The Specialty Pharmacist’s Role in Monitoring and Counseling Patients with Growth Hormone Deficiency
DISCLAIMER

The information within this CME/CE activity is for continuing education purposes only, and is not intended to substitute for the medical judgment of the healthcare provider. Recommendations for use of any particular therapeutic agents or methods are based upon the best available scientific evidence and clinical guidelines. Reference in this activity to any specific commercial products, process, service, manufacturer, or company does not constitute its endorsement or recommendation.
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Director, Managed Care Pharmacy Consulting
OPTUM
Pittsburgh, Pennsylvania

Renee is Director, Managed Care Pharmacy Consulting, part of the Pharmacy & Analytics Strategy Group of OPTUMInsight. Currently she is focused on specialty pharmacy management strategies and solutions for both the medical and pharmacy benefits. She brings to the team over 25 years extensive & diverse experience in a variety of pharmacy practice settings including both provider & payer. She earned her Bachelor of Science degree in Pharmacy from Duquesne University.

Prior to joining OPTUMInsight, Renee worked as Director, Clinical Services for BioScrip, an independent specialty pharmacy provider where she provided clinical management and support across managed markets business units including utilization management strategies & solutions for payers. Renee developed short & long-term client solutions for the management of their specialty pharmacy spend including the development & implementation of clinical programs. Prior to BioScrip, Renee worked for the University of Pittsburgh Medical Center (UPMC) Health Plan as Director, Clinical Pharmacy. She led a staff of 9 pharmacists including 2 pharmacy residents where she was responsible for formulary development & management, drug utilization management including clinical program development, development & implementation of a physician education program, drug utilization reviews, clinical portion of drug rebate contracting, function & expansion of a pharmacy residency program, pharmacist patient outreach & integration of pharmacists among medical management staff. Renee’s experience in managed care also includes working as a clinical pharmacy specialist for Gateway Health Plan & Eckerd Health Services.
DISCLOSURES

- I do not intend to discuss an off-label use of a product during this activity.

- I currently have the following relevant financial relations to disclose:
  - Optum (employee; salary, stocks)
OBJECTIVES

1. Discuss the role of drugs in the treatment of Growth Hormone Deficiency

2. Describe Growth Hormone Deficiency treatment goals in children and adults

3. Identify current drug therapy options for treatment of Growth Hormone Deficiency

4. Explain the importance of communication and patient education in the management and counseling of patients with Growth Hormone Deficiency
What is growth hormone?

- Growth hormone is an anabolic steroid, produced & secreted by the pituitary gland, a small gland about the size of a dime located at the base of the center of the brain right behind the eyes.

- The hypothalamus controls the amount of growth hormone released by the pituitary gland.

- Growth hormone is released throughout our lifetime.
  - Higher amounts released during childhood especially during pubertal growth spurts.
  - Declining amounts as we age.

- Growth hormone is released into the bloodstream and then leaves as it enters the tissues where it exerts its effects.

- Growth hormone effects many tissues including bones, muscles, and fat.

- Growth hormone is needed for our entire life in order to maintain proper balance within these tissues.
What is the importance of growth hormone?

Growth Hormone (GH) helps bone, muscle & other tissues grow

In muscle GH stimulates

- Protein synthesis
- Fat metabolism

GH also

- Decreases blood sugar utilization
- Decreases glycogen synthesis
- Increases amino acid transport into cells & protein synthesis
- Increases fat breakdown & utilization
- Increases collagen synthesis & cartilage growth
- Increases retention of nitrogen, sodium, potassium and phosphorus
- Increases kidney flow & filtration
Growth Hormone

- Secreted by the pituitary gland
- Stimulates release of growth factors (somatomedins, e.g., IGF-1) from the liver
- IGF-1 is responsible for growth in bones and other tissues
- Growth factors create the cascade of events needed for increased concentrations of GH

Source: www.magicfoundation.org
GH Production & Release

Controlled via negative feedback

- Hypothalamus releases growth hormone releasing hormone (GHRH)
- GH is secreted by the pituitary in response to GHRH
- Somatostatin suppresses the release of GH
- When somatomedin levels are high, GH levels are reduced by stimulating the production of somatostatin
What is growth hormone deficiency?

