

# NUTRITION & DIAGNOSIS- RELATED CARE

*Ninth Edition*

SYLVIA ESCOTT-STUMP

MA, RDN, LDN, FAND



Academy of Nutrition  
and Dietetics

# NUTRITION & DIAGNOSIS- RELATED CARE

*Ninth Edition*

**SYLVIA ESCOTT-STUMP**

**MA, RDN, LDN, FAND**



Academy of Nutrition and Dietetics  
120 S. Riverside Plaza, Suite 2190  
Chicago, IL 60606

*Nutrition and Diagnosis-Related Care*, 9th Edition

ISBN 978-0-88091-057-6 (print)  
ISBN 978-0-88091-143-6 (eBook)  
Catalog Number 057622 (print)  
Catalog Number 057622e (eBook)

Copyright © 2022, Academy of Nutrition and Dietetics. All rights reserved. Except for brief quotations embodied in critical articles or reviews, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written consent of the publisher.

The views expressed in this publication are those of the authors and do not necessarily reflect policies and/or official positions of the Academy of Nutrition and Dietetics. Mention of product names in this publication does not constitute endorsement by the authors or the Academy of Nutrition and Dietetics. The Academy of Nutrition and Dietetics disclaims responsibility for the application of the information contained herein.

10 9 8 7 6 5 4 3 2 1

For more information on the Academy of Nutrition and Dietetics, visit [www.eatright.org](http://www.eatright.org).

#### Library of Congress Cataloging-in-Publication Data

Names: Escott-Stump, Sylvia, author.

Title: Nutrition & diagnosis related care / Sylvia Escott-Stump, MA, RDN, LDN, FAND.

Other titles: Nutrition and diagnosis related care

Description: Ninth edition. | Chicago, IL : Academy of Nutrition and Dietetics, [2022] | Includes bibliographical references and index.

Identifiers: LCCN 2021037212 (print) | LCCN 2021037213 (ebook) | ISBN 9780880910576 (hardcover) | ISBN 9780880911436 (ebook)

Subjects: LCSH: Diet therapy--Handbooks, manuals, etc. | Nutrition--Handbooks, manuals, etc.

Classification: LCC RM217.2 .E83 2021 (print) | LCC RM217.2 (ebook) | DDC 615.8/54--dc23

LC record available at <https://lcn.loc.gov/2021037212>

LC ebook record available at <https://lcn.loc.gov/2021037213>



# TABLE OF CONTENTS

<i>Alphabetical List of Topics</i>	<i>vii</i>
<i>Reviewers</i>	<i>x</i>
<i>Preface</i>	<i>xi</i>
<i>Acknowledgments</i>	<i>xii</i>
<i>Common Abbreviations</i>	<i>xiv</i>
<i>Publisher's Note on Gender-Inclusive Language</i>	<i>xvi</i>

## SECTION 1 Normal Life Stages

<b>Overview of Normal Nutrition and Noncommunicable Disease</b>	<b>2</b>
<b>Pregnancy and Lactation</b>	
Pregnancy	7
Lactation	18
<b>Infancy, Childhood, and Adolescence</b>	
Infant (0 to 6 Months)	28
Infant (6 to 12 Months)	33
Childhood	38
Adolescence	46
<b>Stages of Adulthood</b>	
Adulthood	51
Nutrition in Aging	69
<b>Fitness and Lifestyle</b>	
Sports Nutrition	79
Vegetarianism	87

## SECTION 2 Oral, Sensory, Skin Conditions, and Adverse Reactions to Food

<b>Overview of Microbiome</b>	<b>92</b>
<b>Orofacial Conditions</b>	
Dental and Oral Conditions	93
Periodontal Disease and Gingivitis	101
Temporomandibular Joint Dysfunction	104
<b>Sensory Impairment</b>	
Sensory Impairments: Vision, Coordination, Chewing, Taste, Smell, and Hearing	106
Autoimmune Inner Ear Disease (Ménière Disease)	113
<b>Skin Conditions, Pressure Injuries, and Vitamin Deficiencies</b>	
Skin Disorders	115
Pressure Injuries	121
Vitamin Deficiencies	126

## Food Allergy and Foodborne Illness

Food Allergy	130
Food Poisoning and Foodborne Illness	140

## SECTION 3 Pediatrics: Birth Defects and Genetic and Acquired Disorders

<b>Overview of Nutrition in Pediatric Disorders</b>	<b>149</b>
Abetalipoproteinemia	155
Achondroplasia	157
Attention Deficit Disorders	160
Autism Spectrum Disorder	163
Biliary Atresia	167
Bronchopulmonary Dysplasia	170
Carbohydrate Metabolic Disorders	173
Cerebral Palsy	178
Cleft Lip and Palate	182
Congenital Heart Disease	185
Cystinosis and Fanconi Syndrome	189
Down Syndrome	191
Faltering Growth or Failure to Thrive	194
Fatty Acid Oxidation Disorders	198
Fetal Alcohol Syndrome	201
Hirschsprung Disease (Congenital Megacolon)	204
HIV Infection, Pediatric	207
Homocystinuria and Inborn Errors of Cobalamin and Folate	211
Leukodystrophies	214
Low Birth Weight or Premature Birth	217
Macrosomia (Large for Gestational Age)	222
Maple Syrup Urine Disease	225
Mucopolysaccharidoses	228
Necrotizing Enterocolitis	231
Neural Tube Defects: Spina Bifida and Melomeningocele	234
Obesity, Childhood	238
Otitis Media	245
Phenylketonuria	248
Prader-Willi Syndrome	252
Rickets	255
Small for Gestational Age and Intrauterine Growth Restriction	258
Tay-Sachs Disease	261
Turner Syndrome	263

