Dietetics in Health Care Communities

a dietetic practice group of the American Dietetic Association

# Pocket Resource for Nutrition Assessment

## 2009 Edition

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## PREFACE

Dietetics in Health Care Communities, a practice group of the American Dietetic Association is proud to offer the seventh edition of the **Pocket Resource for Nutrition Assessment**. This manual has been a cumulative effort by membership since the first edition was written in 1990. This year has seen many changes within our organization; our name changed from Consultant Dietitians in Health Care Facilities to Dietetics in Health Care Communities, our Guiding Principles were updated changing the size and scope of the Executive Committee, and the Executive Committee began producing Webinars.

As this work began, so did the work on this latest edition of the **Pocket Resource for Nutrition Assessment.**

We have updated every section and for the first time, included many web links and new references to further enhance the use of this tool.

We have included the following new sections:

- Regulatory requirements and interpretive guidelines for skilled nursing
- Determination of completeness of protein in protein supplements
- Discussion of Indirect Calorimetry
- Nutrition Care Process and PES statements
- Nutrition and Wound Care

Our hope is that this tool will become part of your daily reference guides and will increase your knowledge and effectiveness in the work place.

Special thanks to Katy Adams, my Coeditor, Marla Carlson, our Executive Director for her knowledge and guidance, to the other members of the Executive Committee for their contributions and review, and to all members who wrote sections of this manual and reviewed sections. The completion of the manual would not be possible without them.

Cynthia Piland, MS, RD, CSG, LD
Editor of 7th Edition of Pocket Resource for Nutrition Assessment
Sponsorship Chair, DHCC

## Foreword

The first edition of the Pocket Resource for Nutrition Assessment (PRNA) was published in 1990. This is the 7th issue. The PRNA is Dietetics in Health Care Communities (DHCC) volunteers working together to collect and organize current evidence based nutrition practices for nutrition care of the residents within long-term care, young and old.

Healthcare continues to change at breakneck speed. It is our goal to keep our members at the forefront of dietetics in healthcare communities.

Special thanks to Marla Carlson, Executive Director of DHCC and Cynthia Piland, RD, CSG, LD, and Katy Adams, RD, CSG, LD, Editors of PRNA. Without their hard work and dedication this edition would be nothing more than a great idea.

Linda Roberts, MS, RD, LDN
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**NUTRITION SCREENING**

As the name of our practice group has changed to Dietetics in Health Care Communities, so has the patient/resident that we see in our practice. Dietitians in community based programs, skilled nursing facilities, assisted living facilities, corrections, and rural hospitals provide nutrition screening and nutrition services to a much larger variety of clients. The nutrition services that the registered dietitian provides must be tailored to fit that client base whether they are patients, clients or residents. The dietitian must adapt to the changes in the health care communities. Each step that is taken is an improvement in the quality of life of our client populations and an increase in the awareness of the knowledge and skills of the registered dietitian.

## Nutrition Care Process

The Nutrition Care Process (NCP) has altered the nutrition assessment format in all areas of health care. The Registered Dietitian (RD) or competent Dietetic Technician, Registered (DTR) is responsible for the analysis of nutrition data to determine Nutrition Diagnosis, Intervention, and Evaluation. Nutrition Screening may be a key step in your systematic referral of high-risk patients and residents to the RD for the NCP. Screening programs should be designed to rapidly and accurately identify those patients and residents who require a more comprehensive nutrition assessment to determine if there is a nutrition problem requiring intervention. (5)

A Nutrition Screening Instrument should have the following characteristics: (4)

1. A validated and reliable scale in the intended population
2. A clear definition of thresholds
3. Compatibility with skills of a generalist assessor
4. Minimal bias due to data collector
5. Acceptability to patients
6. Relatively inexpensive in time and energy costs
7. Sensitivity to change in score

When selecting a Nutrition Screening Tool evaluate the population for its intended use, what you are screening for, and whether or not it has been validated. (3)

**Available Tools for Nutrition Screening**

| Purpose | Tool | Validated? | Population | Web Reference |
|---|---|---|---|---|
| Identify patients/residents with a decrease in appetite | Simplified Nutritional Appetite Questionnaire (SNAQ) | Yes | Older adults | http://www.slu.edu/readstory/newslink/6349 |
| | Council on Nutrition Appetite Questionnaire (CNAQ) | Yes | | http://medschool.slu.edu/agingsuccessfully/pdfsurveys/appetitequestionnaire.pdf |
| Identify people at risk for malnutrition | DETERMINE Your Nutritional Health Checklist | No | Community living older adults | http://www.eatright.org/ada/files/Checklist.pdf |
| | Meals on Wheels | No | | http://www.annalsoflongtermcare.com/attachments/1079364363-NutritionLTC.pdf |
| | SCALES | No | | http://www.merck.com/mkgr/mmg/tables/61t3.jsp |
| Evaluate nutrition risk (predicting future complications) | **Subjective Global Assessment (SGA** | Yes | Acute care | http://www.hospitalmedicine.org/geriresource/toolbox/pdfs/subjective_global_assessmen.pdf |
| Predict the need for Nutrition Assessment | Malnutrition Screening Tool (MST) | Yes | Acute Care | http://www.abbottnutrition.ca/static/content/document/ENS348A08.pdf |

| Purpose | Tool | Validated? | Population | Web Reference |
|---|---|---|---|---|
| | Malnutrition Universal Screening Tool (MUST) | | | http://www.bapen.org.uk/pdfs/must/must_full.pdf |
| Assess under-nutrition | Mini Nutrition Assessment (MNA) | Yes | Older adult | http://www.mna-elderly.com/forms/mini/mna_mini_english.pdf |
| | Nutrition Risk Assessment | In process | Older adult | www.dhccdpg.org |
| | Nutrition Screening Initiative (NSI) Level 1 Screen Level II Screen | | Older Adult | http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_nsi_ENU_HTML.htm |

**References**


1. Anthony PS. Nutrition Screening Tools for Hospitalized Patients. *Nutr Clin Pract*. 2008;23:373-382.
2. Escott-Stump S. Nutrition and Diagnosis-Related Care, 6 ed, Wolters Kluwer; Lippincott, Williams & Wilkins. 2007.
3. Anderson SJ, Baxi AS, Wilson MG, Thomas DR. Assessment of the reliability of a consensus based questionnaire for appetite evaluation in long-term care residents. J Amer Geriatr Soc 2003; 51(4): S206.


**Additional Resources**


1. Appetite Questionnaire in community-dwelling seniors. J Amer Geriatr Soc 2004; 52(Supp 4): S184
2. Thomas DR. Nutrition Assessment in Long-Term Care. *Nutr Clin Pract*. 2008;23:383-387.
3. Charney P. Nutrition Screening vs Nutrition Assessment: How Do They Differ? *Nutr Clin Pract*. 2008;23:366-372
4. Niedert, K. and Dorner, B. eds. *Nutrition Care of the Older Adult 2nd Edition*. American Dietetic Association. 2004

## NUTRITIONAL NEEDS AND ASSESSMENT

The first step in the Nutrition Care Process is the completion of a nutritional assessment and determination of nutrition needs. The ADA Evidence Analysis Team has completed an extensive literature search on the validity of predictive energy needs equations. These equations are used to predict resting metabolic rate (RMR). (1) These equations can be found in various reference materials. "*It is clear that the practitioner should become aware of the limitations and the use of these equations*." (1) A review of current literature still demonstrates several equations and methods to determine needs. The literature suggests that a comprehensive review of intake, consistency in assessment and recommendations for interventions are all key steps in the process.

The American Dietetic Association has completed evidence based analysis of several methods.
The *Harris-Benedict Equation* has been widely used by dietetics professionals and has been cited in this reference since the first edition. Although this equation was said to measure basal energy expenditure (BEE), in fact, it measures RMR. Indirect calorimetry is the most accurate measurement of resting metabolic rate, but if this method is not available the Mifflin-St. Jeor equation is the most accurate for overweight and obese individuals. (reference ADA pocket guide)

It is important to note that predictive equations are not as reliable in older adults as in other age groups. There is limited information available on older adults, especially those over the age of 80 years. Information on nonwhite ethnic groups is also limited.

