

Diabetes care pathways thematic data review

Summary of CQC secondary care analysis comparing people with and without diabetes

Introduction

The following is a summary of the methodology, results and conclusions that can be drawn from the national level analysis looking at differences between people with diabetes and similar people without diabetes for a selection of 13 conditions in terms of rates of emergency admissions, mortality, readmissions and lengths of stay in hospital. Also included is a summary of the analysis looking at differences between people with diabetes and similar people without diabetes in terms of the proportions of therapeutic procedures scheduled as day cases that turned into overnight stays.

Others, such as the National Diabetes Information Service (now part of Public Health England) and the National Diabetes Audit, have conducted this type of analysis for mortality, length of stay and readmissions at the Hospital Resource Group (HRG) and total emergency admissions levels. But CQC decided to conduct comparisons for individual conditions to gain a deeper understanding of what might be driving the higher level differences seen between people with and without diabetes. By way of context, results from Public Health England and the National Diabetes Audit show that people with diabetes have significantly higher mortality rates, stay in hospital longer and are more likely to be readmitted as an emergency within 28 days than would be expected in comparison to similar people without diabetes.

Method

The primary methodology for this area of analysis involved comparison of standardised ratios between people with and without diabetes for a selection of emergency hospital admissions based on primary diagnosis or procedure codes over the four-year period 2009/10 to 2012/13. Standardised ratios were calculated by comparing observed counts against expected ones using gender, age and co-morbidity (as measured by a modified Charlson index score excluding diabetes) and primary diagnosis (or primary procedure as the case applies) to calculate expected values. The results for people with and without diabetes were then compared to explore if there were significant differences in the standardised ratios for each of these groups. Effectively this analysis involves comparing outcomes for people with diabetes against a reference group of similar people without diabetes.

People were identified as having diabetes if they had been ascribed a diagnostic code of E10-14 anywhere in their hospital records during the last four years. Due to deficiencies in the use of diagnostic coding, it is not possible to accurately distinguish between Type 1 and Type 2 diabetes using only Hospital Episode Statistics (HES), therefore for the purposes of this analysis people with diabetes were considered as one group.

For the mortality, readmissions, length of stay and day case measures, both numerators and denominators are derived from the Hospital Episode Statistics (HES) data used, while for the emergency admissions analysis the non-diabetic population is taken from ONS 2011 population estimates and the diabetic population is taken from the 2011/12 National Diabetes Audit¹ results.

While not detailed here, analysis at the clinical commissioning group and hospital trust level also involved the creation of a second indicator looking at the 'difference of the differences' (i.e. if some CCGs or trusts had a significantly greater difference in outcomes between people with and without diabetes than the average).

Due to the low numbers in some areas, such as mortality for appendectomy, most analysis was performed using all four years of data. Breakdowns were attempted for mortality and readmissions by individual year and population group to further examine if there were any underlying patterns of variation.

For the day case procedures turning into overnight stays a set of 56 common therapeutic procedures were selected that were recorded as being elective and planned day cases. For the analysis looking at emergency admissions, mortality, readmissions and lengths of stay the following 13 conditions were selected:

- Fractured neck of femur - Primary diagnosis S72.
- Appendectomy - Primary procedure H01, H02 and primary diagnosis K35, K36, K37, K38 or R10.
- Drainage of abscess - Primary procedure of S47.1, S47.2 or H58.
- Essential Hypertension (*diabetes related*) - Primary diagnosis I10.
- Chronic Ischaemic heart disease (*diabetes related*) - Primary diagnosis I25.
- Acute myocardial infarction (*diabetes related*) - Primary diagnosis I21-I22.
- Stroke (*diabetes related*) - Primary diagnosis I61-I64.
- Chronic Obstructive Pulmonary Disease - Primary Diagnosis J40-J44.
- Asthma - Primary diagnosis J45-J46.
- Congestive heart failure (*diabetes related*) - Primary diagnosis I50.0
- Peripheral vascular disease (*diabetes related*) - Primary diagnosis I73.9.
- Chronic Kidney failure (*diabetes related*) - Primary diagnosis I73.9.
- Lower limb amputation (but excluding patients with malignancies or injury/trauma) (*diabetes related*) - Primary procedure X09 (leg), X10 (foot) or X11 (toe) but excluding patients with malignancies (C00-C97, D37-D48) or injury/trauma (S00-T98) in any diagnosis position.