Tyrosinemia	266
Urea Cycle Disorders	268
Wilson Disease	272

## SECTION 4 Neuropsychiatric Disorders

### Overview of Neuropsychiatric Disorders 276

#### Neurologic Disorders

Alzheimer Disease and Dementias	284
Amyotrophic Lateral Sclerosis	290
Brain Trauma	293
Cerebral Aneurysm	296
Disorders of Consciousness	298
Epilepsy and Seizure Disorders	301
Guillain-Barré Syndrome and the Zika Virus	305
Huntington Disease	308
Migraine	312
Multiple Sclerosis	316
Myasthenia Gravis and Neuromuscular Junction Disorders	319
Parkinson Disease	322
Sleep and Circadian Rhythm Disorders	327
Spinal Cord Injury and Paralysis	330
Stroke (Cerebrovascular Accident)	335
Trigeminal Neuralgia	340

#### Eating Disorders

Anorexia Nervosa	342
Avoidant/Restrictive Food Intake Disorder	347
Binge Eating Disorder	350
Bulimia Nervosa	352

#### Other Psychiatric Disorders

Bipolar Disorder	357
Depression	361
Schizophrenia	365
Substance Use Disorder and Addiction	371
Tardive Dyskinesia	375

## SECTION 5 Pulmonary Disorders

### Overview of the Pulmonary System 380

Asthma	382
Bronchiectasis	388
Bronchitis	391
Chronic Obstructive Pulmonary Disease	394
Chylothorax	400
Cor Pulmonale	402
Cystic Fibrosis	404
Interstitial Lung Disease	410
Lung Transplantation	413
Pneumonia	416
Pulmonary Embolism	420
Respiratory Distress Syndrome	423

Respiratory Failure and Mechanical Ventilation	425
Sarcoidosis	429
Sleep Apnea	432
Thoracic Empyema	435
Tuberculosis	437

## SECTION 6 Cardiovascular Disorders

### Overview of Cardiovascular Disease 444

Angina Pectoris and Ischemic Heart Disease	453
Arteritis and Vasculitis	456
Atherosclerotic Cardiovascular Disease	459
Cardiac Cachexia	465
Cardiomyopathies	468
Heart Failure	472
Heart or Heart-Lung Transplantation	479
Heart Valve Disorders	483
Hypertension	486
Myocardial Infarction	492
Pericarditis and Cardiac Tamponade	496
Peripheral Artery Disease	499
Thromboembolism and Phlebitis	502

## SECTION 7 Gastrointestinal Disorders

### Overview of the Gastrointestinal System 506

#### Upper Gastrointestinal Tract Disorders

Dysphagia	511
Esophageal Disorders	516
Esophageal Varices	519
Esophagitis, Gastroesophageal Reflux, and Hiatal Hernia	521

#### Stomach Disorders

Dyspepsia, Indigestion, and Bezoar Formation	525
Gastrectomy and Vagotomy	527
Gastritis and Gastroenteritis	530
Gastroparesis and Gastric Retention	533
Giant Hypertrophic Gastritis and Ménétrier Disease	535
Peptic Ulcer Disease	537
Vomiting, Pernicious	543

#### Lower Gastrointestinal Tract Disorders

Carcinoid Syndrome	546
Celiac Disease and Gluten Intolerance	548
Constipation	553
Diarrhea, Dysentery, and Traveler's Diarrhea	557
Diverticular Diseases	562
Fat Malabsorption Syndrome	565
Inflammatory Bowel Disease: Crohn's Disease	569
Inflammatory Bowel Disease: Ulcerative Colitis	574
Intestinal Failure and Transplantation	577
Intestinal Fistula	581

Intestinal Lymphangiectasia	583
Irritable Bowel Syndrome	586
Lactose Maldigestion	589
Megacolon	593
Ostomy: Colostomy	596
Ostomy: Ileostomy	599
Peritonitis	602
Short Bowel Syndrome	604
Tropical Sprue	610
Whipple Disease (Intestinal Lipodystrophy)	612

### Rectal Disorders

Fecal Incontinence	614
Hemorrhoids	618
Proctitis	620

## SECTION 8 Hepatic, Pancreatic, and Biliary Disorders

### Overview of Hepatic, Pancreatic, and Biliary Disorders 624

#### Hepatic Disorders

Alcoholic Liver Disease	627
Ascites and Chylous Ascites	631
Hepatitis	634
Hepatic Cirrhosis	638
Liver Failure, Encephalopathy, and Coma	645
Liver Transplantation	650
Nonalcoholic Fatty Liver Disease	655

#### Pancreatic Disorders

Pancreatic Insufficiency	658
Pancreatitis, Acute	661
Pancreatitis, Chronic	664
Pancreatic Transplantation	668
Zollinger-Ellison Syndrome (Gastrinoma)	671

#### Biliary Disorders

Cholangitis	674
Cholestasis	676
Gallbladder Disease	679

## SECTION 9 Endocrine Disorders

### Overview of Endocrine Disorders 685

#### Diabetes Mellitus

Gestational Diabetes Mellitus	696
Prediabetes	701
Type 1 Diabetes Mellitus	705
Type 2 Diabetes Mellitus in Adults	718
Type 2 Diabetes Mellitus in Children and Teens	724

