DIETITIAN PRACTICE AND SKILL

# Drug-Nutrient Interactions: Screening for

## What is Involved in Screening for Drug-Nutrient Interactions?

› Drug-nutrient interactions are alterations of a drug's pharmacokinetics (i.e., rate of absorption, bioavailability, distribution, and rate of excretion) and/or pharmacodynamics (i.e., the drug's effects on the body) by a component of the diet, including a nutritional supplement, as well as changes in the ability to absorb or metabolize a nutrient due to the effects of a medication. Decreased drug efficacy, increased drug toxicity, or nutritional deficiency can occur

- *What*: Screening for drug-nutrient interactions is the process of identifying nutrients and medications that interact in a way that can compromise the nutritional status of the patient and/or effectiveness of drug therapy. Screening may be indicated when the efficacy of a prescribed drug is suboptimal, when nutritional status unexpectedly changes, or when blood testing indicates a toxic drug level
- *How*: The patient's diet is screened for components that are known to interact with a medication he or she is taking. If any are found, either a change is made in the patient's diet or an alternative medication is selected to avoid the interaction. The risk for drug-nutrient interactions can be reduced by limiting the number of medications the patient is taking to only those that are absolutely necessary and by using medications for as short a period of time as possible
- *Where*: Screening for drug-nutrient interactions may be done in inpatient, outpatient, and home settings
- *Who*: A registered dietitian (RD), nursing personnel, or pharmacy personnel may take part in the screening process. Patient education is provided to encourage active participation in the detection of possible drug-nutrientinteractions and in changes to the pharmaceutical/dietary plan. It is appropriate for family members to be present during patient education about possible drug-nutrient interactions

## What is the Desired Outcome of Screening for Drug-Nutrient Interactions?

› The desired outcome of screening for drug-nutrient interactions is to prevent

- changes in the pharmacokinetics and/or pharmacodynamics of a medication by dietary nutrients, including nutritional supplements, that can change the rate of absorption and/or how a medication is metabolized
- drug-nutrient interactions that can cause vitamin and mineral deficiencies if the medication causes changes in the absorption of these nutrients
- changes in the effectiveness of medication by direct nutrient interaction, such as binding with the drug molecules

## Why Is Screening for Drug-Nutrient Interactions Important?

› Screening can prevent serious medical problems and nutritional deficiencies

- Failure to identify and properly manage drug-nutrient interactions can result in serious medical problems
- Undetected interactions can lead to treatment failure that may worsen the patient's condition or even cause the death of the patient. These serious consequences may be mistaken by clinicians as a reflection of disease progression

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## Facts and Figures

› Nutrient-drug interactions are a frequent cause of adverse drug reactions (Youdim, 2016)
› Older patients are at particularly high risk for drug-nutrient interactions because they are often prescribed several medications at a time (i.e., polypharmacy)(Salazar et al., 2007; Genser, 2008)
› Results of a review of 58 oral chemotherapeutics indicate that there is potential for numerous food-drug interactions. The efficacy of many of the medications examined was dependent on ingestion either with or without food, and certain drugs had pH- and fat-dependent absorption. Grapefruit interaction was noted in 19 of the drugs. Researchers caution that patients receiving oral chemotherapy should be closely monitored since drug-nutrientinteractions may be difficult to manage and may require lifestyle changes (Segal et al., 2014)
› It is estimated that 6–12% of patients taking both medications and supplements are at risk for serious drug-nutrient interactions (Mason, 2010)
› Existing practice guidelines for oral oncology treatment offer different or conflicting dietary recommendations for about 14% of current oral anticancer agents, increasing risk for confusion among clinicians and patients, and suboptimal treatment efficacy (Yu et al., 2018)

## What You Need to Know Before Screening for Drug-Nutrient Interactions

› Many foods contain compounds that can interact with medications, possibly causing therapeutic failure. Examples include the following:
  • Grapefruit juice interferes with the enzymes that break down certain medications and is known to increase blood levels of over 40 medications. This effect can also be caused by other citrus fruits and by dietary supplements that contain flavonoids, a component naturally found in citrus and other plant foods
  • Calcium decreases absorption of fluoroquinolones, levothyroxine, and tetracyclines
  • Folic acid decreases blood levels of phenytoin
  • Iron decreases absorption of ACE inhibitors, levodopa, and methyldopa
  • Magnesium decreases absorption of digoxin
  • Vitamin E increases the effects of aspirin, digoxin, and warfarin and may interact with the immunosuppressant agent cyclosporine A. In addition, some studies suggest vitamin E may alter the effectiveness of tamoxifen therapy in breast cancer patients
  • Zinc decreases absorption of fluoroquinolones and tetracyclines
  • Several nutrients may affect the action of warfarin. Though most reports are based on case studies and/or small-population studies, these potential interactions are clinically important because changes in the anticoagulant action of warfarin may lead to serious problems such as thromboembolism or cerebrovascular events. It is therefore important to be aware of foods and nutritional supplements consumed by patients who are on warfarin. Specific interactions that have been reported in the literature include
    – potentiation of warfarin by fenugreek, grapefruit juice, fish oil, fiber supplements, and mango
    – inhibition of the action of warfarin by green leafy vegetables (e.g., spinach, kale), as they contain vitamin K, as well as by foods and supplements containing vitamin C, ginseng, St. John's wort, soy milk, and seaweed
  • Tyramine-containing foods (cheese, alcoholic beverages, smoked and pickled fish, fermented/aged meats such as salami, and beans) interact with monoamine oxidase inhibitors (MAOIs), potentially causing severe hypertension and arrhythmia
  • Ingestion with food increases bioavailability of the anaplastic lymphoma kinase inhibitor agent
› Patients at increased risk for drug-nutrient interactions include
  • older patients
  • patients with chronic disease
  • patients on long-term drug therapy
  • patients on multiple drug therapy
  • patients who are malnourished
  • patients with increased nutritional needs
  • patients receiving enteral nutrition
› Drug-nutrient interactions can create marginal nutritional deficiencies that can have medical consequences for some patients. Examples include the following:
  • Aminoglycoside antibiotics (e.g., gentamicin) and diuretics can reduce blood levels of potassium and other electrolytes
  • Cephalosporin is associated with decreased vitamin K levels
  • Rifampin is associated with decreased vitamin $B_6$, niacin, and vitamin D levels

