IDF GUIDE FOR NURSES

on Immune Globulin Therapy for Primary Immunodeficiency Diseases

SECOND EDITION

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IMMUNE DEFICIENCY FOUNDATION
40 West Chesapeake Avenue, Suite 308
Towson, MD 21204
800-296-4433
410-321-8647
410-321-9165 (Fax)
www.primaryimmune.org
idf@primaryimmune.org
INTRODUCTION

Immune Deficiency Foundation

The Immune Deficiency Foundation (IDF) is the national non-profit patient organization dedicated to improving the diagnosis and treatment of primary immunodeficiency diseases through research, education and advocacy. IDF was founded in 1980 by parents of children with primary immunodeficiencies and their physicians. At that time, there were few treatments for primary immunodeficiency diseases; almost no educational materials for patients, no public advocacy initiatives, and little research being done. Over the years, IDF has worked on these issues and made tremendous strides in the following areas:

- Helping the patient and professional communities gain a broader understanding of primary immunodeficiency diseases through our education and outreach efforts;
- Promoting, participating in, and funding research that has helped characterize primary immunodeficiency diseases and given patients and physicians substantially improved treatment options;
- Addressing patient needs through public policy programs on a national level by focusing on issues such as insurance reimbursement, patient confidentiality, ensuring the safety and availability of immune globulin therapy, and maintaining and enhancing patient access to a full range of treatment options.

There are over 130 different primary immunodeficiency diseases and they affect approximately 250,000 people in the United States. These individuals live throughout the country and often find it difficult to receive specialized healthcare. IDF has documented inordinate delays in reaching proper diagnoses and the lack of availability of appropriate treatment. Individuals affected by primary immunodeficiency diseases may also experience difficulties financing their healthcare, finding instructional materials on their diseases and educating school personnel and members of the larger community about these diseases. Feeling isolated, patients need assistance locating others with similar diseases, with whom to share their experiences. The goal of IDF is to help individuals overcome these difficulties and live healthy and productive lives.

IDF Nurse Advisory Committee

A Resource for Nurses

The Immune Deficiency Foundation established the Nurse Advisory Committee in 1999 to improve the quality of healthcare and education provided by nurses for patients with primary immunodeficiency diseases. The Nurse Advisory Committee increases awareness of primary immunodeficiency diseases through professional education and outreach on a national and international level. The Committee is also instrumental in increasing educational and peer support opportunities for individuals and families. The members collaborate with IDF to develop patient educational programs in their own communities and throughout the country.

The Nurse Advisory Committee is available as a resource for nurses administering IVIG or treating patients with primary immunodeficiency diseases. They can be reached by contacting IDF and the staff will assist in contacting a member of the committee. The activities of the Nurse Advisory Committee are made possible by an unrestricted educational grant by CSL Behring.

The Nurse Advisory Committee is proud to offer this guide to help nurses to administer immune globulin replacement therapy in the safest and most effective way. Immune globulin replacement therapy is medically indicated for the majority of patients with primary immunodeficiency diseases (PIDD). Many patients with PIDD are treated with IgG infusions either in the hospital, physician’s office/infusion suite, or in the home. Since most of these infusions are administered by nursing professionals, nurses are in a unique position to improve the treatment experiences and provide an improved quality of life for patients living with PIDD.
CLINICAL USES FOR IMMUNE GLOBULIN REPLACEMENT THERAPY

Concentrated human IgG preparations first became available during World War II and were used for prophylaxis against infectious diseases such as hepatitis, measles and polio. The use of IgG as replacement therapy for primary immunodeficiency was originated by Dr. Bruton with his description of the first case of X-linked agammaglobulinemia in 1952. Initially, IgG was given only by subcutaneous or intramuscular injections. These injections were painful, and the maximum doses that could be given were limited. In the early 1980’s, preparations that could be safely given by the intravenous route were first licensed in the US. The IV route was generally tolerated by most patients, and larger doses could be given, with resulting improvements in the patients’ conditions. These intravenous preparations, often termed IVIG or IGIV, (the term IVIG will be used throughout this publication) have become the mainstay of treatment for PIDD in the US. In addition to preparations intended for IV use, IgG concentrates for intramuscular and subcutaneous use are also available in the US. All preparations currently available in this country are made from 40,000 to 60,000 units of plasma and are thus expected to contain antibodies against a broad spectrum of infectious agents. All preparations contain > 95% IgG. Most also contain some IgA and trace amounts of other plasma proteins.

IVIG is indicated for various primary and secondary immunodeficiency conditions in which patients do not make sufficient amounts of specific antibodies to adequately protect themselves from infectious diseases, or the antibody that is made does not function correctly, or has poor memory. IVIG is also used in a variety of conditions other than PIDD, in which it is used for anti-inflammatory and/or immunomodulatory effects. Many of these uses are “off-label,” which means that the Food and Drug Administration (FDA) has not approved the use of IVIG for those particular conditions.

In the United States, there are currently six clinical indications for which the FDA has licensed IVIG for use.

<table>
<thead>
<tr>
<th>Clinical Condition</th>
<th>IG Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary immunodeficiency</td>
<td>Replacement therapy to prevent infection</td>
</tr>
<tr>
<td>Idiopathic thrombocytopenia purpura (ITP)</td>
<td>Increase platelet counts</td>
</tr>
<tr>
<td>Kawasaki disease</td>
<td>Prevent coronary artery aneurysms</td>
</tr>
<tr>
<td>B-cell chronic lymphocytic leukemia</td>
<td>Prevent recurrent bacterial infections</td>
</tr>
<tr>
<td>HIV infection in children</td>
<td>Reduce infections</td>
</tr>
<tr>
<td>Hematopoietic stem cell (bone marrow) transplantation</td>
<td>Prevent infections, pneumonitis and acute graft-versus-host disease (GVHD) in post transplant recipients</td>
</tr>
</tbody>
</table>

**Replacement Therapy Uses**

### Primary Immunodeficiency

- Agammaglobulinemia (X-linked and autosomal forms)
- Hypogammaglobulinemia with impaired specific antibody production
  - Common variable immunodeficiency
  - Hyper IgM syndromes
  - Transient Hypogammaglobulinemia of Infancy (in some cases)
- Normogammaglobulinemia with selective antibody deficiency
  - Wiskott-Aldrich syndrome
  - Specific polysaccharide antibody deficiency and/or other “lacunar” antibody deficiencies

### Secondary Immunodeficiency

- Chronic lymphocytic leukemia (CLL) with antibody deficiency and recurrent infection
- Pediatric HIV Infection
- Hypogammaglobulinemia and/or specific antibody deficiency due to chemotherapy and/or monoclonal antibody treatment
PRODUCT SELECTION AND CHARACTERISTICS

There are various IgG products licensed in the US, in addition to several hyperimmune globulins. Since product composition and availability may change, readers are urged to consult current manufacturer and FDA listings for availability and information regarding different products. The broad spectrum IgG products currently available in the US are listed in Table 1. Since the characteristics of these products differ, and some products may be more appropriate for some patients than others, nurses should familiarize themselves with the different products available.