#### Diabetes Complications and Related Conditions

Diabetic Gastroparesis	728
Diabetic Ketoacidosis	731

Hyperosmolar Hyperglycemic State	734
Hypoglycemia	737
Hypoglycemia With Hyperinsulinism	740
Metabolic Syndrome	743
Preeclampsia and Hypertension in Pregnancy	747

### Pituitary, Ovary, and Adrenal Disorders

Acromegaly	750
Cushing Syndrome	752
Diabetes Insipidus	755
Hypopituitarism	757
Syndrome of Inappropriate Antidiuretic Hormone	760
Polycystic Ovarian Syndrome	763
Adrenocortical Insufficiency and Addison Disease	766
Hyperaldosteronism	770
Pheochromocytoma	772

### Thyroid Disorders

Hyperthyroidism	775
Hypothyroidism	779
Hypoparathyroidism and Hypocalcemia	783
Hyperparathyroidism and Hypercalcemia	785

## SECTION 10 Malnutrition: Overnutrition and Undernutrition

### Overview of Malnutrition 790

Overnutrition, Overweight, and Obesity	798
Undernutrition	813
Malnutrition in Children and Adults	819
Refeeding Syndrome	827

## SECTION 11 Musculoskeletal and Collagen Disorders

### Overview of Rheumatic and Bone Disorders 832

Fibromyalgia and Polymyalgia Rheumatica	837
Gout	840
Immobilization	844
Lupus	847
Muscular Dystrophy	851
Osteoarthritis	856
Osteomyelitis	861
Osteomalacia	864
Osteopenia and Osteoporosis	867
Paget Disease (Osteitis Deformans)	873
Polyarteritis Nodosa	876
Rhabdomyolysis	878
Rheumatoid Arthritis	881
Ruptured Disk and Radiculopathy	888
Scleroderma and Systemic Sclerosis	890
Spondyloarthritis	894

## SECTION 12 Hematology: Anemias and Blood Disorders

### Overview of Blood and Anemias 898

#### Anemias

Anemia of Inflammation	902
Anemias in Neonates	905
Anemia of Renal Disease	907
Aplastic Anemia and Fanconi Anemia	910
Copper-Deficiency Anemia	913
Folic Acid-Deficiency Anemia	917
Hemolytic Anemias	921
Iron-Deficiency Anemia	923
Malaria and Parasitic Anemias	929

#### Megaloblastic Anemias

Pernicious and Vitamin B12-Deficiency Anemias	933
---	-----

#### Hemoglobinopathies

Sickle Cell Disease	937
Sideroblastic Anemias	941
Thalassemias	943

#### Other Blood Disorders

Bleeding Disorders: Hemorrhage and Hemophilia	946
Hemochromatosis and Iron Overload	949
Polycythemia Vera	953
Thrombocytopenia	956

## SECTION 13 Cancer

### Overview of Cancer 960

#### General Cancer Types

Bone Marrow or Hematopoietic Stem Cell Transplantation	975
Bone Cancers	979
Brain Tumors	982
Colorectal Cancer	985
Esophageal, Head and Neck, and Thyroid Cancers	991
Gastric Cancer	996
Liver Cancer	1000
Lung Cancers	1003
Pancreatic Cancer	1007
Skin Cancers	1010
Urinary Bladder and Renal Cancers	1014

#### Hormonal Cancers

Breast Cancer	1017
Choriocarcinoma	1022
Endometrial Cancer	1025
Ovarian Cancer	1027
Prostate Cancer	1030

#### Hematological Cancers

Leukemias	1034
Lymphomas	1038
Myeloma	1041

## SECTION 14 Surgery and Nutrition Support

### Overview of General Surgery Guidelines 1047

Perioperative Nutrition	1050
-------------------------	------

#### Gastrointestinal Surgeries

Bariatric Surgery	1064
Bowel Surgeries	1070

#### Nutrition Support

Nutrition Support	1075
Enteral Nutrition	1079
Parenteral Nutrition	1087

## SECTION 15 Immunology and Critical Care

### Overview of Nutrition and Immunocompetence 1092

AIDS and HIV Infection	1105
Burn Injury	1112
Fractures	1118
Intestinal Parasite Infections	1122
Multiple Organ Dysfunction Syndrome	1127
Sepsis	1131
Trauma	1135

## SECTION 16 Kidney Disorders

### Overview of Kidney Disorders 1140

Chronic Kidney Disease and Acute Kidney Injury	1144
Dialysis	1154
Glomerular and Autoimmune Kidney Diseases	1161
Glomerular Basement Membrane Disorders and Alport Syndrome	1164
Kidney Stones (Nephrolithiasis)	1167
Nephrotic Syndrome	1171
Renal Metabolic Disorders: Hypophosphatemic Rickets and Hartnup Disorder	1175
Polycystic Kidney Disease	1178
Kidney Transplantation	1180
Urinary Tract Infections	1186

## APPENDIX A Basic Nutrition Principles, Nutrients, and Dietary Supplements

Dietary Reference Intakes	1190
Nutrients and Metabolism	1190
Carbohydrates and Fiber	1190
Lipids and Fatty Acids	1191
Proteins and Amino Acids	1194
Minerals	1198
Major Minerals	1198
Trace Minerals	1203

