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Full Length Research Paper

Analysis of Thiamine prescription rates in a tertiary hospital setting

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Thiamine, or Vitamin B1 is a water soluble vitamin, essential for the normal growth and development of our nervous systems. It is also an essential cofactor for enzymes crucial to metabolic homeostasis. Vulnerable patient groups, particularly those with a alcohol dependence syndrome, alcohol withdrawal syndrome and malnourished patient groups have been identified as being at risk of thiamine deficiency, and hence Wernicke's Encephalopathy. This is a debilitating neuropsychiatric disease characterized as a triad of gait ataxia, ophthalmoplegia, and confusion. Our aim was to assess thiamine prescription rates and compliance to the NICE guidelines with regard to supplementation of thiamine in patients at risk of Wernicke's Encephalopathy. In June, 2102 Beaumont Hospital we completed a retrospective audit on the kardexes of 240 patients admitted over the previous 31 days in Beaumont Hospital over four weeks. Only 28 patients had been prescribed thiamine during their admission. We noted incomplete documentation of the indications for thiamine prescription in the medical notes and variation in the dosing and duration of prescribed regimens. Our results indicate that education is needed in the area of thiamine supplementation among healthcare workers to ensure best practice and patient care.

Keywords: Thiamine, Vitamin B1, Alcohol withdrawal, Dependence syndrome

INTRODUCTION

Thiamine is one of the vitamin B complexes; it is a water-soluble vitamin that has an important role in cell metabolism. It is responsible for converting carbohydrate to energy by acting as a co-enzyme for number of important enzymes. It is a dietary requirement, found in a variety of foods and therefore is usually present at adequate levels in a normal diet. These food-stuffs include pulses, whole-wheat grains and green vegetables (Higdon and Drake, 2012; Mahan and Escott-Stump,

2011).

Thiamine is crucial in energy metabolism through its activity as a cofactor for enzymes including transketolase, and pyruvate dehydrogenase (1 UTD). Therefore, the body's need for this vitamin increases dramatically in times of high metabolic activity and subsequent to a high glucose intake. There are a myriad complications associated with thiamine deficiency. An insufficient intake of Thiamine has a number of characteristic clinical outcomes such as beriberi, polyneuritis, and cardiovascular disease (Mahan and Escott-Stump, 2011; Da Silva and Velarde, 2010). Thiamine deficiency may be multifactorial with malnutrition, increase metabolic requirements, malabsorption, and many other factors

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playing a role in its aetiology. In the acute hospital setting, the neurological complication of most concern, and the focus of many preventative supplementation regimes is Wernicke's Encephalopathy and Wernicke - Korsakoff Syndrome.

Wernicke's encephalopathy is characterized by a classical triad of confusion, gait ataxia and ophthalmoplegia, with additional psychological deficits such as short-term memory loss. Post-mortem findings include small haemorrhages around the centricles and cerebral aqueduct of Sylvius and mamillary body atrophy in the chronic setting. The pathology of Wernicke's encephalopathy is the neuronal death due to the effects of vitamin B1 deficiency on astrocytes. This induces glutamate uptake and excess stimulation of the neurons causing excitotoxicity and death. In imaging, this is apparent as white brain matter death. This condition may be reversible in its early pathological evolution, and is often preventable with appropriate and timely administration of thiamine to at-risk patient populations (Da Silva and Velarde, 2010; Subramanya et al., 2010; Hazell, 2009).

Wernicke's Encephalopathy is often preceded by a patient history of poor nutritional intake, with recent systemic illness or recent introduction of feeding. Studies have consistently identified patient populations at particular risk of Wernicke's Encephalopathy on admission to hospital. This condition is most commonly associated with chronic alcoholism and alcohol withdrawal. However, there may be a lower recognition of the potential risk of Refeeding Syndrome in patients without a history of chronic alcohol abuse. These patients include those with a history of anorexia nervosa, prolonged parenteral nutrition, patients with a history of poor nutritional intake and recent dramatic weight loss, haemodialysis patients, oncology patients, and AIDS. Approximately 20% of patients admitted to hospital drink excessively in cases where the primary complaint is unrelated to alcohol abuse. In patients with a history of prolonged alcohol abuse, there is a risk of the development of acute complications of alcohol excess, including alcohol withdrawal syndrome including delirium tremens, pancreatitis, liver disease and Wernicke's Encephalopathy. Wernicke's Encephalopathy has devastating effects on the patient, and it is both clinically appropriate and cost-effective to prevent development of this condition by adherence to clinical guidelines (Ross et al., 2012; Mehanna et al., 2009).

