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

Constipation audits and pharmaconutrition

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Commentary

Constipation is a common side effect of many prescribed medications and contributes to further issues such as increased brittleness in pain management, increased risk of falling, increased confusion, increased frequency and duration of parkinson's freezing, increased frequency and duration of difficult, resistive, aggressive behaviours, inexplicable vomiting, etc. These consequences typically result in further interventions being administered which may modify the immediate secondary problem but likely exacerbate the risk of further constipation-initiated episodes.

The purpose of a constipation management audit is to determine the effectiveness of the currently prescribed regimen for each person. In developing this audit, we collected data for the previous 3 calendar months, or since admission if admitted within the last 3 months; the audit is based on drug chart entries.

Although developed in the Residential Aged Care sector, this audit can also be applied to individual clients.

Example constipation audit data collection template

(Timeframe)

XXX Unit	Regular Prescribed Interventions		PRN ordered				Intermittent interventions		
Resident	Yes	No	Yes			No	Oral	Anal	Total
	#	#	#O	#A	#OA	#	#	#	#
	√		√				3 x 06/21 1 x 07/21		3 x 06/21 1 x 07/21
	√			√					
		√			√		3 x 08/21	1 x 06/21 1 x 06/21NI	2 x 06/21 3 x 08/21
		√				√	1 x 08/21		1 x 08/21

O – oral, A – anal, OA – oral + anal, # - number, NI – Nurse Initiated, date is recorded as month and year

The residents are initially screened on whether they are prescribed regular medications for constipation management or not, and then the date of each administered PRN and Nurse Initiated intervention is recorded.

If 4+ intermittent interventions per month for each month are administered

then review of the constipation management strategies for that resident is strongly recommended.

The issue is not whether and how many interventions are prescribed and their administered but whether the regimen is effective for that person.

The frequency of anal interventions is also identified – these should be neither the first nor the only intermittent intervention administered.

Nurse preference is also identified when there is a choice between oral and anal PRN interventions. Personal experience indicates that the further the residential facility is from the CBD (of that State's capital city) then the more likely the nursing staff will preferentially choose anal interventions. Further these interventions may not be recorded on the drug chart and may only be written in the desk diary – one needs to directly ask if any anal interventions are being administered and where they are recorded.

If no intermittent interventions are administered in a 3-month period then one should ask whether constipation management is being monitored as it is unusual for a resident to not request or require an occasional intervention.

Comments included in an audit report

We developed some parameters for Quality Improvement for internal and external benchmarking purposes, including

- **No Regular Interventions** – less than 50% residents should be prescribed regular constipation interventions,
- **Average intermittent interventions per resident** – acceptable upper limit at this stage be 2 intermittent interventions per month per resident ie maximum of 6 intermittent interventions,
- **intermittent interventions (≥ 4/month)** – should be less than 10%.

Other management strategies to consider (although not yet benchmarked)

- **Anal-only interventions prescribed** – there are very clearly-defined interventions to be initiated prior to administration of anal interventions,
- **PRN prescribed** – there should be a policy and flowchart indicating preferred options.

It is often difficult to determine whether an audit indicates excellent constipation management practices or not -

- more than 50% residents are prescribed regular constipation interventions – however this may reflect individual necessity,
- only one resident is prescribed an anal-only PRN intervention which may reflect individual requirement or GP prescribing practice,
- several occasions of Nurse Initiated interventions although PRN prescribed,
- two residents had Nurse Initiated oral interventions administered although PRN anal interventions prescribed – this could be interpreted as good practice as oral

interventions are preferred initial interventions rather than anal,
- two residents had Nurse Initiated anal interventions administered although oral PRN interventions prescribed – this may reflect individual practice rather than facility guidelines,
- no resident required 4+ PRN interventions in each of the audit months which may indicate good or bad constipation management practices are being followed,
- there are significantly more Nurse Initiated interventions administered in Unit A than in Unit B which may indicate Unit population or poor prescribing or initiation practices.

There can be a significant disparity between Units with regard to administration of intermittent interventions, which likely reflects resident status ie some Units are more dependent than others – a factor that requires identification.

Common causes of constipation include inadequate fibre in the diet, inadequate fluid intake, inadequate exercise, and the number of prescribed drugs that have constipation as a side effect. Many residents refuse to, or are unable to, exercise or drink more fluid or are fluid restricted therefore advisable to review the medications from a constipation impact perspective.

Recommendations

Advisable to -

- review constipation charts for the same audit period and ensure intermittent interventions are being administered as per facility protocol,
- review current constipation management practices,
- review staff awareness of, and compliance with, current constipation management protocols,
- submit this audit report to the Medication Advisory Committee to update them on status and compliance with facility's policies and procedures, for endorsement of the constipation management policy and procedures, and for their authorisation to distribute the constipation management policy, including flowchart, to relevant GPs.

