NMNEC Concept: **Immunity**

Mega Concept: Health and Illness

Category: Protection and Movement

Concept Name: Immunity

Concept Definition:
The expected and optimal physiologic immune response as well as conditions associated with an inadequate or excessive immune response.

Scope and Categories:
Immunity responses fall on a spectrum: Suppressed ←Optimal →Exaggerated

- **Optimal** immune integrity involves protective functions along with several lines of defense.
- **Suppressed** immune function is referred to as immunocompromised or immunodeficient. The 2 types are *Primary* (immune cells are improperly developed or absent) and *Secondary* (occurs secondary to other cause such as illness or treatment).
- **Exaggerated** immune responses are classified as *Hypersensitivity Reactions.*

Immunity can be also be classified as **Innate and Acquired:**

- **Innate:** pre-exists in individual; no contact with antigen. This involves intact anatomical barriers and the presence of normal flora within the body. It is a non-specific response involving natural enzymes and acidic secretions that make the skin, mucous membranes inhospitable to pathogens.
- **Acquired:** process of developing immunity; requires antigen exposure. Acquired immunity by either an Active or Passive process.
    - **Active:** the body reacts to an antigen and actively forms antibodies (long term)
        - **Natural:** natural contact with antigen through clinical infection (chickenpox, measles, mumps, etc.)
        - **Artificial:** immunization with antigen (live or killed vaccines)
    - **Passive:** antibodies are passively acquired (short term – no memory cells formed)
        - **Natural:** trans placental (IgG) and colostrum (IgA) transfer from mother to child
        - **Artificial:** injection of serum from immune human (gamma globulin)

Risk Factors:

All individuals regardless of age, gender, race, or socioeconomic status may potentially have suppressed or exaggerated immune function. The following are examples of specific population and individual risk factors.

Non-modifiable Risk Factors:

Populations:

- Newborns: rely on passive natural immunity. After birth, newborns begin to develop their own immune defenses.
- Pregnancy – Hormonal changes decrease immune response.
- Elderly: Decreased immune response is part of the aging process.
- Gender, Race, Ethnicity: some of the Hypersensitivity Reactions have a higher incidence and prevalence based on gender, race or ethnicity
- Genetics: primary immunodeficiency, allergies, Type I Diabetes

Modifiable Risk Factors:

Individual:

- Environmental factors: nutrition, pollutants, sanitary conditions
- Medical Treatment: secondary suppressed immunity
    - Immunosuppressive medications
    - Radiation, chemo and/or biologic therapy treatments for Cancer
    - Treatment following organ transplantation
- Chronic alcohol consumption
- Chronic illness: Decreased immune function caused be the disease and/or treatment
- High-risk behaviors: sharing needles, sexual behavior
- Stress response reduces immune function.
- Poor nutrition
- Un-healthy body mass index (BMI)
- Smoking
- Lack of routine screening
- Non-immunized state: Herd immunity and individuals are at increased risk of acquiring diseases that could have been prevented or lessened with the administration of appropriate vaccinations.

Physiological Processes:

- Optimal immune function requires that the individual can distinguish between normal host cell development and foreign protein and respond appropriately to foreign protein.

- Lymphoid-structures of the immune system are spread throughout the body (lymph nodes, thymus, spleen, etc.) and form lymphocytes that are transported by the lymphatic and circulatory system.
- Several components work together to initiate a cellular immune response:
  - Bone marrow
  - B and T lymphocytes
  - Antibody production
  - Chemical mediators or Complement system
  - Phagocytes

Consequences:

Suppressed Immune Responses may occur because the immune system isn't functioning optimally, or be related to an illness or treatment for an illness. The result is the potential to acquire opportunistic diseases or iatrogenic conditions (infections, superinfections).

Exaggerated Immune Responses (*see Hypersensitivity Reactions*) may be systemic or local. There are several autoimmune disorders that fall in this category.

