035</b>	<b>100.0</b>	<b>25.7</b>	<b>24.4</b>	<b>27.0</b>	<b>3</b>
Ultrasound; pelvis	27.9	361	17.7	4.6	2.9	6.3	19
Ultrasound; abdomen	20.4	253	12.5	3.2	1.6	4.8	25
Ultrasound; obstetric	15.2	214	10.5	2.7	0	5.6	54
Ultrasound; breast; F	18.3	194	9.5	2.5	0.7	4.2	36
Ultrasound; shoulder	12.6	155	7.6	2.0	0	4.1	55
Ultrasound; kidney	8.8	98	4.8	1.2	0	3.7	100
Test; Doppler	8.1	85	4.2	1.1	0	3.9	100
Ultrasound NOS	7.5	80	3.9	1.0	0	3.6	100
Ultrasound; abdomen upper	6.3	79	3.9	1.0	0	4.4	100
Ultrasound; thyroid	5.8	53	2.6	0.7	0	3.5	100
Ultrasound; scrotum	4.5	49	2.4	0.6	0	4.1	100
Echocardiography	3.6	47	2.3	0.6	0	4.5	100
Test; Doppler carotid	4.6	46	2.3	0.6	0	4.1	100
Ultrasound; renal tract	3.6	44	2.2	0.6	0	4.5	100
Ultrasound; gallbladder	3.2	38	1.9	0.5	0	6.2	100
<i>Sub-total ultrasound</i>	..	1,796	88.3	..	..	..	..
<b>Computed tomography</b>	<b>39.5</b>	<b>674</b>	<b>100.0</b>	<b>8.5</b>	<b>7.1</b>	<b>9.9</b>	<b>9</b>
CT scan; brain	10.6	130	19.3	1.7	0	3.6	60
CT scan; head	9.3	107	15.9	1.4	0	4.0	100
CT scan; spine; lumbosacral	5.7	76	11.2	1.0	0	4.1	100
CT scan; abdomen	4.5	61	9.1	0.8	0	4.5	100
CT scan; spine; lumbar	4.8	60	8.9	0.8	0	4.7	100
CT scan; chest	3.9	52	7.7	0.7	0	5.1	100
CT scan; sinus	4.7	47	6.9	0.6	0	4.4	100
<i>Sub-total CT scans</i>	..	533	79.1	..	..	..	..
<b>Magnetic resonance imaging</b>	<b>2.2</b>	<b>24</b>	<b>100.0</b>	<b>0.3</b>	<b>0.0</b>	<b>5.3</b>	<b>100</b>
<b>Nuclear medicine imaging</b>	<b>1.5</b>	<b>16</b>	<b>100.0</b>	<b>0.2</b>	<b>0.0</b>	<b>5.1</b>	<b>100</b>
<b>Other NEC</b>	<b>8.7</b>	<b>128</b>	<b>100.0</b>	<b>1.6</b>	<b>0.0</b>	<b>4.4</b>	<b>100</b>
<b>Total imaging tests ordered</b>	<b>98.7</b>	<b>7,919</b>	<b>..</b>	<b>100.0</b>	<b>..</b>	<b>..</b>	<b>..</b>

Note: UCL—upper confidence limit; LCL—lower confidence limit; RSE—relative standard error.

## **Ultrasound**

Orders for ultrasound numbered 2,035 and accounted for one-quarter (25.7%) of the total. More than three-quarters (78.5%) of the GPs ordered at least one. The ultrasounds most often ordered were those of the pelvis (17.7% of all ultrasounds), the abdomen (12.5%), the breast (9.5%) and the shoulder (7.6%). However, it is notable that obstetric ultrasounds (10.5%) took third place in relative frequency in this group. These top five types of ultrasound made up almost 60% of all ultrasounds ordered and the estimates of ordering rates for only these five tests could be considered to have any acceptable level of statistical reliability according to the relative standard errors in the right hand column of Table 6.1.