Conclusions

There are two primary functions that the constipation audit is expected to fulfil -

1. clarify the effectiveness of current constipation management strategies, and
2. identify any unacceptable staff constipation management practices.

Based on drug chart entries the constipation management strategies seem to be effective. However, audit of constipation management charts will identify appropriateness of the PRN interventions.

Caveats withstanding, overall the constipation audit indicates generally good constipation management practices for the majority of residents.

What interventions will you initiate when you see someone whose

prescribed medications include constipation management medications – will you -

- request electrolytes, especially potassium status be checked?
- check whether current water and fibre intake at least meet the minimum acceptable intake recommendations?
- suggest reviewing prescribed medications with regard to significant negative impact on bowel status?

Conclusions

Constipation is a side effect of many commonly prescribed medications and its consequences can profoundly and negatively impact the quality of life of the individual.

Constipation management audits can also identify -

- those whose current regimens are ineffective,
- inappropriate Care Staff choices.

By identifying ineffective regimens and those who administer inappropriate interventions, the negative outcomes due to constipation can be modified or minimised.

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: leg oedema, Ca sigmoid

Other: tinnitus, tremor, GORD, chronic pain, anxiety

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
Aspirin	C, Fe		☑	NV				☐				☐	☐	☑
Atorvastatin			☑	NV	CD	↑	↓	☑				☐	☐	☐
Cholecalciferol	(25 mcg/day))		☐					☐				☐	☐	☐
COLOXYL WITH S			☐		D			☐				☐	☐	☐
Frusemide	(120 mg/day) Ca, Cl, K, Mg, Na		☑	NV	CD		↓	☐				☑	☐	☑
MOVICOL			☐	N	D			☐				☐	☐	☐
Omeprazole	(20 mg/day) B1, B12, Ca, Fe,		☑	NV	CD	↑		☑				☑	☐	☐
PANADOL OSTEO			☐	NV	CD			☐				☐	☐	☐
Perindopril			☐	NV	D			☑				☑	☐	☐
Propranolol			☑	NV	CD		↓	☐				☐	☐	☑
Quetiapine			☐		C	↑		☐				☑	☐	☐
Sertraline	Na		☑	NV	CD	↑	↑	☐				☑	☐	☐
TARGIN			☐	NV	CD		↕	☑				☑	☑	☐
			▩					▩				▩	▩	▩

Extra drug: vit C

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

FLUID RESTRICTION 1.5 L/DAY

No recent relevant biochemistry available. Advisable to check plasma proteins (albumin, total proteins) as markers of nutritional status. The plasma proteins are the primary transporters for 6 of the prescribed drugs and hypoproteinaemia may alter their effects.

Vitamin C (960 mg/day) attenuates aspirin-induced gastric injury.

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

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

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

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.

Perindopril impairs zinc status.

Regular monitoring sodium levels recommended whilst sertraline prescribed.

Currently prescribed vitamin D 25 mcg/day (1 tab/day); 25 mcg vitamin D is equivalent to 1000 IU vitamin D. Evidence indicates 50 mcg vitamin D per day is a maintenance dose. Increasingly the evidence is indicating vitamin D levels should be > 100 nmol/L to minimise non-bone health impacts. Currently prescribed atorvastatin which negatively impacts vitamin D availability therefore advisable to check vitamin D levels and if still low then review current vitamin D management strategy.

Currently prescribed the daily double ie two drugs that decrease magnesium and thiamine availability - being frusemide and omeprazole -

- **magnesium** – magnesium deficiency manifests as confusion, disorientation, personality changes, loss of appetite, depression, muscle cramps, tingling, numbness, hypertension, cardiac dysrhythmia, seizures, and activation of iodide and vitamins B1, C, D. Magnesium is an intracellular ion therefore serum levels are unlikely to detect early depletion of status. Cellular magnesium status remains unknown whilst magnesium levels within acceptable range however if magnesium levels are low then that typically indicates significant cellular depletion and intervention consequently recommended;

advisable to check magnesium status.

- **thiamine** - evidence indicates thiamine is important in glycaemic and lipid control, neurological function and energy production; when there is insufficient thiamine then food is converted to alternatives such as fat stores, cholesterol and triglycerides. A short term (90-120 days), low dose (~ 10 mg/day) thiamine intervention on a regular basis such as annually may confer benefit.

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

- conversion of UV 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.

Evidence from a Scottish lipid study shows that a 5-year prescription of atorvastatin confers 20 years of benefit; other evidence indicates statins administered weekly (for those who don't tolerate daily doses) also confer adequate benefit, therefore advisable to -

- clarify duration of statin prescription and consider its cessation if > 5year. Mr ABE has been prescribed atorvastatin since admission and likely before then,

- check lipid levels and if within acceptable range then review necessity for its continued prescription if duration of prescription is more than 5 years.