Both the Harris-Benedict and the Mifflin-St. Jeor Equations are included. Dietitians are encouraged to review current literature and research at the ADA Evidence Based Library and to continue to follow the evidence-based research.

**Harris-Benedict Equation**
Basal Energy Expenditure (BEE) The equation varies depending on the sex of the subject.

Men: BEE = 66.47 + (13.75 x Weight in kg) + (5.0 x Height in cm) - (6.76 x Age in yrs)

Women: BEE = 655.10 + (9.56 x Weight in kg) + (1.85 x Height in cm) - (4.68 x Age in yrs)

**Mifflin-St. Jeor Equation**

Men: RMR = (9.99 x weight) + (6.25 x height) – (4.92 x age) + 5

Women: RMR = (9.99 x weight) + (6.25 x height) – (4.92 x age) - 161

**BEE Tables (based on Harris-Benedict equation) (2)**
How to Use Tables on pages 38-43:

**Step 1:** Obtain weight, height, age and sex of subject.

**Step 2:** Using the tables on the following pages, determine the appropriate kCals for the height, weight, age and sex of the subject using the following formula.

**Step 3:** BEE = weight kCal + height kCal - age kCal

**Example:** Sex: male
Weight: 70 kilogram (kg)
Height: 178 centimeter (cm)
Age: 45
BEE = 1029 + 889 - 304 = 1614

**BASAL ENERGY EXPENDITURE (BEE)**

**HEIGHT – MALE**

| ft | in | in | cm | kCal | ft | in | in | cm | kCal | ft | in | in | cm | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4' | 7" | 55 | 139.7 | 699 | 5' | 5" | 65 | 165.1 | 825 | 6' | 3" | 75 | 190.5 | 953 |
| | 8" | 56 | 142.2 | 711 | | 6" | 66 | 167.6 | 838 | | 4" | 76 | 193.0 | 965 |
| | 9" | 57 | 144.8 | 724 | | 7" | 67 | 170.2 | 851 | | 5" | 77 | 195.6 | 978 |
| | 10" | 58 | 147.3 | 737 | | 8" | 68 | 172.7 | 864 | | 6" | 78 | 198.1 | 991 |
| | 11" | 59 | 149.9 | 749 | | 9" | 69 | 175.3 | 876 | | 7" | 79 | 200.7 | 1003 |
| 5' | 0" | 60 | 152.4 | 762 | 5' | 10" | 70 | 177.8 | 889 | 6' | 8" | 80 | 203.2 | 1016 |
| | 1" | 61 | 154.9 | 775 | | 11" | 71 | 180.3 | 902 | | 9" | 81 | 205.7 | 1029 |
| | 2" | 62 | 157.5 | 787 | 6' | 0" | 72 | 182.9 | 914 | | 10" | 82 | 208.3 | 1041 |
| | 3" | 63 | 160.0 | 800 | | 1" | 73 | 185.4 | 927 | | 11" | 83 | 210.8 | 1054 |
| | 4" | 64 | 162.6 | 813 | | 2" | 74 | 188.0 | 940 | 7' | 0" | 84 | 213.4 | 1067 |

**BASAL ENERGY EXPENDITURE (BEE)**
**WEIGHT – MALE**

| lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 88.0 | 40 | 616 | 121.0 | 55 | 823 | 154.0 | 70 | 1029 | 187.0 | 85 | 1235 | 220.0 | 100 | 1441 | 253.0 | 115 | 1648 |
| 90.2 | 41 | 630 | 123.2 | 56 | 836 | 156.2 | 71 | 1043 | 189.2 | 86 | 1249 | 222.2 | 101 | 1455 | 255.2 | 116 | 1661 |
| 92.4 | 42 | 644 | 125.4 | 57 | 850 | 158.4 | 72 | 1056 | 191.4 | 87 | 1263 | 224.4 | 102 | 1469 | 257.4 | 117 | 1675 |
| 94.6 | 43 | 658 | 127.6 | 58 | 864 | 160.6 | 73 | 1070 | 193.6 | 88 | 1276 | 226.6 | 103 | 1483 | 259.6 | 118 | 1689 |
| 96.8 | 44 | 671 | 129.8 | 59 | 878 | 162.8 | 74 | 1084 | 195.8 | 89 | 1290 | 228.8 | 104 | 1496 | 261.8 | 119 | 1703 |
| 99.0 | 45 | 685 | 132.0 | 60 | 891 | 165.0 | 75 | 1098 | 198.0 | 90 | 1304 | 231.0 | 105 | 1510 | 264.0 | 120 | 1716 |
| 101.2 | 46 | 699 | 134.2 | 61 | 905 | 167.2 | 76 | 1111 | 200.2 | 91 | 1318 | 233.2 | 106 | 1524 | 266.2 | 121 | 1730 |
| 103.4 | 47 | 713 | 136.4 | 62 | 919 | 169.4 | 77 | 1125 | 202.4 | 92 | 1331 | 235.4 | 107 | 1538 | 268.4 | 122 | 1744 |
| 105.6 | 48 | 726 | 138.6 | 63 | 933 | 171.6 | 78 | 1139 | 204.6 | 93 | 1345 | 237.6 | 108 | 1551 | 270.6 | 123 | 1758 |
| 107.8 | 49 | 740 | 140.8 | 64 | 946 | 173.8 | 79 | 1153 | 206.8 | 94 | 1359 | 239.8 | 109 | 1565 | 272.8 | 124 | 1771 |
| 110.0 | 50 | 754 | 143.0 | 65 | 960 | 176.0 | 80 | 1166 | 209.0 | 95 | 1373 | 242.0 | 110 | 1579 | | | |
| 112.2 | 51 | 768 | 145.2 | 66 | 974 | 178.2 | 81 | 1180 | 211.2 | 96 | 1386 | 244.2 | 111 | 1593 | | | |
| 114.4 | 52 | 781 | 147.4 | 67 | 988 | 180.4 | 82 | 1194 | 213.4 | 97 | 1400 | 246.4 | 112 | 1606 | | | |
| 116.6 | 53 | 795 | 149.6 | 68 | 1001 | 182.6 | 83 | 1208 | 215.6 | 98 | 1414 | 248.6 | 113 | 1620 | | | |
| 118.8 | 54 | 809 | 151.8 | 69 | 1015 | 184.8 | 84 | 1221 | 217.8 | 99 | 1428 | 250.8 | 114 | 1634 | | | |

**BASAL ENERGY EXPENDITURE (BEE)**
**AGE – MALE**

| yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 122 | 28 | 189 | 38 | 257 | 48 | 324 | 58 | 392 | 68 | 460 | 78 | 527 | 88 | 595 | 93 | 629 |
| 19 | 128 | 29 | 196 | 39 | 264 | 49 | 331 | 59 | 399 | 69 | 466 | 79 | 534 | 89 | 602 | 94 | 635 |
| 20 | 135 | 30 | 203 | 40 | 270 | 50 | 331 | 60 | 406 | 70 | 473 | 80 | 541 | 90 | 608 | 95 | 642 |
| 21 | 142 | 31 | 210 | 41 | 277 | 51 | 345 | 61 | 412 | 71 | 480 | 81 | 548 | 91 | 615 | 96 | 649 |
| 22 | 149 | 32 | 216 | 42 | 284 | 52 | 352 | 62 | 419 | 72 | 487 | 82 | 554 | 92 | 622 | 97 | 656 |
| 23 | 155 | 33 | 223 | 43 | 291 | 53 | 358 | 63 | 426 | 73 | 493 | 83 | 561 | | | | |
| 24 | 162 | 34 | 230 | 44 | 297 | 54 | 365 | 64 | 433 | 74 | 500 | 84 | 568 | | | | |
| 25 | 169 | 35 | 237 | 45 | 304 | 55 | 372 | 65 | 439 | 75 | 507 | 85 | 575 | | | | |
| 26 | 176 | 36 | 243 | 46 | 311 | 56 | 379 | 66 | 446 | 76 | 514 | 86 | 581 | | | | |
| 27 | 183 | 37 | 250 | 47 | 318 | 57 | 385 | 67 | 453 | 77 | 521 | 87 | 588 | | | | |