¹ Audit participation is voluntary with around 88% of practices taking part in the 2011/12 audit. The audit therefore does not cover all people diagnosed with diabetes, however it presents the most complete picture currently available as other measures such as QOF and prevalence estimates only cover the adult population.

As seen from the list above, eight of these conditions are directly related to diabetes, primarily in the sense of being a long-term complication, although they were not recorded on these particular spells as being caused by diabetes (at least in the primary diagnosis field).

Results

Emergency admissions

Table 1 below shows standardised emergency admission ratios and 95% confidence intervals for people with and without diabetes over the last four years for each of the 13 conditions listed in the method section above.

Table 1: Comparison of emergency admission rates between similar people with and without diabetes

Condition	People without diabetes			People with diabetes			Difference
	Standardised ratio	95% LCL	95% UCL	Standardised ratio	95% LCL	95% UCL	
Fractured Neck of Femur	100.00	99.57	100.43	378.65	374.75	382.57	Significantly worse for patients with diabetes
Appendectomy	100.00	99.46	100.54	49.48	47.71	51.30	Significantly better for patients with diabetes
Drainage of abscess	100.00	99.42	100.58	311.98	307.14	316.88	Significantly worse for patients with diabetes
Essential Hypertension	100.00	98.61	101.40	367.00	354.54	379.78	Significantly worse for patients with diabetes
Chronic Ischaemic heart disease	100.00	99.06	100.94	735.12	723.17	747.21	Significantly worse for patients with diabetes
Acute myocardial infarction	100.00	99.53	100.48	708.82	702.86	714.82	Significantly worse for patients with diabetes
Stroke	100.00	99.58	100.42	580.02	575.22	584.84	Significantly worse for patients with diabetes
Chronic Obstructive Pulmonary Disease	100.00	99.66	100.34	499.17	495.61	502.75	Significantly worse for patients with diabetes
Asthma	100.00	99.57	100.44	186.70	183.91	189.53	Significantly worse for patients with diabetes
Congestive heart failure	100.00	99.34	100.66	1237.63	1226.76	1248.58	Significantly worse for patients with diabetes
Peripheral vascular disease	100.00	97.96	102.07	940.57	911.10	970.74	Significantly worse for patients with diabetes

Chronic kidney failure	100.00	98.19	101.84	1327.42	1296.31	1359.08	Significantly worse for patients with diabetes
Lower limb amputation	100.00	96.34	103.77	4924.95	4803.32	5048.88	Significantly worse for patients with diabetes

As expected, results from Table 1 above show significantly higher (worse) ratios for emergency admissions among people with diabetes for the eight conditions most directly related to diabetes, although it is interesting to note that of the other five conditions, four also showed significantly higher ratios of admissions for people with diabetes with appendectomy being the only one where people with diabetes had a significantly lower ratio.

Length of stay

Table 2 below shows the results for comparisons of length of stay for similar people with and without diabetes. Due to the slightly different method of calculation, standardised ratios for the non-diabetic group are not included in the table below; instead the lengths of stay for people without diabetes are used to create the expected average length for people with diabetes. Significant difference for length of stay is therefore determined by whether the 95% confidence intervals cross 100.