Appropriate management of conditions such as malnutrition, Refeeding Syndrome and alcohol withdrawal in hospital inpatients requires the prescription of thiamine, or Vitamin B¹. The administration of either oral or parenteral thiamine may prevent the development of Wernicke's Encephalopathy, a potentially devastating neuropsychiatric disorder. The formulation most commonly used in the wide patient population at risk is Pabrinex, a parenteral formulation.

The NICE Guidelines, CG100, on the diagnosis and management of alcohol related physical complications were published in 2010, giving clear recommendations on the initial management of patients who present to hospital with a high risk of alcohol withdrawal syndrome. At our tertiary centre, guidelines for the management of acute alcohol withdrawal syndrome have also been published, with reference to appropriate thiamine prescription practices in this setting. According to the NICE guidelines, thiamine should be prescribed at doses at the upper end of the range outlined in the British National Formulary, and should be given parenterally in harmful or dependent drinkers who are malnourished or have decompensated liver disease, and who attend an emergency department or have an acute illness. In patients in whom Wernicke's Encephalopathy is suspected, parenteral treatment is recommended for 5 days, with subsequent prescription of oral thiamine at high doses of 200mg per day. The BNF recommends in patients presenting with coma or delirium from alcohol, barbiturates or following collapse from narcosis, that Pabrinex or intravenous thiamine should be prescribed every 8 hours (National Institute for Clinical Excellence, 2010; National Institute for Clinical Excellence, 2011; bnf.org/bnf/bnf/current/alphaindex-THIAMINE.htm).

Aim

Our aim is to assess current levels of thiamine and Pabrinex prescription at our institution by reviewing the drug Kardex of inpatients both on the wards and in the emergency department. Our next aim is to analyse the demographic of patients prescribed thiamine in order to assess the percentage of patients prescribed thiamine with and without a history of alcohol abuse. This will enable use to paint a clear picture of the pattern and indications for thiamine use at Beaumont Hospital. In those patients prescribed thiamine, we will determine whether the regimen prescribed is compliant with published guidelines by the NICE institute (CG100) and the British National Formulary. Anecdotally, we have noted that there may be variation in prescribed dosing regimens of intravenous thiamine (Pabrinex) in the context of patients at risk of Wernicke's Encephalopathy.

METHODS

In June 2102 Beaumont hospital a review of the drug Kardex of 240 inpatients at Beaumont Hospital was carried out over a 4 week period, excluding those who had been admitted for over one month (31 days). These patients were excluded, as our aim was to review the chart history and drug history of acutely admitted patients. A template was drafted to enable clear and consistent data collection, taking care to record information on an anonymous basis. This was submitted