Growth hormone deficiency (GHD) is a medical condition in which the body produces inadequate amounts of growth hormone

- Affects both children & adults

Growth hormone is secreted by the pituitary gland which is located at the base of the brain

Growth hormone is needed for

- Normal growth & development in children
- Maintenance of proper amounts of body fat, muscle & bone in adults
Causes & Types of GHD

Although the cause of GHD is sometimes unknown, it can be categorized three ways

- **Congenital** - present from birth due to genetic mutations or structural defects in the brain
- **Acquired** - result of trauma, pituitary tumor, radiation to the head, infection
- **Idiopathic** - unknown cause

There are 2 main types of GHD

- Childhood-onset
- Adult-onset
Incidence in the United States

- Incidence of short stature as a result of GHD is estimated to range from 1 in 4,000 to 1 in 10,000 children
- Approximately 20,000 children per year receive growth hormone therapy
  - Approximately 4000 new cases diagnosed per year
- Approximately 35,000 adults have GHD
  - Approximately 6000 new cases diagnosed per year

GHD – Affected Populations

• Congenital GHD and most cases of idiopathic GHD are thought to be present from birth

• Diagnosis of idiopathic GHD often is delayed until child’s short stature is noticed
  • Starting school – around 5 years of age
  • Delayed pubertal growth spurt
    • 10-13 years of age for girls
    • 12-16 years of age for boys

Source: www.rarediseases.org
Symptoms of GHD

Childhood-Onset

- Slow growth (< 2 in. / year)
- Short height
- Increased fat around waist & face
- Delayed onset of puberty
- Delayed tooth development

Adult-Onset

- Low energy
- Decreased strength & exercise tolerance
- Decreased muscle mass
- Weight gain
- Depression or anxiety
- Thin & dry skin
What are the risks for not treating GHD?

Children

- Short stature
  - Inability to reach adult predicted height
- Delayed puberty

Adults

- Decreased bone mineral density leading to Increased risk of osteoporotic fractures
- Impaired cardiac function
- Central obesity
- Increased insulin sensitivity
- Decreased exercise capacity
- Emotional disturbances
- Decreased quality of life
What treatments are available for GHD?

Multiple brands of recombinant human (rDNA) growth hormone (somatropin) are available today (e.g., Humatrope, Norditropin, Genotrope)

- Although all products are somatropin they vary in
  - Strength
  - Dosage form
  - Dosing devices
  - FDA approved indications
What are the goals of treatment?

Childhood-Onset

• Promote linear growth
• Restore body composition

Adult-Onset

• Improve conditioning & strength
• Restore normal body composition
• Improve quality of life
Childhood Onset GHD Facts

A child’s height is controlled by genetics

• Children of short parents usually do not grow up to be tall

Children grow at different rates

• Highly dependent on when they go through puberty

Short stature is defined as standing height

• More than 2 standard deviations below the mean or
• Below the 2.5 percentile for sex

Growth failure is a pathological state of abnormally low growth rate over time
FDA Approved Indications for GH

Growth hormone is used to supplement or replenish growth hormone in children and adults who do not make enough growth hormone on their own.

Pediatric Indications

- Growth failure due to
  - Growth hormone deficiency (GHD)
  - Small for Gestational Age (SGA)
  - Turner syndrome
  - SHOX
  - Noonan Syndrome
  - Chronic kidney disease (before transplantation)
  - Idiopathic Short Stature
  - Prader-Willi Syndrome (PWS)

Adult Indications

- Adult or childhood –onset GHD
Short Stature due to Other Disorders
Small for Gestational Age (SGA)

- Any infant whose birth weight and/or length is < 3rd percentile (adjusted for prematurity)
  - Low birth weight, short birth length
  - Failure to achieve catch-up growth within the first 2 years of life

Tuner Syndrome

- Chromosome disorder due to complete or partial absence of the second sex chromosome
- Affects 1 in 2,500 females
- Characterized by
  - Short stature – average height for adult female without GH is 4.8”
  - Lack of sexual development at puberty
- Specific physical characteristics
  - Webbed neck, low hairline, low-set ears
  - Narrow high-arched palate & receding lower jaw
  - Slight droop to eyes
  - Arms which turn out slightly at elbows, short 4th metacarpals
  - Heart defects, kidney abnormalities
Short Stature due to Other Disorders (Cont.)

