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## Hospital utilisation and funding for patients with selected chronic conditions - 2. Diabetes

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Diabetes Mellitus (diabetes) refers to a chronic disease defined by excess sugar in blood (hyperglycaemia) as a result of the body failing to produce an adequate amount of insulin, or to utilise the insulin produced effectively<sup>1,2</sup>. Diabetes is known to increase the risk of onset of serious complications, and substantially reduce quality of life<sup>2</sup>. Although the current prevalence of diabetes in Australia is not well understood, various studies have suggested that there has been an alarming increase within the population, and it is expected that by 2023, it will be the leading specific cause of burden of disease in Australia, surpassing the burden from ischemic heart disease<sup>3</sup>. Such an increase will require a significant increase in health care expenditure, where a national report has projected that health expenditure for hospital admission of these patients will increase from \$0.76B to \$2.6B between 2012/13 and 2032/33, which is a two fold increase in the proportion of GDP used for the admitted patient care of these patients<sup>4</sup>. The disease is particularly of concern for the Indigenous population, where self-reported data suggests that the prevalence of diabetes is 3 times higher than in non-Indigenous Australians<sup>5</sup>. Although diabetes is a severe chronic condition which can lead to death, onset of certain types of diabetes are known to be preventable, and post-onset, hospital admissions are often considered potentially preventable if the disease is managed effectively<sup>1</sup>.

This is the second report in the series looking at the hospital utilisation and expenditure by the Queensland Government for hospital care for patients with various chronic conditions. Episodes of care with diagnoses of diabetes (E10-E14.x) were used to determine if a patient had been 'ever' coded with diabetes in the Queensland Hospital Admitted Patient Data Collection (QHAPDC) between 1 July 2003 and 30 June 2010. The methodology for defining the sample and in-scope admissions is described in Endo, 2012<sup>6</sup>. The figures presented in this report may not be comparable to an earlier study which looked at coding issues for diabetes in QHAPDC<sup>7</sup>, as a different linkage technique was utilised and episodes for renal dialysis have not been excluded in this report. Renal dialysis episodes have been included so that total hospital utilisation in an admitted patient care settings can be evaluated. Where appropriate, analyses were done separately for the periods where ICD-10AM versions 3 to 5 were utilised (2003/04-2007/08), when the coding rule for diabetes remained relatively stable, and for the period version 6 was utilised (2008/09-2009/10), when the rules were changed significantly compared to previous versions<sup>8</sup>, as the results may be affected by the changes in coding rules. The Indigenous status of a patient was based on whether the patient had ever identified as Indigenous in QHAPDC during the study period. The volatility of Indigenous identification in QHAPDC has been previously reported<sup>9</sup>.

### Characteristics of diabetes admissions

During the study period, there were 843,774 episodes of care by those patients who were ever coded with diabetes. Approximately 21% of these episodes are from patients who identified themselves as Indigenous, while 8% of the patients included in the cohort identified themselves as Indigenous. In 2009/10, nearly 145,000 episodes (excluding the index episode) were from the 'ever coded' patients, which equates to approximately 16% of total admitted patient care in Queensland public hospitals<sup>10</sup>.

Of these, 7,961 (5.5%) episodes had diabetes as a principal diagnosis and 36,657 (25.3%) had diabetes recorded as an other diagnosis.

Table 1 displays the frequency of admission for the cohort of patients in 2009/10 who had 'ever' been admitted for diabetes prior to 2009/10 and who did not link to death records or to a hospital record where discharge status was 'died in hospital' prior to the start of 2009/10, by Indigenous status. Overall, approximately 34% of the patients had at least one hospital admission, with 5.7% of them being admitted more than 3 times in a year. The proportion increased to 10% for those who identified themselves as Indigenous. Only approximately 19% of the patients had admissions with diagnosis of diabetes recorded\*.

**Table 1. Frequency of admission for ever-diabetes patients, 2009/10**

No. of admissions	All admissions**			Diabetes related admissions# ^*		
	Non-Indigenous	Indigenous	Total	Non-Indigenous	Indigenous	Total
0	44,569 66.4%	3,513 55.9%	48,082 65.5%	54,989 81.9%	4,574 72.8%	59,563 81.1%
1	11,875 17.7%	1,258 20.0%	13,133 17.9%	7,833 11.7%	939 15.0%	8,772 12.0%
2	4,863 7.2%	552 8.8%	5,415 7.4%	2,401 3.6%	388 6.2%	2,789 3.8%
3	2,264 3.4%	310 4.9%	2,574 3.5%	913 1.4%	145 2.3%	1,058 1.4%
4+	3,557 5.3%	649 10.3%	4,206 5.7%	992 1.5%	236 3.8%	1,228 1.6%
<b>Total</b>	<b>67,128</b> <b>100.00%</b>	<b>6,282</b> <b>100.00%</b>	<b>73,410</b> <b>100.00%</b>	<b>67,128</b> <b>100.00%</b>	<b>6,282</b> <b>100.00%</b>	<b>73,410</b> <b>100.00%</b>

Source: Queensland Hospital Admitted Patient Data Collection

#If a patient had an episode change or was transferred to another hospital, this series of episodes was grouped as an "admission". The admission was included if they were ever admitted with diabetes prior to and were alive at the start of 2009/10.