Table 2: Comparison of lengths of stay between similar people with and without diabetes

Condition	Average length of stay (O)	Expected mean length of stay (E)	O/E (%)	95% LCL	95% UCL	Difference
Fractured Neck of Femur	15.81	14.15	111.68	106.58	116.78	Significantly worse than expected for patients with diabetes
Appendectomy	4.95	3.06	161.80	152.39	171.20	Significantly worse than expected for patients with diabetes
Drainage of abscess	3.64	1.92	188.90	169.81	207.99	Significantly worse than expected for patients with diabetes
Essential Hypertension	3.13	1.90	164.39	146.68	182.11	Significantly worse than expected for patients with diabetes
Chronic Ischaemic heart disease	6.84	4.82	141.81	131.28	152.34	Significantly worse than expected for patients with diabetes
Acute myocardial infarction	7.95	5.84	136.28	127.54	145.02	Significantly worse than expected for patients with diabetes
Stroke	10.26	9.15	112.10	104.17	120.03	Significantly worse than expected for patients with diabetes

Chronic Obstructive Pulmonary Disease	6.82	5.80	117.48	108.17	126.78	Significantly worse than expected for patients with diabetes
Asthma	4.99	1.43	348.95	323.02	374.88	Significantly worse than expected for patients with diabetes
Congestive heart failure	10.47	9.40	111.48	104.07	118.89	Significantly worse than expected for patients with diabetes
Peripheral vascular disease	11.34	7.86	144.36	134.69	154.04	Significantly worse than expected for patients with diabetes
Chronic Kidney failure	5.94	5.44	109.10	97.91	120.28	Not significantly different
Lower limb amputation	13.46	15.02	89.60	84.88	94.32	Significantly better for patients with diabetes

As can be seen from table 2 above lengths of stay for people with diabetes were significantly higher across the board with only lower limb amputations showing significantly lower lengths of stay and chronic kidney failure having no significant difference.

Emergency readmissions within 30 days of discharge

Table 3 below shows standardised emergency readmission ratios and 95% confidence intervals for people with and without diabetes over the last four years for each of the 13 conditions listed in the Method section above.

Table 3 – Comparison of emergency admission rates within 30 days of discharge between similar people with and without diabetes

Condition	People without diabetes			People with diabetes			Difference
	Standardised Ratio	95% LCL	95% UCL	Standardised Ratio	95% LCL	95% UCL	
Fractured Neck of Femur	100	98.86	101.15	119.91	116.96	122.92	Significantly worse for patients with diabetes
Appendectomy	100	98.41	101.61	135.45	123.23	148.57	Significantly worse for patients with diabetes
Drainage of abscess	100	98.00	102.03	128.48	122.75	134.40	Significantly worse for patients with diabetes
Essential Hypertension	100	95.85	104.29	131.37	120.10	143.42	Significantly worse for patients with diabetes
Chronic Ischaemic heart disease	100	97.83	102.20	117.41	113.34	121.59	Significantly worse for patients with diabetes

Acute myocardial infarction	100	98.94	101.07	114.08	112.09	116.09	Significantly worse for patients with diabetes
Stroke	100	98.87	101.14	116.66	114.24	119.11	Significantly worse for patients with diabetes
Chronic Obstructive Pulmonary Disease	100	99.35	100.66	111.32	109.87	112.77	Significantly worse for patients with diabetes
Asthma	100	98.80	101.21	148.51	143.80	153.34	Significantly worse for patients with diabetes
Congestive heart failure	100	98.57	101.44	114.39	112.36	116.45	Significantly worse for patients with diabetes
Peripheral vascular disease	100	95.77	104.37	121.93	114.82	129.35	Significantly worse for patients with diabetes
Chronic Kidney failure	100	96.69	103.39	125.85	120.99	130.86	Significantly worse for patients with diabetes
Lower limb amputation	100	91.22	109.40	121.89	115.40	128.66	Significantly worse for patients with diabetes

As can be seen from table 3 above, standardised ratios of emergency readmissions were significantly worse for people with diabetes for all 13 of the conditions regardless of whether there is a direct link between the condition and diabetes.

Mortality in hospital within 30 days of admission

Table 4 below shows the standardised mortality ratios and 95% confidence limits for people with and without diabetes over four years for each of the 13 conditions listed in the Method section above.