Ultra-Trace Minerals	1204
Less-Studied Ultra-Trace Minerals	1206
Vitamins	1207
Fat-Soluble Vitamins	1207
Water-Soluble Vitamins	1212
Prebiotics, Probiotics, and Synbiotics	1217
Antioxidants	1217
Dietary Supplements: Botanicals and Other Supplements	1221

**APPENDIX****B****Nutrition Assessment  
Tools and Forms**

Intake Records	1234
Nutrition Assessment and Documentation Forms	1235
Nutrition Focused Physical Examination and Micronutrient Deficiencies	1236
Calculation of Energy and Protein Requirements	1239
Biochemical Assessment	1239
Food–Nutrient–Drug Interactions	1250
Clinical Case Documentation	1252

**APPENDIX****C****Culturally Sensitive and Inclusive  
Nutrition Care, Education, and  
Counseling**

Understanding Cultural Humility and Competence	1254
Practice-Based Cultural Humility and Competence	1254
Culturally Sensitive and Inclusive Nutrition Care and Counseling	1256
Nutrition Education and Counseling	1261

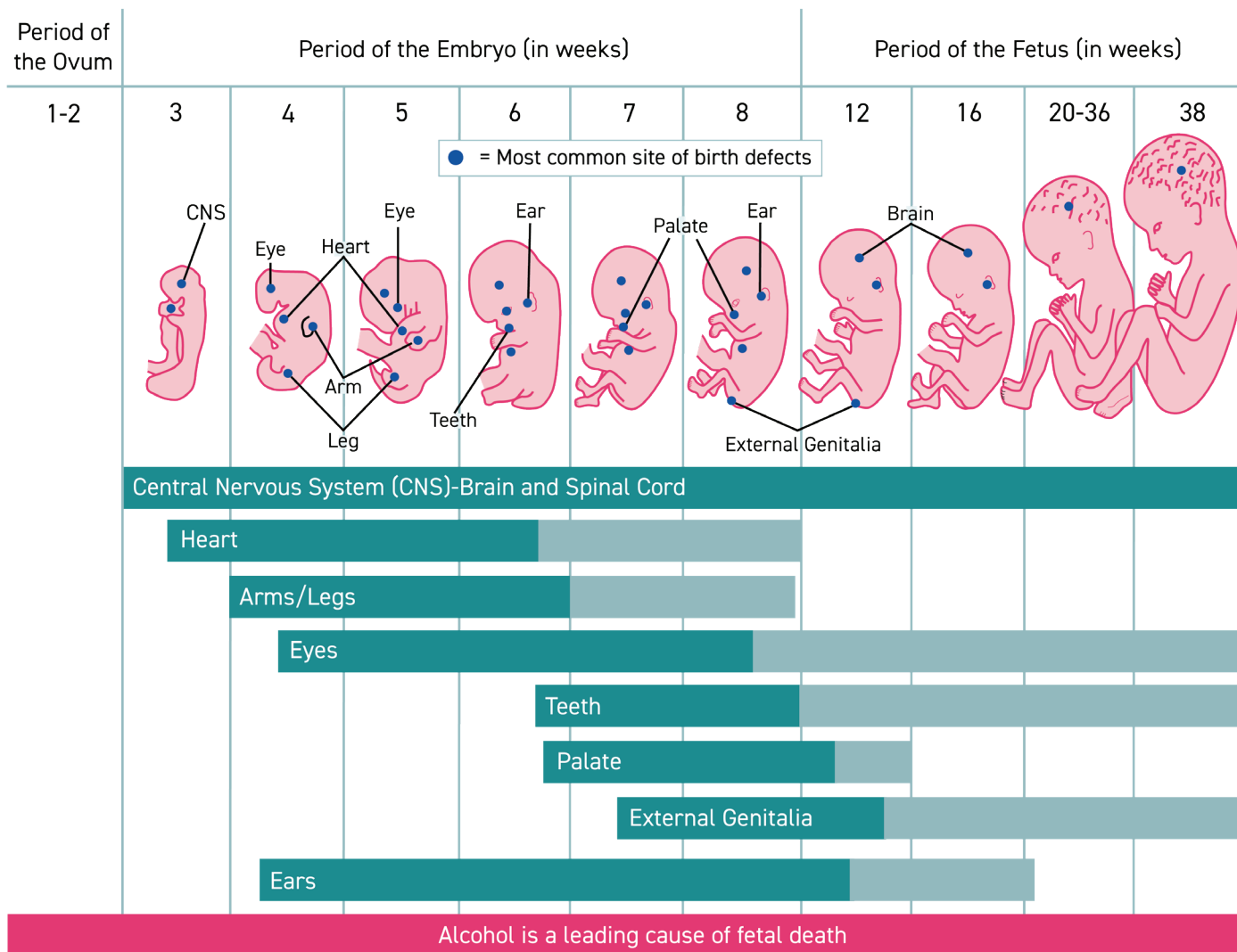
**APPENDIX****D****The Practice of Nutrition  
and Dietetics: Nutrition Services  
and Management**

The Practice of Nutrition and Dietetics	1268
Role Definition	1268
Standards of Practice and Standards of Professional Performance	1268
External Standards and Regulations for Safe Practice	1268
Scope of Practice	1268
Nutrition Care Process	1268
Interprofessional Collaboration	1271
Medical Nutrition Therapy and Reimbursement for Services	1271
Continuum of Care	1271
Research and Evidence-Based Practice	1271
Medical Classification Systems	1272
Accountability	1272
Competence and Autonomy	1273
Order-Writing Privileges	1275
Excellence in Practice	1275
Technology	1275
Client Satisfaction	1275
Business and Nutrition Services Management	1276
Consulting and Private Practice	1276