All products sold in the US are made from carefully screened and tested US donors. The production processes of all of the products include dedicated steps which have been documented to remove and/or inactivate blood borne pathogens. These steps may include low pH treatment, pasteurization, solvent/detergent treatment, and/or nanofiltration. Nevertheless, potential transmission of blood borne pathogens or emerging pathogens cannot be absolutely ruled out.

Products

Preparations are lyophilized (freeze-dried) or liquid. Lyophilized products may be prepared at more than one concentration depending on the volume of fluid in which it is reconstituted. Nurses may be asked to reconstitute lyophilized products and/or to pool liquid products in the home or infusion clinic and must be aware of manufacturer’s guidelines, sterile technique, and physician’s orders. It is imperative to follow the manufacturer guidelines.

Stabilizers

Sugars, including sorbitol, maltose or sucrose, are added to several of the products to stabilize the IgG and keep the molecules from aggregating. Products that contain sucrose have been identified as carrying increased risk of exacerbating or causing renal disease in the elderly and patients with underlying renal disease. Particularly with these, but also with other products, care should be taken to make sure the patient is well hydrated before beginning the infusion.

IgA Levels

All currently available products contain some IgA, but the concentrations of this protein vary in different brands. Patients with common variable and other partial antibody deficiencies may be at risk for anaphylaxis if they produce IgE against IgA. Other patients may develop IgG against IgA, which can also cause adverse reactions. If a patient’s serum contains detectable IgA, it is less likely that they will react to IgA in the products. In most facilities, neither high sensitivity assays for IgA in the patient’s serum nor assays for IgE against IgA are available. Therefore, care must always be used when administering IgG products to patients with undetectable IgA, and the risk of anaphylaxis must be taken seriously in patients with documented reactions to IgA containing blood products. There is an FDA approved IgG preparation that contains low IgA.

Documentation

With each infusion of any blood product, lot number(s), expiration dates and dosage should be recorded in the patient’s record, in a central database, or preferably both. Documentation will help recognize trends for patient tolerance or identify a particular lot of IgG that might be recalled.

Product Integrity

All products should be inspected prior to pooling, and before, as well as after, reconstitution of lyophilized products. Before beginning the infusion, products should be carefully examined for any evidence of tampering with the packaging of the product, including the carton, as well as the vial and its closures. Any evidence of tampering should be reported at once to the supplier and/or producer, and that product should not be given to the patient. In addition, the product, once in solution, should be inspected for clarity, and to be sure it does not contain particles, precipitates or fibers. No product should be infused if there is evidence of particulate matter, precipitants, or cloudiness.
### Characteristics of Available Immune Globulin Products

<table>
<thead>
<tr>
<th>BRAND NAME</th>
<th>Gammagard S/D</th>
<th>Gammagard Liquid</th>
<th>Carimune NF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRAND NAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANUFACTURER</td>
<td>Baxter Corporation/ BioScience Division</td>
<td>Baxter Corporation/ BioScience Division</td>
<td>CSL Behring</td>
</tr>
<tr>
<td>METHOD OF PRODUCTION (including Viral Inactivation)</td>
<td>Cohn-Oncley fractionation, ultra-filtration, ion-exchange chromatography, solvent/detergent treatment</td>
<td>Cohn-Oncley fractionation, solvent/detergent treatment, ANX chromatography, 35nm nanofiltration, low pH/elevated temperature incubation</td>
<td>Kistler Nitschmann fractionation, pH 4.0, trace pepsin, nanofiltration</td>
</tr>
<tr>
<td>FORM</td>
<td>Lyophilized</td>
<td>Liquid</td>
<td>Lyophilized</td>
</tr>
<tr>
<td>SHELF-LIFE</td>
<td>24 Months</td>
<td>36 Months</td>
<td>24 Months</td>
</tr>
<tr>
<td>RECONSTITUTION TIME</td>
<td>&lt;5 minutes at room temperature &gt;20 minutes if cold</td>
<td>None (Liquid Solution)</td>
<td>Several Minutes</td>
</tr>
<tr>
<td>AVAILABLE CONCENTRATIONS</td>
<td>5% 10%</td>
<td>10%</td>
<td>3 to 12%</td>
</tr>
<tr>
<td>MAXIMUM RECOMMENDED INFUSION RATE</td>
<td>4 mL/kg/hour 8 mL/kg/hour 5 mL/kg/hour &gt;2.5 mL/kg/hour</td>
<td>20 mL per hour 6.0 mL/kg/hour &lt;4.2 mL/kg/hour 4.8 mL/kg/hour</td>
<td></td>
</tr>
<tr>
<td>TIME TO INFUSE 35 gms</td>
<td>2.5 hours 0.6 hours 1 hour &lt;3.3 hours (6% Solution)</td>
<td>1.6 hours 2.5 hours 1.0 hours</td>
<td></td>
</tr>
<tr>
<td>SUGAR CONTENT</td>
<td>20 mg/ml glucose 40 mg/ml glucose No added sugars 1.67 gm sucrose per gram of protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SODIUM CONTENT</td>
<td>8.5 mg/ml sodium chloride 17 mg/ml sodium chloride No added sodium &lt;20 mg sodium chloride per gram of protein</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSMOLARITY/ OSMOLALITY</td>
<td>636 mOsm/L 1250 mOsm/L 240 - 300 mOsm/kg 192 - 1074 mOsm/kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH</td>
<td>6.4 – 7.2 4.8 – 5.1 6.4 – 6.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IgA CONTENT</td>
<td>&lt; 2.2 µg/mL in a 5% solution 37 µg/mL 720 µg/mL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPROVED METHOD OF ADMINISTRATION</td>
<td>Intravenous</td>
<td>Intravenous</td>
<td>Intravenous</td>
</tr>
</tbody>
</table>