**BASAL ENERGY EXPENDITURE (BEE)**
**HEIGHT – FEMALE**

| ft | in | in | cm | kCal | ft | in | in | cm | kCal | ft | in | in | cm | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4' | 0" | 48 | 121.9 | 226 | 4' | 10" | 58 | 147.3 | 273 | 5' | 8" | 68 | 172.7 | 320 |
| | 1" | 49 | 124.5 | 230 | | 11" | 59 | 149.9 | 277 | | 9" | 69 | 175.3 | 324 |
| | 2" | 50 | 127.0 | 235 | 5' | 0" | 60 | 152.4 | 282 | | 10" | 70 | 177.8 | 329 |
| | 3" | 51 | 129.5 | 240 | | 1" | 61 | 154.9 | 287 | | 11" | 71 | 180.3 | 334 |
| | 4" | 52 | 132.1 | 244 | | 2" | 62 | 157.5 | 291 | 6' | 0" | 72 | 182.9 | 338 |
| 4' | 5" | 53 | 134.6 | 249 | 5' | 3" | 63 | 160.0 | 296 | | | | | |
| | 6" | 54 | 137.2 | 254 | | 4" | 64 | 162.6 | 301 | | | | | |
| | 7" | 55 | 139.7 | 258 | | 5" | 65 | 165.1 | 305 | | | | | |
| | 8" | 56 | 142.2 | 263 | | 6" | 66 | 167.6 | 310 | | | | | |
| | 9" | 57 | 144.8 | 268 | | 7" | 67 | 170.2 | 315 | | | | | |

**BASAL ENERGY EXPENDITURE (BEE)**
**WEIGHT – FEMALE**

| lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal | lbs | kg | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77.0 | 35 | 990 | 110.0 | 50 | 1133 | 143.0 | 65 | 1277 | 176.0 | 80 | 1420 | 209.0 | 95 | 1563 | 242.0 | 110 | 1707 |
| 79.2 | 36 | 999 | 112.2 | 51 | 1143 | 145.2 | 66 | 1286 | 178.2 | 81 | 1429 | 211.2 | 96 | 1573 | 244.2 | 111 | 1716 |
| 81.4 | 37 | 1009 | 114.4 | 52 | 1152 | 147.4 | 67 | 1296 | 180.4 | 82 | 1439 | 213.4 | 97 | 1582 | 246.4 | 112 | 1726 |
| 83.6 | 38 | 1018 | 116.6 | 53 | 1162 | 149.6 | 68 | 1305 | 182.6 | 83 | 1449 | 215.6 | 98 | 1592 | 248.6 | 113 | 1735 |
| 85.8 | 39 | 1028 | 118.8 | 54 | 1171 | 151.8 | 69 | 1315 | 184.8 | 84 | 1458 | 217.8 | 99 | 1602 | 250.8 | 114 | 1745 |
| 88.0 | 40 | 1038 | 121.0 | 55 | 1181 | 154.0 | 70 | 1324 | 187.0 | 85 | 1468 | 220.0 | 100 | 1611 | 253.0 | 115 | 1755 |
| 90.2 | 41 | 1047 | 123.2 | 56 | 1190 | 156.2 | 71 | 1334 | 189.2 | 86 | 1477 | 222.2 | 101 | 1621 | 255.2 | 116 | 1764 |
| 92.4 | 42 | 1057 | 125.4 | 57 | 1200 | 158.4 | 72 | 1343 | 191.4 | 87 | 1487 | 224.4 | 102 | 1630 | 257.4 | 117 | 1774 |
| 94.6 | 43 | 1066 | 127.6 | 58 | 1210 | 160.6 | 73 | 1353 | 193.6 | 88 | 1496 | 226.6 | 103 | 1640 | 259.6 | 118 | 1783 |
| 96.8 | 44 | 1076 | 129.8 | 59 | 1219 | 162.8 | 74 | 1363 | 195.8 | 89 | 1506 | 228.8 | 104 | 1649 | 261.8 | 119 | 1793 |
| 99.0 | 45 | 1085 | 132.0 | 60 | 1229 | 165.0 | 75 | 1372 | 198.0 | 90 | 1516 | 231.0 | 105 | 1659 | | | |
| 101.2 | 46 | 1095 | 134.2 | 61 | 1238 | 167.2 | 76 | 1382 | 200.0 | 91 | 1525 | 233.2 | 106 | 1668 | | | |
| 103.4 | 47 | 1104 | 136.4 | 62 | 1248 | 169.4 | 77 | 1391 | 202.4 | 92 | 1535 | 235.4 | 107 | 1678 | | | |
| 105.6 | 48 | 1114 | 138.6 | 63 | 1257 | 171.6 | 78 | 1401 | 204.6 | 93 | 1544 | 237.6 | 108 | 1688 | | | |
| 107.8 | 49 | 1124 | 140.8 | 64 | 1267 | 173.8 | 79 | 1410 | 206.8 | 94 | 1554 | 239.8 | 109 | 1697 | | | |

**BASAL ENERGY EXPENDITURE (BEE)**
**AGE – FEMALE**

| yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal | yr | kCal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 84 | 28 | 131 | 38 | 178 | 48 | 225 | 58 | 271 | 68 | 318 | 78 | 365 | 88 | 412 | 98 | 459 |
| 19 | 89 | 29 | 136 | 39 | 183 | 49 | 229 | 59 | 276 | 69 | 323 | 79 | 370 | 89 | 417 | 99 | 463 |
| 20 | 94 | 30 | 140 | 40 | 187 | 50 | 234 | 60 | 281 | 70 | 328 | 80 | 374 | 90 | 421 | 100 | 468 |
| 21 | 98 | 31 | 145 | 41 | 192 | 51 | 239 | 61 | 285 | 71 | 332 | 81 | 379 | 91 | 426 | 101 | 473 |
| 22 | 103 | 32 | 150 | 42 | 197 | 52 | 243 | 62 | 290 | 72 | 337 | 82 | 384 | 92 | 431 | 102 | 477 |
| 23 | 108 | 33 | 154 | 43 | 201 | 53 | 248 | 63 | 295 | 73 | 342 | 83 | 388 | 93 | 435 | | |
| 24 | 112 | 34 | 159 | 44 | 206 | 54 | 253 | 64 | 300 | 74 | 346 | 84 | 393 | 94 | 440 | | |
| 25 | 117 | 35 | 164 | 45 | 211 | 55 | 257 | 65 | 304 | 75 | 351 | 85 | 398 | 95 | 445 | | |
| 26 | 122 | 36 | 168 | 46 | 215 | 56 | 262 | 66 | 309 | 76 | 356 | 86 | 402 | 96 | 449 | | |
| 27 | 126 | 37 | 173 | 47 | 220 | 57 | 267 | 67 | 314 | 77 | 360 | 87 | 407 | 97 | 454 | | |

**BEE Tables**

**For males:** To use the chart, find the number for the height and weight and then subtract the age number to determine BEE.