## **Computed tomography**

There were 674 CT scans ordered and the variety in types was far less than in the previous groups. Less than half the participating GPs ordered any computed tomography. Seven specific tests accounted for 79.1% of all CT scans and these included CTs of the brain, the head, the lumbosacral spine and the abdomen. Note that the relative standard errors for each of the specific tests listed in this group indicate that the estimates of ordering levels for each are not statistically reliable.

## **Magnetic resonance imaging**

There were only 24 orders for MRIs and these were ordered by 23 GPs. This is not surprising because GPs cannot currently order an MRI under the Medical Benefits Scheme. These 24 cases therefore led to further investigation to assess the extent to which these were likely to have been ordered by GP/specialists (those who have dual registration) and the extent to which the costs are likely to have been covered by workers' compensation or other third party payments.

Due to the small sample of orders for MRIs, these are not investigated in further detail later in this report. However, a review of these orders demonstrated that they were associated with 24 different problem labels; that six of the 24 cases were associated with injuries; that six of the 24 were part of encounters claimable from Workers' Compensation Insurance and that four were at encounters claimable from other non-Medicare sources.

These data suggest that the 16 encounters at which an MRI was ordered that were claimable through Medicare were placed by GPs who had dual registration as a specialist or that these patients would be required to cover the costs of the MRI themselves.

## **Nuclear medicine imaging**

There were only 16 tests of this type ordered among 16 GPs over the 12 months.

## **Other tests not elsewhere classifiable**

There were 128 test orders that were not classifiable within the MBS groups due either to lack of information (for example, a tick that imaging had been done) or illegibility. These represented only 1.6% of total imaging ordered.

## 6.2 Comparison of *BEACH* and Health Insurance Commission data

### Distribution of imaging ordered by MBS groups

The HIC imaging claims data related to all orders for imaging in the 1999–00 financial year were obtained from the HIC web site (HIC 2001). The DHAC also supplied the numbers of imaging tests undertaken from GP-generated requests for the same financial year. Earlier in this report the extrapolated *BEACH* data suggested there were approximately eight million imaging orders placed by GPs per year nationally. The total number of tests recorded as originating in a GP order in the MBS was 7.594 million for the 1999–00 financial year.

The distributions of these datasets across MBS diagnostic imaging groups are compared with the distribution of the imaging orders from *BEACH* in Table 6.2. No statistical tests of significance have been applied. Due to the sheer size of the HIC database, confidence intervals are very tight, ensuring that almost any comparison with a smaller database will generate significant differences.

It must be remembered that the HIC data report the number of tests claimed through the MBS. They do not include any tests paid for privately by the patient. Further, the radiologist has considerable professional freedom in deciding on the tests most suitable for the patient on any occasion so that the test order from the GP to the radiologist may not result in the same test as that ordered or may result in more tests being undertaken than were ordered by the GP. However, with these differences in mind these comparisons serve to provide a rough measure of the extent to which the *BEACH* data reflect the HIC claims data from radiologists.

As shown in Table 6.2 the distribution of the MBS imaging data across groups from all practitioners and those originating from general practice was remarkably similar to the distribution of the GP imaging test orders found in *BEACH*, with approximately two-thirds of the tests falling into the diagnostic radiology group.

**Table 6.2: Comparison of distribution of MBS and *BEACH* imaging data**

MBS group	MBS data Per cent of total imaging ( <i>n</i> =10,967,698) <sup>(a)</sup>	MBS data Per cent of imaging ordered by GPs ( <i>n</i> =7,594,538) <sup>(b)</sup>	BEACH Per cent of total imaging orders ( <i>n</i> =7,791) <sup>(c)</sup>
Diagnostic radiology	64.2	62.4	64.8
Ultrasound	28.1	28.4	26.1
Computed tomography	4.4	7.8	8.7
Nuclear medicine	2.5	1.5	0.2
MRI	0.8	0.0	0.3
<b>Total diagnostic imaging</b>	<b>10,967,698</b>	<b>7,594,538</b>	<b>7,791</b>

(a) Source: Health Insurance Commission.