### Licensed for Use in the UNITED STATES

<table>
<thead>
<tr>
<th>BRAND NAME</th>
<th>Vivaqlobin</th>
<th>Feboqammina</th>
<th>Octagam</th>
<th>Gamunex</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURER</td>
<td>CSL Behring</td>
<td>Grifols</td>
<td>Octapharma</td>
<td>Talecris</td>
</tr>
<tr>
<td>METHOD OF PRODUCTION (including Viral Inactivation)</td>
<td>Cold alcohol fractionation, ethanol-fatty alcohol/pH precipitation, pasteurization, diathermal and ultrafiltered</td>
<td>Cold alcohol fractionation, PEG ion-exchange chromatography, pasteurized at 60°C for 10 hours</td>
<td>Cohn-Oncley cold ethanol fractionation, ultra-filtration, chromatography, solvent detergent treatment</td>
<td>Cohn-Oncley fractionation, caprylate/chromatography purification, cloth and depth filtration, final container low pH incubation</td>
</tr>
<tr>
<td>FORM</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Liquid</td>
</tr>
<tr>
<td>SHELF-LIFE</td>
<td>24 Months</td>
<td>24 Months</td>
<td>24 Months</td>
<td>36 Months</td>
</tr>
<tr>
<td>RECONSTITUTION TIME</td>
<td>None (Liquid Solution)</td>
<td>None (Liquid Solution)</td>
<td>None (Liquid Solution)</td>
<td>None (Liquid Solution)</td>
</tr>
<tr>
<td>AVAILABLE CONCENTRATIONS</td>
<td>16% (160 mg protein/ per ml)</td>
<td>5%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>MAXIMUM RECOMMENDED INFUSION RATE</td>
<td>20 mL per hour 6.0 mL/kg/hour &lt;4.2 mL/kg/hour 4.8 mL/kg/hour</td>
<td>1.6 hours 2.5 hours 1.0 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME TO INFUSE 35 gms</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>SUGAR CONTENT</td>
<td>3 mg/mL</td>
<td>&lt;3.2 mEq/L</td>
<td>≤30 mMol/L</td>
<td>Trace Amounts</td>
</tr>
<tr>
<td>SODIUM CONTENT</td>
<td>445 mMol/kg</td>
<td>240 - 350 mMol/L</td>
<td>310 - 380 mMol/kg</td>
<td>258 mMol/kg</td>
</tr>
<tr>
<td>OSMOLARITY/ OSMOLALITY</td>
<td>5.1 - 6.0</td>
<td>5.1 – 6.0</td>
<td>4.0 – 4.5</td>
<td></td>
</tr>
<tr>
<td>PH</td>
<td>6.4 – 7.2</td>
<td>6.4 – 7.2</td>
<td>6.4 – 7.2</td>
<td>6.4 – 7.2</td>
</tr>
<tr>
<td>IgA CONTENT</td>
<td>&lt;1700 µg/mL</td>
<td>&lt;50 µg/mL</td>
<td>&lt;100 µg/mL</td>
<td>46 µg/mL</td>
</tr>
<tr>
<td>APPROVED METHOD OF ADMINISTRATION</td>
<td>Intravenous</td>
<td>Intravenous</td>
<td>Intravenous</td>
<td>Intravenous</td>
</tr>
</tbody>
</table>

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1. 0.5 g/kg for a 70 kg adult = 35 gms; 5% Concentrations: 1g = 20 mL; 10% Concentrations: 1g = 10 mL. The time to infuse is based on the maximal infusion rate. Check product label for storage temperatures, which vary among Immunoglobulin brands. Check package insert for detailed prescribing information.

2. Time will vary depending upon volume & tolerability. Using 35 grams as monthly dose, calculate weekly dose=8.75 grams=55 mL. infused into 4 sites @ rate up to 20cc/hr/site, which can range from 45 mins. To 3 hrs. Table updated June 2007.
ADVERSE REACTIONS AND MANAGEMENT OF IG REPLACEMENT

A number of adverse events have been associated with the use of IVIG in both children and adults. Up to 15 to 30% of recipients experience some type of reaction, with the severity ranging from mild to severe. Most reactions occur during the initial 30 to 60 minutes of the infusion and are mild and self-limited. Infusion reactions are more likely to occur in patients receiving IVIG for the first time, and whenever a patient is receiving a new product or one they have not received in recent months. Severe anaphylactic reactions are rare.

There are risk factors that may identify persons at greater risk for having a reaction to IVIG. It is advised to read the specific package insert for the IVIG product used, as the incidence and types of adverse events varies from product to product.

Types of Adverse Reactions

Pyrogenic Reactions
These reactions are marked by a significant rise in temperature and are usually accompanied by systemic symptoms. Fever is the most common side effect in children. Management of acute pyrogenic reactions includes the use of antipyretic medications such as acetaminophen or ibuprofen. Persons who repeatedly experience temperature elevations during administration of IVIG may benefit from pre-medication with an antipyretic such as acetaminophen, one hour prior to initiation of the infusion.

Allergic Reactions
These events are associated with an allergic mechanism and include hypersensitivity to IVIG or its components, most often IgA. These types of reactions can lead to anaphylactic shock. These reactions are very uncommon, and although severe, usually do not preclude future use of IVIG. Allergic reactions often present with an uncomfortable feeling, especially a tightening around the neck, chest, or abdomen. There may be difficulty swallowing, a choking sensation, or difficulty breathing. Other symptoms of anaphylaxis include wheezing, rash, hives, rapid or weak pulse, hypotension, sweating, or an upset stomach with or without nausea, vomiting or diarrhea. Management of symptoms associated with an allergic reaction begins by immediately turning off the infusion of IVIG and maintaining patency of the IV line. The patient may require an antihistamine. Usually the symptoms resolve with these measures. The patient’s healthcare provider should be notified. In many cases, reactions to IVIG mimic those of true IgE mediated allergy, but are actually due to activation of complement or other mediator systems by the IVIG. If the symptoms do not resolve, or are noticed to progress, the patient should lie flat (if there is no evidence of fluid overload or congestive heart failure), be given adrenaline (EPI PEN) and arrangements should be made for the patient to be evaluated by a physician, or to be transported to an Emergency Room. The infusion of the IVIG product should not be restarted if the symptoms are consistent with an allergic reaction. The healthcare provider may decide to select another gamma globulin product for the patient’s future treatments.

Vasomotor Symptoms
These can occur with or without additional cardiac manifestations. Blood pressure can either increase or decrease, and may be accompanied by flushing or tachycardia. Patients experiencing such reactions may report shortness of breath or tightness in the chest. Slowing or stopping the infusion may provide relief of vasomotor symptoms. Patients exhibiting hypotension may require additional hydration and/or epinephrine.

Non-allergic Systemic (Anaphylactoid) Reactions
These reactions most commonly include headache, dizziness, or lightheadedness. Patients can also experience chills, nausea, vomiting, back or hip pain, malaise, myalgia and arthralgias. Rigors are a rare infusion reaction that is an extreme form of chills that affects the whole body with vigorous shaking. The most frequent cause of such reactions is infusion at an excessively rapid rate. These types of reactions are more common in patients naïve to IgG treatment and/or who harbor chronic infection. These reactions may be marked by flushing and warmth of the skin, chills, headache, dizziness, nausea, vomiting, and muscle aches. Frequently the patient reports anxiety and in some cases, “a sense of impending doom.” Often, the patient will have elevated blood pressure rather than hypotension, distinguishing this type of reaction from true anaphylaxis. Management of a non-anaphylactic reaction begins with slowing or temporarily stopping the infusion by closing off the clamp. The infusion can be restarted when the symptoms begin to subside, usually within 30 minutes. Restart at one-half of the previous rate tolerated and gradually increase until the recommended rate is reached.

It is important to remember that individuals require varying rates of infusion, although most can tolerate administration of IVIG conventional replacement doses of IVIG over 2 to 4 hours. It may be helpful for someone who has experienced a reaction in the past to prepare for the infusion by taking a pre-medication, such as a corticosteroid, acetaminophen or an NSAID approximately one hour prior to beginning the infusion. If the patient requires a longer duration of infusion, the pre-medication can be re-administered 4 to 6 hours into the infusion. Antihistamines may be ordered to help with the side effects of therapy. However, be aware that the use of antihistamines may mask a potential reaction. Over time, the need for premedication may decrease; therefore periodic reassessment of the premedication regime is suggested.

Post-infusion Reactions
These reactions can occur immediately or up to 48 to 72 hours following the infusion. Symptoms associated with post-infusion reactions are usually less severe in nature, but can interfere with a patient’s quality of life. Common post-infusion reactions may include headache, low-grade fever, nausea, arthralgias, and generalized malaise. These reactions are generally managed with over-the-counter analgesics, antihistamines, and low dose systemic steroids. Some patients, particularly those with histories of migraines at other times, may have severe headaches and/or typical migraines up to 72 hours after their infusion. In some cases, aseptic meningitis, with meningeal signs on physical exam, has occurred.