Characteristics	***Type I Allergic***	***Type II Cytotoxic Tissue Specific***	***Type III Immune Complex***	***Type IV Cell-Mediated***
Antibody	IgE	IgG, IgM	IgG, IgM	None
Response Time	Immediate	Immediate	Immediate	Delayed
Principal Cells Involved	Mast	Macrophages in tissue	Neutrophils	Macrophages and Lymphocytes
Examples	• Seasonal allergic rhinitis • Anaphylaxis • Hives	• ABO/Rh incompatibility • Erythroblastosis fetalis • Goodpasture's Syndrome • Grave's Disease • Autoimmune Thrombocytopenic Purpura	• Systemic Lupus Erythematosus (SLE) • Rheumatoid Arthritis (RA) • Acute post streptococcal glomerulo-nephritis	• Tuberculosis (TB) test • Poison ivy • Dermatitis • Latex

Assessment:

History: Both the past, current and family history may reveal pertinent information about the functioning of the Immune system. Topics to discuss include:

- Allergies
- Medications
- Immunizations
- General health status (nutrition, exercise, weight, wound healing, stress)
- Environmental exposure
- Recent exposure to known immunosuppressive pathogens

Examination Findings:

- Suppressed immune function:
  - Impaired wound healing
  - Opportunistic infections
  - Weight loss
  - Fatigue
- Exaggerated immune function:
  - Mild to severe allergic responses
  - Specific symptoms depending on affected organ system

Diagnostic Tests:

- Complete blood count (CBC) w/ differential – cellular immunity
- Chemistry panels to assess for metabolic disorders that might cause secondary immune deficiency
- Urinalysis for proteinuria, casts, or cells which suggest nephritis (related to SLE)
- Allergy testing
- Inflammation markers (antinuclear antibody [ANA], anti-DNA antibodies, c-reactive protein [CRP], erythrocyte sedimentation rate [ESR]): Elevated in infectious and inflammatory disorders
- Antibody levels and function(titers and immune globulins)
- Radiologic imaging and/or biopsy of affected organs

Clinical Management - Interdisciplinary:

Primary Prevention: Interventions that support illness prevention and health promotion are essential.

- Immunizations:

  - The nurse's role in immunizations include: reviewing immunization status, obtaining informed consent (vaccine information statement [VIS] sheets), appropriate storage and use of immunizations, awareness of precautions and contraindications, safe administration, education re: side effects and comfort measures, documentation of immunizations, and the identification and reporting of adverse effects.
- Education:
  - Modifiable risk factors:
    - Avoiding high risk behaviors
    - Minimizing exposure to environmental triggers
    - Nutrition
    - Exercise
    - Stress management
  - Disease process and treatment
  - Medications

Secondary Prevention: Screening

There is no true screening related to Immunity disorders, unless there is an identified risk for an Immune dysfunction such as HIV screening for high risk individuals. Secondary prevention focus is early identification of high risk individuals, minimize the impact, early treatment to reduce progression of identified immune disorder and maintain optimal level of health.

Tertiary Prevention: Minimize the impact of illness and manage long term complex health problems

- Support groups
- Rehabilitation

Interventions: Nursing interventions vary and are specific to the Immunity disorder.

- Suppressed immune response conditions may involve management of:
  - Infection (see Infection concept)
  - Gastrointestinal dysfunction: diarrhea (see Elimination concept), fluid and electrolyte imbalance (see Fluid and Electrolyte Balance concept)
  - Skin disorders (see Tissue Integrity concept)
  - Nutritional support and education (see Nutrition concept)
- Exaggerated immune response conditions may involve management of:
  - Anaphylaxis: Airway, breathing, and circulation (ABC) support, pharmacotherapy and education

- Immunosuppression: pharmacotherapy
- Pain management (see Comfort concept)

Interrelated Concepts:

- **Infection** can be either a consequence or a triggering event of several of the Immunity exemplars.
- **Inflammation** is the usual response when the Immune response is triggered – particularly those on the exaggerated side of the Immunity spectrum – Hypersensitivity reactions.
- If **Tissue Integrity** is compromised the immune system response may lead to infection and/or inflammation.
- **Stress and Coping** is closely related to the Immunity exemplars as individuals and families adjust to both acute and chronic, physical and emotional conditions (and adaptation). Stress may also be a trigger for some conditions.
- Depending on the exemplar, these concepts may also be related to Immunity:
  - Nutrition
  - Comfort
  - Anxiety
  - Fluid and Electrolyte Balance

Exemplars:

New Mexico Nursing Education Consortium (NMNEC) Required Exemplars:

- Systemic Lupus Erythematosus (SLE): This Hypersensitivity Type III Reaction can affect many organ systems and is much more prevalent in women. African Americans, Asian Americans, Hispanics, and Native Americans are more likely than whites to develop the disease.
- Human Immunodeficiency Virus (HIV): (secondary condition to a primary infection) based on incidence and prevalence this is the best condition to highlight as a suppressed immune response.

Optional Exemplars:

- Exaggerated Immune Response
  - See above table
- Suppressed Immune Response
  - DiGeorge Syndrome
  - Primary immunodeficiency
  - Organ transplant
- See information above in Scope and Categories section for other exemplars

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