- Tetracycline is associated with reduced absorption of calcium, riboflavin, and vitamin C
- Aspirin, diuretics, antacids, and oral contraceptives can reduce the absorption or activity of many vitamins and minerals
- Phenytoin is associated with decreased calcium absorption, as well as decreased vitamins D and K and folate levels
- Cholestyramine may interfere with absorption of the fat-solublevitamins A, D, E, and K as well as vitamin $B_{12}$ and iron
- Methyldopa is associated with decreased vitamin $B_{12}$, folate, and iron levels
- Levodopa can cause decreased vitamin $B_6$ levels

› Preliminary steps that should be performed before screening for drug-nutrientinteractions include the following:
- Review the facility/unit-specific protocol for screening for drug-nutrient interactions, if one is available
- Review the treating clinician's order for screening for drug-nutrientinteractions, if one exists
- Review the patient's medical history/medical record for
  - any allergies (e.g., to latex, medications, or other substances); use alternative materials, as appropriate
  - history of drug-nutrient interactions
  - current medications
  - typical diet

› Gather the following supplies:
- Nonsterile gloves; additional personal protective equipment (PPE; e.g., gown, mask, eye protection) may be needed if exposure to body fluids is anticipated
- Facility approved drug-nutrient screening documentation tools
- Written information, if available, to reinforce verbal education

## How to Provide Screening for Drug-Nutrient Interactions

› Perform hand hygiene and don PPE if appropriate

› Identify the patient according to facility protocol

› Establish privacy by closing the door to the patient's room and/or drawing the curtain surrounding the bed

› Introduce yourself to the patient and family member(s), if present; explain your clinical role; assess the coping ability of the patient and family and for knowledge deficits and anxiety regarding screening for drug-nutrientinteractions
- Determine if the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs if they are present
  - Use professional certified medical interpreters, either in person or via phone, when language barriers exist
- Explain the procedure and purpose for screening for drug-nutrientinteractions; answer any questions and provide emotional support as needed
  - Advise the patient of
    - what to expect during the screening
    - the typical duration of the screening process

› Ask the patient to list all medications and supplements being used

› Ask the patient about perceived efficacy of medications and overall sense of health

› Ask whether the patient regularly consumes foods and nutritional supplements known to interact with a medication in his/her regimen (e.g., grapefruit juice and/or vitamin and mineral supplements)

› If a drug-nutrient interaction is suspected, reinforce the clinician's explanation of the importance of avoiding or limiting specific dietary components while taking the medication. If the patient cannot or will not do so, collaborate with the treating clinician to offer an alternative medication
- If possible, medications such as warfarin that are often associated with a number of drug-nutrient interactions should be replaced in the patient's medical treatment with an alternative medication
- Medications should be re-evaluated regularly to screen for possible drug-nutrient interactions and, if possible, to minimize the number of medications the patient is taking

› Dispose of used procedure materials and PPE if used; perform hand hygiene

› Update the patient's plan of care, if appropriate, and document the drug-nutrient screening process in the patient's medical record, including the following information:
- Date and time the screening was performed
- Patient's response to the screening process, including his/her status and any concerns following the drug-nutrient screening
- Any unexpected patient events or outcomes, interventions performed, and if the treating clinician was notified
- Patient/family member education, including topics presented, response to education provided/discussed, plan for follow-up education, and details regarding any barriers to communication and/or techniques that promoted successful communication

## Other Tests, Treatments, or Procedures That May Be Necessary Before or After Screening for Drug-Nutrient Interactions

› Several laboratory tests may be performed, depending on specific medication regimen and/or suspected interaction (e.g., to determine drug level, electrolyte balance, clotting time)

› Some drugs may have their properties altered when crushed or diluted for administration in feeding tubes. To avoid precipitation of drugs that may clog feeding tubes and reduce drug effectiveness, staff may be educated on proper medication administration (i.e., not to add medications directly to enteral formulas, and to flush the tube with water before and after each medication is administered)

## What to Expect After Screening for Drug-Nutrient Interactions

› The patient will not experience a clinically significant drug-nutrientinteraction

› Foods that may interact with the patient's medication are identified and either omitted from the diet or replaced with other foods that are acceptable

› Medications that potentially interact with commonly ingested foods and nutrients may be replaced with other medications in the patient's medical treatment

## Red Flags

› Newly approved pharmaceutical agents may have drug-nutrient interactions that are not yet established. Carefully monitor the patient and report any adverse reactions to the clinician

## What Do I Need to Tell the Patient or Patient's Family?

› Encourage compliance with follow-up visits for ongoing evaluation of diet and medication regimen. Provide written information about potential drug-nutrient interactions and ways to minimize risk

› Reinforce the importance of carefully reading all medication labels, taking medications with a glass of water (unless otherwise instructed), and reporting to the treating clinician/pharmacist all medications, over-the-counter vitamin, mineral, and/or herbal supplements taken

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