Genotropin, and other recombinant human growth hormones (somatotropins) are purified polypeptide hormones of recombinant DNA origin; somatropin contains the identical sequence of amino acids found in human growth hormone; human growth hormone assists growth of linear bone, skeletal muscle, and organs by stimulating chondrocyte proliferation and differentiation, lipolysis, protein synthesis, and hepatic glucose output; stimulates erythropoietin which increases red blood cell mass; exerts both insulin-like and diabetogenic effects; enhances the transmucosal transport of water, electrolytes, and nutrients across the gut.

**Pre-Authorization Criteria:**
Somatotropin is covered for the following indications: (Note: different formulations may apply to different conditions)

1) **Children:**
   a) Treatment of growth failure due to inadequate endogenous growth hormone secretion (Genotropin®, Humatrope®, Norditropin®, Nutropin®, Nutropin AQ®, Omnitrope®, Saizen®, Tev-Tropin®)
   b) Treatment of short stature associated with Turner syndrome (Genotropin®, Humatrope®, Norditropin®, Nutropin AQ®, Omnitrope®)
   c) Treatment of Prader-Willi syndrome (Genotropin®, Omnitrope®)
   d) Treatment of growth failure associated with chronic renal insufficiency (CRI) up until the time of renal transplantation (Nutropin®, Nutropin AQ®)
   e) Treatment of growth failure in children born small for gestational age who fail to manifest catch-up growth by 2 years of age (Genotropin®, Omnitrope®) or by 2-4 years of age (Humatrope®, Norditropin®)
   f) Treatment of idiopathic short stature (nongrowth hormone-deficient short stature) defined by height standard deviation score (SDS) ≤-2.25 and growth rate not likely to attain normal adult height (Genotropin®, Humatrope®, Nutropin®, Nutropin AQ®, Omnitrope®)
   g) Treatment of short stature or growth failure associated with short stature homeobox gene (SHOX) deficiency (Humatrope®)
   h) Treatment of short stature associated with Noonan syndrome (Norditropin®)

2) **Adults:**
   a) HIV patients with wasting or cachexia with concomitant antiviral therapy (Serostim®)
   b) Replacement of endogenous growth hormone in patients with adult growth hormone deficiency who meet both of the following criteria (Genotropin®, Humatrope®, Norditropin®, Nutropin®, Nutropin AQ®, Omnitrope®, Saizen®):
- Biochemical diagnosis of adult growth hormone deficiency by means of a subnormal response to a standard growth hormone stimulation test (peak growth hormone ≤5 mcg/L). Confirmatory testing may not be required in patients with congenital/genetic growth hormone deficiency or multiple pituitary hormone deficiencies due to organic diseases.

And

- Adult-onset: Patients who have adult growth hormone deficiency whether alone or with multiple hormone deficiencies (hypopituitarism) as a result of pituitary disease, hypothalamic disease, surgery, radiation therapy, or trauma

or

- Childhood-onset: Patients who were growth hormone deficient during childhood, confirmed as an adult before replacement therapy is initiated

c) Treatment of short-bowel syndrome (Zorbtive®)

Dosing: Adult:

Growth hormone deficiency: Adjust dose based on individual requirements: To minimize adverse events in older or overweight patients, reduced dosages may be necessary. During therapy, dosage should be decreased if required by the occurrence of side effects or excessive IGF-I levels.

Weight-based dosing:

Norditropin®: SubQ: Initial dose ≤0.004 mg/kg/day; after 6 weeks of therapy, may increase dose up to 0.016 mg/kg/day
Nutropin®, Nutropin® AQ: SubQ: ≤0.006 mg/kg/day; dose may be increased up to a maximum of 0.025 mg/kg/day in patients <35 years of age, or up to a maximum of 0.0125 mg/kg/day in patients ≥35 years of age
Humatrope®: SubQ: ≤0.006 mg/kg/day; dose may be increased up to a maximum of 0.0125 mg/kg/day
Genotropin®, Omnitrope®: SubQ: Weekly dosage: ≤0.04 mg/kg divided into equal doses 6-7 days per week; dose may be increased at 4- to 8-week intervals to a maximum of 0.08 mg/kg/week
Saizen®: SubQ: ≤0.005 mg/kg/day; dose may be increased to not more than 0.01 mg/kg/day after 4 weeks

Nonweight-based dosing: SubQ: Initial: 0.2 mg/day (range: 0.15-0.3 mg/day); may increase every 1-2 months by 0.1-0.2 mg/day based on response and/or serum IGF-I levels

Dosage adjustment with estrogen supplementation (growth hormone deficiency): Larger doses of somatropin may be needed for women taking oral estrogen replacement products; dosing not affected by topical products

HIV-associated adipose redistribution syndrome (HARS) (unlabeled use): Serostim®: SubQ: Induction: 4 mg once daily at bedtime for 12 weeks; Maintenance: 2 mg or 4 mg every other day at bedtime for 12-24 weeks. Note: Every-other-day dosing during induction has also been studied. Although a greater response was seen with daily dosing, it was associated with an increased incidence of adverse events. HIV patients with wasting or cachexia:

Serostim®: SubQ: 0.1 mg/kg once daily at bedtime (maximum: 6 mg/day). Alternately, patients at risk for side effects may be started at 0.1 mg/kg every other day. Patients who continue to lose weight after 12 weeks should be re-evaluated for opportunistic infections or other clinical events; rotate injection sites to avoid lipodystrophy. Adjust dose if needed to manage side effects.

