MedNut Mail

The How, When, Where, Which and Why of pharmacotnutrition

Falls and pharmaconutrition

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Commentary

A fall is defined as an event in which a person inadvertently comes to rest on the ground or other lower level. A fall can result in physical harm such as broken skin and bones, emotional and mental harm such as loss of confidence, and damaged ego as falling is quite inelegant.

Falls are the largest single cause of injury mortality in the elderly and are also an independent indicator of the functional decline that results in 40% of all nursing home admissions.

Pharmaconutritional factors that may be contributing to an increased risk of falls include -

- **high vitamin B3.** High doses (≥1000 mg/d) can be associated with low blood pressure.
- **high pyridoxine.** High doses (≥500 mg/d) associated with neurological symptoms, including ataxia, neuropathy, and decreased muscle tone.
- **high homocysteine.** Can permanently degrade the molecular structural integrity of collagen, elastin and proteoglycans, and cause an increased risk of muscular–skeletal mechanical instability. Can be due to low riboflavin and/or low pyridoxine and/or low B12 and/or low folate.
- **low B12.** Can cause neuropathy that can lead to impaired balance, proprioception, amyotrophy and depressed psychomotor retardation; is important in the righting reflex when a person stumbles.
- **low folate.** Is important in neurotransmitter synthesis, myelination, synthesis of DNA and protein, DNA methylation and epigenetic regulation.
- **low vitamin D**. Protects bone mineral density and improves muscle function and strength.
- **low calcium.** Important in muscle function. More likely to be low if potassium or magnesium low.
- **low potassium.** Maintains nerve and muscle function, bone health and insulin sensitivity, and muscle mass.
- **low iron.** Important in a range of functions including muscle function; more likely to be low if loss of weight.
- **low magnesium.** Magnesium is important in muscle function, especially cardiac muscle,

amongst other functions, and is an intracellular ion therefore serum levels are unlikely to detect early depletion of status.

- **low zinc.** Important in a range of functions including muscle function; more likely to be low if loss of weight.

- **low carnitine.** Carnitine is both absorbed and produced de novo, and is important in a range of muscle functions; magnesium is important in de novo carnitine production.

- **low Hb.** If Serum Iron Studies are within acceptable range and Hb is low then may indicate reduced biotin availability - biotin is important in five stages of Hb formation.

- **loss of weight**. Typically results in reduced muscle mass and strength. Can be due to a range of factors.

What actions will you initiate when you see someone whose diagnoses include falls, will you -

- ensure identified nutritional factors are well within acceptable ranges?
- review prescribed medications that may negatively impact nutritional factors that have been associated with falls risk?
- include pharmaconutrition impacts on falls risk in your report to colleagues?

Conclusions

The research into risk factors for falls causation and outcomes remains limited as the health and productivity consequences continue to be underestimated.

Prescribed medications that impact nutritional factors associated with falls risk are likely to further exacerbate that falls risk.

Case study

Medical History with Nutritional Aspect

Amputation	☐	Constipation	☐	Dysphagia	☐	MND	☐
Anaemia	☐	CVA	☐	Enteral Feed	☐	MS	☐
Arthritis	☑	CVD	☐	Falls	☑	Osteoporosis	☐
Cancer	☐	Dementia	☑	Fracture	☐	PD	☐
CCF	☐	Dentures	☑	Frailty	☐	Pressure Area	☐
Chest Infection	☐	Depression	☑	Gout	☐	Renal	☐
COAD	☐	DM Type 1	☐	Hypertension	☐	Ulcer	☐
Confusion	☐	DM Type 2	☑	Incontinent	☑	UTI	☑

Food Allergies:

Other: IBS, chronic pain, anxiety, deafness

Biochemistry with Pharmaconutritional Consequences

No recent relevant results available that may have a pharmaconutrition component.

