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Guidelines on the Use of Digoxin		

Guidelines on the Nursing Care of Residents on Digoxin	
Developed by: Drogheda Services for Older People.	Date Developed: January 2016 October 2020, October 2021, Sept 2023
Developed By: Nursing Administration	Date Approved: January 2016 October 2020, October 2021, Sept 2023
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Digoxin

General

High Alert Medication: This medication bears a heightened risk of causing significant patient harm when it is used in error.

CAUTION OLDER PEOPLE ON DIGOXIN MAY EXPERIENCE HIGH RISK OF FALLING



Trade Name(s)

- Lanoxin

Pregnancy Category

Category C

Ther. Class.

antiarrhythmics
inotropics

Pharm. Class.

digitalis glycosides

Indications

- Heart failure.
- Atrial fibrillation and atrial flutter (slows ventricular rate).
- Paroxysmal atrial tachycardia.

Action

- Increases the force of myocardial contraction.
- Prolongs refractory period of the AV node.

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- Decreases conduction through the SA and AV nodes.

Therapeutic Effect(s):

Increased cardiac output (positive inotropic effect) and slowing of the heart rate (negative chronotropic effect).

Pharmacokinetics

Absorption: 60–80% absorbed after oral administration of tablets; 70–85% absorbed after administration of elixir; 80% absorbed from IM sites (IM route not recommended due to pain/irritation).

Distribution: Widely distributed; crosses placenta and enters breast milk.

Metabolism and Excretion: Excreted almost entirely unchanged by the kidneys.

Half-life: 36–48 hr (↑ in renal impairment).

TIME/ACTION PROFILE (antiarrhythmic or inotropic effects, provided that a loading dose has been given)

ROUTE	ONSET	PEAK	DURATION
Digoxin–PO	30–120 min	2–8 hr	2–4 days†
Digoxin–IM	30 min	4–6 hr	2–4 days†
Digoxin–IV	5–30 min	1–4 hr	2–4 days†

†Duration listed is that for normal renal function; in impaired renal function, duration will be longer

Contraindication/Precautions

Contraindicated in:

- Hypersensitivity;
- Uncontrolled ventricular arrhythmias;
- AV block (in absence of pacemaker);
- Idiopathic hypertrophic subaortic stenosis;
- Constrictive pericarditis;
- Known alcohol intolerance (elixir only).

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Use Cautiously in:

- Hypokalemia (↑ risk of digoxin toxicity);
- Hypercalcemia (↑ risk of toxicity, especially with mild hypokalemia);
- Hypomagnesemia (↑ risk of digoxin toxicity);
- Diuretic use (may cause electrolyte abnormalities including hypokalemia and hypomagnesemia);
- Hypothyroidism;
- **Geri:** Very sensitive to toxic effects; dose adjustments required for age-related ↓ in renal function and body weight;
- Myocardial infarction;
- Renal impairment (dose ↓ required);
- Obesity (dose should be based on ideal body weight);
- **OB:** Although safety has not been established, has been used without adverse effects on the fetus;
- **Lactation:** Similar concentrations in serum and breast milk result in subtherapeutic levels in infant, use with caution.

Adverse Reactions/Side Effects

CNS: *fatigue*, headache, weakness

EENT: blurred vision, yellow or green vision

CV: **ARRHYTHMIAS**, *bradycardia*, ECG changes, AV block, SA block

GI: *anorexia*, *nausea*, *vomiting*, diarrhea

Hemat: thrombocytopenia

Metabolic: electrolyte imbalances with acute digoxin toxicity

* **CAPITALS** indicate life-threatening.
Italics indicate most frequent.

Interactions

Drug-Drug

- **Thiazide** and **loop diuretics**, **piperacillin**, **ticarcillin**, **amphotericin B**, **corticosteroids**, and excessive use of **laxatives** may cause hypokalemia which may ↑ risk of toxicity.
- **Amiodarone**, some **benzodiazepines**, **cyclosporine**, **diphenoxylate**, **indomethacin**, **itraconazole**, **propafenone**, **quinidine**, **quinine**, **spironolactone**, and **verapamil** may ↑ levels and lead to toxicity (serum level monitoring/dose ↓ may be required).

