MedNut Mail

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

Non-insulin diabetes preparations and pharmaconutrition

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https://medicationsandnutrition.online

Commentary

I now understand why duration of therapeutic effect of the non-insulin diabetes drugs is not an integral part of most clinicians' toolkits – the information is extraordinarily difficult to access. When I compiled my chart in 2015, I was very lucky as I had identified a good quality resource and was able to access the information easily. Sadly, that resource is now redundant.

I have now compiled a chart that variously, but not completely, includes duration, time to peak, half-life, time to steady state, terminal phase half-life, and references, for non-insulin diabetes drugs; it is now available as pdf on this link.

As a glycaemia management strategy, BSLs are commonly tested before breakfast, and these results guide the clinical management of diabetes.

Usually, early afternoon BSLs are not checked, and when they are checked they are typically high, and the elevation is ascribed to dietary non-compliance, so their drug doses are reviewed and usually increased.If the consumer of those prescribed medications is seen to be grazing on seriously sweet snacks, then they are quickly labelled "non-compliant". No-one ever questions why an otherwise responsible person is not behaving more responsibly with their food intake.

Are the afternoon BSLs elevated because the consumer is under-medicated or over-medicated? If BSLs are falling in response to the prescription of several powerful medicines conferring concurrent peak therapeutic effect, then two common responses are likely –

1. eating sweet foods to offset the hypoglycaemia, and/or
2. the liver releasing extra glucose from its store to prevent BSLs falling further.

Therefore, are elevated afternoon BSLs actually indicating over-medication?

What will you do when you see a person prescribed diabetes management drugs, will you –

- recommend monitoring BSLs in the peak therapeutic effect period and clarify status?
- review duration of effect and time to peak to identify the peak therapeutic effect period?
- clarify if the consumer is deemed "non-compliant" and why?

Conclusions

An important diabetes management strategy is the identification of the peak therapeutic effect period and to clarify BSL status within that timeframe.

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: cellulitis, chronic leg ulcer, GORD, lymphoedema

Biochemistry with Pharmaconutritional Consequences

Na:	140	mmol/l	Hb:	113	g/L	Albumin:		g/L	BSL:		mmol/l
K:	4.8	mmol/l	Lymph:	1.5		Total Protein:		g/L	HbA1C:	6.8	
Urea:	21.4	mmol/l	MCV:	91	mmol/l	B12:		pmol/L	INR:		
Creatinine:	0.213	mmol/l	Zn:		umol/l	Folate:		nmol/L	TSH:		mIU/L

Other: eGFR 18, chol 3.9, Tg 1.4

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
AVAPRO HCT	Ca, Cl, K, Mg, Na		☑	NV	CD	↑	↓	☑				☑	☑	☐
DIAMICRON MR	(12:00)		☑	NV	CD	↑	↕	☑				☐	☐	☑
FERRO-F	Ca, Mg, Zn		☐					☐				☐	☐	☐
Frusemide	(40 mg/day) Ca, Cl, K, Mg, Na,		☑	NV	CD		↓	☐				☑	☐	☑
Omeprazole	(20 mg/day) B1, B12, Ca, Fe,		☑	NV	CD	↑		☑				☑	☐	☐
OSTEVIT-D	(2/day)		☐					☐				☐	☐	☐
Pravastatin			☐	NV	CD	↕	↓	☑				☐	☐	☐
Prazosin			☑	NV	CD			☐				☑	☐	☑
Sertraline	Na		☑	NV	CD	↑	↑	☐				☑	☐	☐

Extra drug: lantus 4U mane, 8U nocte

Summary of organs and some transporters, relevant prescribed medications, and impacted nutrients

Organ (transporter)	Thiamine	Choline	Carnitine
Inhibitor function			
Liver	omeprazole prazosin sertraline	omeprazole prazosin sertraline	
Into kidneys	omeprazole prazosin sertraline	omeprazole prazosin sertraline	
From kidneys (into urinary system)	sertraline	sertraline	
Skeletal muscle	omeprazole prazosin	omeprazole prazosin	omeprazole prazosin
Substrate function			
Liver	prazosin	prazosin	
Skeletal muscle	prazosin sertraline	prazosin sertraline	sertraline

Organ uptake of 2 key nutrients is inhibited by three of the prescribed medicines therefore it remains in the blood.

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

Biochemistry comments

Recent relevant biochemistry indicates -
- elevated urea + creatinine - typically indicates renal function; also indicates loss of lean body mass;
- low Hb - associated with increased risk of falls, and poor appetite; likely exacerbated by omeprazole intervention.

Advisable to check plasma proteins (albumin, total proteins) as they are the primary transporters for six of the prescribed drugs and hypoproteinaemia may alter their effects.

Glycaemia comments

Currently prescribed 4 medications that may alter glycaemia, being Avapro HCT, frusemide, pravastatin and sertraline.

BSLs
- before breakfast - 3.1-7.2; recommended range 4-6;
- daily range - 3.1-19.8; recommended range 4-10;
- tested daily bd;
- reportable limits: < 4 and > 16;
- recent HbA1c indicates good glycaemic control.

Diabetes drugs

- lantus has a time to onset of 1hour, minimal peak, and duration of 20-26 hours;
- diamicron has a duration of 18-24 hours.