SHOX – short stature homebox – containing gene deficiency

- Short stature caused by mutation in one copy of the SHOX gene

Noonan-Syndrome – genetic disorder evident at birth, affects 1 in 1,000-2,500

- Specific physical characteristics: distinct facial features, webbed neck, low posterior hairline, typical chest deformity, short stature
- Many infants have cardiac defects (e.g., pulmonary valvular stenosis)

Chronic Kidney Disease – growth retardation very common, leads to decreased adult height

- Failure to stimulate IGF-1 despite normal levels of GH

Idiopathic Short Stature – having height significantly shorter than the normal population

- -2.25 SD, shorter than 1.2% population of same age & gender
- Poor adult height prediction (< 5’4” males, 4’11” females)
- No detectable cause for short stature
Prader-Willi Syndrome (PWS) – genetic disorder, results from an abnormality on the 15th chromosome

- Affects approximately 1 in 12,000 - 15,000
- Occurs equally in gender & race
- Characterized by
  - Low muscle tone
  - Short stature
  - Incomplete sexual development
  - Chronic feeling of hunger along with a metabolism that uses fewer calories than normal which leads to excessive eating and life-threatening obesity
- Most common known genetic cause of life-threatening childhood obesity

Short Stature due to Other Disorders (cont.)
Establish child is short

• Documentation of growth over time

Obtain child & family history

• Height & weight at birth
• Height & weight parents, grandparents

Establish target height for child

• Height Mom+ Dad
• Girls: subtract 13, divide by 2
• Boys: add 13, divide by 2
What is considered normal growth?

Normal growth in height for age

- 10% or more decrease in these levels is cause for concern

<table>
<thead>
<tr>
<th>Age</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 6 months of life</td>
<td>16 – 17cm (6.3-6.6 inches)</td>
</tr>
<tr>
<td>Second 6 months of life</td>
<td>8cm (3 inches)</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Year</td>
<td>\geq 8cm (3 inches)</td>
</tr>
<tr>
<td>3\textsuperscript{rd} year</td>
<td>7cm (2.7 inches)</td>
</tr>
<tr>
<td>4-10 years old</td>
<td>Average of 5-6cm (2 inches)</td>
</tr>
</tbody>
</table>

Most children grow on average two more yrs. following their pubertal growth spurt

- Girls are usually done around 12-14 years old
- Boys are usually done around 14-16 years old

Source: [www.rarediseases.org](http://www.rarediseases.org)
Growth Chart Examples
Lab Evaluation of GHD in a Child

CBC & lab work-up
- IGF-1, IGFBP-3
- Karyotype by G-banding
- IGA, IGG
- Wintrobe sedimentation rate
- Thyroid levels

Provocative Stimulation Testing
- Use of arginine, clonidine, levodopa or insulin
- Blood samples at timed intervals
- < 10µ/L kids, <5µ/L adults

X-ray left hand/wrist
- Establish bone age
- Confirm status of growth plates
Adult Growth Hormone Deficiency

Adult GHD can be classified as two types

- **Pituitary disease from known causes**: pituitary tumor, pituitary damaged by surgery, hypothalamic disease, irradiation or trauma
- **Re-confirmed childhood GHD** confirmed through stimulation testing with a peak value < 5µg/L

GHD in adults has consequences which reflect the absence of both GH and IGF-1, both of which are responsible for different biologic effects

- Absence of which can lead to
  - Increased body fat, especially visceral fat
  - Decrease in muscle mass leading to poor exercise performance
  - Decrease in bone density
  - Increase in several cardiac risk factors
Why is GH used in adults?

GH in Adults is Useful for

- Increasing bone density
- Increasing lean tissue
- Decreasing adipose tissue
- Bolstering cardiac contractility
- Improving mood & motivation
- Enhancing exercise capacity
Diagnosis of GHD in an Adult

CBC & lab work-up
- Low IGF-1 and
- Deficiency of 3 or more pituitary hormones
- Deficiency of 2 or more pituitary hormones + stim test

MRI of hypothalamic pituitary region
- Pituitary tumor
- Pituitary damaged by surgery, trauma, irradiation or hypothalamic disease

Re-confirmed childhood GHD
- Confirmed through stim test
- Peak value <5µ/L
GH Use in Adults

GH Dosing

- Initiate at a low dose, titrate slowly
- Starting dose 0.1 to 0.3mg/day
- Dosing is variable, women tend to require higher doses