Post-infusion Reactions

These may be managed with over-the-counter analgesics, antihistamines, and low dose systemic steroids. In some cases, aseptic meningitis, with meningeal signs on physical exam, has occurred.
INTRAVENOUS IMMUNE GLOBULIN REPLACEMENT THERAPY DELIVERY (IVIG)

Nurse Responsibilities with IVIG Administration

The nurse has the responsibility to provide the safest and most effective method of IVIG administration based on the physician’s order. The following are broad guidelines for nursing interventions prior to, during, and after administration of IVIG, to help minimize adverse effects and safely provide a successful infusion experience for the patient.

Key Assessments Prior to the Infusion

- Assess brand of IgG ordered for the patient. Be aware of the differences between the various brands of IVIG. The qualities of a particular product may affect the success of an infusion, especially if it is the first time the patient is receiving the medication. Remember, not all IVIG products are the same. Different products may have different implications for different patients. Be sure that the product ordered and supplied for a given patient is appropriate for that individual. Properties such as salt content, sugar content, concentration of protein and total volume should be considered in light of the individual patient's condition and concomitant medications.
- Be sure that the product ordered and supplied for a given patient is appropriate for that individual. Properties such as salt content, sugar content, concentration of protein and total volume should be considered in light of the individual patient’s condition and concomitant medications.
- Assess product integrity. If the protective seals are not intact, immediately notify the pharmacy that dispensed the medication and do not use the product. The infusion product should be at room temperature prior to administration. Solutions should be allowed to come to room temperature naturally. Product integrity may be compromised (denatured) by freezing or heating and this may lead to adverse events. Never put product into the microwave.
- Assess level of patient understanding of therapy, especially if working with a new patient.
- Assess need for and presence of back-up services in the case of inability to obtain IV access. Obtain IV access prior to product preparation, if possible. Due to the high cost of IgG, if product is prepared for infusion and brought to room temperature and IV access cannot be obtained, quickly call for assistance while being mindful of the product stability. Consider referring the patient to an acute care facility for the infusion. If IV access cannot be obtained promptly, notify the physician on medications such as EPI PEN, Diphenhydramine and IV fluids and be prepared to administer as ordered.
- Assess need for laboratory blood work prior to start of infusion based on physician orders. Review previous lab work with the patient and discuss with physician if routine lab work may be necessary to follow a chronic condition.
- Assess need for and presence of back-up services in the case of inability to obtain IV access. Obtain IV access prior to product preparation, if possible. Due to the high cost of IgG, if product is prepared for infusion and brought to room temperature and IV access cannot be obtained, quickly call for assistance while being mindful of the product stability. Consider referring the patient to an acute care facility for the infusion. If IV access cannot be obtained promptly, notify the physician on medications such as EPI PEN, Diphenhydramine and IV fluids and be prepared to administer as ordered.
- Assess patient hydration status. Encourage proper hydration 24 hours prior to infusion and for 24 hours post infusion. Dehydration may prevent your ability to achieve successful venous access and will increase the risk of renal and/or thrombotic complications. If prescribed, infusions of other intravenous fluids may be needed to treat dehydration before the IVIG itself is started.
- Assess patient’s weight to monitor for unexpected weight gain as a sign of fluid retention, and in children, to monitor for a possible dose adjustment.
- Assess preparedness for emergency situations. Emergency equipment should be readily available during the infusion. Be prepared for the possibility of anaphylactic shock. Check expiration dates on medications such as EPI PEN, Diphenhydramine and IV fluids and be prepared to administer as ordered.
- Assess the need for Child Life Services, if available, to assist with coping techniques that may aid catheter placement. Review developmental milestones to provide adequate and age-appropriate resources. Provide small rewards/stickers to help children deal with the psychological effect of chronic illness requiring infusion therapy.
- Assess the need for localized anesthesia and obtain order as necessary. Children, especially, may prefer to have local anesthesia patches or creams applied in advance to numb the sites at which the IV will be placed.
- Assess the need for pre-medication. Ask the patient if any adverse events occurred after the previous infusion. Pre-medication may be indicated to diminish the risk of infusion-related adverse events. Intravenous corticosteroids, IV or oral antihistamines, acetaminophen and/or NSAIDs may be required to prevent or diminish adverse events.
- Assess need for laboratory blood work prior to start of infusion based on physician orders. Review previous lab work with the patient and discuss with physician if routine lab work may be necessary to follow a chronic condition.
- Assess for fever prior to the start of infusion. If you have contact with the patient before the scheduled infusion time, ask if fever is present. If present, confirm with physician that infusion should be administered. The infusion may need to be postponed until the patient is treated with antibiotics and/or the fever defervesces, or the infusion may be administered at a slower than usual infusion rate to decrease potential side effects.
- Assess breath sounds for any abnormal breath sounds. Patients may need to use their bronchodilators to diminish bronchospasm before beginning the infusion. Patients at risk for congestive heart failure or fluid accumulation should be assessed carefully before beginning the infusion, which could exacerbate pulmonary edema or cardiac dysfunction. Patients should be reassessed frequently during the infusion to be sure that there is no change in respiratory status. If prescribed, bronchodilators, oxygen and/or diuretics may be required before and/or during the infusion to prevent or relieve respiratory distress.
- Assess for adequate IV access. Listen to the patient; they have the best knowledge of which IV insertion sites have worked for them. Adults and children may benefit from using a warm compress or heating pad to a potential IV site to help dilate the vein. If at all possible, rotate IV sites, to prevent difficulty for future IV access.
- Assess the need for pre-medication. Ask the patient if any adverse events occurred after the previous infusion. Pre-medication may be indicated to diminish the risk of infusion-related adverse events. Intravenous corticosteroids, IV or oral antihistamines, acetaminophen and/or NSAIDs may be required to prevent or diminish adverse events.
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- Assess need for laboratory blood work prior to start of infusion based on physician orders. Review previous lab work with the patient and discuss with physician if routine lab work may be necessary to follow a chronic condition.
- Assess the need for Child Life Services, if available, to assist with coping techniques that may aid catheter placement. Review developmental milestones to provide adequate and age-appropriate resources. Provide small rewards/stickers to help children deal with the psychological effect of chronic illness requiring infusion therapy.
- Assess need for and presence of back-up services in the case of inability to obtain IV access. Obtain IV access prior to product preparation, if possible. Due to the high cost of IgG, if product is prepared for infusion and brought to room temperature and IV access cannot be obtained, quickly call for assistance while being mindful of the product stability. Consider referring the patient to an acute care facility for the infusion. If IV access cannot be obtained promptly, notify the physician on medications such as EPI PEN, Diphenhydramine and IV fluids and be prepared to administer as ordered.
- Assess the need for pre-medication. Ask the patient if any adverse events occurred after the previous infusion. Pre-medication may be indicated to diminish the risk of infusion-related adverse events. Intravenous corticosteroids, IV or oral antihistamines, acetaminophen and/or NSAIDs may be required to prevent or diminish adverse events.
- Assess need for laboratory blood work prior to start of infusion based on physician orders. Review previous lab work with the patient and discuss with physician if routine lab work may be necessary to follow a chronic condition.
- Assess for fever prior to the start of infusion. If you have contact with the patient before the scheduled infusion time, ask if fever is present. If present, confirm with physician that infusion should be administered. The infusion may need to be postponed until the patient is treated with antibiotics and/or the fever defervesces, or the infusion may be administered at a slower than usual infusion rate to decrease potential side effects.
- Assess breath sounds for any abnormal breath sounds. Patients may need to use their bronchodilators to diminish bronchospasm before beginning the infusion. Patients at risk for congestive heart failure or fluid accumulation should be assessed carefully before beginning the infusion, which could exacerbate pulmonary edema or cardiac dysfunction. Patients should be reassessed frequently during the infusion to be sure that there is no change in respiratory status. If prescribed, bronchodilators, oxygen and/or diuretics may be required before and/or during the infusion to prevent or relieve respiratory distress.
- Assess for adequate IV access. Listen to the patient; they have the best knowledge of which IV insertion sites have worked for them. Adults and children may benefit from using a warm compress or heating pad to a potential IV site to help dilate the vein. If at all possible, rotate IV sites, to prevent difficulty for future IV access.
- Assess the need for pre-medication. Ask the patient if any adverse events occurred after the previous infusion. Pre-medication may be indicated to diminish the risk of infusion-related adverse events. Intravenous corticosteroids, IV or oral antihistamines, acetaminophen and/or NSAIDs may be required to prevent or diminish adverse events.
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**Key Assessments During the Infusion**