Daily dose based on body weight:

<35 kg: 0.1 mg/kg
35-45 kg: 4 mg
45-55 kg: 5 mg
>55 kg: 6 mg

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Short-bowel syndrome: Zorbative®: SubQ: 0.1 mg/kg once daily for 4 weeks (maximum: 8 mg/day)

Fluid retention (moderate) or arthralgias: Treat symptomatically or reduce dose by 50%

Severe toxicity: Discontinue therapy for up to 5 days; when symptoms resolve, restart at 50% of dose. If severe toxicity recurs or does not disappear within 5 days after discontinuation, permanently discontinue treatment.

Dosing: Pediatric:
Growth hormone deficiency:
Genotropin®, Omnitrope®: SubQ: Weekly dosage: 0.16-0.24 mg/kg divided into equal doses 6-7 days per week
Humatrope®: SubQ: Weekly dosage: 0.18-0.3 mg/kg divided into equal doses 6-7 days per week
Norditropin®, Nutropin® AQ: SubQ: Weekly dosage: 0.3 mg/kg divided into equal daily doses; pubertal patients: ≤0.7 mg/kg divided into equal daily doses
Tev-Tropin®: SubQ: Up to 0.1 mg/kg/dose administered 3 days per week
Saizen®: I.M., SubQ: Weekly dosage: 0.18 mg/kg divided into equal daily doses or as 0.06 mg/kg/dose administered 3 days per week or as 0.03 mg/kg/dose administered 6 days per week

Note: Therapy should be discontinued when patient has reached satisfactory adult height, when epiphyses have fused, or when the patient ceases to respond. Growth of 5 cm/year or more is expected, if growth rate does not exceed 2.5 cm in a 6-month period, double the dose for the next 6 months; if there is still no satisfactory response, discontinue therapy

Chronic renal insufficiency (CRI): Nutropin®, Nutropin® AQ: SubQ: Weekly dosage: 0.35 mg/kg divided into daily injections; continue until the time of renal transplantation
Dosage recommendations in patients treated for CRI who require dialysis:
Hemodialysis: Administer dose at night prior to bedtime or at least 3-4 hours after hemodialysis to prevent hematoma formation from heparin
CCPD: Administer dose in the morning following dialysis
CAPD: Administer dose in the evening at the time of overnight exchange

Turner syndrome:
Genotropin®, Omnitrope®: SubQ: Weekly dosage: 0.33 mg/kg divided into equal doses 6-7 days per week
Humatrope®: SubQ: Weekly dosage: 0.375 mg/kg divided into equal doses 6-7 days per week
Norditropin®, SubQ: Up to 0.067 mg/kg/day
Nutropin®, Nutropin® AQ: SubQ: Weekly dosage: ≤0.375 mg/kg divided into equal doses 3-7 days per week

Prader-Willi syndrome: Genotropin®, Omnitrope®: SubQ: Weekly dosage: 0.24 mg/kg divided into equal doses 6-7 days per week

Small for gestational age:
Genotropin®, Omnitrope®: SubQ: Weekly dosage: 0.48 mg/kg divided into equal doses 6-7 days per week
Humatrope®: SubQ: Weekly dosage: 0.47 mg/kg divided into equal doses 6-7 days per week
Norditropin®, SubQ: Up to 0.067 mg/kg/day

Alternate dosing (small for gestational age): In older/early pubertal children or children with very short stature, consider initiating therapy at higher doses (0.067 mg/kg/day) and then consider reducing the dose (0.033 mg/kg/day) if substantial catch-up growth observed. In younger children (<4 years) with less severe short stature, consider initiating therapy with lower doses (0.033 mg/kg/day) and then titrating the dose upwards as needed.