Measurable Endpoints for GH replacement in Adults

- IGF-1 in normal range
- Normalization of pituitary hormones
- Improvement in blood lipid levels
- Improvement in waste to hip ratio
- Improvement in body composition
- Improvement in quality of life
- Reduction in cardiovascular risk factors

Source: American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for Growth Hormone Use in Adults & Children 2003 Update, ENDOCRINE PRACTICE Vol. 9 No. 1 January/February 2003
<table>
<thead>
<tr>
<th>Drug Name</th>
<th>FDA Approved Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Genotropin</strong></td>
<td><strong>Pediatric</strong></td>
</tr>
<tr>
<td></td>
<td>• Growth failure due to growth hormone deficiency (GHD), Prader-Willi syndrome (PWS), Small for Gestational Age (SGA) &amp; Idiopathic Short Stature (ISS)</td>
</tr>
<tr>
<td></td>
<td><strong>Adult</strong></td>
</tr>
<tr>
<td></td>
<td>• Adult or childhood onset GHD</td>
</tr>
<tr>
<td><strong>Humatrope</strong></td>
<td><strong>Pediatric</strong></td>
</tr>
<tr>
<td></td>
<td>• Short stature or growth failure due to GHD, Turner Syndrome, ISS, SHOX deficiency, failure to catch-up in height after SGA at birth</td>
</tr>
<tr>
<td></td>
<td><strong>Adult</strong></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td><strong>Norditropin</strong></td>
<td><strong>Pediatric</strong></td>
</tr>
<tr>
<td></td>
<td>• Growth failure due to GHD</td>
</tr>
<tr>
<td></td>
<td>• Short stature associated with Noonan Syndrome, Turner Syndrome</td>
</tr>
<tr>
<td></td>
<td>• Short stature born SGA with no catch-up growth by age 2-4 years</td>
</tr>
<tr>
<td></td>
<td><strong>Adult</strong></td>
</tr>
<tr>
<td></td>
<td>• Adult or childhood onset GHD</td>
</tr>
<tr>
<td>Drug Name</td>
<td>FDA Approved</td>
</tr>
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</tr>
<tr>
<td><strong>Nutropin</strong></td>
<td>Pediatric</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
</tr>
<tr>
<td><strong>Omnitrope</strong></td>
<td>Pediatric</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
</tr>
<tr>
<td><strong>Saizen</strong></td>
<td>Pediatric</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
</tr>
<tr>
<td><strong>Tev-Tropin</strong></td>
<td>Pediatric</td>
</tr>
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</table>
## GH – Very Different Indications

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>FDA Approved Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serostim</td>
<td>Treatment of HIV patients with wasting or cachexia to increase lean body mass &amp; body weight and improve physical endurance</td>
</tr>
<tr>
<td>Zorbtive</td>
<td>Treatment of short bowel syndrome in patients receiving specialized nutritional support</td>
</tr>
</tbody>
</table>

- Both are somatropin of rDNA origin
- They are not used for GHD or other related growth failure diagnoses
- Both have very specific FDA approved indications
# GH – Dosage Forms

## Solution, Subcutaneous

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Available Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norditropin FlexPro</td>
<td>5,10,15mg/1.5ml</td>
</tr>
<tr>
<td>Norditropin Noridflex Pen</td>
<td>30mg/3ml</td>
</tr>
<tr>
<td>Nutropin AQ</td>
<td>10mg/2ml</td>
</tr>
<tr>
<td>Nutropin AQ Pen</td>
<td>10, 20mg/2ml</td>
</tr>
<tr>
<td>Nutropin AQ NuSpin</td>
<td>5, 10, 20mg/2ml</td>
</tr>
<tr>
<td>Omnitrope</td>
<td>5,10mg/1.5ml</td>
</tr>
</tbody>
</table>

## Solution, Reconstituted, Injection

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Available Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humatrope</td>
<td>5,6,12,24mg</td>
</tr>
<tr>
<td>Saizen</td>
<td>5, 8,8mg</td>
</tr>
<tr>
<td>Saizen ClickEasy</td>
<td>8,8mg</td>
</tr>
</tbody>
</table>

Source: Lexicomp online, [www.onlinelexi.com](http://www.onlinelexi.com), accessed 6/2013
## GH – Dosage Forms