Diabetes drugs coverage

- before breakfast BSLs - minimal, if any, coverage from previous morning's lantus, or previous midday diamicron; covered by previous evening's lantus;
- before evening meal BSLs - minimal, if any, coverage from previous evening's lantus; covered by current morning's lantus, and current midday diamicron.

Bowel management comments

- no regular interventions prescribed;
- no PRN interventions prescribed;
- no Nurse Initiated interventions administered.

Staff comments

Staff advise Mrs ACB refuses to eat hot meals.

Observations

Mrs ACB is a small, pale, charming lady who was sitting in the Day Room when I went to speak to her - she told me she does not feel like a hot meal at midday as it is too soon after breakfast, and that she eats sandwiches and dessert at midday; she assured me she eats the evening meal.

Pharmaconutrition comments

Currently prescribed 7 medications that include nausea, vomiting, constipation, diarrhoea and reduced appetite as side effects.

Currently prescribed 5 medications that include dry mouth, altered appetite and altered weight as side effects.

Currently prescribed 4 medications that include altered taste as a side effect.

Urinary thiamine losses have been indicated with almost all diuretics including Avapro HCT and frusemide.

Frusemide increases urinary excretion of calcium, magnesium, potassium, sodium and thiamine.

Regular monitoring sodium levels recommended whilst Avapro HCT and sertraline prescribed.

Concurrent administration of sertraline with a diuretic has a synergistic effect for hyponatraemia.

Diamicron MR may affect intestinal absorption of vitamin B12, or its metabolism.

Iron decreases zinc absorption.

Currently prescribed Ostevit (2/day) therefore advisable to clarify vitamin D status and if still low then review current vitamin D management strategy.

Omeprazole decreases B12, vitamin C, magnesium, zinc, and iron absorption,

may decrease calcium absorption, and decreases thiamine availability.

Currently prescribed the daily double ie two drugs that decrease magnesium availability - being frusemide and omeprazole. 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. Advisable to clarify magnesium status.

Statins interfere early in the cholesterol metabolic pathway and consequently decrease -

- conversion of sun to vitamin D - vitamin D intervention recommended;
- production of CoQ10 - important in cellular energy production; CoQ10 intervention recommended;
- DHEA production - low DHEA associated with increased risk of metabolic syndrome; intervention recommended.

Mrs ACB is pale, and is prescribed an iron supplement and a proton pump inhibitor - it is likely the proton pump inhibitor is minimising the effectiveness of the iron supplement; low iron levels can diminish appetite. May be worthwhile considering a non-oral iron intervention as gastric acidity is not required for iron absorption and so intervention is more likely to be effective.

Mrs ACB has had several low BSL readings before breakfast - advisable to review evening lantus dose.

As Mrs ACB's cholesterol levels are well within acceptable range, she is aged 80, and she is not eating quite as well, and further that statin side effects include poor appetite, advisable to review necessity for continued pravastatin prescription.

Some of Mrs ACB's diagnoses fit within the metabolic syndrome cluster. Metabolic syndrome is characterised by insulin resistance and consequent hyperinsulinaemia - hyperinsulinaemia is associated with increased appetite and consequent weight gain which then compounds the insulin resistance. Physiologically the body releases insulin once glucose is present in the bloodstream - the presence of insulin in the bloodstream at other times increases the risk of insulin resistance.

There are a number of strategies to improve insulin sensitivity or reduce insulin resistance including -

- vitamin D within acceptable range - early evidence indicates low vitamin D is a predictor of peripheral insulin resistance and elevated inflammatory response markers. Currently prescribed an

intervention therefore advisable to clarify status;

- magnesium – is important in glycaemic control; currently prescribed omeprazole which significantly decreases magnesium absorption, and currently no intervention. Advisable to review status;
- chromium - evidence indicates chromium both increases the number of insulin receptor cells on cell walls, and improves intracellular response to insulin. Advisable to clarify status;
- thiamine - is important in glycaemic control; currently prescribed frusemide which increases thiamine excretion. Advisable to clarify status;
- biotin – evidence indicates biotin is important in a number of steps in carbohydrate metabolism. Advisable to clarify status;
- TNF-α – evidence indicates TNF-α has systemic effects that result in insulin resistance and NIDDM; low B12 status exacerbates elevated TNF- α and currently prescribed omeprazole therefore advisable to check B12 status.

What else would you include?

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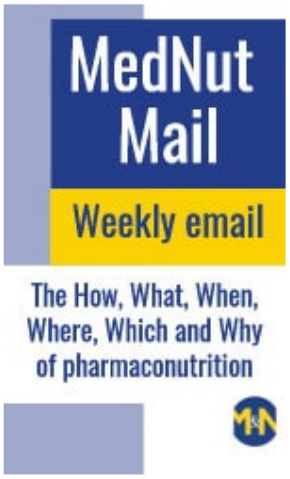

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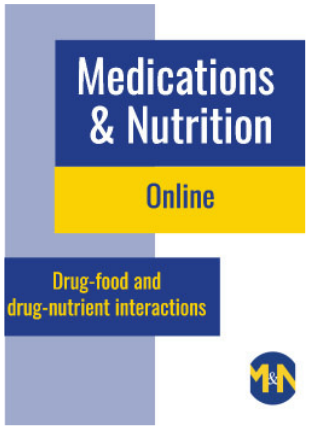

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