| **Male** | **Height** | | | | | | | | | | | | | | | | | **Age** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wt** | **58** | **59** | **60** | **61** | **62** | **63** | **64** | **65** | **66** | **67** | **68** | **69** | **70** | **71** | **72** | **73** | **74** | | |
| **80** | 1299 | 1314 | 1324 | 1339 | 1349 | 1364 | 1379 | 1389 | 1404 | 1414 | 1429 | 1439 | 1454 | 1464 | 1479 | 1489 | 1504 | **25** | **170** |
| **85** | 1330 | 1345 | 1355 | 1370 | 1380 | 1395 | 1410 | 1420 | 1435 | 1445 | 1460 | 1470 | 1485 | 1495 | 1510 | 1520 | 1535 | **30** | **204** |
| **90** | 1361 | 1376 | 1386 | 1401 | 1411 | 1426 | 1441 | 1451 | 1466 | 1476 | 1491 | 1501 | 1516 | 1526 | 1541 | 1551 | 1566 | **35** | **238** |
| **95** | 1393 | 1408 | 1418 | 1433 | 1443 | 1458 | 1473 | 1483 | 1498 | 1508 | 1523 | 1533 | 1548 | 1558 | 1573 | 1583 | 1598 | **40** | **272** |
| **100** | 1424 | 1439 | 1449 | 1464 | 1474 | 1489 | 1504 | 1514 | 1529 | 1539 | 1554 | 1564 | 1579 | 1589 | 1604 | 1614 | 1629 | **45** | **306** |
| **105** | 1455 | 1470 | 1480 | 1495 | 1505 | 1520 | 1535 | 1545 | 1560 | 1570 | 1585 | 1595 | 1610 | 1620 | 1635 | 1645 | 1660 | **50** | **340** |
| **110** | 1486 | 1501 | 1511 | 1526 | 1536 | 1551 | 1566 | 1576 | 1591 | 1601 | 1616 | 1626 | 1641 | 1651 | 1666 | 1676 | 1691 | **55** | **374** |
| **115** | 1517 | 1532 | 1542 | 1557 | 1567 | 1587 | 1597 | 1607 | 1622 | 1632 | 1647 | 1657 | 1672 | 1682 | 1697 | 1707 | 1722 | **60** | **408** |
| **120** | 1548 | 1563 | 1573 | 1588 | 1598 | 1613 | 1628 | 1638 | 1653 | 1663 | 1678 | 1688 | 1703 | 1713 | 1728 | 1738 | 1753 | **65** | **442** |
| **125** | 1579 | 1594 | 1604 | 1619 | 1629 | 1644 | 1659 | 1669 | 1684 | 1694 | 1709 | 1719 | 1734 | 1744 | 1759 | 1769 | 1784 | **70** | **476** |
| **130** | 1611 | 1626 | 1636 | 1651 | 1661 | 1676 | 1691 | 1701 | 1716 | 1726 | 1741 | 1751 | 1766 | 1776 | 1791 | 1801 | 1816 | **75** | **510** |
| **135** | 1642 | 1657 | 1667 | 1682 | 1692 | 1707 | 1722 | 1732 | 1747 | 1757 | 1772 | 1782 | 1797 | 1807 | 1822 | 1832 | 1847 | **80** | **544** |
| **140** | 1673 | 1688 | 1698 | 1713 | 1723 | 1738 | 1753 | 1763 | 1778 | 1788 | 1803 | 1813 | 1828 | 1838 | 1853 | 1863 | 1878 | **85** | **578** |
| **145** | 1704 | 1719 | 1729 | 1744 | 1754 | 1769 | 1784 | 1794 | 1809 | 1819 | 1834 | 1844 | 1859 | 1869 | 1884 | 1894 | 1909 | **90** | **612** |
| **150** | 1735 | 1750 | 1760 | 1775 | 1785 | 1800 | 1815 | 1825 | 1840 | 1850 | 1865 | 1875 | 1890 | 1900 | 1915 | 1925 | 1940 | **95** | **646** |
| **155** | 1766 | 1781 | 1791 | 1806 | 1816 | 1831 | 1846 | 1856 | 1871 | 1881 | 1896 | 1906 | 1921 | 1931 | 1946 | 1956 | 1971 | **100** | **680** |
| **160** | 1797 | 1812 | 1822 | 1837 | 1847 | 1862 | 1877 | 1887 | 1902 | 1912 | 1927 | 1937 | 1952 | 1962 | 1977 | 1987 | 2002 | | |
| **165** | 1829 | 1844 | 1854 | 1869 | 1879 | 1894 | 1909 | 1919 | 1934 | 1944 | 1959 | 1969 | 1984 | 1994 | 2009 | 2019 | 2034 | | |
| **170** | 1860 | 1875 | 1885 | 1900 | 1910 | 1925 | 1940 | 1950 | 1965 | 1975 | 1990 | 2000 | 2015 | 2025 | 2040 | 2050 | 2068 | | |
| **175** | 1891 | 1906 | 1916 | 1931 | 1941 | 1956 | 1971 | 1981 | 1996 | 2006 | 2021 | 2031 | 2046 | 2056 | 2071 | 2081 | 2096 | | |
| **180** | 1922 | 1937 | 1947 | 1962 | 1972 | 1987 | 2002 | 2012 | 2027 | 2037 | 2052 | 2062 | 2077 | 2087 | 2102 | 2112 | 2127 | | |
| **185** | 1953 | 1968 | 1978 | 1993 | 2003 | 2018 | 2033 | 2043 | 2058 | 2068 | 2083 | 2093 | 2108 | 2118 | 2133 | 2143 | 2158 | | |
| **190** | 1984 | 1999 | 2009 | 2024 | 2034 | 2049 | 2064 | 2074 | 2089 | 2099 | 2114 | 2124 | 2139 | 2149 | 2164 | 2174 | 2189 | | |
| **195** | 2015 | 2030 | 2040 | 2055 | 2065 | 2080 | 2095 | 2105 | 2120 | 2130 | 2145 | 2155 | 2170 | 2180 | 2195 | 2205 | 2220 | | |
| **200** | 2046 | 2061 | 2071 | 2086 | 2098 | 2111 | 2126 | 2136 | 2151 | 2161 | 2176 | 2186 | 2201 | 2211 | 2226 | 2236 | 2251 | | |
| **205** | 2078 | 2093 | 2103 | 2118 | 2128 | 2143 | 2158 | 2168 | 2183 | 2193 | 2208 | 2218 | 2233 | 2243 | 2258 | 2268 | 2283 | | |
| **210** | 2109 | 2124 | 2134 | 2149 | 2159 | 2174 | 2189 | 2199 | 2214 | 2224 | 2239 | 2249 | 2264 | 2274 | 2289 | 2299 | 2314 | | |
| **215** | 2140 | 2155 | 2165 | 2180 | 2190 | 2205 | 2220 | 2230 | 2245 | 2255 | 2270 | 2280 | 2295 | 2305 | 2320 | 2330 | 2345 | | |
| **220** | 2171 | 2186 | 2196 | 2211 | 2221 | 2236 | 2251 | 2261 | 2276 | 2286 | 2301 | 2311 | 2326 | 2336 | 2351 | 2361 | 2376 | | |
| **225** | 2202 | 2217 | 2227 | 2242 | 2252 | 2267 | 2282 | 2292 | 2307 | 2317 | 2332 | 2342 | 2357 | 2367 | 2382 | 2392 | 2407 | | |
| **230** | 2233 | 2248 | 2258 | 2273 | 2283 | 2298 | 2313 | 2323 | 2338 | 2348 | 2363 | 2373 | 2388 | 2398 | 2413 | 2423 | 2438 | | |

Based on the Harris-Benedict equation (see beginning of this section) (2)

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**BEE Tables**

For females: To use the chart, find the number for the height and weight and then subtract the age number to determine BEE.