- Assess the proper rate of infusion. Infuse at rate ordered, or, if not specified, infusions are generally started slowly and the rate is increased stepwise at 15 to 30 minute intervals, as tolerated by the patient. Many infusion reactions are rate-related. Do not exceed manufacturer’s recommendations for the maximum infusion rates. (There may be exceptions to this if it has been carefully documented that the patient tolerates a more rapid infusion of a given product, however, that may not apply if a different product is given to that patient.)
- Assess the vital signs prior to each rate change to identify any increase or decrease in blood pressure, an increase in respiratory rate or respiratory distress due to fluid overload, or if a fever is present, assess for chills and treat as necessary. Assess the clinical relevance of any changes in vital signs observed. (For example, if a comfortable patient falls asleep, his/her blood pressure may drop; while an equivalent drop in another patient who is flushed and in distress may be indicative of anaphylaxis.) If clinically significant changes in vital signs occur, decrease the rate of infusion by half of the current rate, or temporarily stop the infusion. The infusion rate should be advanced slowly, if possible, and the nurse should provide any treatments necessary to stabilize the patients and ameliorate side effects based on the physician’s recommendations.
- Assess the need for comfort measures during the infusion if side effects occur. The most common side effects are: chills, headache, and fever, shortness of breath, back pain, urticaria, nausea, vomiting, flu-like symptoms, and fatigue. Apply blankets and heating pads, reinforce relaxation techniques, and administer medications as directed.
- Assess for signs of anaphylaxis. Although rare, if patient has difficulty breathing, throat swelling, a feeling that the throat is closing, stridor, increased wheezing and/or chest tightness, generalized urticaria, or extreme anxiety, treat as directed per physician orders and CALL 911!

**Key Interval History Questions**

- Review interval history of infections, including the length of symptoms, type and severity of symptoms, treatment of infection and length of treatment, if any. If symptoms are noted when treatment is due, be sure to re-enforce with the patient that symptoms can potentially worsen when antibodies are suddenly introduced into the body and the response to the infection becomes more rigorous. Flu-like symptoms, shakes and chills frequently occur in this situation.
- Discuss and review with the patient, any hospitalizations, ER visits or new concomitant illnesses that have occurred since the last infusion. Communicate any new problems with the physician and determine if any changes in the treatment plan are required.
- Review with the patient/parent the number of days missed from work, school or activities of daily living due to illness.

**Key Activities Post Infusion: Up to 72 Hours**

- Document any significant post infusion reactions and notify the physician and pharmacist to discuss future recommended changes in therapy, if any. This may include contacting the manufacturer if it is considered likely that there may have been a problem with the product itself.
- Send lab work to the appropriate laboratory for analysis. Follow up with physician to identify if there are any necessary changes required to the infusion treatment plan, i.e., following serial WBC’s or sedimentation rates.
- Encourage patients to be seen by the physician on a regular basis to monitor for any sequelae related to the diagnosis and or the infusions.
- Instruct patients to immediately report symptoms of decreased urine output, sudden weight gain, fluid retention/edema, and/or shortness of breath (which may suggest kidney damage) to their physician.
# NURSING INTERVENTIONS FOR SIDE EFFECTS

The following tables describe suggestions for management of infusion related reactions. Physicians will give direction about when and how to administer medications to alleviate the side effects associated with IVIG administration.

## Anaphylactoid Reactions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Nursing Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chills/ Rigors</td>
<td>Slow rate or stop infusion, administer ibuprofen, aspirin, and/or diphenhydramine.</td>
</tr>
<tr>
<td>Headache</td>
<td>Administer acetaminophen, ibuprofen, or NSAID’s. Alternate after infusion every 3 to 6 hours for 24 to 48 hours based on physician recommendations.</td>
</tr>
<tr>
<td>Migraine Headache</td>
<td>Administer prescribed anti-migraine medications as soon as the first signs of a migraine occur to have better success with resolution of the symptoms. Oral or IV steroids may help decrease the intensity of the headache. This is based on physician recommendations. Non-pharmacological interventions may include: Turn off lights, apply cold compresses, and increase fluid intake prior to and during the infusion.</td>
</tr>
</tbody>
</table>

## Malaise/Flu-like Symptoms

<table>
<thead>
<tr>
<th>Condition</th>
<th>Nursing Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myalgia/Arthralgia</td>
<td>Educate the patient that resting after an IVIG infusion may help to minimize muscle aches or pain and to avoid excessive fatigue. Some children have the opposite effect, with an increased amount of energy, but then usually require an increased amount of sleep.</td>
</tr>
</tbody>
</table>

## Allergic Reactions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Nursing Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urticaria</td>
<td>In patients who have not experienced transient urticaria with many of their previous infusions, the development of urticaria should trigger the immediate stopping of the infusion. Contact the physician or call 911. Administer ordered medications such as antihistamines and/or steroids. Observe for signs of true anaphylaxis and give epinephrine if indicated.</td>
</tr>
<tr>
<td>Vasomotor Symptoms: Hypotension, Hypertension, Flushing or Tachycardia</td>
<td>Slow or stop infusion, or administer fluid with hypotension, based on physician order. Administer diuretics on physician’s order if fluid overload is likely.</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>Stop or slow the infusion. Administer antacids as needed. If ordered, administer IV hydration and/or antiemetic medications.</td>
</tr>
</tbody>
</table>

## Adverse Reactions to Rare

<table>
<thead>
<tr>
<th>Condition</th>
<th>Nursing Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back Pain/Hip Pain/Arthralgias</td>
<td>Stop or slow the infusion, administer ibuprofen to help with discomfort, apply heating pad, and administer other medications per physician order.</td>
</tr>
</tbody>
</table>

### Anaphylaxis:

- Hypotension, strong uncomfortable feeling, tightening in or around the neck, chest, or abdomen. Difficulty in swallowing, a choking sensation, or difficulty in breathing. Wheezing, rash or hives, rapid or weak pulse, sweating, or an upset stomach with or without vomiting and diarrhea.