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Available Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotropin</td>
<td>5,12mg</td>
</tr>
<tr>
<td>Nutropin</td>
<td>10mg</td>
</tr>
<tr>
<td>Omnitrope</td>
<td>5.8mg</td>
</tr>
<tr>
<td>Serostim</td>
<td>4,5,6mg</td>
</tr>
<tr>
<td>Tev-Tropin</td>
<td>5mg</td>
</tr>
<tr>
<td>Zorbttive</td>
<td>8.8mg</td>
</tr>
</tbody>
</table>

### Solution, Reconstituted, Subcutaneous (preservative-free)

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Available Strengths</th>
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</thead>
<tbody>
<tr>
<td>Genotropin Miniquick</td>
<td>0.2,0.4,0.6,0.8,1,1.2,1.4,1.6,1.8,2mg</td>
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</tbody>
</table>

Source: Lexicomp online, [www.onlinelexi.com](http://www.onlinelexi.com), accessed 6/2013
<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Manufacturer</th>
<th>Delivery Device</th>
<th>Patient Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saizen 5mg, 8.8mg Saizen Click Easy 8.8mg</td>
<td>EMD Serono</td>
<td>• cool.click (needle-free device)</td>
<td>Connections for Growth 800-582-7989</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• easypod (automated electronic device)</td>
<td></td>
</tr>
<tr>
<td>Humatrope 5, 6, 12, 24mg</td>
<td>Eli Lilly</td>
<td>• Humatro Pen syringe &amp; needle</td>
<td>Humatrope Reimbursement Center (HRC) 800-642-2340 Injection Training 877-997-8253</td>
</tr>
<tr>
<td>NutropinAQ 10mg/2ml NutropinAQ Pen 10, 20mg/2ml NutropinAQ NuSpin 5, 10, 20mg/2ml</td>
<td>Genentech</td>
<td>• AQ pen device</td>
<td>NutropinGPS.com 1-866-688-7674</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• AQ NuSpin (disposable prefilled pen)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Lexicomp online, [www.onlinelexi.com](http://www.onlinelexi.com), accessed 6/2013
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<th>Patient Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norditropin FlexPro 5,10,15mg/1.5ml</td>
<td>Novo Nordisk</td>
<td>Nordipen, NordiPenMate</td>
<td>All Support Services 888-668-6444</td>
</tr>
<tr>
<td>Norditropin Nordi-Flex 5,10,15mg/1.5ml 30mg/3ml Norditropin Cartridges 5,15mg/1.5ml</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Genotropin Lyophilized powder 5,12mg Genotropin MiniQuick 0.2,0.4,0.6,0.8,1mg 1.2,1.4,1.6,1.8,2mg</td>
<td>Pfizer</td>
<td>Pen5, Pen12, Mini-Quick, Mixer</td>
<td>Bridge Program 800-645-1280</td>
</tr>
<tr>
<td>Omnitrope</td>
<td>Sandoz</td>
<td>Pen5, ,Pen10 (syringe &amp; needle)</td>
<td>OmniSource 877-456-6794</td>
</tr>
<tr>
<td>Tev-Tropin</td>
<td>Teva</td>
<td>T-Jet Needle-free device</td>
<td>Growth Solutions 866-838-8767</td>
</tr>
<tr>
<td>Drug Name</td>
<td>Pediatric Dosing</td>
<td>Adult Dosing</td>
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</tr>
<tr>
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<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Genotropin</td>
<td><strong>GHD</strong> 0.16mg/kg/week</td>
<td><strong>Non-wt based:</strong> 0.2mg/day range 0.15 - 0.30mg/day</td>
<td></td>
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<tr>
<td></td>
<td><strong>PWS</strong> 0.24mg/kg/week</td>
<td><strong>Wt based:</strong> not more than 0.04mg/kg/week may increase to</td>
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<tr>
<td></td>
<td><strong>SGA up to</strong> 0.48mg/kg/week</td>
<td>not more than 0.08mg/kg/week at 4-8 week intervals</td>
