Early Death in Type 1 Diabetes

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Introduction

A morbidity and mortality audit of patients with Type 1 diabetes who died under the age of 45 was carried out. It identified four patients and their case notes were reviewed to identify any learning points. All four patients died at home or at work. All four patients were well known to at least one member of the specialist diabetes team who had been supporting them out with the general clinic setting.

Method

The clinical records of each patient were reviewed. Using the national database SCI-Diabetes, the most recent specialist contact, blood pressure recording, HbA1c level, medications, smoking status, microalbuminuria, foot and eye screening could be analysed. Using their CHI number their electronic notes via the hospital system were viewed and details including last hospital admission, diabetes clinic letters, blood results and other specialist contact were collected. Finally the procurator fiscal was contacted and kindly supplied the autopsy results for all four patients. This information included a police report stating the events surrounding each death.

Patient One was age forty when he died. He had had a diagnosis of Type 1 Diabetes for twenty-six years. His last HbA1c one month prior to death was 82mmol/mol. He had been in contact with hospital services two months prior to his death as a day case when having a fistula formation for end stage renal disease and four months prior to death as an inpatient with diabetic ketoacidosis. This patient had a number of complications related to his diabetes. These included Stage IV chronic kidney disease with a protein/creatinine ratio of 95mmol/L and proliferative diabetic retinopathy. Four years prior to death age 36 he had an ischaemic stroke and hypercholesterolaemia was diagnosed. This patient was on an ACE-Inhibitor and his last recorded BP was in target at 125/78. He was a smoker. In the 12 months prior to his death he had problems with hypoglycaemic unawareness and an admission with diabetic ketoacidosis. Other medical history included drug dependence and alcohol excess. Outpatient letters confirm this was an ongoing problem in the months leading to his death. This patient passed away within 24 hours of feeling generally unwell. He had been vomiting but was not felt by family to need medical attention. Post mortem showed he had severe atherosclerosis of the left circumflex coronary artery with 70-80% stenosis. He had an elevated vitreous glucose of 23.2mmol/L and a vitreous lactate of 96.6mmol/L. He had evidence of diazepam and cannaboids in his toxicology. His death certificate showed cause of death 1a. Coronary Artery Atheroma and Diabetic Ketoacidosis. His toxicology results were not mentioned on the death certificate.

Patient Two died unexpectedly at the age of 41. Type one diabetes had been diagnosed 2 years prior to this. The last HbA1c was 70mmol/mol, six months prior to death measured in the diabetes clinic. He did not attend a subsequent diabetes clinic. This patient had a history of hypoglycaemia without awareness. Other history included alcohol excess and recreational drug use. He was a smoker. His last clinical recordings included a BP mildly elevated at 145/90 and a normal albumin ACR 0.8mg/mmol. He had been an inpatient in hospital earlier in the month of death and was discharged only 2-3 days prior to death. Post mortem revealed severe coronary artery disease, liver fibrosis and evidence of diabetic ketoacidosis. Cause of death following post-mortem showed 1a. Ketoacidosis, 1b. Diabetes mellitus with fatty degeneration of liver, 2. Chronic excessive alcohol use, Pancreatitis, Ischaemic Heart Disease.

Patient Three was 28 years old. He had not attended a clinic in the eighteen months prior to death and had been supported by the diabetes team meeting him with our psychiatric colleagues outside the hospital setting. He developed Type 1 Diabetes age seventeen. His HbA1c was last completed 8 months prior to death and was 104mmol/mol. He had a number of complications from his diabetes including proliferative diabetic retinopathy, peripheral neuropathy, autonomic neuropathy and a urine ACR had measured 2.9mg/mmol in the previous 12 months. His last blood pressure recording was three months prior to death at 136/89. Other medical history included schizophrenia and paranoid psychosis. His symptoms from this meant he did not feel able to attend the diabetes clinic and had not attended the last four appointments offered to him. Six weeks prior to death he had been admitted as an emergency with diabetic ketoacidosis. The post mortem report describes this patient as feeling generally unwell and he suffered a vomiting episode in the forty eight hours leading up to his death. The report detailed he had emphysematous changes in his lungs, fatty infiltration of the liver, changes to stomach and oesophagus suggesting metabolic disturbance, a vitreous glucose of 48.5mmol/L and there was evidence of hypothermic changes. Cannabis was found in this patient's flat. Death certificate was completed showing 1a. Complications of Hyperglycaemic Ketoacidosis. 1b Type 1 Diabetes Mellitus.

Patient Four died suddenly at work age 33. He was diagnosed with Type 1 Diabetes at age four and his last HbA1c in the month prior to death was 80mmol/mol when reviewed in diabetes clinic. His complications from diabetes included three episodes of severe hypoglycaemia in the five months prior to death, peripheral neuropathy, diabetic retinopathy and had a previous unsuccessful pancreatic transplant. His peripheral neuropathy resulted in poor healing from an ankle fracture and he had had a below knee amputation three years prior to death. His fiscal report states he was working alone on a nightshift when he died. He had been in contact with family during this shift and a blood glucose monitor found with the patient showed a reasonable blood glucose level of 6.2 at this time. His post mortem revealed ulcers to his left ankle and foot, an enlarged liver, fibrosis of the pancreas and diabetic nephropathy of the kidneys. He had atherosclerosis with pinpoint narrowing of his left anterior descending coronary artery. Looking through medication records he was not on an ACE-Inhibitor due to his history of postural hypotension. He was intolerant to statins and took ezetimibe. Cause of death, 1a. Coronary Atherosclerosis 1b. Diabetes Mellitus.

Conclusion

All four patients reviewed were male; three were smokers and the fourth had previously smoked. They had all been seen in a hospital setting in the four months prior to death. This was not always a diabetes contact however if any issues were identified the inpatient diabetes service could have reviewed them during this time. Three patients had evidence of ischaemic heart disease on their post mortem results. Two of these patients were prescribed an ACE-Inhibitor, one of these took Ezetimibe and the other a statin. None had a diagnosis of ischaemic heart disease prior to death. All four patients had at least one complication from their Type 1 Diabetes, in all cases diabetes was mentioned on their death certificate. Diabetic ketoacidosis was evident as a contributing factor to death in three cases. All four patients had previously been in hospital with this condition in the past. Three out of four patients had their BP checked in the 12 months prior to death. According to NICE guidelines BP should be <135/85 or <130/80 if evidence of albuminuria[1]. BP was recorded elevated in the one patient but the post mortem did not show evidence of cardiac disease. It is suggested that all patients over the age of 40 years are offered statin therapy[1]. One patient was on a statin and he was 33 but had had diabetes for >10years, one patient age 40 took ezetimibe due to a reaction to a statin. These four patients had been identified by at least one member of the diabetes specialist team as vulnerable and had increased input from the service. Extra measures included meeting a patient off the hospital site, regular telephone calls, e-mail contact, and extra clinic appointments with our diabetes nurse specialists. All patients had sub-optimal HbA1c[1] and three had evidence of drug or alcohol misuse at the time death. This analysis highlights the danger associated with having Type 1 diabetes and psychiatric or drug dependence problems. We have also shown significant coronary atherosclerosis at an early age in this subgroup of patients and this has encouraged us to be even more active in cardiovascular risk reduction in this patient group.

[1] National Institute for Health and Clinical Excellence (2015) Type 1 diabetes in adults: diagnosis and management NICE guideline (NG17)