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PATIENT CARE

Avoiding Food-Drug Interactions: A Proposal

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Abstract

The treating physician has a great responsibility when prescribing medication. He must be aware of any situations that might interfere with his prescription. He checks current medications in order to avoid drug-drug interactions. However, other factors that may affect the effectiveness or clearance of the prescription are often overlooked, including food-drug and supplement-drug interactions. Even the healthiest and most desirable foods, such as leafy greens or fiber, can affect the medication, leading to treatment failure. Physicians rarely ask patients about eating habits, and patients do not know to offer such information. I therefore propose the use of a food frequency questionnaire during the first visit to the doctor, in order to have realistic basis for prescriptions and to allow physicians to advise patients about intake of various foods during treatment. In addition to opening communications between the physician and patient, this would result in more effective treatment strategies that have better adherence, since they would be adapted to the patient's current lifestyle. Physicians would be able to offer more inclusive instructions when prescribing, increasing patient confidence and treatment outcomes.

Key Findings

- Food-drug interaction can be an important factor in treatment effectiveness
- Physicians are usually unaware of patient dietary patterns
- A food frequency questionnaire at the time of the initial visit can improve treatment outcomes

Introduction

Many factors can influence the dosage and effectiveness of prescribed medications, including comorbidities and other drugs (drug-drug interaction). However, another factor that is often overlooked is the patient's dietary consumption and use of supplements and "naturistic" complements. In addition, many medications can affect the absorption and excretion of nutrients [1]. Most physicians never ask the patient about these habits, and yet their effect on the prescription can be serious. Guzman, et al. in 2019, found that most physicians rely on the physician-patient relationship to discover the patient's dietary habits. However, patients don't consider many of their habits relevant to medical care and do not disclose them, and physicians are not pro-active in pursuing the subject [2].

Food frequency questionnaires have been used since the 1960's [3]. Some use a log for consumption, others use recall. Some form has been validated in most countries. They have proven helpful in epidemiological studies, studies of effects of a specific nutrient, such as vitamin D, and to help dieticians design a dietary plan for a specific individual. If used properly, they can also be a source of useful information for the treating physician, especially in primary care.

I therefore propose that a food frequency questionnaire become a part of the forms for a new patient, along with the usual anthropometric and background information. This will enhance the effectiveness of treatments, and should improve patient outcomes.

Some Unexpected Food-Drug Interactions

While the effects of grapefruit on multiple medications is well known, there are several other foods, often considered healthy and therefore part of a normal diet, that can affect the absorption and excretion of important drugs. Some examples are listed below:

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Fiber

Most people, especially women and the elderly, strive for a diet rich in fiber. But, a diet high in fiber can reduce the effectiveness of metformin (commonly used for diabetes) in non-responders and levothyroxine (for hypothyroidism), by absorbing T4 [4], as well as lovastatin (by increasing LDL-cholesterol) and amoxicillin (by impeding absorption) [5].

Fruits and vegetables

Most dieticians recommend a diet rich in fruits and vegetables. However, many fruits and vegetables can interfere with cytochrome P450 (CYP) enzymes, especially CYP3A4, which is the family responsible for the absorption and clearance of many medications. This occurs through properties of compounds found in these foods, especially polyphenols and flavonoids, which inhibit the metabolizing and activation of CYP enzymes. These foods include grapes, oranges, mango, as well as broccoli and bell peppers [6]. Oranges, bananas and leafy green vegetables can also interfere with Angiotensin-Converting Enzyme (ACE) inhibitors, such as enalapril and captopril, and prescribed diuretics, while broccoli, spinach and kale can affect blood thinners such as warfarin and heparin, important to patients on hemodialysis [7].

Yogurt, cheese and milk

Dairy products are valuable sources of calcium and vitamin D, noted for their benefits in increasing bone mineral density, and are often recommended for older people and post-menopausal women to avoid osteopenia and osteoporosis. It should be taken into account that these products affect tetracycline and MAO inhibitors (used to treat depression and often Parkinson's disease), by binding to them and thus reducing absorption [8]. Even enriched bread and antacids containing calcium can have these effects [4].

Caffeine

In the case of caffeine, it is the drugs that can affect the caffeine. Oral contraceptives and prednisone can increase the side effects of caffeine by inhibiting its metabolism [4], while the use of estrogen can decrease caffeine clearance [9]. Other medications that affect caffeine are serotonin inhibitors, bronchodilators, and lithium [9]. This is due to the fact that caffeine indirectly activates serotonin transporters, as well as other neurotransmitter systems, and modulates the dopaminergic system [10].

Nutrients and Drug Interactions

Various nutrients, when their consumption is increased, can have negative effects on certain medications. For example, both calcium, magnesium and zinc can reduce the effect of tetracycline [11]. Vitamin C can affect amphetamines and antihistamines, due to its effect on dopaminergic system [4]. Calcium can affect levothyroxine and antibiotics, and can actually reverse the effects of verapamil [9]. In addition, thiazides can reduce the clearance and excretion of calcium, often leading to kidney stones [11]. Potassium can increase the risk of hyperkalemia in patients with kidney failure, diabetes or a history of heart failure [11].