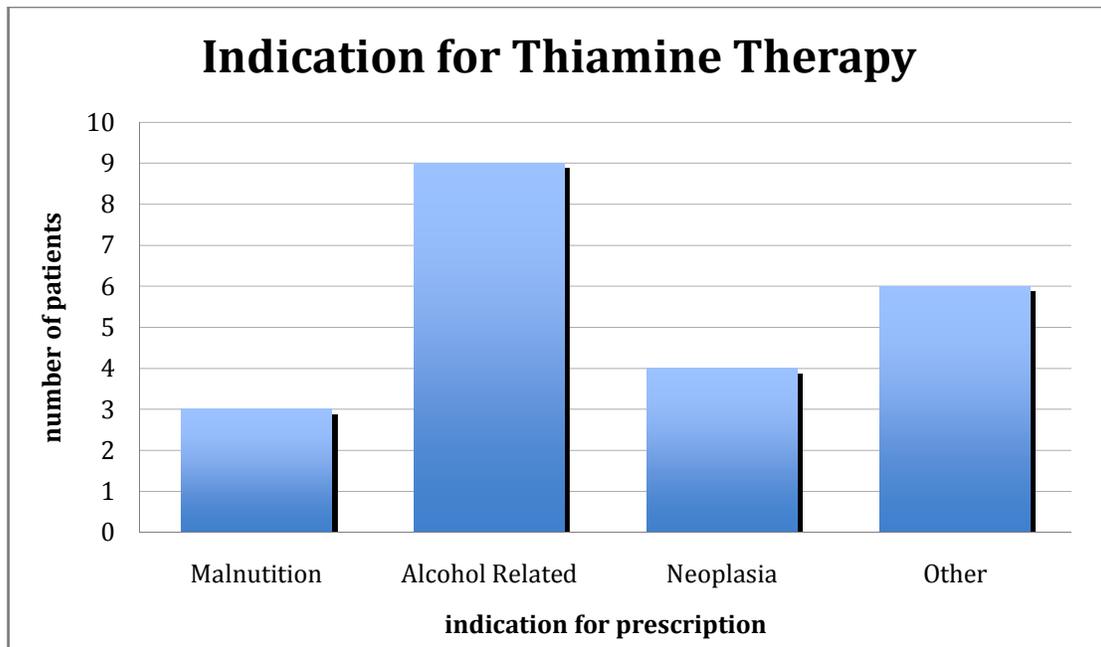


Figure 1. Indication for Thiamine prescription

40.9% were found to be receiving Thiamine for alcohol dependence syndrome alcohol withdrawal years of alcohol abuse. 13.6% were started on Thiamine therapy due to malnutrition. 18.2% were receiving Thiamine therapy due to being diagnosed with cancer. 27.3% were prescribed Thiamine for various different reasons.

to the clinical governance office at Beaumont Hospital before consent was obtained to proceed with data collection.

Criteria such as date of admission, age, and sex were recorded. In the case of patients who had been prescribed thiamine during their admission, the formulation, dose, method of administration and duration of therapy was recorded. Their charts were then reviewed carefully, noting the indication for prescription and the patient history including reason for admission and any comorbidities. This was carried out in order to identify which thiamine dose should be prescribed according to NICE Guidelines.

RESULTS

We collected data from 240 patients at Beaumont Hospital who had been admitted during the previous 31 days. Of those 240 patients, 238 were Caucasian and 2 were Asian. Only 28 (11.7%) of patients had been prescribed thiamine during their admission. Of these 28 patients, the most prevalent method of administration was oral, with 22 patients (78.6%) receiving oral thiamine. 9 patients (32.1%) received intravenous Pabrinex. 3 patients were prescribed both oral Thiamine and intravenous Pabrinex; however, these were not

concurrent, with the patients in question receiving oral thiamine subsequent to discontinuation of intravenous Pabrinex as is recommended by local and European Guidelines.

We further analysed the history of these patients receiving thiamine. 12 patients (42.9%) were admitted acutely through the Accident and Emergency Department with prescription of thiamine on the day of admission. The remaining 16 patients (57.1%) were admitted electively or have thiamine therapy initiated over 1 week after admission. With regard to patient demographics, 20 patients (71.4%) were male, and 8 (28.6%) were female. The average patient age was 63 years (25 – 93 years).

Analysis of medical records was completed to clarify the patient history, reason for admission, risk of Wernicke's Encephalopathy and rationale for thiamine prescription. Indications for prescription among acutely admitted patients included alcohol dependence syndrome, traumatic amnesia, vomiting, delirium, systemic neoplasia, acute renal failure, hepatic encephalopathy on a background of alcoholic cirrhosis, malnutrition, acute cerebrovascular accident, and cardiac failure. However, the majority of patients were prescribed thiamine on a background of alcohol dependence syndrome.

Unfortunately due to failures in the chain of sequence starting from taking credible patients histories to proper

customary record keeping we could not establish the indications for Thiamine prescription for all patients but we had findings in 22 out of the 28 patients found on Thiamine. As we can observe in the chart above, The majority of the 22 patients, 9 patients (40.9%) were found to be receiving Thiamine for alcohol dependence syndrome, alcohol withdrawal and/or years of alcohol abuse that resulted in the deterioration of the health of the patient causing them to seek medical attention to start with. 3 patients (13.6%) were started on Thiamine therapy due to malnutrition. 6 other patients (27.3%) were prescribed Thiamine for various different reasons namely acute renal failure, tracheostomy, Acute Congenital Impairment, acute stroke and cardiac disease. The remaining 4 patients (18.2%) were receiving Thiamine therapy due to being diagnosed with cancer. One of those 4 patients has breast cancer, the next one has colon cancer, the third one was a trigeminal schwannoma, while the fourth one had systemic neoplasia. After inspecting the patients while taking their information, we were convinced that more patients were admitted and prescribed Thiamine due to malnutrition as many of the patients were elderly and looked physically frail. However we cannot confirm that due to the absence of that information in the patient documentation.