| Female | Height | | | | | | | | | | | | | | | Age | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Weight** | **58** | **59** | **60** | **61** | **62** | **63** | **64** | **65** | **66** | **67** | **68** | **69** | **70** | **71** | **72** | | |
| **80** | 1254 | 1259 | 1262 | 1268 | 1271 | 1276 | 1281 | 1285 | 1290 | 1293 | 1298 | 1302 | 1307 | 1310 | 1315 | **25** | **118** |
| **85** | 1276 | 1281 | 1284 | 1289 | 1293 | 1298 | 1303 | 1306 | 1312 | 1315 | 1320 | 1323 | 1329 | 1332 | 1337 | **30** | **141** |
| **90** | 1298 | 1303 | 1306 | 1311 | 1315 | 1320 | 1325 | 1328 | 1333 | 1337 | 1342 | 1345 | 1350 | 1364 | 1359 | **35** | **165** |
| **95** | 1320 | 1325 | 1328 | 1333 | 1336 | 1342 | 1347 | 1350 | 1355 | 1359 | 1364 | 1367 | 1372 | 1376 | 1381 | **40** | **188** |
| **100** | 1342 | 1346 | 1350 | 1355 | 1358 | 1363 | 1368 | 1372 | 1377 | 1380 | 1385 | 1389 | 1394 | 1397 | 1402 | **45** | **212** |
| **105** | 1364 | 1368 | 1372 | 1377 | 1380 | 1385 | 1390 | 1394 | 1399 | 1402 | 1407 | 1411 | 1416 | 1419 | 1424 | **50** | **235** |
| **110** | 1385 | 1390 | 1393 | 1399 | 1402 | 1407 | 1412 | 1416 | 1421 | 1424 | 1429 | 1433 | 1438 | 1441 | 1446 | **55** | **259** |
| **115** | 1407 | 1412 | 1415 | 1420 | 1424 | 1429 | 1434 | 1437 | 1442 | 1446 | 1451 | 1454 | 1459 | 1463 | 1468 | **60** | **282** |
| **120** | 1429 | 1434 | 1437 | 1442 | 1446 | 1451 | 1456 | 1459 | 1464 | 1468 | 1473 | 1476 | 1481 | 1485 | 1490 | **65** | **306** |
| **125** | 1451 | 1455 | 1459 | 1464 | 1467 | 1472 | 1478 | 1481 | 1486 | 1489 | 1495 | 1498 | 1503 | 1506 | 1512 | **70** | **329** |
| **130** | 1473 | 1477 | 1481 | 1486 | 1489 | 1494 | 1499 | 1503 | 1508 | 1511 | 1516 | 1520 | 1525 | 1528 | 1533 | **75** | **353** |
| **135** | 1495 | 1499 | 1502 | 1508 | 1511 | 1516 | 1521 | 1525 | 1530 | 1533 | 1538 | 1542 | 1547 | 1550 | 1555 | **80** | **376** |
| **140** | 1516 | 1521 | 1524 | 1529 | 1533 | 1538 | 1543 | 1546 | 1552 | 1555 | 1560 | 1563 | 1569 | 1572 | 1577 | **85** | **400** |
| **145** | 1538 | 1543 | 1546 | 1551 | 1555 | 1560 | 1565 | 1568 | 1573 | 1577 | 1582 | 1585 | 1590 | 1594 | 1599 | **90** | **423** |
| **150** | 1560 | 1565 | 1568 | 1573 | 1576 | 1582 | 1587 | 1590 | 1595 | 1699 | 1604 | 1607 | 1612 | 1616 | 1621 | **95** | **447** |
| **155** | 1582 | 1586 | 1590 | 1595 | 1598 | 1603 | 1608 | 1612 | 1617 | 1620 | 1625 | 1629 | 1634 | 1637 | 1642 | **100** | **470** |
| **160** | 1604 | 1608 | 1612 | 1617 | 1620 | 1625 | 1630 | 1634 | 1639 | 1642 | 1647 | 1651 | 1656 | 1659 | 1664 | | |
| **165** | 1625 | 1630 | 1633 | 1639 | 1642 | 1647 | 1652 | 1656 | 1661 | 1664 | 1669 | 1673 | 1678 | 1681 | 1686 | | |
| **170** | 1647 | 1652 | 1655 | 1660 | 1664 | 1669 | 1674 | 1677 | 1682 | 1686 | 1691 | 1694 | 1699 | 1703 | 1708 | | |
| **175** | 1669 | 1674 | 1677 | 1682 | 1686 | 1691 | 1696 | 1699 | 1704 | 1708 | 1713 | 1716 | 1721 | 1725 | 1730 | | |
| **180** | 1691 | 1695 | 1699 | 1704 | 1707 | 1712 | 1718 | 1721 | 1726 | 1729 | 1735 | 1738 | 1743 | 1746 | 1752 | | |
| **185** | 1713 | 1717 | 1721 | 1726 | 1729 | 1734 | 1739 | 1743 | 1748 | 1751 | 1756 | 1760 | 1765 | 1768 | 1773 | | |
| **190** | 1735 | 1739 | 1742 | 1748 | 1751 | 1756 | 1761 | 1765 | 1770 | 1773 | 1778 | 1782 | 1787 | 1790 | 1795 | | |
| **195** | 1756 | 1761 | 1764 | 1769 | 1773 | 1778 | 1783 | 1786 | 1792 | 1795 | 1800 | 1803 | 1809 | 1812 | 1817 | | |
| **200** | 1778 | 1783 | 1786 | 1791 | 1795 | 1800 | 1805 | 1808 | 1813 | 1817 | 1822 | 1825 | 1830 | 1834 | 1839 | | |
| **205** | 1800 | 1805 | 1808 | 1813 | 1816 | 1822 | 1827 | 1830 | 1835 | 1839 | 1844 | 1847 | 1852 | 1856 | 1861 | | |
| **210** | 1822 | 1826 | 1830 | 1835 | 1838 | 1843 | 1548 | 1852 | 1857 | 1860 | 1865 | 1869 | 1874 | 1877 | 1882 | | |
| **215** | 1844 | 1848 | 1852 | 1857 | 1860 | 1865 | 1870 | 1874 | 1879 | 1882 | 1887 | 1891 | 1896 | 1899 | 1904 | | |
| **220** | 1865 | 1870 | 1873 | 1879 | 1882 | 1887 | 1892 | 1896 | 1901 | 1904 | 1909 | 1913 | 1918 | 1921 | 1926 | | |
| **225** | 1887 | 1892 | 1895 | 1900 | 1904 | 1909 | 1914 | 1917 | 1922 | 1926 | 1931 | 1934 | 1939 | 1943 | 1948 | | |
| **230** | 1909 | 1914 | 1917 | 1922 | 1926 | 1931 | 1936 | 1939 | 1944 | 1948 | 1953 | 1956 | 1961 | 1965 | 1970 | | |

"Based on the Harris-Benedict equation:" (see beginning of this section) (2)



**Energy Estimation in Obesity** (1)

The use of either the Harris-Benedict or Mifflin-St. Jeor predictive equations to estimate energy needs for obese adults is less accurate and has an increased range of individual errors compared to estimates for non-obese. Review of evidence-based literature found that in healthy obese individuals, use of the Mifflin-St. Jeor equation was more accurate and had a smaller magnitude of error. Each equation has its limitations. Practitioners are urged to exercise clinical judgment in their choice of which equation to use and when to use it.

Mifflin-St. Jeor Equation - 70% accuracy, estimates of RMR may range from 20% below needs to 15% above needs.

Harris-Benedict Equation –

- 38% - 64% accuracy using actual body weight, errors tend to be overestimates, RMR needs ranged from 35% below to 43% above
- 26% accuracy using adjusted body weight, RMR needs ranged from 42% below to 25% above
- Use of adjusted body weight in HBE reduces risk of overestimating RMR but drastically increases the maximum underestimation error.
- ADA expert panel recommends avoiding use of this equation in obesity

**Energy Estimation for Older Adults** (1)

There is limited data on the use of BEE/RMR equations in elderly adults. In general these formulas do not work well for this age group; the age range in trials is 50 – 84 years, with few studies of subjects over 80 years.

Mifflin-St. Jeor equation:

Elderly men: Underestimates energy needs by up to 18%, overestimates by 5%
Elderly women: Underestimates energy needs by up to 31%, overestimates by 7%

Harris-Benedict equation:

Elderly men: Underestimates energy needs by up to 19%, overestimates by 9%
Elderly women: Underestimates energy needs by up to 27%, overestimates by 12%

Practitioners are urged to exercise clinical judgment in selecting which equation to use for determination of energy needs.