*Index*

1279





**Figure 1.2 Fetal development and vulnerability chart**

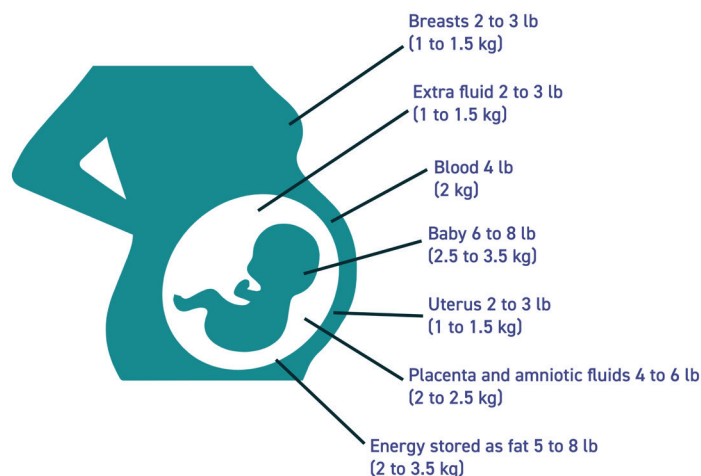
Adapted with permission from the National Organization on Fetal Alcohol Syndrome.

Nutritional deficits during preconception, pregnancy, and early years of life are serious (Procter et al, 2014). Nutrient depletion of energy and protein at conception will alter pregnancy outcomes. A short span between pregnancies or an early pregnancy within 2 years of menarche will increase the risk for stunting (low height-for-age) or preterm delivery. Underweight is associated with small-for-gestational-age (SGA) births as well as prematurity.

Energy restriction during gestation and lactation impacts the developmental programming of energy balance in the infant. Susceptibility to obesity, incapacity to regulate energy balance, altered leptin and insulin sensitivity, and changes in body composition may result (Reynolds et al, 2015).

Poor iron and folate intakes during pregnancy have been associated with preterm births and intrauterine growth retardation, common in early or closely spaced pregnancies. Use of prenatal folic acid supplements around the time of conception has been associated with lower risks of both autism spectrum disorders and neural tube defects (Surén et al, 2013). Iodine deficiency in utero is also a concern, as it may lead to cretinism.


Stillbirths are another risk. To prevent stillbirths, the following measures are protective: childbirth care; induction for prolonged



**Figure 1.3 Typical tissue weight gains of pregnancy**

Adapted with permission from Nutrition Connections, Ontario Public Health Association. Healthy weight gain during pregnancy. Accessed November 5, 2020. [www.healthunit.com/healthy-weights-in-pregnancy](http://www.healthunit.com/healthy-weights-in-pregnancy)

# Choriocarcinoma



## DEFINITIONS AND BACKGROUND

*Choriocarcinoma* (CC) involves a highly malignant neoplasm that starts in cells of the placenta with a secretion of the pregnancy hormone, human chorionic gonadotropin ( $\beta$ -hCG). CC occurs once in every 20,000 to 40,000 pregnancies and is often asymptomatic except for shortness of breath (Hensley et al, 2014). Fatty acid synthase is a tumor-associated marker found in all CCs. After the initial diagnosis, a careful examination is done to rule out metastasis. CC can be fatal if there is metastasis to the kidney.

CC can be either gestational or nongestational in origin (containing or lacking a paternal chromosome complement, respectively); the androgenetic form is typical (Savage et al, 2017). CC may occur after miscarriage, ectopic pregnancy, full-term delivery, or a molar pregnancy. It is more common among Asian populations.

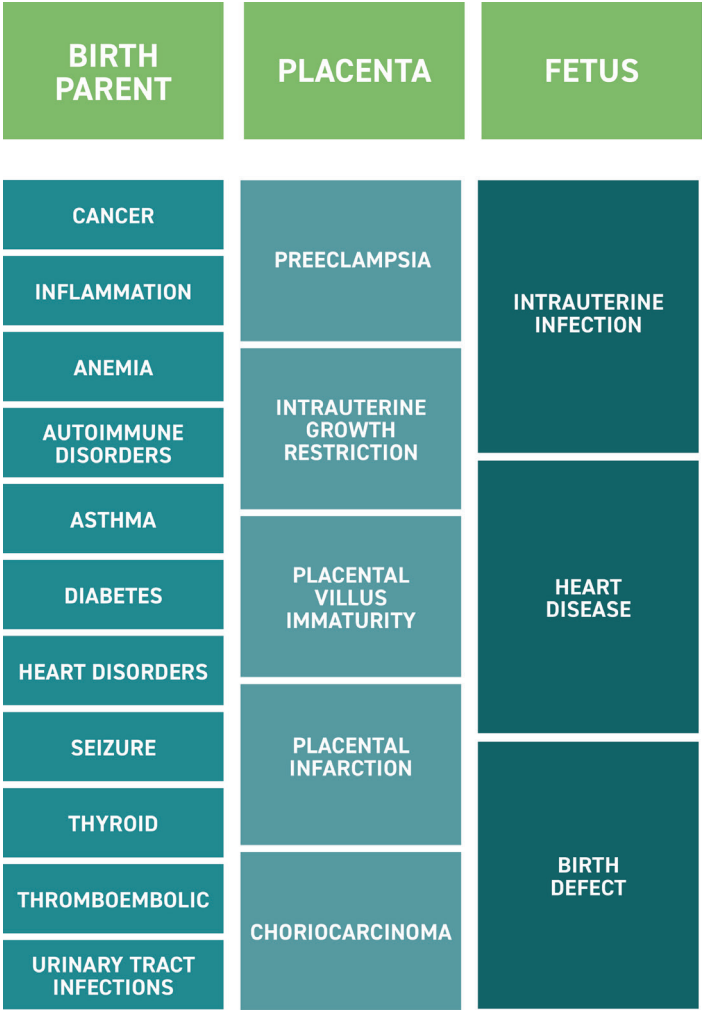
CC leads to abnormal trophoblast formation. In some, the growth persists and develops into *gestational trophoblastic neoplasia* (GTN), a malignant form of the disease (Wang et al, 2017). Diet affects the development of this type of cancer because the placenta plays a large role in nutrient availability. Patients with CC may have deficiencies in protein, carotene, and vitamin A; more research is needed.