We observed a failure for fully comply with NICE institute guidelines with regard to thiamine doses and formulations. In particular, we noted inconsistency in the context of patients admitted with a history of chronic alcohol dependence syndrome who fulfil criteria for prescription of intravenous Pabrinex I and II. For example, some patients received Thiamine 300 mg PO, while the other patients received Pabrinex I+II. The doses of Thiamine were 100 mg, 200 mg, 300 mg, OD and TDS. One patient was receiving oral Thiamine 300 mg for 35 days after being found at home collapsed with difficulty breathing. Furthermore, clarification of the indication for thiamine prescription was difficult in some cases, with failure to clearly document the prescription of thiamine in the medical notes and adequate social history including alcohol intake in patients' medical notes.

On close data analysis, we have concluded that the full recommendations as laid out by the NICE Guidelines and the British National Formulary were not adhered to. There was wide and variation in the duration of thiamine prescription in patients with a history of malnutrition at risk of Wernicke's Encephalopathy. Some prescriptions had documented durations of 5, 7, 9, 10, 11 and 35 days. Other patient had thiamine prescriptions which did not fill the appropriate 3 or 5 day treatment regimes, dependent on the indication for therapy. Interestingly, we noted that some subjects prescribed thiamine with a chronic history of alcohol dependence syndrome and previous admissions for alcohol withdrawal had not received prophylactic thiamine during all prior admissions demonstrating some inconsistency in prescribing practices.

DISCUSSION

As referenced above, we have the understanding that thiamine is necessary for the normal functioning of our nervous system. We now know that the progression of Wernicke's Encephalopathy may be halted and reversed with the appropriate prescription of Thiamine. When compared with previously published data, and the NICE guidelines with regard to patient populations for whom thiamine prescription is recommended, our prescription rates are low. Therefore, a further audit closely analysing patient admission data over a set time period may retrospectively clarify whether patients who fulfil guidelines for recommended thiamine therapy should be considered.

Clear and comprehensive documentation of patient care practices and indications for any medications commenced leads to improved patient care with complete access to patient history by healthcare workers and the multidisciplinary teams including the dietetic services and alcohol liaison services where appropriate. Our chart review identified patient whose admission records have no documentation of the indication for thiamine treatment, and in particular, did not differentiate between patients in acute alcohol withdrawal and those with alcohol dependence syndrome. The guidelines as outlined in CG100 differentiate between these patient groups, and recommend separate treatment regimes for both of these populations. Therefore, it was impossible for us to definitively state whether all patients with Pabrinex prescribed for alcohol dependence were truly treated according to best practice.

Alcoholism has a role in the aetiology of depletion of thiamine reserves in the body which has been established as one of the factors contributing to the development of Wernicke's encephalopathy. Furthermore studies have demonstrated that alcoholics are a high risk group for malnutrition. These two factors work to deteriorate the patients health and aid in the progression of Wernicke's encephalopathy. Patients suffering from malnutrition should be diagnosed and treated with thiamine with special care to patients who are at risk of Refeeding Syndrome. In patients with Refeeding Syndrome must be given parenteral thiamine and electrolytes. The development of local hospital guidelines regarding the identification and management of patients at high risk of Refeeding Syndrome will be accompanied by a local education initiative. We believe that repeated audit of thiamine prescription practices subsequent to this may lead to an elevated rate of thiamine prescription due to improved detection of patients at risk of Wernicke's Encephalopathy.

Wernicke's Encephalopathy is a preventable yet potentially devastating condition with profound chronic neurological consequences. Thiamine prescription is an economically viable and very affordable step in the prevention of this condition. There are now clear local

and European Guidelines on the prescription of thiamine, particularly in the context of patients with a history of alcohol dependence syndrome. Therefore, we feel that simple measures such as links to these guidelines available in hospital intranet services may enable Non Consultant Hospital Doctors and admitting services to comprehensively identify patients at risk of Wernicke's Encephalopathy and manage their risk appropriately.

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