Idiopathic short stature:
Genotropin®, Omnitrope®: SubQ: Weekly dosage: 0.47 mg/kg divided into equal doses 6-7 days per week
**Humatrope®**: SubQ: Weekly dosage: 0.37 mg/kg divided into equal doses 6-7 days per week
**Nutropin®, Nutropin AQ®**: SubQ: Weekly dosage: Up to 0.3 mg/kg divided into equal daily doses

**SHOX deficiency**: **Humatrope®**: SubQ: Weekly dosage: 0.35 mg/kg divided into equal doses 6-7 days per week

HIV patients with wasting or cachexia (unlabeled use): **Serostim®**: SubQ: Limited data; doses of 0.04 mg/kg/day were reported in five children, 6-17 years of age; doses of 0.07 mg/kg/day were reported in six children, 8-14 years of age

**Noonan syndrome**: **Norditropin®**: SubQ: Up to 0.066 mg/kg/day

**Dosing: Geriatric**: Patients ≥65 years of age may be more sensitive to the action of growth hormone and more prone to adverse effects; in general, dosing should be cautious, beginning at low end of dosing range.

**Dosing: Renal Impairment**: No dosage adjustment provided in manufacturer’s labeling (has not been studied).

**Dosing: Hepatic Impairment**: No dosage adjustment provided in manufacturer’s labeling (has not been studied).

**Dosage Forms: U.S.**
Excipient information presented when available (limited, particularly for generics); consult specific product labeling.  [DSC] = Discontinued product

**Solution, Subcutaneous**:
- **Norditropin FlexPro**: 5 mg/1.5 mL (1.5 mL); 10 mg/1.5 mL (1.5 mL); 15 mg/1.5 mL (1.5 mL) [contains phenol]
- **Norditropin NordiFlex Pen**: 30 mg/3 mL (3 mL) [contains phenol]
- **Nutropin AQ NuSpin 5**: 5 mg/2 mL (2 mL) [contains phenol]
- **Nutropin AQ NuSpin 10**: 10 mg/2 mL (2 mL) [contains phenol]
- **Nutropin AQ NuSpin 20**: 20 mg/2 mL (2 mL) [contains phenol]
- **Nutropin AQ Pen**: 10 mg/2 mL (2 mL)
- **Nutropin AQ Pen**: 20 mg/2 mL (2 mL) [contains phenol]
- **Omnitrope**: 5 mg/1.5 mL (1.5 mL) [contains benzyl alcohol]
- **Omnitrope**: 10 mg/1.5 mL (1.5 mL) [contains phenol]

**Solution Reconstituted, Injection**:
- **Humatrope**: 5 mg (1 ea)
- **Humatrope**: 6 mg (1 ea); 12 mg (1 ea); 24 mg (1 ea) [contains glycerin, metacresol]
- **Saizen**: 5 mg (1 ea); 8.8 mg (1 ea)
- **Saizen Click.Easy**: 8.8 mg (1 ea)

**Solution Reconstituted, Subcutaneous**:
- **Genotropin**: 5 mg (1 ea); 12 mg (1 ea) [contains metacresol]
- **Nutropin**: 10 mg (1 ea [DSC]) [contains benzyl alcohol]
- **Omnitrope**: 5.8 mg (1 ea)
- **Serostim**: 4 mg (1 ea); 5 mg (1 ea); 6 mg (1 ea)
- **Tev-Tropin**: 5 mg (1 ea)
- **Zorbtive**: 8.8 mg (1 ea) [contains benzyl alcohol]

**Solution Reconstituted, Subcutaneous [preservative free]**:
Genotropin MiniQuick: 0.2 mg (1 ea); 0.4 mg (1 ea); 0.6 mg (1 ea); 0.8 mg (1 ea); 1 mg (1 ea); 1.2 mg (1 ea); 1.4 mg (1 ea); 1.6 mg (1 ea); 1.8 mg (1 ea); 2 mg (1 ea)

Generic Equivalent Available: U.S.-No

**Administration:**

Do not shake; administer SubQ or I.M. (not all products are approved for I.M. administration). Rotate administration sites to avoid tissue atrophy. When administering to newborns, do not reconstitute with a diluent that contains benzyl alcohol; sterile water for injection may be used as an alternative.

Norditropin® cartridge must be administered using the corresponding color-coded NordiPen® injection pen.

Omnitrope®: Solution in the cartridges must be administered using the Omnitrope® pen; when installing a new cartridge, prime pen prior to first use.

Humatrope®: When administering for growth hormone deficiency, SubQ route is preferred

Tev-Tropin®: SubQ injections of solutions >1 mL not recommended.

**Revision History:**

Date Reviewed/No Updates: 1/13/15 by C. Sanders, MD
Date Approved by P&T Committee: 1/27/15
Date Reviewed/No Updates: 1/26/16 by C. Sanders, MD; R. Sterling, MD
Date Approved by P&T Committee: 1/26/16
Date Reviewed/No Updates: 1/24/17 by C. Sanders, MD; R. Sterling, MD
Date Approved by P&T Committee: 1/24/17
Date Reviewed/No Updates: 1/23/18 by C. Sanders, MD; R. Sterling, MD
Date Approved by P&T Committee: 1/23/18
Date Reviewed/No Updates: 1/22/19 by C. Sanders, MD; R. Sterling, MD
Date Approved by P&T Committee: 1/22/19

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