**MIFFLIN ST. JOER EQUATION**

Male: BMR = 10×weight + 6.25×height - 5×age + 5
Female: BMR = 10×weight + 6.25×height - 5×age - 161

**Height in Inches**

| WT | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 1407 | 1423 | 1439 | 1455 | 1471 | 1486 | 1502 | 1518 | 1534 | 1550 | 1566 | 1582 | 1598 | 1613 | 1629 |
| 105 | 1430 | 1446 | 1462 | 1477 | 1493 | 1509 | 1525 | 1541 | 1557 | 1573 | 1589 | 1604 | 1620 | 1636 | 1652 |
| 110 | 1453 | 1468 | 1484 | 1500 | 1516 | 1532 | 1548 | 1564 | 1580 | 1595 | 1611 | 1627 | 1643 | 1659 | 1675 |
| 115 | 1475 | 1491 | 1507 | 1523 | 1539 | 1555 | 1570 | 1586 | 1602 | 1618 | 1634 | 1650 | 1666 | 1682 | 1697 |
| 120 | 1498 | 1514 | 1530 | 1546 | 1561 | 1577 | 1593 | 1609 | 1625 | 1641 | 1657 | 1673 | 1688 | 1704 | 1720 |
| 125 | 1521 | 1537 | 1552 | 1568 | 1584 | 1600 | 1616 | 1632 | 1648 | 1664 | 1679 | 1695 | 1711 | 1727 | 1743 |
| 130 | 1543 | 1559 | 1575 | 1591 | 1607 | 1623 | 1639 | 1655 | 1670 | 1686 | 1702 | 1718 | 1734 | 1750 | 1766 |
| 135 | 1566 | 1582 | 1598 | 1614 | 1630 | 1646 | 1661 | 1677 | 1693 | 1709 | 1725 | 1741 | 1757 | 1773 | 1788 |
| 140 | 1589 | 1605 | 1621 | 1636 | 1652 | 1668 | 1684 | 1700 | 1716 | 1732 | 1748 | 1763 | 1779 | 1795 | 1811 |
| 145 | 1612 | 1627 | 1643 | 1659 | 1675 | 1691 | 1707 | 1723 | 1739 | 1754 | 1770 | 1786 | 1802 | 1818 | 1834 |
| 150 | 1634 | 1650 | 1666 | 1682 | 1698 | 1714 | 1730 | 1745 | 1761 | 1777 | 1793 | 1809 | 1825 | 1841 | 1857 |
| 155 | 1657 | 1673 | 1689 | 1705 | 1721 | 1736 | 1752 | 1768 | 1784 | 1800 | 1816 | 1832 | 1848 | 1863 | 1879 |
| 160 | 1680 | 1696 | 1712 | 1727 | 1743 | 1759 | 1775 | 1791 | 1807 | 1823 | 1839 | 1854 | 1870 | 1886 | 1902 |
| 165 | 1703 | 1718 | 1734 | 1750 | 1766 | 1782 | 1798 | 1814 | 1830 | 1845 | 1861 | 1877 | 1893 | 1909 | 1925 |
| 170 | 1725 | 1741 | 1757 | 1773 | 1789 | 1805 | 1820 | 1836 | 1852 | 1868 | 1884 | 1900 | 1916 | 1932 | 1947 |
| 175 | 1748 | 1764 | 1780 | 1796 | 1811 | 1827 | 1843 | 1859 | 1875 | 1891 | 1907 | 1923 | 1938 | 1954 | 1970 |
| 180 | 1771 | 1787 | 1802 | 1818 | 1834 | 1850 | 1866 | 1882 | 1898 | 1914 | 1929 | 1945 | 1961 | 1977 | 1993 |
| 185 | 1793 | 1809 | 1825 | 1841 | 1857 | 1873 | 1889 | 1905 | 1920 | 1936 | 1952 | 1968 | 1984 | 2000 | 2016 |
| 190 | 1816 | 1832 | 1848 | 1864 | 1880 | 1896 | 1911 | 1927 | 1943 | 1959 | 1975 | 1991 | 2007 | 2023 | 2038 |
| 195 | 1839 | 1855 | 1871 | 1886 | 1902 | 1918 | 1934 | 1950 | 1966 | 1982 | 1998 | 2013 | 2029 | 2045 | 2061 |
| 200 | 1862 | 1877 | 1893 | 1909 | 1925 | 1941 | 1957 | 1973 | 1989 | 2004 | 2020 | 2036 | 2052 | 2068 | 2084 |
| 205 | 1884 | 1900 | 1916 | 1932 | 1948 | 1964 | 1980 | 1995 | 2011 | 2027 | 2043 | 2059 | 2075 | 2091 | 2107 |
| 210 | 1907 | 1923 | 1939 | 1955 | 1971 | 1986 | 2002 | 2018 | 2034 | 2050 | 2066 | 2082 | 2098 | 2113 | 2129 |
| 215 | 1930 | 1946 | 1962 | 1977 | 1993 | 2009 | 2025 | 2041 | 2057 | 2073 | 2089 | 2104 | 2120 | 2136 | 2152 |
| 220 | 1953 | 1968 | 1984 | 2000 | 2016 | 2032 | 2048 | 2064 | 2080 | 2095 | 2111 | 2127 | 2143 | 2159 | 2175 |
| 225 | 1975 | 1991 | 2007 | 2023 | 2039 | 2055 | 2070 | 2086 | 2102 | 2118 | 2134 | 2150 | 2166 | 2182 | 2197 |
| 230 | 1998 | 2014 | 2030 | 2046 | 2061 | 2077 | 2093 | 2109 | 2125 | 2141 | 2157 | 2173 | 2188 | 2204 | 2220 |
| 235 | 2021 | 2037 | 2052 | 2068 | 2084 | 2100 | 2116 | 2132 | 2148 | 2164 | 2179 | 2195 | 2211 | 2227 | 2243 |
| 240 | 2043 | 2059 | 2075 | 2091 | 2107 | 2123 | 2139 | 2155 | 2170 | 2186 | 2202 | 2218 | 2234 | 2250 | 2266 |
| 245 | 2066 | 2082 | 2098 | 2114 | 2130 | 2146 | 2161 | 2177 | 2193 | 2209 | 2225 | 2241 | 2257 | 2273 | 2288 |
| 250 | 2089 | 2105 | 2121 | 2136 | 2152 | 2168 | 2184 | 2200 | 2216 | 2232 | 2248 | 2263 | 2279 | 2295 | 2311 |

Created by Katheryn Adams, RD, CSG, LD, 2009

| For Women Subtract | | | | For Men Subtract | | | |
|---|---|---|---|---|---|---|---|
| Age | Kcals | Age | Kcals | Age | Kcals | Age | Kcals |
| 65 | 486 | 81 | 566 | 65 | 320 | 81 | 400 |
| 66 | 491 | 82 | 571 | 66 | 325 | 82 | 405 |
| 67 | 496 | 83 | 576 | 67 | 330 | 83 | 410 |
| 68 | 501 | 84 | 581 | 68 | 335 | 84 | 415 |
| 69 | 506 | 85 | 586 | 69 | 340 | 85 | 420 |
| 70 | 511 | 86 | 591 | 70 | 345 | 86 | 425 |
| 71 | 516 | 87 | 596 | 71 | 350 | 87 | 430 |
| 72 | 521 | 88 | 601 | 72 | 355 | 88 | 435 |
| 73 | 526 | 89 | 606 | 73 | 360 | 89 | 440 |
| 74 | 531 | 90 | 611 | 74 | 365 | 90 | 445 |
| 75 | 536 | 91 | 616 | 75 | 370 | 91 | 450 |
| 76 | 541 | 92 | 621 | 76 | 375 | 92 | 455 |
| 77 | 546 | 93 | 626 | 77 | 380 | 93 | 460 |
| 78 | 551 | 94 | 631 | 78 | 385 | 94 | 465 |
| 79 | 556 | 95 | 636 | 79 | 390 | 95 | 470 |
| 80 | 561 | | | 80 | 395 | | |

1.200 = sedentary (little or no exercise)