  - Immediately turn off infusion. Administer an antihistamine. Notify the healthcare provider.
  - If symptoms do not resolve, the patient should lie flat and be given a single dose of adrenaline (Epi-Pen) and arrangements should be made for the patient to be evaluated. CALL 911 if adrenaline is used in the home care environment. Literature supports that a second dose of adrenaline may need to be administered.

### Aseptic Meningitis:

- Patients with Aseptic Meningitis develop symptoms of severe headache with nuchal rigidity, drowsiness, fever, and lethargy. Symptoms often begin 24 to 48 hours or more after the infusion has been completed.

  - Patients exhibiting these symptoms should undergo a thorough neurological evaluation, including CSF studies, to rule out other causes of meningitis. Symptoms are not relieved by slowing or stopping the infusion, and the headache does not resolve with acetaminophen or nonsteroidal anti-inflammatory agents. Using a different IVIG preparation may be helpful in preventing the recurrence of aseptic meningitis. Severe cases requiring discontinuation of therapy are rare.

### Thrombotic Events

- Patients with these risk factors should follow a conservative infusion protocol, using a product with a low (5%) concentration, and proceed slowly and cautiously with incremental increases in the rate of infusion to a maximum of 4 mL per kg of body weight per hour.
COMPLICATIONS OF IVIG TREATMENT

Persons with IgA deficiency and partial antibody deficiency syndromes are at greatest risk for experiencing an adverse reaction to the IgA in IVIG, and caution must be used when a patient has IgA deficiency as determined by the total absence of IgA on the highest sensitivity test available. The patient may produce antibodies against IgA in the IVIG preparation that can induce a severe anaphylactic response the next time the IVIG product is given. The risk of reaction in patients with IgA deficiencies can be reduced by selecting the product with the lowest IgA content available. Note that patients with XLA are NOT at risk for this.

Aseptic Meningitis

Aseptic meningitis has developed in patients who have received standard replacement doses (300-800 mg/kg/dose) as well as high-doses (2gm/kg) of IVIG. The symptoms usually develop within 24 hours of the infusion. A previous history of migraine headaches has been noted to be a risk factor. Patients with aseptic meningitis develop severe headache with nuchal rigidity, drowsiness, fever, lethargy, photophobia, painful eye movements, nausea and vomiting. Pleocytosis and elevated protein levels in the CSF are common. This condition may be prevented or ameliorated by treatment with corticosteroids immediately before and/or at the end of the infusion. It is not clear if headache, migraine and aseptic meningitis are different points on a spectrum of pathophysiology or if they represent events occurring due to different mechanisms.

Transfusion-Related Acute Lung Injury (TRALI)

There have been reports of noncardiogenic pulmonary edema [Transfusion-Related Acute Lung Injury (TRALI)] associated with administration of IVIG. TRALI is a rare but potentially devastating complication of blood component therapy characterized by severe respiratory distress, hypotension, fever, dyspnea, and tachycardia. Patients exhibit pulmonary edema, hypoxemia, normal left ventricular function, and fever with a typical onset within 1 to 6 hours after infusion of the product. Patients with TRALI may be managed using oxygen therapy with adequate ventilatory support, with symptoms resolving within 96 hours. IVIG recipients should be monitored for pulmonary adverse reactions. If TRALI is suspected, appropriate tests should be performed for the presence of anti-neutrophil antibodies in both the product and patient serum.

Transmission of Blood-borne Pathogens

IVIG products are manufactured from large numbers of carefully screened human donors who have been tested for the absence of hepatitis B surface antigen, hepatitis C antibody and HIV antibody, and by nucleic acid testing for HIV and HCV. In addition, all products are produced using techniques to remove or inactivate potentially contaminating viral pathogens. Techniques have been developed that dramatically reduce the potential presence of pathogenic prion agents that have been associated with the development of transmissible spongiform encephalopathies such as variant Creutzfeldt-Jakob disease.

Renal Adverse Events

Potential adverse effects involving the kidneys include acute renal failure, acute tubular necrosis, proximal tubular nephropathy, and osmotic nephrosis. There have been rare reports of increased serum creatinine, oliguria, and acute renal failure occurring from 1 to 7 days after IVIG administration. Hyperosmolality and the presence of sucrose have been implicated as factors contributing to renal adverse events. Patients who are not adequately hydrated prior to onset of the infusion, or who have diabetes mellitus, any pre-existing renal insufficiency, receiving nephrotoxic antibiotics, have paraproteinemia, or who are over age 65 are at greater risk. Renal function (serum Creatinine and BUN) and urine output should be monitored in patients at risk for developing renal adverse events. Using slow infusion rates during administration of IVIG and assuring adequate hydration are advised for such at-risk patients.

Thrombotic Events

Thrombotic (vascular occlusive) events have been reported in association with IVIG. The mechanisms for these episodes may include increased blood viscosity after high-dose IgG and/or the presence of pro-coagulant proteins in the IVIG preparation. These episodes have been noted with increased frequency in patients following rapid infusion protocols. Thrombotic events are serious in nature and include chest pain, myocardial infarction, congestive cardiac failure, transient (cerebral) ischemic attack (TIA) and stroke. Pulmonary embolism and lung dysfunction due to transfusion related acute lung injury (TRALI) have also been observed during or immediately after IVIG infusions. Patients at risk include those with a history of atherosclerosis, multiple cardiovascular risk factors, advanced age, impaired cardiac output, and/or known or suspected hyperviscosity, hypercoagulable disorders, including women taking oral contraceptives, especially if they also smoke, and anyone who has had prolonged periods of immobilization.

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**CONCOMITANT MEDICATIONS**

IVIG preparations should be given in dedicated IV lines. Different products differ in their compatibility with normal saline, sterile water or D5W, and manufacturer’s guidelines should be followed carefully. Administration of concomitant medications through the same IV line should be avoided, if at all possible. Should medications be required prior to, or during, an infusion, it is recommended to flush the line with at least 5 to 10 mL of compatible fluid prior to administering the medication.

Medications will precipitate in the line, especially Lasix or Valium. No medications should be directly administered into the same line as the IVIG. If multiple medications are required, a second IV line should be placed as not to interfere with the infusion. Another option is to piggyback the IVIG into the closest port of a compatible fluid which can act as a flush when needed.

**SUBCUTANEOUS IMMUNE GLOBULIN REPLACEMENT THERAPY DELIVERY (SCIG)**

After the determination has been made that a patient would benefit from immune globulin replacement therapy, the decision must be made as to the route of administration. Most patients in the US currently receive their immune globulin via intravenous infusion. In January 2006, the FDA approved a preparation of IgG which is given subcutaneously under the skin, (SCIG). The use of small portable pumps to deliver IgG in this way was first described in the early 1980’s, and this method of therapy has become quite popular in Europe.