Medications That May Adversely Affect Nutritional Status

Drug	Vits + Mins	bpp	>90%	N/V	C/D	Wt	App	Tst	Thir	Sal	Drlg	d/m	Dys	BSL
AVANZA		☐		N	D	↑	↑	☐				☑	☐	☐
COLOXYL WITH S		☐			D			☐				☐	☐	☐
MACRODANTIN		☐		NV	CD		↓	☐				☐	☐	☐
Paracetamol		☐		NV	CD			☐				☐	☐	☐
Quetiapine		☐			C	↑		☐				☑	☐	☐
SOMAC	(40 mg/day) B1, B12, Ca, Fe,	☑		NV	CD		↓	☑				☑	☐	☐
		▩						▩				▩	▩	▩

Extra drug: cranberry

Comments – medication and nutrition impacts (direct and indirect) only

No recent relevant biochemistry available, "old" biochemistry indicates -

- elevated normal TSH - evidence indicates increased risk of altered thyroid function once TSH > 2.5
- low Fe, TRF, satn - likely due to somac prescription. Advisable to recheck status and if still low then advisable to consider a short term (90-120 days) iron intervention however evidence indicates iron deficiency anaemia is unlikely to resolve whilst a proton pump inhibitor such as somac is prescribed therefore a non-oral intervention is likely to confer more benefit.

Advisable to check plasma proteins (albumin, total proteins) as markers of nutritional status. The plasma proteins are the primary transporters for one of the prescribed drugs and hypoproteinaemia may alter its effects.

BSLs (Jun-Jul) –

before breakfast - 5.2-6.6; recommended range 4-6

- daily range - 5.2-9.2; recommended range 4-10

- tested weekly (Wednesdays)

- reportable limits: < 4 and > 18

- advisable to check HbA1c and clarify overall glycaemic control

Currently no prescribed interventions for diabetes management.

Avanza may cause delayed-onset hyponatraemia therefore regular monitoring of sodium and ADH levels recommended.

Chronic use of coloxyl + senna may promote excessive loss of water and electrolytes, especially potassium, and their regular monitoring recommended.

Dietary levels of caffeine intake in conjunction with paracetamol inhibit antinocieception.

Concurrent ingestion of paracetamol and iron results in increased rate of iron absorption and decreased extent of drug absorption; the authors advise drug and iron to be administered at different times from each other.

Quetiapine associated with negative impacts on glycaemic control.

Somac decreases B12, vitamin C, magnesium, zinc and iron absorption, may decrease calcium absorption, and decreases thiamine availability.

Evidence indicates pump inhibitors such as somac significantly impair magnesium absorption. Magnesium deficiency manifests as confusion, disorientation, personality changes,

loss of appetite, depression, muscle cramps, tingling, numbness, hypertension, cardiac dysrhythmia, seizures. Magnesium is an intracellular ion therefore serum levels are unlikely to detect early depletion of status. Cellular magnesium status is unknown whilst magnesium levels within acceptable range however if magnesium levels are low then typically indicates significant cellular depletion and intervention recommended.

Bowels –

- regular aperient prescribed; - oral + anal PRN interventions prescribed

- oral administered 1 x 07, 7 x 06, 9 x 05, 5 x 04;

- anal administered 2 x 06, 4 x 05, 5 x 04;

- Nurse Initiated interventions administered - oral 1 x 06, 2 x 05, 1 x 04; anal 1 x 04;

Total PRN administered – 1 x 07, 10 x 06, 15 x 05, 11 x 04.

Mrs ABH is a small, pale, rubinesque lady with thyroidy eyes who was sitting in the Day Room when we went to speak to her - she told us she eats well and sleeps well.

Mrs ABH has required more than 4 PRN bowel interventions for each of the last three months, therefore advisable to review current bowel management strategies.

Mrs ABH has been prescribed a proton pump inhibitor for at least 6 years, and likely before then. There is increasing evidence that longterm (3+ years) proton pump inhibitor prescription is associated with -

- altered gut microbiome;

- increased risk of food sensitivities at a level of peanut allergy, due to partial protein digestion;

- increased risk of coeliac disease due to partial protein digestion;

- increased risk of scurvy;

- generalised malnutrition due to impaired absorption of a range of nutrients such as B12, vitamin C, magnesium, zinc, iron, etc;

- altered gastric pH which reduces absorption dynamics of a range of drugs and nutrients. Altered drug availability is relatively easily identified however reduced nutrient absorption is rarely identified due to the non-specific nature of their signs and symptoms.

Consequently, advisable to reconsider reviewing current proton pump inhibitor prescription and consider -

- whether proton pump inhibitor prescription is still required;
- if suppression of gastric acidity is still required then could it be managed with an H2 antagonist such as ranitidine (there is a general belief that they cause

less nutritional harm than proton pump inhibitors).