1.375 = lightly active (light exercise/sports 1-3 days/week)

1.550 = moderately active (moderate exercise/sports 3-5 days/week)

1.725 = very active (hard exercise/sports 6-7 days a week)

1.900 = extra active (very hard exercise/sports and physical job)

## **Estimating Kilocalorie Needs Based on Activity and Injury Factor** (3-7)

**Total kilocalorie requirements = BEE x Activity Factor X Injury Factor**

**Activity Factor (AF):**

| | |
|---|---|
| Confined to bed | 1.2 |
| Out of bed | 1.3 |
| Seated work, little movement, little leisure activity | 1.4 – 1.5 |
| Seated work with requirement to move, little leisure activity | 1.6 – 1.7 |
| Standing work | 1.8 - 1.9 |
| Strenuous work or highly active leisure activity | 2.0 – 2.4 |
| 30 – 60 minutes strenuous leisure activity 4 – 5 times per week | AF + 0.3 |

**Injury Factors:**

| | |
|---|---|
| Blunt trauma | 1.25 - 1.50 |
| Burns (% total body surface): | |
| 0 - 20 | 1.00 - 1.50 |
| 20 - 40 | 1.50 - 1.85 |
| 40 - 100 | 1.85 - 2.05 |
| Cancer | 1.1 - 1.45 |
| Closed head injury | 1.3 |
| Elective surgery | 1.0 – 1.1 |
| Fever | 1.2 per 1º C > 37 º C |
| Post operative (no complication) | 1.00 - 1.05 |
| Multiple/long bone fracture | 1.1 - 1.3 |
| Multiple trauma with patient on ventilator | 1.50 - 1.70 |
| Multiple trauma | 1.4 |
| Peritonitis | 1.05 - 1.25 |
| Sepsis | 1.2 – 1.4 |

| | |
|---|---|
| Severe infection/multiple trauma | 1.3- 1.55 |
| Trauma with steroids | 1.60 - 1.70 |
| Wound healing | 1.20 - 1.60 |

**Shortcut Method for Estimating Adult Energy Needs per Kilogram** (8-10)

| | **kCals Required** |
|---|---|
| Non obese Population | 25 – 35 kCal/ kg body weight |
| Obese, Critically Ill Population | 21 kCal/ kg body weight |
| Paraplegics * | 28 kCal/kg/day |
| Quadriplegics * | 23 kCal/kg/day |

*Estimated energy needs for paraplegics and quadriplegics are adjusted by reducing calculated desirable body weights because immobilized patients lose muscle.

**INDIRECT CALORIMETRY**

Indirect calorimetry (IC) is considered the gold standard for energy expenditure estimation**.** IC determines resting metabolic rate (RMR) by measuring respiratory gas exchange. Measured RMR is preferred to the use of prediction equations because such equations fail by more than 10% in up to one third of patients. Because IC quantifies stress due to injury, illness, and other idiosyncratic medical conditions, including the affects of medications, the dietitian only needs to apply the appropriate activity factor.

Pros: Advances in technology make IC accurate, affordable, accessible, and easy to administer with minimal staff training.

Cons: Food, ethanol, stimulants, physical activity, and ambient conditions affect RMR; therefore, adherence to pre-test protocol is necessary to obtain accurate results.

Costs: IC units range in price from $4000 to $20,000. Insurance reimbursement for IC ranges from $10 to $130.

**"Because energy expenditure is difficult to predict on the basis of conventional equations, patients in long-term acute care facilities routinely are overfed and underfed, with only 25% receiving calories within 10% of required needs. Measuring a patient's energy requirement at least once by IC is important, because the degree of metabolism predicts how easily a patient will be underfed or overfed."** – McClave, S, Are patients fed appropriately according to their caloric requirements?, JPEN, Nov-Dec 1998; vol. 22, p 375-81.

**References Indirect Calorimetry**


1. Compher, C., et.al., Best Practice Methods to Apply to Measurement of Resting Metabolic Rate in Adults: A Systematic Review, J Am Diet Assoc, February 2006.
2. Schoeller, D., Making Indirect Calorimetry a Gold Standard for Predicting Energy Requirements for Institutionalized Patients, J Am Diet Assoc, March 2007.
3. Manual of Clinical Dietetics, 6th edition, 2000, p 31.


**Protein Needs for Adults (see Pressure Ulcer section at the end of this chapter for further information)**

| **Condition** | **Albumin Level** | **Protein Requirement** |
|---|---|---|
| Normal nutrition (Healthy adults) | 3.5 gm/dL | 0.8-1.0 gm/kg/day |
| Normal nutrition (Elderly adults) | >3.5 gm/dL | 0.8 to 1.00 gm/kg/day |
| Mild depletion | 2.8-3.5 gm/dL | 1.0-1.2 gm/kg/day |
| Moderate depletion | 2.1-2.7 gm/dL | 1.2-1.5 gm/kg/day |
| Severe depletion | 2.1 gm/dl | 1.5-2.0 gm/kg/day |
| COPD | | 100-125 gm protein/day total |

**EXCEPTIONS**

**Hepatic Failure** 0.25-0.5 gm/kg/day

Another method of calculating protein needs is as a ratio of non-protein calories to grams of nitrogen (6.25 gm protein = 1 gm N).

| Patient Conditions | Ratio of non-protein kCal : 1 gm N |
|---|---|
| Adult Medical | 125-150 : 1 |
| Minor Catabolic | 125-180 : 1 |
| Severe Catabolic | 150-250 : 1 |
| Hepatic or Renal Failure | 250-400 : 1 |

## **Adult Fluid Requirements** (12)

Hydration status as a part of nutritional status is often overlooked. This can affect interpretation of biochemical measurements, anthropometry and the physical exam. Assessment of hydration is quick and easy and should include assessment of fluid intake.

**Method I:** Wt (kg) x 30 ml = Daily Fluid Requirement

Fluid requirements may differ for those clients with cardiac problems, renal failure, dehydration or for those requiring fluid restrictions.

**Method II:** 100 ml/kg for 1st ten kg body weight
+ 50 ml/kg for 2nd ten kg body weight
+ 15 ml/kg for remaining kg body weight

**Shortcut Method II:**
(kg body weight – 20) x 15 + 1500 = ml fluid requirement

## **Serum Osmolality** (13)

Osmolality measures the concentration of particles in solution. Osmolality increases with dehydration (loss of water without loss of solutes) and decreases with overhydration.

Greater than normal levels may indicate: Dehydration, Diabetes Insipidus, Hyperglycemia, Hypernatremia, Uremia.

Lower than normal levels may indicate: Hyponatremia, Overhydration, inappropriate ADH secretion.

Serum Osmolality = (2 x (Na + K)) + (BUN / 2.8) + (glucose / 18) An online calculator of serum osmolality is available at (accessed 22 September 2009). Normal range is 285-295 mOsm/kg.