*Hydatidiform mole*, also called a molar pregnancy, is characterized by an overgrowth of fetal chorionic tissue within the uterus; it may be partial or complete (Wang et al, 2017). In a molar pregnancy, the fetus does not develop at all.

Perturbation of placental functions can limit the transfer of necessary nutrients, alter the production of hormones needed during pregnancy, and allow the undesired passage of xenobiotics to the developing fetus (Fournier et al, 2018). Because phytoestrogens induce biologic responses by mimicking or modulating the action or production of endogenous hormones, genistein isoflavonoids and coumestrol may be protective. In the future, engineered nanomaterials may someday be available for targeted therapy (Fournier et al, 2018); see Figure 13.15.

Most patients with low-risk GTN can be cured by evacuation of the uterus with or without single-agent chemotherapy (Lawrie et al, 2016). The patient should not become pregnant for 1 year after chemotherapy. Surgical excision or dilation and curettage is reserved for acute emergencies. A hysterectomy is rarely indicated but may be needed for some patients under 40 years of age.

*Testicular CC* is an exceptionally rare cancer in men, potentially asymptomatic but with specific clinical features: skin hyperpigmentation (from excess  $\beta$ -hCG cross-reacting with the  $\alpha$ -melanocyte-stimulating hormone receptor), gynecomastia, and weight loss. Pure CC of the testes is an aggressive germ cell tumor that can metastasize to the brain. Although the prognosis for testicular CC has improved with the development of cisplatin-based chemotherapy regimens, cerebral metastases are prone to hemorrhage and are associated with high morbidity (Hoffman et al, 2017). Radiotherapy may be needed to complement radical orchiectomy and chemotherapy to achieve full remission.



**Figure 13.15** Perinatal conditions that can be treated using therapies developed on an engineered nanomaterial platform

Adapted with permission from Fournier SB, D’Errico JN, Stapleton PA. Engineered nanomaterial applications in perinatal therapeutics. *Pharmacol Res.* 2018;130:36-43.



## ASSESSMENT, MONITORING, AND EVALUATION

See Appendix B for support information.

### ANTHROPOMETRICS

- Height
- Weight
- BMI
- Weight loss

Patient Education: Food Safety

Educate the patient about food safety issues. Discuss safe food handling and preparation, keeping foods at proper temperatures, and reheating foods properly.

NUTRITION CARE PROCESS MINI CASE STUDY

Inadequate Bioactive Substance Intake

Assessment Data

37-year-old female who had a healthy pregnancy 6 months ago. She is still breastfeeding, but her lab values show high levels of beta hCG.<sup>a</sup> Diagnosis of choriocarcinoma. The medical team plans to start chemotherapy soon using methotrexate. BMI<sup>b</sup> is 25. Her diet history is notable for no intake of soy or other foods containing isoflavonoids.

Nutrition Diagnoses (PES)

Inadequate bioactive substance intake related to phytoestrogens as evidenced by food frequency records showing no intake of soy or other isoflavonoids

Interventions

**Food and nutrient delivery:** Offer recipes and tips for ways to increase the intake of isoflavonoids from soy, legumes, and other foods.

**Education:** Educate the patient about the role of bioactive substances in isoflavonoids in the prevention of this form of

cancer. Educate on food sources of isoflavonoids (soy, legumes, spinach, brussels sprouts, tofu, etc). Provide recipes. Educate about possible nutrition side effects of chemotherapy.

**Counseling:** Encourage behavioral change of increasing intake of foods with isoflavonoids from 0 servings daily to 2 servings daily. Encourage optimal meal/snack intakes and consuming nutrient-dense foods to help maintain weight throughout chemotherapy treatments.

**Coordination of care:** Collaborate with interdisciplinary team. Physician to help manage side effects of chemotherapy.

Monitoring and Evaluation

**Monitoring: After 24 hours:** Patient is started on chemotherapy. She consumes ~75% of her dinner meal, which contains tofu.

**Evaluation: After 3 months:** Patient consumes 1 cup of soy milk daily. She incorporates more tofu, legumes, and other sources of isoflavonoids into her diet. Her weight has been relatively stable since starting chemotherapy.

<sup>a</sup>hCG = human chorionic gonadotropin   <sup>b</sup>BMI = body mass index

References

Dubinsky V, Poehlmann TG, Suman P, et al, Gutierrez G. Role of regulatory and angiogenic cytokines in invasion of trophoblastic cells. *Am J Reprod Immunol.* 2010;63(3):193-199.