Supplements and Drug Reactions

In the United States, almost one quarter of the population taking prescribed medications also consumes some dietary supplement [12]. These patients never consider the supplements as important to disclose to their physicians. While some supplements may not affect medications, others do. In addition, most supplements are not subject to government regulation, and are often contaminated [13]. Since the FDA only removes products proven to be unsafe, many supplements may contain banned substances, heavy metals (arsenic, lead, aluminum, etc.), and/or microbial material, such as toxigenic fungi, molds and yeast, and strains of salmonella [14]. Overuse of some supplements can have health consequences by themselves, and medications only increase the risks. Below are a few examples of supplements that can affect medication use and health:

Ginseng: This herb can increase bleeding, especially when taken with heparin, aspirin, and anti-inflammatory drugs such as naproxen and ibuprofen. When taken with MAO inhibitors, it can increase side effects such as headaches, dizziness, and hyperactivity [6,7]. Another effect of ginseng is to lower blood sugar, making it dangerous for diabetic patients taking hypoglycemic drugs [15]. It has also been shown to reduce the effects of chemotherapy, HIV treatments, and some antidepressants and anti-hypertensive medications [12].

Aloe and cat´s claw: Unfortunately, these supplements, taken incorrectly, can cause nephrotoxicity, leading to renal damage and failure, due to the direct nephrotoxic effect of chromium and germanium, which may cause tubular apoptosis and interstitial fibrosis [16].

Gingko biloba: This supplement, frequently used to stimulate memory, can seriously affect anticoagulants [6,14].

Iron supplements: While these are often suggested for anemia, they have also been shown to decrease the effects of penicillamine by as much as 82% [5].

Mineral supplements: Various of these supplements can reduce the effects of certain antibiotics [6]. Folic acid can cause toxicity of methotrexate. Aluminum, magnesium and iron can reduce the absorption and effect of a variety of medications, including levothyroxine, fluoriquinolones, and tetracyclines. Potassium can interfere with ACE inhibitors, angiotensin receptor blockers, and lead to hyperkalemia [17].

WHAT Can Be DONE?

Any physician prescribing a medication is concerned about the patient's adherence and the adequacy of the treatment. He/she will ask questions about the frequency and dosage in taking the medication, about other medications and comorbidities, and may even administer a well-being questionnaire, such as the SF-36, in order to adjust the treatment. Physicians almost never ask the patient about his eating habits, the one factor that is rarely considered.

A recent study in France proposed a structured list of information to be offered primary care givers after in-hospital prescription. That list did NOT address the change in dietary pattern from the controlled to uncontrolled environment [18].

Pharmacists may have access to a patient's history of medication, to avoid drug-drug interactions, but not dietary patterns.

It is important for physicians and pharmacists to be aware of the possible food-drug, nutrient-drug and supplement-drug interactions, in order to provide correct medication and adequate therapy.

To aid physicians, I suggest that a food frequency questionnaire be added to the routine first-visit paperwork for a patient. This questionnaire should include the foods customarily consumed, as well as herbs and dietary supplements (natural and vitamins, etc.), usually over a period of the last week or month, and can be used in addition to the customary anthropometric measurements taken. In general, there is no need to calculate specific nutrient intake, although this questionnaire could be used in the future to establish the dietary pattern of the patient. There are a variety of such questionnaires available, and they can be modified to include information about supplements and herbal consumption. The methodology for creating such a form was described in 2006 in Hawaii [19], which was later used to develop the SURE-QX form for assessing supplements [20,21]. These forms have been used for assessments of interventions and other studies, but not in the clinical setting. However, if used as suggested, the physician would be aware of any possible interference, and would be able to adjust the treatment or dosage accordingly. He/she would also be able to advise the patient of the dietary precautions necessary when prescribing any medication. After the initial visit, a simple question of "have you changed your diet recently?" during anthropometric measurements should suffice. This simple questionnaire might also help in uncovering underlying conditions and comorbidities, such as eating disorders, deficiencies and malnutrition.

Patient health status could be greatly improved if the physician or nursing personnel were able to indicate small changes to an individual's dietary pattern in order to improve overall health and boost the immune system. The dietician might become a more integral part of the health care team, able to offer nutritional alternatives where a food-drug interaction is suspected. While some blogs exist with warnings of supplements and foods to avoid in the case of specific diseases, such as the American Parkinson Disease Association blog entitled "What we know about avoiding particular foods and supplements for Parkinson's" [22] or "Food and drug interactions" by the Arthritis Foundation [23], most people either don't read or don't trust in them.

As noted by Guzman, et al. [2], most physicians rely on the patient to disclose any supplements that may affect drug efficacy. But the patient doesn't know or even consider the importance of his dietary habits. I suggest that the inclusion of a food frequency questionnaire would be invaluable for clinicians, especially primary care physicians, to develop effective therapeutic strategies for each individual patient. In addition to opening communications between the physician and patient, this would result in more effective treatment strategies that have better adherence, since they would be adapted to the patient's current lifestyle. Physicians would be able to offer more inclusive instructions when prescribing, increasing patient confidence and treatment outcomes.

Compliance with Ethical Standards

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