(b) Health Insurance Commission data by personal communication with DHAC.

(c) The 128 other tests that could not be classified in an MBS group were removed for the purposes of this comparison.

Note: MBS—Medical Benefits Schedule.

The comparison of *BEACH* with the HIC data for tests generated from GPs shows slight differences in the distribution. These differences (and that of the extrapolated total imaging order count) may be due to the inclusion in the *BEACH* data of all recorded orders for mammography, some of which would be referrals to BreastScreen Australia rather than to the private radiologists whose services are counted in the MBS (see Section 8.2). Further, a small proportion of diagnostic radiology ordered by the GP may not be followed up by the patient (i.e. the patient chooses not to present for the test). The slightly higher proportion of tests that fell into the diagnostic radiology group in *BEACH* has an effect on the proportion falling into the other MBS groups. The considerable difference in the relative rate of nuclear medicine tests between the MBS data (1.5%) and *BEACH* (0.3%) may reflect the small sample size in the *BEACH* program compared with the total MBS dataset.

## MBS imaging groups by patient sex

The gender distribution of the patient (per cent male patients) associated with imaging tests from the major MBS groups are compared with those from *BEACH* in Table 6.3. Note that the MBS data in this case include all imaging tests, not only those that emanated from a GP order. Considering the inclusion of GPs orders for mammography to BreastScreen earlier mentioned, the gender distributions of the patients for whom the imaging tests were ordered/undertaken were remarkably similar, with approximately 40% of all tests being conducted for males.

**Table 6.3: Major MBS imaging group by patient sex**

Imaging group	Patient gender—per cent male	
	MBS ( <i>n</i> =10,967,698) <sup>(a)</sup>	BEACH ( <i>n</i> =7,791)
Diagnostic radiology	44.7	43.7
Ultrasound	26.3	29.7
CT	45.7	44.9
<b>Total diagnostic imaging</b>	39.5	40.3

(a) Source: Health Insurance Commission.

Note: MBS—Medical Benefits Schedule.

## MBS imaging group by age distribution of patients

The age distributions from MBS data and *BEACH* data of the patients for whom each of the major MBS test groups was undertaken are compared in Table 6.4. The MBS data again include all patients for whom imaging tests were claimed rather than those generated by a GP. The overall distributions of total diagnostic imaging by age group were remarkably similar, approximately 13% of tests being undertaken for young people of less than 20 years, one-third being for those aged 20–44 years, one-third for those aged 45–64 years and about one-quarter for elderly people.

**Table 6.4: Comparison of age distribution of patients for whom imaging ordered**

Test group	Dataset	Age group of patient (per cent)			
		<20	20–44	45–64	65+
Diagnostic radiology	MBS <sup>(a)</sup>	17.1	27.0	30.4	25.5
	BEACH	15.8	27.7	31.5	25.1
Ultrasound	MBS <sup>(a)</sup>	7.7	45.6	27.1	19.6
	BEACH	9.0	44.5	30.1	16.4
CT	MBS <sup>(a)</sup>	6.1	28.3	36.0	29.5
	BEACH	7.2	29.4	37.0	26.4
<b>Total diagnostic imaging</b>	<b>MBS<sup>(a)</sup></b>	<b>13.7</b>	<b>32.2</b>	<b>30.0</b>	<b>24.1</b>
	<b>BEACH</b>	<b>13.0</b>	<b>32.3</b>	<b>31.5</b>	<b>23.1</b>

(a) Source: Health Insurance Commission.

Note: MBS—Medical Benefits Schedule.

### 6.3 Individual imaging test types ordered most often

Table 6.5 provides a speedy overview of the results by listing the 30 most frequent imaging test types ordered, irrespective of their MBS group, in relative order of frequency. Note that the estimates are reliable only for about the top 10 test types ordered according to the relative standard error.