Fournier SB, D’Errico JN, Stapleton PA. Engineered nanomaterial applications in perinatal therapeutics. *Pharmacol Res.* 2018;130:36-43.

Hensley JG, Shviraga BA. Metastatic choriocarcinoma in a term pregnancy: a case study. *MCN Am J Matern Child Nurs.* 2014;39(1):8-15.

Hoffman HA, Toshkezi G, Fullmer JM, et al. Pitfalls in diagnosis and management of testicular choriocarcinoma metastatic to the brain: report of 2 cases and review of literature. *World Neurosurg.* 2017;106:536-542.

Lawrie TA, Alazzam M, Tidy J, et al. First-line chemotherapy in low-risk gestational trophoblastic neoplasia. *Cochrane Database Syst Rev.* 2016;(6):CD007102.

Savage J, Adams E, Veras E, et al. Choriocarcinoma in women: analysis of a case series with genotyping. *Am J Surg Pathol.* 2017;41(12):1593-1606.

Wang Q, Fu J, Hu L, et al. Prophylactic chemotherapy for hydatidiform mole to prevent gestational trophoblastic neoplasia. *Cochrane Database Syst Rev.* 2017;(9):CD007289.

For More Information

- Cancer Research UK: Persistent Trophoblastic Disease and Choriocarcinoma  
[www.cancerresearchuk.org/about-cancer/gestational-trophoblastic-disease-gtd/persistent-trophoblastic-disease-ptd-choriocarcinoma](http://www.cancerresearchuk.org/about-cancer/gestational-trophoblastic-disease-gtd/persistent-trophoblastic-disease-ptd-choriocarcinoma)
- MedlinePlus: Choriocarcinoma  
<https://medlineplus.gov/ency/article/001496.htm>