While IVIG is usually given as a single large infusion every 3 to 4 weeks, SCIG usually involves giving smaller doses more often, once or twice a week in most cases. Fractionating the total dose into smaller portions decreases the rapid and extreme changes in serum IgG levels that accompany intermittent IV infusions. This may eliminate some of the adverse effects associated with IV infusions. Furthermore, since infusions are given more often, the low “trough” IgG levels that occur just before the next infusion are also eliminated. The serum IgG concentration becomes level over time. The SCIG is usually self-administered or administered by a parent to their child, or one spouse or partner to the other. IgG given subcutaneously is often administered by very small needles, in as many as 6 sites simultaneously, although most often no more than 2 sites are used at the same time. Usually a small syringe driver or ambulatory infusion pump is used to give the infusion over 1 to 3 hours. A great deal of flexibility in the regimen, including the number of sites, duration of the infusion, and frequency of infusions, is possible. The disadvantages of SCIG include the requirement for more frequent dosing and the need for adherence and compliance with the SCIG dosing schedule. However, the option of SCIG may be attractive to the patient/family who seeks greater control over scheduling the infusions in order to minimize absence from school or work and to be able to determine when they will self-infuse. Thus, the clinician must assess and evaluate several factors in the selection of candidates for this therapy, including the perceptions of inconvenience and/or pain of IV infusions along with relevant clinical factors.

**Assessment of Patients for SCIG**

Although any patient who requires IgG replacement may be a candidate for subcutaneous therapy, this method may be particularly appealing or useful for patients who:

- Experience adverse events during or immediately after IVIG infusions
- Have peripheral venous access problems
- Desire independence from either hospital or home based IV administration
- Want greater convenience

**Nurse’s Role**

The nursing role in subcutaneous IgG administration is primarily that of an educator, and the goal is usually to help the patient/family to become independent. Patients and/or caregivers will need to be taught those skills necessary to administer the immune globulin in a safe and aseptic manner. Utilizing a systematic approach will cover all the topics and promote understanding with the nurse first demonstrating the skill, and then allowing for the patient to practice the skill, with a final return demonstration by the patient/caregiver to demonstrate mastery.
Assessment of Patient Selection

There are several nursing considerations with subcutaneous immune globulin administration to ensure successful implementation of the overall therapeutic regimen. This includes assessment of appropriate patient selection for self-administration. When considering which patients will be good candidates, attention should be given to a patient’s ability to learn, independence, self motivation, compliance, ability to read and follow instructions, physical limitations (especially for manual dexterity) presence of an adult or another caregiver, availability of venous access, tolerability issues with intravenous immune globulin infusions and/or insurance issues.

Patient Teaching

Nursing responsibilities also include adequate patient teaching with return demonstration of the necessary skill set. Much of the education for SCIG administration surrounds instruction about maintaining a sterile pathway for delivery of the drug, setting up the equipment and drawing up the product, inserting the needle, monitoring local effects, discontinuing the infusion and safely discarding the used equipment and needles. Topics include: storage and handling of medication, traveling with medication, supplies and pumps; using aseptic technique for filling a cassette or syringe, subcutaneous catheter site selection and rotation cycle, site preparation, insertion and removal of catheter, checking to be sure there is no blood return (inadvertent intravenous or intra-arterial infusion must be avoided), pump preparation: priming tubing, setting rate for infusion, trouble shooting techniques with pump and infusion site problems and discontinuing infusion; comfort measures and site care; and appropriate waste disposal. Documentation of the patient’s mastery of skills is important. The number of sessions required for the patient to master all of these steps may vary widely depending on the individual’s capacity for learning coupled with their anxiety level. Two to eight sessions are normally required. Like IVIG, many issues regarding SCIG, such as supplier and supplies used, may be influenced by the patient’s insurance coverage and/or their preferred provider.

Another equally important nursing responsibility includes insuring that the patient understands adverse reactions and complications and how to initiate the appropriate action. Expectations regarding site reactions and management should be discussed. Patient must be taught the signs of anaphylaxis. EpiPen training should be provided when an EpiPen has been prescribed. Be sure the patient/caregiver fully understands when and how to use an EpiPen.

Administering SCIG

Subcutaneous administration does not require venous access or a professional clinician to access the vein. It facilitates self-infusion in the home or non-clinic setting. The subcutaneous catheter can be self inserted into the subcutaneous tissue which is the fat layer under the skin. By infusing into the subcutaneous space, SCIG allows for slow administration and gradual absorption of the IgG (this may take 24 to 48 hours). SCIG commonly is started one week after an IV infusion to build on the higher level of IgG in the bloodstream. This method of infusion eliminates rapid large swings in serum IgG when infusing intravenously, reduces severe headaches and other systemic adverse events and maintains more consistent IgG levels.

When the physician establishes a SCIG infusion regimen, the patient’s input should be solicited and incorporated into customizing a routine that will fit the patient’s lifestyle. Establishing an infusion regimen includes deciding on the number of sessions per week, the number of sites, volume per site, the site locations (abdomen, inner and outer thighs, upper arms, and flank) and how much involvement a caregiver will have. Factors to be discussed include work or school schedules, home environment, day/evening routines, and any other pertinent information. It will be up to the prescribing physician to determine dose and volume per site based on product labeling and published data.

Adverse Reactions

The published studies on SCIG consistently demonstrate a low rate of systemic reactions. The most common reported adverse events with subcutaneously administered IgG are localized site reactions including vague feelings of discomfort, itching, burning sensations, mild redness and/or swelling. In almost all cases, these symptoms resolve within 12 to 24 hrs. Some kind of local reaction is quite common when a patient first starts on subcutaneous IgG, but the frequency decreases if therapy by this route is continued. Systemic reactions such as headache, nausea, fever and chills are much less frequent with subcutaneous IgG than with IV infusions, and anaphylaxis is extremely rare. Local site reactions are managed with gentle massage, warm compresses, antihistamines, and/or mild pain medications such as ibuprofen or acetaminophen.

<table>
<thead>
<tr>
<th>Site Reaction</th>
<th>Non-pharmacological Interventions</th>
<th>Possible Pharmacological Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itching</td>
<td>- Stop or slow infusion</td>
<td>- Diphenhydramine</td>
</tr>
<tr>
<td></td>
<td>- May need longer needle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Apply cold compress (do not apply cold pack directly to skin)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Decrease volume per site</td>
<td></td>
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<tr>
<td></td>
<td>- Adjust site rotation by potentially not rotating as frequently</td>
<td></td>
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<tr>
<td></td>
<td>- When priming the SC needle sets, do not allow excessive drops of IgG to cover needle</td>
<td></td>
</tr>
<tr>
<td>Redness</td>
<td>- Nothing, if not uncomfortable</td>
<td>- Antihistamine</td>
</tr>
<tr>
<td></td>
<td>- Slow infusion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Apply cold compress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Change brands of tape</td>
<td></td>
</tr>
<tr>
<td>Burning</td>
<td>- Clamp off catheter for 5 to 10 minutes</td>
<td>- Non sedating anti-histamine</td>
</tr>
<tr>
<td></td>
<td>- Cold compress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Gentle massage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Distraction techniques for younger children</td>
<td>- Topical diphendydramine</td>
</tr>
<tr>
<td></td>
<td>- Slow the infusion</td>
<td>- If uncontrollable itching, seek medical attention and determine if SCIG therapy can be continued</td>
</tr>
<tr>
<td></td>
<td>- Remove catheter and replace in another site</td>
<td></td>
</tr>
<tr>
<td>Swelling</td>
<td>- Warm compresses for 5 to 10 minutes; if using a heating pad, use low setting</td>
<td>- Move area as tolerated, i.e., leg site: take a walk to help mobilize the fluid</td>
</tr>
<tr>
<td></td>
<td>- Move area as tolerated, i.e., leg site: take a walk to help mobilize the fluid</td>
<td></td>
</tr>
<tr>
<td>Urticaria</td>
<td>- Stop SCIG</td>
<td>- Antihistamine</td>
</tr>
<tr>
<td></td>
<td>- Seek medical attention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- With physician, determine if therapy can continue</td>
<td></td>
</tr>
<tr>
<td>Rash</td>
<td>- Stop SCIG</td>
<td>- With physician, determine if therapy can continue</td>
</tr>
<tr>
<td></td>
<td>- Seek medical advice</td>
<td>- Identify if tape or latex sensitivity</td>
</tr>
<tr>
<td></td>
<td>- With physician, determine if therapy can continue</td>
<td></td>
</tr>
<tr>
<td>Discomfort</td>
<td>- Slow infusion</td>
<td>- If intolerable pain - may be in muscle, remove catheter</td>
</tr>
<tr>
<td></td>
<td>- If intolerable pain - may be in muscle, remove catheter</td>
<td>- After needle removed, warm compress and gentle massage</td>
</tr>
</tbody>
</table>
ADDITIONAL NURSING RESPONSIBILITIES