\*Diabetes related admission is defined as an admission where diabetes was coded at least once within the episodes of care included.

## Co-existing conditions

### 1. Principal diagnosis and other diagnoses, where diabetes was recorded

For those episodes where diabetes was coded as a diagnosis, 15% of the episodes had diabetes as the principal diagnosis (Figure 1). The most commonly recorded 3-digit ICD-10AM code recorded as other diagnoses where diabetes was the principal diagnosis were:

- hypertension (I10; 46.1%)
- personal history of medical treatment (Z92.x; 21.9%), mainly from Personal history of long term (current) use of insulin (Z92.22), and

\* It should be noted that the result of this analysis is heavily depended on the coding rule that was in place at the time, and the results may change substantially depending on the year used for the analysis. Also, it is acknowledged that the differences in coding of diabetes for renal dialysis episodes exist between Queensland public hospitals<sup>11</sup>, which may have an impact on the figures presented in Table 1.

- chronic renal failure (N18.x; 20.1%)

Conditions such as atherosclerosis (I70.x), disorders of lipoprotein metabolism and other lipidaemias (E78.x) were also consistently recorded commonly among both Indigenous and non-Indigenous populations over time (for both 2003/04–2007/08 and 2008/09–2009/10).

When diabetes was included as an other diagnosis, at the ICD-10 AM chapter level, ICD-10AM Chapter 21: *Factors influencing health status and contact with health services* was the most commonly recorded principal diagnosis, which was mostly for renal dialysis (Z49.1, Z49.2) (Figure 1). *Diseases of the Circulatory system* was the next most commonly recorded chapter as the principal diagnosis.

Apart from renal dialysis, for those episodes where diabetes was coded as an other diagnosis, the common 3-character ICD-10AM principal diagnoses included:

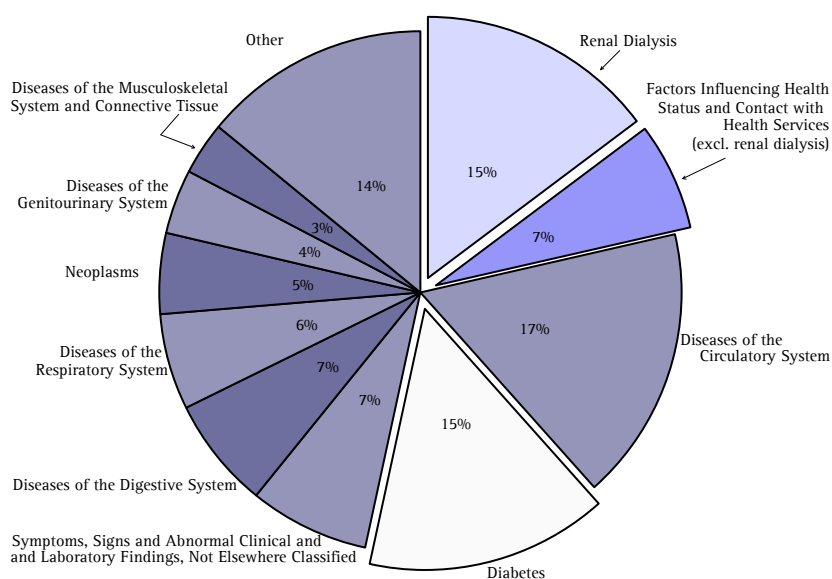
- angina pectoris (I20.x; 5.0%)
- acute myocardial infarction (I21.x; 3.8%) and
- pain in throat and chest (R07.x; 3.6%), particularly R07.4 (chest pain, unspecified).