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<tr>
<td></td>
<td><strong>TS</strong> 0.33mg/kg/week</td>
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<td></td>
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<tr>
<td></td>
<td><strong>ISS</strong> 0.47mg/kg/week</td>
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<td></td>
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<tr>
<td></td>
<td>Divided into 6-7 doses/week</td>
<td></td>
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<tr>
<td>Humatrope</td>
<td><strong>GHD</strong> 0.18mg – 0.30mg/kg/week</td>
<td><strong>Non-wt based:</strong> 0.2mg/day range 0.15 - 0.30mg/day</td>
<td></td>
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<tr>
<td></td>
<td><strong>TS</strong> up to 0.375mg/kg/week</td>
<td><strong>Wt based:</strong> not more than 0.006mg/kg/day may increase to</td>
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<tr>
<td></td>
<td><strong>ISS</strong> up to 0.37mg/kg/week</td>
<td>max of 0.0125mg/kg/day</td>
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<td></td>
<td><strong>SHOX</strong> 0.35mg/kg/week</td>
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<tr>
<td></td>
<td><strong>SGA</strong> up to 0.47mg/kg/week</td>
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<tr>
<td></td>
<td>Divided into 6-7 doses/week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noridtropin</td>
<td><strong>GHD</strong> 0.024-0.034mg/kg/day</td>
<td><strong>Non-wt based:</strong> 0.2mg/day range 0.15 - 0.30mg/day</td>
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<tr>
<td></td>
<td><strong>Noonan</strong> up to 0.066mg/kg/day</td>
<td><strong>Wt based:</strong> 0.004mg/kg/day may increase up to max</td>
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<tr>
<td></td>
<td><strong>TS</strong> up to 0.067mg/kg/day</td>
<td>0.016mg/kg/day after 6 weeks</td>
<td></td>
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<tr>
<td></td>
<td><strong>SGA</strong> up to 0.067mg/kg/day</td>
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<tr>
<td></td>
<td>Divided into 6-7 doses/week</td>
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<td></td>
</tr>
<tr>
<td>Drug Name</td>
<td>Pediatric Dosing</td>
<td>Adult Dosing</td>
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<tr>
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<td>------------------</td>
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</tbody>
</table>
| **Nutropin** | GHD up to 0.3mg/kg/week  
Pubertal pts up to 0.7mg/kg/week  
ISS up to 0.3mg/kg/week  
CKD up to 0.35mg/kg/week  
TS up to 0.375mg/kg/week | **Non wt-based:** 0.2mg/day  
range 0.15 – 0.30mg/day  
**Wt based:** not more than 0.006mg/kg/day may increase to max of 0.025mg/kg/day ≤35  
0.0125mg/kg/day if >35 yrs old |
| **Omnitrope** | GHD 0.16-0.24mg/kg/week  
PWS 0.24mg/kg/week  
SGA up to 0.48mg/kg/week  
TS 0.33mg/kg/week  
ISS up to 0.47mg/kg/week  
Divided into 6-7 doses/week | Not more than 0.04mg/kg/week may increase to max of 0.08mg/kg/week |
| **Saizen** | 0.18mg/kg/week in equal doses on 3 alternate days 6 times per week or daily | **Non wt-based:** 0.2mg/day  
range 0.15 – 0.30mg/day  
**Wt based:** Not more than 0.005mg/kg/day may increase to no more than .01mg/kg/day after 4 weeks |
| **Tev-Tropin** | Up to 0.1mg/kg 3 times per week | N/A |
GH Therapy Challenges
Diagnosing, treating & prescribing growth hormone involves multiple stakeholders