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- Levels may be ↓ by some **antineoplastics** (**bleomycin, carmustine, cyclophosphamide, cytarabine, doxorubicin, methotrexate, procarbazine, vincristine**), activated charcoal, **cholestyramine, colestipol, kaolin/pectin, metoclopramide, penicillamine, rifampin, or sulfasalazine** .
- In a small percentage (10%) of patients gut bacteria metabolize digoxin to inactive compounds **macrolide anti-infectives** (**erythromycin, azithromycin, clarithromycin**) and **tetracyclines**, by killing these bacteria, will cause ↑ levels and toxicity; dose may need to be ↓ for up to 9 wk.
- Additive bradycardia may occur with **beta blockers, diltiazem, verapamil, clonidine**, and other **antiarrhythmics** (**quinidine, disopyramide**).
- Concurrent use of **sympathomimetics** may ↑ risk of arrhythmias.
- **Thyroidhormones** may ↓ therapeutic effects.

Drug-Natural Products:

- Licorice and stimulant natural products (aloe) may ↑ risk of potassium depletion.
- St. John's wort may ↓ levels and effect.

Drug-Food:

Concurrent ingestion of a high-fiber meal may ↓ absorption. Administer digoxin 1 hour before or 2 hours after such a meal.

Route/Dosage

For rapid effect, a larger initial loading/digitalizing dose should be given in several divided doses over 12–24 hr. Maintenance doses are determined for digoxin by renal function. All dosing must be evaluated by individual response. In general, doses required for atrial arrhythmias are higher than those for inotropic effect.

PO: Geriatric MEDICINE Initial daily dosage should not exceed 0.125 mg FOR OLDER PEOPLE.

Availability (generic available)

Tablets: 0.0625 mg 0.125 mg, 0.25 mg

Generic: All strengths **Elixir (lime flavor):** 0.05 mg/ML

Assessment

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- Monitor apical pulse for 1 full min before administering. Withhold dose and notify health care professional if pulse rate is <60 bpm in an adult, <70 bpm in a child, or <90 bpm in an infant. Also notify health care professional promptly of any significant changes in rate, rhythm, or quality of pulse.
- **Pedi:** Heart rate varies in children depending on age, ask physician to specify at what heart rates digoxin should be withheld.
- Monitor BP periodically in patients receiving IV digoxin.
- **Monitor ECG throughout IV administration and 6 hr after each dose. Notify health care professional if bradycardia or new arrhythmias occur.**
- Observe IV site for redness or infiltration; extravasation can lead to tissue irritation and sloughing.
- Monitor intake and output ratios and daily weights. Assess for peripheral edema, and auscultate lungs for rales/crackles throughout therapy.
- Before administering initial loading dose, determine whether patient has taken any digitalis preparations in the preceding 2–3 wk.
- **Geri:** Digoxin has been associated with an increased risk of falls in the elderly. Assess for falls risk and implement prevention strategies per facility protocol.

Lab Test Considerations:

Evaluate serum electrolyte levels (especially potassium, magnesium, and calcium) and renal and hepatic functions periodically during therapy. Notify health care professional before giving dose if patient is hypokalemic. Hypokalemia, hypomagnesemia, or hypercalcemia may make the patient more susceptible to digitalis toxicity. **Pedi:** Neonates may have falsely elevated serum digoxin concentrations due to a naturally occurring substance chemically similar to digoxin. **Geri:** Older adults may be toxic even when serum concentrations are within normal range; assess for clinical symptoms of toxicity even when serum levels are normal.

Toxicity Overdose:

Therapeutic serum digoxin levels range from 0.5–2 ng/mL. Serum levels may be drawn 6–8 hr after a dose is administered, although they are usually drawn immediately before the next dose. Bacteria in the GI tract can metabolize a substantial amount of digoxin before it is absorbed. Patients receiving erythromycin or tetracycline, which kill gut bacteria, can develop toxicity on their usual doses of digoxin. **Geri:** Older adults are at increased risk for toxic effects of digoxin (appears on Beers list) due to age-related decreased renal clearance, which can exist even when serum creatinine levels are normal. Digoxin requirements in the older adult may change and a formerly therapeutic dose can become toxic.