Commencement of the somac indicates prudent clinical practice for B12 management as outlined:-

- establish B12 status at commencement of drug treatment, and monitor on a regular basis, or
- commence a prophylactic B12 intervention with oral supplements as they are not protein-bound and therefore do not require gastric acidity for absorption.

The combination of falls and incontinence can be associated with low B12 levels therefore advisable to check status.

Mrs AB's diagnoses include chronic pain - nutritional factors that may be useful to consider in pain management include -

- **vitamin C** - pain increases the reactive substances (formerly Reactive Oxygen Species) within cells. Vitamin C is important in quenching reactive substances and if there is insufficient vitamin C then cell status becomes compromised and the cells typically die which also causes pain. Vitamin C is not considered part of the pain management armament however it won't cause harm and evidence suggests it may confer benefit. Currently prescribed somac which decreases conversion of vitamin C to its active form.
- **low B12** - exacerbates elevated TNF- α which is an inflammatory response marker; elevation of the inflammatory response can include a pain response and currently prescribed somac therefore advisable to check B12 status.
- **magnesium** – proposed mechanism magnesium blocks the NMDA receptor channels in the spinal cord and thus limits the influx of calcium ie reduces the risk of excitotoxicity and consequent exacerbation of pain. Currently prescribed somac which decreases magnesium absorption.

Mrs ABH's diagnoses include deafness – nutritional factors associated with deafness include -

- **B12 and folate - l**ow B12 and/or folate have been found to be associated with deafness, and in fact some researchers recommended vitamin B12 and folate testing be routinely included when evaluating symptomatic hearing loss. There is some evidence that B12 interventions are therapeutic in tinnitus management. Currently prescribed somac.
- **Vitamin C -** hearing impairment is being related to inadequate dietary intake especially in the elderly, particularly with findings

that an adequate dietary intake of vitamin C is associated with better hearing in the older population. Currently prescribed somac.

- **Calcium -** apoptosis (programmed cell death) is a calcium-dependent process, and is a common theme in many forms of acquired hearing loss. There is a suggestion that calcium channel blockers may reduce damage caused by apoptosis. Currently prescribed somac.

- **Iron Deficiency Anaemia (IDA) -** evidence indicates mild maternal IDA during pregnancy and lactation may inhibit hair cell development in the infant. Further, latent iron deficiency is associated with abnormal auditory neural maturation in infants at 34 weeks gestational age. Currently prescribed somac.
- **Zinc -** inadequate zinc status has been associated with impaired hearing. Currently prescribed somac.
- **Thiamine** - there is some recent evidence that thiamine deficiency can present as bilateral hearing loss. Thiamine transporter OCT2 is expressed in the hair cells of the cochlea therefore interruptions to thiamine accessibility are likely to impact hair cell function. Currently prescribed somac, quetiapine and avanza.
- **Dysfunctional mitochondria -** the evidence is increasing that diagnoses that include dementia, diabetes, overweight and/or obesity ie all diagnoses associated with dysfunctional mitochondria, are associated with increased risk of hearing impairment. Currently prescribed somac, quetiapine and avanza.

Three drugs, being Avanza, quetiapine, somac, negatively impact thiamine status and intervention may be advisable – best administered at least one hour before and two hours after administration times of the identified drugs.

What else would you include?

Medications have profoundly and positively changed health outcomes however they do generally come with some nutritional harms. By identifying and addressing the nutritional harms, optimal health outcomes are closer to being achieved.

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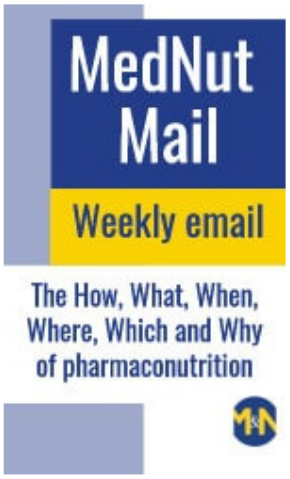

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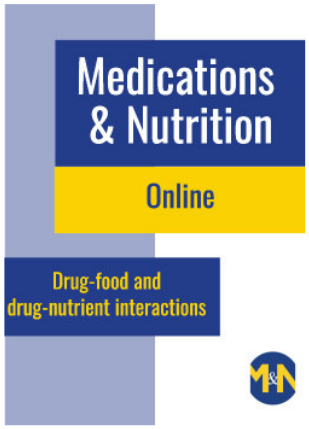

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