## 2. Principal diagnosis where diabetes was not recorded

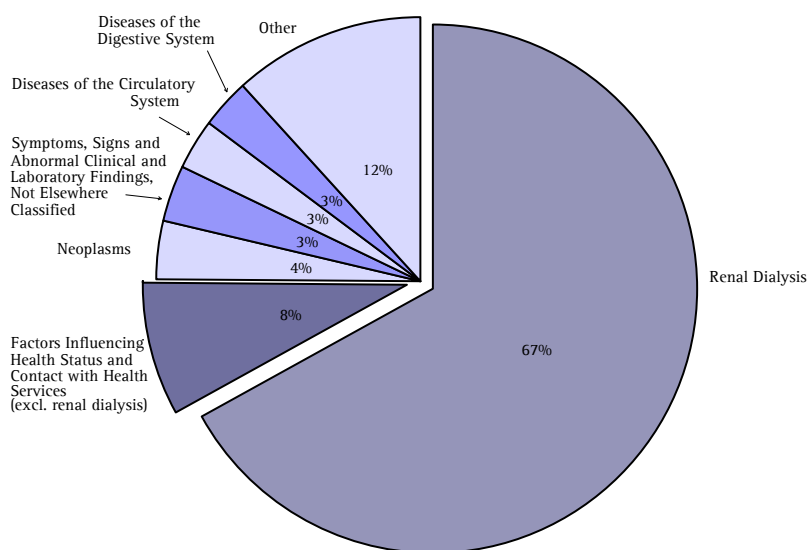
Between 2003/04–2009/10, 447,390 ‘ever-coded’ episodes did not have a record of diabetes within the episode of care at all. Of these episodes:

- more than 75% (336,047) had a principal diagnosis starting with ‘Z’ (ICD-10AM Chapter 21: *Factors influencing health status and contact with health services*) with 299,587 of these for renal dialysis (Z49.1, Z49.2) (Figure 2)
- Z51.1 (Pharmacotherapy session for neoplasm) and Z50.9 (Care involving use of rehabilitation procedure, unspecified) were also common, which contributed to 4.6% of the total episodes for this cohort.

**Figure 1. Principal diagnosis where diabetes was recorded**



**Figure 2. Principal diagnosis where diabetes was not recorded**



Source: Queensland Hospital Admitted Patient Data Collection

For the Indigenous population, R07.4 (chest pain) and J18.9 (pneumonia, unspecified) were also common principal diagnoses.

In total, there were 1,773 patients who had an episode where the principal diagnosis was renal dialysis, and 29% of these patients identified themselves as Indigenous.

### 3. Common co-morbidities among the cohort

For patients with diabetes ever recorded:

- more than 76% of patients had a circulatory condition (I00-I99) recorded at least once in the ever-diabetes QHAPDC data. 65% of patients had hypertension (I10) recorded at least once, and 29% had coronary heart disease (I20-I25.x) recorded.
- 46% had at least one tobacco-related diagnosis (Z86.43 – personal history of tobacco disorder, Z72.0 – Tobacco use, current or F17.x – Mental and behavioural disorders due to tobacco)
- 16% of non-Indigenous and 23% of Indigenous ever-diabetes patients had chronic renal failure (N18.x) recorded as a diagnosis.

### Funding

In 2009/10, funding provided by the Queensland Government for treatment of patients who had been admitted for diabetes at least once since 2003/04 totalled approximately \$629M in admitted care settings (Table 2). Roughly 66% of this was for

**Table 2. Average and total funding for episodes of care by type of diagnoses recorded for patients with diabetes, 2009/10**

Type	Diabetes as PD	Diabetes as OD	No Diabetes recorded
# of episodes (n)	10,143	42,837	100,217
Psychiatric ( av. \$)	\$29.38	\$530.38	\$95.78
Sub/Non-Acute ( av. \$)	\$86.46	\$1,261.61	\$206.93
ICU ( av. \$)	\$482.18	\$1,073.70	\$73.03
DRG ( av. \$)	\$6,229.28	\$5,232.95	\$1,750.54
Total ( av. \$)	\$6,827.30	\$8,098.64	\$2,125.97
<b>Total (\$)</b>	<b>\$69,249,334.30</b>	<b>\$346,921,525.1</b>	<b>\$213,058,357.91</b>

Source: Queensland Hospital Admitted Patient Data Collection, pAWS\_archive database

episodes with diabetes recorded, even though these episodes accounted for only 35% of the total number of episodes. When diabetes was recorded as the principal diagnosis, the total amount funded was approximately \$69M, with approximately 91% funded through DRG funding, and 7% funded for treatments in the Intensive Care Unit (ICU). The average funding per episode for these episodes was roughly \$6,800. For those episodes with no diabetes recorded, the average funding per episode was approximately \$2,100. This increased to \$4,200 when episodes involving renal dialysis, which has relatively low funding, were removed. For episodes where diabetes was recorded as an other diagnosis the average funding was \$8,100 per episode, which contributed to a total funding of \$347M. When renal dialysis episodes were removed the average funding increases to \$11,200. This pattern is similar to that found for asthma/COPD<sup>6</sup>. Overall, 65% of episodes for the cohort did not include a diagnosis of diabetes. These episodes were associated with the funding of \$213M which

could potentially be attributed to these conditions. The magnitude of the differences may be more substantial when 2010/11 data are analysed, where application of version 7 of the Australian Coding Standards has resulted in a reduced number of episodes coded with diabetes compared to version 6<sup>7,8,12</sup>.

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