These top 30 tests accounted for almost two-thirds (61.9%) of all tests ordered. Chest x-rays were by far the most common, accounting for 13.3% of total imaging orders, at least one being ordered by more than half the participating GPs. These were followed by x-rays of the knee which were ordered on at least one occasion by 29.6% of the GPs and accounted for 5.1% of all imaging tests ordered.

Mammography and pelvic ultrasound were ordered at almost identical rates, each accounting for 4.6% of imaging orders and being ordered by the same proportion of the GP participants (27.6% and 27.9% respectively). These were followed by lumbosacral x-rays which accounted for 3.4% of imaging orders but were ordered by fewer individual GPs (17.6%). While abdominal ultrasounds were slightly less often ordered (3.2%), these test orders were spread widely across the GP sample, 30% of participants ordering at least one. Obstetric ultrasounds and plain x-rays of the ankle (each accounting for 2.7%) were ordered by one in seven GPs.

**Table 6.5: Most frequent imaging test types ordered**

<b>Imaging test type</b>	<b>Per cent of GP with at least one order (n=1,047)</b>	<b>Number of orders</b>	<b>Per cent of all imaging tests ordered (n=7,919)</b>	<b>95% LCL</b>	<b>95% UCL</b>	<b>RSE</b>
X-ray; chest	55.6	1,056.6	13.3	12.1	14.6	5
X-ray; knee	29.6	400.2	5.1	3.7	6.5	14
Mammography	27.6	365.2	4.6	3.0	6.2	17
Ultrasound; pelvis	27.9	360.8	4.6	2.9	6.3	19
X-ray; lumbosacral	17.6	266.6	3.4	1.1	5.6	34
Ultrasound; abdomen	30.0	253.3	3.2	1.6	4.8	25
X-ray; ankle	16.2	213.8	2.7	1.0	4.4	32
Ultrasound; obstetric	15.2	213.6	2.7	0.0	5.6	54
X-ray; shoulder	16.8	210.8	2.7	0.9	4.4	34
Ultrasound; breast	18.3	193.7	2.5	0.7	4.2	36
X-ray; foot/feet	15.8	190.6	2.4	0.7	4.1	37
X-ray; hip	15.1	167.7	2.1	0.1	4.1	48
X-ray; wrist	14.0	164.3	2.1	0.2	4.0	47
Ultrasound; shoulder	12.6	154.8	2.0	0.0	4.1	55
X-ray; spine; lumbar	9.5	139.1	1.8	0.0	5.3	100
X-ray; cervical	11.5	130.5	1.7	0.0	3.8	68
CT scan; brain	10.6	130.4	1.7	0.0	3.6	60
X-ray; hand	10.7	122.2	1.5	0.0	3.8	75
X-ray; finger(s)/thumb	11.5	113.6	1.4	0.0	3.5	73
CT scan; head	9.3	107.0	1.4	0.0	4.0	100
Other radiology NOS	5.5	106.8	1.4	0.0	3.7	100
Ultrasound kidney	8.8	98.5	1.2	0.0	3.7	100
x-ray spinal	7.7	98.2	1.2	0.0	3.8	100
x-ray; abdomen	8.1	96.6	1.2	0.0	3.8	100
Test; bone densitometry	9.0	94.6	1.2	0.0	3.8	100
x-ray; neck	7.2	94.3	1.2	0.0	4.5	100
Doppler test	8.1	85.2	1.1	0.0	3.9	100
Ultrasound NOS	7.5	80.3	1.0	0.0	3.6	100
Ultrasound upper abdomen	6.3	79.3	1.0	0.0	4.4	100
Bone scan	6.9	76.2	1.0	0.0	4.1	100
<i>Sub-total top 30 tests</i>	<i>..</i>	<i>4,964.3</i>	<i>61.9</i>	<i>..</i>	<i>..</i>	<i>..</i>
<b>Total tests</b>	<b>87.7</b>	<b>7,979</b>	<b>100.0</b>	<b>..</b>	<b>..</b>	<b>..</b>

Note: LCL—upper confidence limit; UCL—upper confidence limit; RSE—relative standard error; NOS—not otherwise stated.