Monitoring Parameters

Parallel to the physician’s management of the specific primary immunodeficiency, the nurse may oversee the establishment of monitoring parameters for compliance, infusion and infusion related issues. The nurse also may coordinate communication between members of the multidisciplinary team to facilitate appropriate delivery of care. Compliance monitoring should include instruction for the patient to record specifics of each infusion in a diary. Information that should be recorded includes: expiration dates, lot numbers, location of sites used, length of time for infusion to be complete, adverse events, and any other pertinent information.

Routine office visits, acute-needs office visits and IgG serum lab values are managed as they would for any patient with a PIDD or other illness requiring continuous treatment for overall control, regardless of route of IgG administration. Patients who self-or home-infuse should be instructed clearly on whom to call for health related issues specific to subcutaneous or intravenous immune globulin administration such as side effects, breakthrough infections, questions, diagnostic lab tests, and office visits. Patients should also be educated about emergency situations, what constitutes an emergency situation and when to call 911. Also included in these directives should be information on who to call regarding equipment related issues such as supplies, pump, drug, etc. A printed instruction list with relevant contact information is useful as a reference guide in the patient’s home.

Educate Patients about Their Medication

Encourage patients to know the name of the IgG brand they are receiving. When intermittent shortages of IgG product are experienced, different brands may need to be substituted which may not be in the patient’s best interest. The patient needs to explain to the healthcare provider if there has been a problem in the past with adverse effects from a specific brand. The nurse should assess if the treatment plan needs to be altered.

Demonstrate to the patient how to use an infusion log. Infusion logs are often available as downloadable PDF files from manufacturers’ Web sites. Infusion logs can be as simple as a calendar with product name, lot numbers, expiration dates, and number of grams noted on the date of administration. Educate the patient/family about the importance of keeping an infusion log to record lot numbers and dosages. Recalls do occur and patients have a right to know if there is a potential problem, and to seek appropriate help if there is a concern. Inform patients that they can enroll in a patient notification system for information on product withdrawals and recalls at www.patientnotificationsystem.org

Educate the patient about the use of topical anesthetic medications to prevent as much discomfort as possible with catheter placement. Apply medication as ordered by the physician and as recommended by manufacturer.

Provide Educational Resources and Support

Provide education and resources for patient and family support as needed. The Immune Deficiency Foundation offers many direct services to patients and their families. All IDF publications are free and most materials are available to download on the IDF Web site: www.primaryimmune.org. (See Resources for additional information about IDF programs and publications.)

The manufacturers of IgG often provide up-to-date information and added financial resources for patients and families dealing with PIDD on their Web sites. The resources vary over time and between manufacturers. It is recommended that patients check manufacturer websites periodically.

Provide ongoing support regarding patient/family education, insurance issues, transition to adulthood, resources for vaccination recommendations, attending school, concerns regarding traveling and vacations, pregnancy and any other life cycle changes.

All of the suggestions here are intended to assist nurses to provide successful IgG replacement therapy for their patients. We encourage nurses to advocate for patients and bring issues to the physician about ways to improve a patient’s quality of life, not only during replacement therapy administration but in other areas in which the patients’ primary immunodeficiency affects their life. Nurses can decrease some of the stress on patients by helping them advocate for themselves and by providing the necessary resources to establish a workable treatment plan.
REFERENCES

- Centers for Disease Control. Renal insufficiency and failure associated with immune globulin intravenous therapy. MMWR. 999;48:518-5211479-1497.
- Duff, KA You Can Make a Difference in Administration of Intravenous Gammaglobulin. JIV Nurs. 2006.
RESOURCES

Immune Deficiency Foundation (IDF)
www.primaryimmune.org
800-296-4433
idf@primaryimmune.org

Services for Medical Professionals
Nurse Advisory Committee members are available as a resource for nurses administering immune globulin therapy or treating patients with primary immunodeficiency diseases
Consulting Immunologist Program (877-666-0866) provides physicians a free consult or second opinion on patients with primary immunodeficiency diseases
LeBien Visiting Professor Program offers Grand Rounds and clinical presentations at medical institutions throughout North America
United States Immunodeficiency Network (USIDNET) IDF administers the NIH contract for research and mentoring for primary immunodeficiency diseases
National Registries of Primary Immunodeficiency Diseases

Educational Publications
Patient & Family Handbook for Primary Immunodeficiency Diseases
Our Immune System
A Guide for School Personnel on Primary Immune Deficiency Diseases
Diagnostic and Clinical Care Guidelines for Primary Immunodeficiency Diseases
IDF Guide for Nurses on Immune Globulin Therapy for Primary Immunodeficiency Diseases
IDF Advocate — newsletter
Primary Immune Tribune — e-newsletter

Services for Patients and Families
Patient Advocacy — inquiries related to diagnosis, treatment, health insurance, peer support and literature
IDF Educational Meetings — local and regional patient meetings, national conference
IDF Volunteer Network — Peer Support, Grassroots Advocacy and Fundraising
Annual Student Scholarships for post-secondary education

Public Policy Initiatives
Advocacy efforts on public policy issues at national and state levels
IDF Grassroots Advocacy Program mobilizes PIOP community to promote healthcare legislation
Advocacy for increased funding for research on primary immunodeficiency diseases
Work on quality of care initiatives for users of plasma products

NIH Web site on Subcutaneous Injections

United Kingdom SCIg Protocol
www.ukpin.org.uk/Guidelines/3.01-Administration-SCIG.pdf

Patient Notification System (PNS)
www.patientnotificationsystem.org
PNS is a free, confidential, 24 hour communication system providing information on plasma-derived and recombinant product withdrawal and recalls. Led by the Plasma Protein Therapeutics Association (PPTA), PNS was developed by the producers and distributors of plasma products with direct input from consumers.