- Observe for signs and symptoms of toxicity. In adults and older children, the first signs of toxicity usually include abdominal pain, anorexia, nausea, vomiting, visual disturbances, bradycardia, and other arrhythmias. In infants and small children, the first symptoms of overdose are usually cardiac arrhythmias. If these appear, withhold drug and notify health care professional immediately.

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- If signs of toxicity occur and are not severe, discontinuation of digitalis glycoside may be all that is required.
- If hypokalemia is present and renal function is adequate, potassium salts may be administered. Do not administer if hyperkalemia or heart block exists. **Correct any other electrolyte abnormalities.**
- Correction of arrhythmias resulting from digitalis toxicity may be attempted with lidocaine, procainamide, quinidine, propranolol, or phenytoin. Temporary ventricular pacing may be useful in advanced heart block.
- Treatment of life-threatening arrhythmias may include administration of digoxin immune Fab (*Digibind*), which binds to the digitalis glycoside molecule in the blood and is excreted by the kidneys.

Potential Diagnoses

- Decreased cardiac output (Indications)

Implementation

- **Do not confuse Lanoxin with levothyroxine or naloxone.**
- **High Alert:** Digoxin has a narrow therapeutic range. Medication errors associated with digoxin include miscalculation of pediatric doses and insufficient monitoring of digoxin levels. **Have second practitioner independently check original order and dose calculations. Monitor therapeutic drug levels.**
- For rapid digitalization, the initial dose is higher than the maintenance dose; 50% of the total digitalizing dose is given initially. The remainder of the dose will be administered in 25% increments at 4–8 hr intervals.
 - When changing from parenteral to oral dose forms, dose adjustments may be necessary because of pharmacokinetic variations in percentage of digoxin absorbed: 100 mcg (0.1 mg) digoxin injection = 125 mcg (0.125 mg) tablet or 125 mcg (0.125 mg) of elixir.
- **PO:** Administer oral preparations consistently with regard to meals. Tablets can be crushed and administered with food or fluids if patient has difficulty swallowing. Use calibrated measuring device for liquid preparations; calibrated dropper is not accurate for doses of less than 0.2 mL or 10 mcg. Do not alternate between dose forms; bioavailability of capsules is greater than that of tablets or elixir.
- **IM:** Administer deep into gluteal muscle and massage well to reduce painful local reactions. Do not administer more than 2 mL of digoxin in each IM site. IM administration is not generally recommended.

Patient/Family Teaching

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- Instruct patient to take medication as directed, at the same time each day. Teach parents or caregivers of infants and children how to accurately measure medication. Take missed doses within 12 hr of scheduled dose or omit. Do not double doses. Consult health care professional if doses for 2 or more days are missed. Do not discontinue medication without consulting health care professional.
- **Teach patient to take pulse and to contact health care professional before taking medication if pulse rate is <60 or >100.**
- **Pedi:** Teach parents or caregivers that changes in heart rate, especially bradycardia, are among the first signs of digoxin toxicity in infants and children. Instruct parents or caregivers in apical heart rate assessment and ask them to notify health care professional if heart rate is outside of range set by health care professional before administering the next scheduled dose.
- Review signs and symptoms of digitalis toxicity with patient and family. Advise patient to notify health care professional immediately if these or symptoms of HF occur. Inform patient that these symptoms may be mistaken for those of colds or flu.
- Instruct patient to keep digoxin tablets in their original container and not to mix in pill boxes with other medications; they may look similar to and may be mistaken for other medications.
- Advise patient that sharing of this medication can be dangerous.
- Instruct patient to notify health care professional of all Rx or OTC medications, vitamins, or herbal products being taken and to consult health care professional before taking other Rx, OTC, or herbal products. Advise patient to avoid taking antacids or antidiarrheals within 2 hr of digoxin.
- Advise patient to notify health care professional of this medication regimen before treatment.
- Patients taking digoxin should carry identification describing disease process and medication regimen at all times.
- **Geri:** Review fall prevention strategies with older adults and their families.
- Emphasize the importance of routine follow-up exams to determine effectiveness and to monitor for toxicity.

Evaluation/Desired Outcomes

- Decrease in severity of HF.
- Increase in cardiac output.
- Decrease in ventricular response in atrial tachyarrhythmia.
- Termination of paroxysmal atrial tachycardia.