• **Patient**
  - Typically detected by pediatrician & referred to endocrinologist

• **Provider**
  - Typically diagnosed and treated by a specialist – endocrinologist
  - Initial diagnosis & follow-up often requires lab testing and documentation including blood work, X-Ray of left hand/wrist, MRI, etc.
  - Typically follow-up every 3-6 months with routine blood work and lab testing required

• **Pharmacy**
  - Typically dispensed from a specialty pharmacy
  - Requires specialized handling/storage (e.g., refrigeration)
  - Injection training may be needed

• **Insurer**
  - Typically prior authorization is required
  - Documentation & lab values often needed to complete review
  - Sometimes preferred GH therapies exist requiring additional coordination
Specialty Pharmacist is Key to GH Coordination
GH Prescribing Process

GH Rx

• MD writes rx
• Starts PA process

Insurer

• Requires clinical info & documentation
• Reviews info
• Approves or denies

Specialty Pharmacy

• Coordinates PA decision
• Patient assistance
• Injection training

4/3/2014
Management Strategies for GH

Given the high cost and potential for misuse of GH, insurers typically utilize multiple strategies to manage as well as ensure appropriate use of GH:

- Children – once diagnosed & GH is prescribed utilization continues monthly until closure of growth plates signifying the end of growth potential
  - Confirmed through X-Ray of left hand/wrist
  - Usually around age 12-14 for girls & 14-16 for boys
- Adults – duration of use varies depending on diagnosis for use
  - Can be chronic in patients who do not produce sufficient amounts of GH as in the cases of pituitary tumor, or damage to pituitary
  - Misuse is common, given the anti-aging benefits & increase in lean muscle mass as well as increase in energy & exercise capacity

Management Strategies include:

- Prior authorization – ensure appropriate use including diagnosis & duration of treatment
- Preferred therapies – limiting coverage to most cost-effective product(s)
## Product Support Programs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Website</th>
<th>Patient Support</th>
<th>Copay Card</th>
<th>Patient Assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotropin</td>
<td><a href="http://www.genotropin.com">www.genotropin.com</a></td>
<td>Yes</td>
<td>$125/month 12 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Humatrope</td>
<td><a href="http://www.humatrope.com">www.humatrope.com</a></td>
<td>Yes</td>
<td>Not listed</td>
<td>Yes</td>
</tr>
<tr>
<td>Norditropin</td>
<td><a href="http://www.norditropin-us.com">www.norditropin-us.com</a></td>
<td>Yes</td>
<td>$125/month Nordisure</td>
<td>Yes Jump-start</td>
</tr>
<tr>
<td>Nutropin</td>
<td><a href="http://www.nutropin.com">www.nutropin.com</a></td>
<td>Yes</td>
<td>Up to $4000 in copay assist.</td>
<td>Yes GATCF</td>
</tr>
<tr>
<td>Omnitrope</td>
<td><a href="http://www.omnitrope.com">www.omnitrope.com</a></td>
<td>Yes</td>
<td>$250/month 12 months</td>
<td>Yes</td>
</tr>
<tr>
<td>Saizen</td>
<td><a href="http://www.saizenus.com">www.saizenus.com</a></td>
<td>Yes</td>
<td>$125/month 12 months</td>
<td>Not listed</td>
</tr>
<tr>
<td>Tev-Tropin</td>
<td><a href="http://www.tev-tropin.com">www.tev-tropin.com</a></td>
<td>Yes</td>
<td>Not listed</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Summary

Growth Hormone Deficiency is a medical condition which affects both children & adults and often requires treatment with growth hormone drug therapy.

GHD in children typically results in short stature & failure to reach adult predicted height:

- Confirmation of GHD is required prior to start of GH therapy
- Supplementation with GH is only needed until growth plates close

GHD in adults has specific causes with measurable values for diagnosis as well as measurable endpoints for evaluation of medical benefits for its use:

- GH does offer positive effects when used in adults which can contribute to inappropriate or misuse

GH use involves multiple stakeholders and coordination of management can be achieved by the specialty pharmacist.
References

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- [www.precisionnutrition.com/all-about-gh](http://www.precisionnutrition.com/all-about-gh), accessed 06/2013
- [www.jeffersonpharma.com/GHRH.html](http://www.jeffersonpharma.com/GHRH.html), accessed 06/2013
- [www.rarediseases.org](http://www.rarediseases.org), accessed 06/2013
- [http://turnersyndrome.org](http://www.turnersyndrome.org), accessed 06/2013
- [www.dukehealth.org](http://www.dukehealth.org), accessed 6/2013
- [www.pwsausa.org](http://www.pwsausa.org), accessed 6/2013
- AACE Medical Guidelines for Clinical Practice for Growth Hormone Use in Adults and Children – 2003 Update, ENDOCRINE PRACTICE, Vol 9 No. 1 Jan/Feb 2003

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References (Cont.)

- Genotropin Product Package Insert, Pfizer, revised Feb. 2012
- Humatrope Product Package Insert, Eli Lilly & Co. revised 8/1/2011
- Norditropin Product Package Insert, Novo Nordisk Healthcare AG, revised June 2011
- Nutropin Product Package Insert, Genentech Inc. 2012
- Omnitrope Product Package Insert, Sandoz Inc. revised 10/2011
- Saizen Product Package Insert, EMD Serono
- Tev-Tropin Product Package insert, Teva, 2012
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