Table 4 – Comparisons of mortality rates in hospital within 30 days of admission for similar people with and without diabetes

Condition	People without diabetes			People with diabetes			Difference
	Standardised Ratio	95% LCL	95% UCL	Standardised Ratio	95% LCL	95% UCL	
Fractured Neck of Femur	100	98.29	101.73	107.21	103.24	111.30	Significantly worse for patients with diabetes
Appendectomy	100	79.17	124.63	219.63	142.09	324.23	Significantly worse for patients with diabetes
Drainage of abscess	100	87.16	114.19	105.79	84.73	130.49	Not significantly different
Essential Hypertension	100	71.43	136.18	84.74	38.67	160.88	Not significantly different

Chronic Ischaemic heart disease	100	95.32	104.85	104.65	97.04	112.70	Not significantly different
Acute myocardial infarction	100	98.44	101.58	97.69	95.18	100.26	Not significantly different
Stroke	100	99.00	101.01	100.13	98.09	102.21	Not significantly different
Chronic Obstructive Pulmonary Disease	100	98.55	101.46	85.57	82.91	88.29	Significantly better for patients with diabetes
Asthma	100	91.65	108.91	102.51	87.51	119.35	Not significantly different
Congestive heart failure	100	98.33	101.69	82.07	80.02	84.16	Significantly better for patients with diabetes
Peripheral vascular disease	100	93.80	106.51	85.87	77.02	95.45	Not significantly different
Chronic Kidney failure	100	92.86	107.54	95.00	86.45	104.16	Not significantly different
Lower limb amputation	100	87.52	113.76	71.53	62.58	81.39	Significantly better for patients with diabetes

Results from comparisons of mortality rates at the individual condition level were somewhat mixed with patients with diabetes having significantly higher ratios for two conditions, lower rates for three and no significant differences for the other eight. These results could be due to the effects of coding practices (e.g. where the condition is directly related to a person's diabetes it may be given a diabetes primary diagnostic coding and would not be included in this analysis), the effect of measuring mortality against admissions rather than patients (e.g. affected by the higher admission rates for people with diabetes), or differences in quality of care for people with diabetes when it comes to particular conditions; however, further in-depth investigation will be required to understand these differences more fully.

For mortality and readmissions, analysis was also conducted looking at breakdowns into individual population groups (by age, gender, ethnicity and deprivation) for individual years. Many of these yielded results that showed no significant difference between patients with diabetes and patients without diabetes, although particularly for mortality there were often low numbers of deaths in the individual groups. Where there was a significant difference shown (often in the largest groups), this always matched the overall results shown in Tables 3 and 4 above.

Planned day cases

Comparisons of the proportion of elective therapeutic procedures planned as day cases that turned into overnight stays over the four year period 2009/10 to 2012/13 showed patients with diabetes to have a significantly higher (worse) standardised ratio than patients without diabetes (standardised ratio of 104.02).

Conclusions

Results for analysis comparing emergency admissions, lengths of stay and emergency readmissions for these 13 selected conditions largely corresponded with the HRG and national level findings from the Yorkshire & Humber Public Health Observatory² (YHPHO, now part of Public Health England). Overall the findings show that people with diabetes are more likely to be admitted to hospital, will probably stay longer and are more likely to experience an emergency readmission within a month of discharge. CQC's analysis shows that these relationships tend to hold at the condition level regardless of whether the condition is directly linked to diabetes or not.

Findings from others have clearly shown that overall, people with diabetes have a raised likelihood of mortality compared to people without diabetes, with the 2011/12 National Diabetes Audit finding that people with all types of diabetes had a 37.5% additional risk of death during 2012 than their peers in the general population with this additional risk of death rising to 129.5% for people with Type 1 diabetes. While the CQC condition level analysis for mortality in hospital within 30 days of admission did support this for some conditions, this was not consistently the case across all the conditions we looked at. Further in-depth investigation will be required to understand these differences more fully.

² Variations in Inpatient Activity - <http://www.yhpho.org.uk/resource/view.aspx?RID=105866>