- stressors on risk for preterm birth, 16<sup>f</sup>  
 tissue weight gains, 8<sup>f</sup>  
 undernutrition, 791<sup>b</sup>  
 venous thromboembolism, 502  
 vulnerability chart, 8<sup>f</sup>  
 pregnancy diet, 1264<sup>b</sup>  
 prehabilitation, 1051  
 prematurity (low birth weight), 217–221  
   enteral nutrient intakes for preterm infants, 220<sup>t</sup>  
   nutritional deficits in, 218<sup>b</sup>  
   nutritional risks associated with, 154<sup>b</sup>  
   parenteral nutrition in preterm infants, 221<sup>b</sup>  
 premenstrual syndrome (PMS)/premenstrual  
   dysphoric disorder (PMDD), adult  
     females, 57<sup>b</sup>  
 presbycusis, 108  
 presbyphagia, 511  
 preschool period, 38  
 pressure injuries, 126  
   definitions, 121–122  
   laboratory values for management, 123<sup>b</sup>  
   skin changes with aging and, 124<sup>b</sup>–125<sup>b</sup>  
 prickly pear cactus, 1227<sup>b</sup>  
 primary adrenal insufficiency, 766  
   testing for, 767<sup>f</sup>  
 primary aldosteronism, 770  
 primary biliary cholangitis (PBC), 674–675  
 primary hyperaldosteronism, 770  
 primary hyperparathyroidism (pHPT), 785  
 primary insomnia, 327  
 primary open-angle glaucoma, 107  
 primary polydipsia, 755  
 primary sclerosing cholangitis (PSC), 674–675  
 private practice, 1276  
 probiotics, 1217, 1227<sup>b</sup>  
 proctitis, 620–622  
 prolactin, 758  
 prostate cancer (PCa), 1030–1033  
   antioxidant color link, 1032<sup>t</sup>  
   protective factors against, 1030<sup>b</sup>  
   vitamin D and genes in, 1031<sup>f</sup>  
 prostate problems, adults, 57<sup>b</sup>  
 protein(s)  
   adulthood, 56  
   amino acids and, 1194, 1198  
   autoimmune inner ear disease, 114  
   aging, 73  
   biological values of selected foods, 1198<sup>t</sup>  
   calculating adult requirements, 1241<sup>b</sup>  
   calculation of, 1239  
   cardiovascular disease, 444–446  
   childhood, 40  
   food allergy, 135  
   food sources, 1199<sup>t</sup>–1200<sup>t</sup>  
   global dietary guidance, 5<sup>b</sup>  
   infants, 29, 34  
   lactation, 23  
   nonmeat, 642<sup>f</sup>  
   nutrients for brain health, 282<sup>b</sup>  
   periodontal disease, 102  
   pregnancy, 11  
   pressure injuries, 123  
   recommended intake for athletes, 82<sup>b</sup>  
   sensory impairment, 109  
   signs of deficiency, 1236<sup>b</sup>  
   skin disorders, 118  
   sports nutrition, 81  
   suggestions for adding, 397<sup>b</sup>–398<sup>b</sup>  
   temporomandibular joint dysfunction, 105  
   vegan sources, 88<sup>f</sup>  
   vegetarianism, 88  
 protein-bound iodine, 1249<sup>b</sup>  
 protein-energy wasting (PEW), 1145  
 protein factors, 1245<sup>b</sup>  
 proteome, 4  
 PSC. *See* primary sclerosing cholangitis (PSC)  
*Pseudomonas aeruginosa*, 405, 408<sup>b</sup>  
 psoriasis, 116, 118<sup>f</sup>, 119  
 psoriatic arthritis (PsA), 894  
 psyllium, 1227<sup>b</sup>  
 public health, achievements and essential  
   services, 4<sup>b</sup>  
 PUD. *See* peptic ulcer disease (PUD)  
 pulmonary embolism (PE), 420–422  
 pulmonary heart disease, 402  
 pulmonary surfactant, 380  
 pulmonary system, 379  
   causes of malnutrition, 382<sup>b</sup>  
   chief assessment factors, 380  
   inflammation, 381  
   metabolic comorbidities in chronic lung  
     disorders, 381<sup>f</sup>  
   overview of, 380–382  
   respiratory quotient and substrate, 381<sup>b</sup>  
   respiratory system, 380<sup>f</sup>  
 pulmonary valve stenosis, 484  
 PV. *See* polycythemia vera (PV)  
 PVD. *See* peripheral vascular disease (PVD)  
 PWS. *See* Prader-Willi syndrome (PWS)  
 pycnogenol, 1227<sup>b</sup>  
 pyorrhea alveolaris, 101  
 pyridoxine, 1213–1214
- Q**  
 quadrantanopia, 107  
 quadriplegia, 331  
   ideal body weight range, 795<sup>b</sup>
- R**  
 RA. *See* rheumatoid arthritis (RA)  
 radiation, cancer risk, 964<sup>b</sup>  
 radiation enteritis, cancer, 971<sup>b</sup>  
 radiculopathy, 888–890  
 Raynaud phenomenon, 499  
 RBC distribution width, 898  
 reactive arthritis (ReA), 894  
 rectal cancer, 985  
 recurrent aphthous stomatitis, 94  
 red blood cell  
   comparison of shapes, 937<sup>f</sup>  
   normal versus thalassemia, 943<sup>f</sup>  
 red clover, 1228<sup>b</sup>  
 red yeast rice, 1231<sup>b</sup>  
 refeeding syndrome (RFS), 827–830  
   algorithm for prevention and management  
     of, 829<sup>f</sup>  
   conditions with high risk for, 827<sup>b</sup>  
   pathophysiology of, 827<sup>f</sup>  
 refractive errors, 107<sup>f</sup>  
 refractory celiac disease, 549  
 Refsum disease, 214  
 religious food practices, 1256, 1256<sup>t</sup>  
 renal abbreviations, 1142<sup>b</sup>–1143<sup>b</sup>  
 renal cell cancer (RCC), 1014, 1015, 1017  
 renal diet, 1264<sup>b</sup>  
 renal Falconi syndrome, 189  
 renal metabolic disorders, 1175–1177  
   Hartnup disease, 1175–1176, 1177  
   hypophosphatemic rickets, 1175  
 renal replacement therapy (RRT), 1141  
 renal values, 1248<sup>b</sup>  
 reperfusion injury, 1136  
 reproductive disorders, adulthood, 54<sup>b</sup>  
 research and evidence-based practice,  
   1271–1272, 1273<sup>f</sup>  
 respiratory distress syndrome, 423–424, 425  
 respiratory factors, 1248<sup>b</sup>  
 respiratory failure (RF), 425–429  
   inflammation, 425  
   symptoms and causes of, 426<sup>b</sup>  
 respiratory quotient (RQ), 382  
 respiratory system, 380<sup>f</sup>. *See also* pulmonary  
   system  
 resting metabolic rate (RMR), 1239  
 restless leg syndrome, 327  
 restrictive cardiomyopathy (RCM), 469  
 retinitis pigmentosa, 107  
 retinol binding protein (RBP), 1241, 1246<sup>b</sup>  
 Rett syndrome, 164  
 revised trauma score (RTS), 1135  
 Reye's syndrome, nutritional implications,  
   1100<sup>b</sup>  
 RF. *See* respiratory failure (RF)  
 RFS. *See* refeeding syndrome (RFS)  
 rhabdomyolysis (RML), 878–880  
   diagnostic algorithm for patients, 879<sup>f</sup>  
   features of, 879<sup>f</sup>  
 rheumatic disorders, 831, 832–833  
   overview of, 832–836  
   phytochemicals and dietary factors, 835<sup>t</sup>  
 rheumatic fever, nutritional implications,  
   1103<sup>b</sup>  
 rheumatoid arthritis (RA), 881–887  
   diet, gut dysbiosis and immune responses  
     in, 883<sup>f</sup>  
   features of, 881<sup>b</sup>  
   inflammation, 881  
   medications for treatment of, 885<sup>t</sup>–887<sup>t</sup>  
   variant forms of, 882<sup>t</sup>  
 rheumatoid cachexia, 881  
 rheumatoid vasculitis, 882<sup>t</sup>  
 rhodiola, 1228<sup>b</sup>  
 rhubarb, 1228<sup>b</sup>  
 riboflavin, 1246<sup>b</sup>  
   signs of deficiency, 1237<sup>b</sup>  
 riboflavin (vitamin B2), 1213  
 riboflavin deficiency, 127<sup>b</sup>, 129  
 rice, food allergy, 136<sup>b</sup>  
 rice bran oil, 1228<sup>b</sup>  
 rickets, 255–256, 257  
 RML. *See* rhabdomyolysis (RML)  
 rosacea, 116, 118<sup>f</sup>, 119  
 rosemary, 1228<sup>b</sup>  
 Roux-en-Y reconstruction, 527  
 rumination syndrome, 356<sup>b</sup>  
 ruptured disk, 888–890  
 Ryan White HIV/AIDS Program, 207