Mr ABE is an unwell-looking man who was sitting at a table in the dining room when we went to speak to him - he told us he eats well, agreed he was constipated (and described his pooh as small hard balls) and informed us he does not sleep well; he also does not go outside on a regular basis. We did emphasize the importance of drinking more fluid however Mr ABE did not seem to listen to this encouragement.

Mr ABE's diagnoses include diabetes however it has not yet progressed to requiring management with prescribed drugs. Many of his diagnoses also fit within the metabolic syndrome cluster. Metabolic syndrome is characterised by insulin resistance and consequent hyperinsulinaemia which in turn 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 nutritional interventions to improve insulin sensitivity or reduce insulin resistance including -

- vitamin D within acceptable range - current intervention may not be adequate to attain and maintain adequate range and currently prescribed atorvastatin**;**

- magnesium – is important in glycaemic control and inadequate intake may impair insulin synthesis, secretion and signalling pathways; there is evidence of an inverse correlation between magnesium status and diabetes incidence. Currently prescribed frusemide and omeprazole which significantly decrease magnesium absorption, and currently no intervention therefore advisable to review status;
- thiamine - people with diabetes have a significantly increased urinary excretion of thiamine; thiamine is important in glycaemic control; currently also prescribed frusemide which further increases thiamine excretion and omeprazole which decreases thiamine availability. Advisable to consider short term (90-120 days), low dose thiamine intervention on a regular basis such as annually and for it to be administered at a different time from frusemide and omeprazole,
- 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. There is disagreement between pathology ranges and research findings with regard to appropriate B12 levels - recent neuro-imaging research shows a direct causal link between B12 status and memory impairment, and recommend B12 interventions once levels are less than 300 pmol/L;
- zinc – is integral to insulin formation, and enhances insulin sensitivity through stimulation of insulin receptors; inadequate intake may impair insulin synthesis, secretion and signalling pathways. It is important in glucose metabolism, protects the mitochondria from oxidative stress and glycation, protects glomerular function, as well as modifying the inflammatory response pathway and activation of the polyol pathway (a part of intracellular signalling and metabolism) and currently prescribed omeprazole therefore advisable to check status,
- potassium - important in the glucose metabolism, and functions in β-cells; inadequate intake may impair insulin synthesis, secretion and signalling pathways; currently prescribed omeprazole therefore advisable to check status,
- calcium - important in the glucose metabolism, and functions in β-cells; inadequate intake may impair insulin synthesis, secretion and signalling pathways. Currently prescribed omeprazole that likely negatively impacts calcium absorption therefore advisable to consider a suitable calcium intervention that accommodates the altered gastric acidity.

Mr ABE's diagnoses include chronic pain - nutritional factors to consider in pain management include -

- **vitamin D** - current intervention may not be adequate to attain adequate range. Advisable to check vitamin D levels and if still low then review current vitamin D management strategy;

- **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. The optimal intervention is 500 mg vitamin C/day (if more than 500 mg vitamin C administered at a time then the excess above 500 mg is not absorbed as the vitamin C transporters are overloaded). 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 omeprazole which decreases conversion of vitamin C to its active form and a vitamin C intervention;
- **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 omeprazole 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 frusemide and omeprazole which decrease magnesium availability.

Tinnitus can be exacerbated by the combination of hypoalbuminaemia and frusemide therefore advisable to check albumin status.

Glycaemic status negatively impacted by aspirin, atorvastatin, frusemide, perindopril, propranolol, quetiapine and sertraline therefore advisable to monitor glycaemic status on a regular basis such as HbA1C's at least annually.

Commencement of omeprazole indicates prudent clinical practice for B12 management as follows -

- 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.

Via the thiamine transporters several prescribed medications, including omeprazole, propranolol, quetiapine, sertraline and targin, negatively impact thiamine status from absorption to distribution throughout the body. Therefore, in order to ensure an adequate availability of thiamine to meet body requirements, advisable to consider a regular low dose thiamine intervention that is administered at a different time from any 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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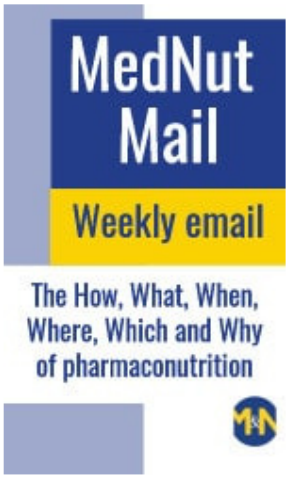

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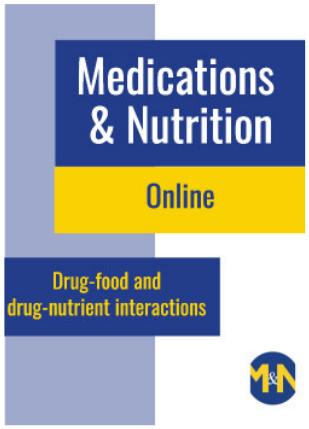

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