**Factors That May Alter Fluid Requirements**
The following may INCREASE fluid needs:

- Anabolism
- Burns
- Constipation
- Dehydration
- Diarrhea
- Emesis
- Fever*
- Fistulas/drains
- Hemorrhage
- Hot or dry environments
- Hyperventilation
- Hypotension
- Medications
- Nasogastric suctioning
- Polyuria**

*Fluid needs increase 7% for each ºF above normal; 13% for each º C
** Poor glucose control; excess alcohol, caffeine; osmotic diuresis

The following may DECREASE fluid needs:

- Cardiac disease (especially CHF)
- Edema
- Fluid overload
- Hepatic failure with ascites
- Medications
- Renal failure
- SIADH
- Significant hypertension
- "Third spacing" of fluids

**Clinical Symptoms of Excess/Deficit Fluids**

| | Deficit Fluids | Excess Fluids |
|---|---|---|
| Blood pressure | Decreased | Increased |
| BUN/creatinine | Increased | Decreased |
| Cardiac output | Decreased | Increased |
| Central venous pressure | Decreased | Increased |
| Edema | | Yes |
| Electrolyte abnormalities | Increased $Na^+$, $Cl^-$ | Decreased $Na^+$, $Cl^-$ |
| Eyes | Sunken | Puffy (eyelids) |
| Heart rate | Increased | |
| Hemoglobin/hematocrit | Increased | Decreased |
| Intake/output | Output > Intake | Intake > Output |
| Neck veins | Flat | Distended |
| Pulmonary arteriole wedge pressure | Decreased | Increased |
| Pulse | | Increased |
| Serum osmolality | Increased | Decreased |
| Shortness of breath | | Yes |
| Skin | Poor turgor | Moist |
| Systemic vascular resistance | Increased | |
| Tachycardia/bradycardia | | Possible |
| Temperature | Increased | |
| Urine specific gravity | Increased | Decreased |
| Weight | Decreased | Increased |

**References**


1. Frankenfield D, Roth-Yousey L, Compher C. Comparison of predictive equations for resting metabolic rate in healthy nonobese and obese adults: a systematic review. J Am Diet Assoc. 2005 May;105(5):775-89.
2. Harris J, Benedict F. *A Biometric Study of Basal Metabolism in Man.* Publication 279. Washington, DC:Carnegie Institution, 1919, 40-44.
3. *American Dietetic Association, Nutrition Care Manual, 2009 (online reference*)
4. Mahan LK, Escott-Stump S. *Krauses' Food, Nutrition & Diet Therapy*, WB Saunders Company, Philadelphia need to add: 12th edition 2007
5. Chidester JC, Spangler AA. Fluid intake in the institutionalized elderly. J Am Diet Assoc. 1997 Jan;97(1):23-8; quiz 29-30.
6. Osmolality. Available at MedLine Plus www.nlm.nih.gov/medlineplus/ency/article/003463.htm (accessed 22 September 2009)
7. NPUAP 2009
8. Lown, D, (1998). Wound healing. In: Matarese, LD, Gottschlich, MM (Eds). Contemporary nutrition support practice, A clinical guide. Philadelphia: WB Saunders, 583-589.
9. **Centers for Medicare & Medicaid Services State Operations Manual Appendix PP - Guidelines to Surveyors for Long Term Care Facilities**, Rev. 48, 6-12-09 Available at: http://cms.hhs.gov/manuals/Downloads/som107ap_pp_guidelines_ltcf.pdf
10. Charney P. **ADA Pocket Guide to Nutrition Assessment.** Second Edition. ADA, Chicago Illinois 2009.

## ANTHROPOMETRIC ASSESSMENT: HEIGHT/WEIGHT/FRAME ESTIMATIONS

Body weight is the most useful single observation for assessment of nutritional status. Frequently, residents report their own height and weight rather than being measured. Accurately measured height and weight are essential for an appropriate nutritional assessment. Establishing an ideal weight range and documenting historical or usual body weight range are also components of the assessment.

**Methods of Estimating Height of Person**
If one is unable to obtain an accurate height, two options exist:

**1. Arm span measurement**
The measurement of the arm span is roughly equal to the maximal height of both men and women at maturity (within approximately 10%). (1) Arm span measurement is calculated as follows: With the upper extremities, including the hands, fully extended and parallel to the ground, measure the distance between the tip of one middle finger to the tip of the other middle finger. If necessary, the measurement from mid-sternum to tip of middle finger on the dominant hand when multiplied by 2 can also be used to estimate height. The arm span measurement remains constant in spite of decreasing height and is an acceptable alternate method for establishing height.

**Document: Estimated height.**
This may not be accurate in Asians, African Americans or in clients with spinal deformities or contractures. (2)

**2. Stature from knee height**
Knee height can be used to estimate the stature of an elderly person who is bedfast or chair bound or who has such spinal curvature that an accurate stature measurement cannot be obtained. **Document this as estimated height.** This estimated stature value can then be used in indexes when estimating basal energy expenditure with the Harris-Benedict equation or the Mifflin-St. Jeor equation (see Nutritional Needs – Section 3). The measurement is made from the bottom of the heel to the anterior surface of the thigh at the knee. The knee should be bent at a 90º angle. Two or more measurements should be made to improve accuracy. Supine knee height is considered more accurate than seated knee height. Knee height calipers should be used.

**Note:** This is not an exact procedure. The actual height of the elderly may be less. It also may not be accurate for Asians or African Americans.

The computation of stature requires the person's knee height, age, sex and race. To convert the estimated stature from centimeters to inches, use the following: Stature in inches = Stature in cm/2.54.

**Calculating Stature from Knee Height – Male**

| **MALES 6 TO 18 YEARS** | | **NOTE: Estimated stature should be within...** |
|---|---|---|
| White Males | Stature (cm) = [Knee Height (cm) x 2.22] + 40.54 | ± 8.42 cm of actual stature for 95% of white boys. |
| Black Males | Stature (cm) = [Knee Height (cm) x 2.18] + 39.60 | ± 9.16 cm of actual stature for 95% of black boys. |
| **MALES 19 TO 59 YEARS** | | |
| White Males | Stature (cm) = [Knee Height (cm) x 1.88] + 71.85 | ± 7.94 cm of actual stature for 95% of white men. |
| Black Males | Stature (cm) = [Knee Height (cm) x 1.79] + 73.42 | ± 7.20 cm of actual stature for 95% of black men. |
| **MALES 60 AND OLDER** | | |
| White Males | Stature(cm) = [Knee Height (cm) x 1.94 – 0.15 age] + 78.31 | ± 7.84 cm of actual stature for 95% of white men. |
| Black Males | Stature(cm) = [Knee Height (cm) x 1.85 – 0.14 age] + 79.69 | ± 8.44 cm of actual stature for 95% of black men. |
| Mex.-American Males | Stature(cm) = [Knee Height (cm) x 1.83 – 0.16 age] + 82.77 | |

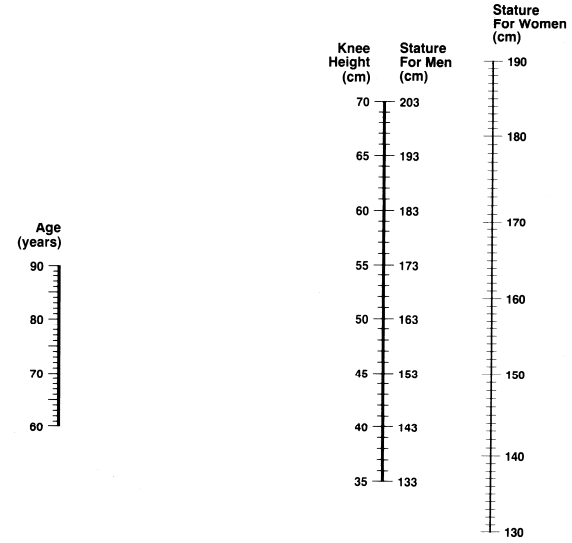
**Calculating Stature from Knee Height – Female**

| | | |
|---|---|---|
| **FEMALES 6 TO 18 YEARS** | | |
| White Females | Stature (cm) = [Knee Height (cm) x 2.15] + 43.21 | ± 7.79 cm of actual stature for 95% of white girls. |
| Black Females | Stature (cm) = [Knee Height (cm) x 2.02] + 46.59 | ± 8.77 cm of actual stature for 95% of black girls. |
| **FEMALES 19 TO 59 YEARS** | | |
| White Females | Stature(cm) = [Knee Height(cm)x1.86] - [Age(years)x0.05] + 70.25 | ± 7.20 cm of actual stature for 95% of white women. |
| Black Females | Stature(cm) = [Knee Height(cm)x1.86] - [Age(years)x0.06] + 68.10 | ± 7.60 cm of actual stature for 95% of black women. |
| **FEMALES 60 AND OLDER** | | |
| White Females | Stature (cm) = [Knee Height (cm) x 1.85 – 0.21age] + 82.21 | ± 8.82 cm of actual stature for 95% of white women. |
| Black Females | Stature (cm) = [Knee Height (cm) x 1.61 – 0.17 age] + 89.58 | ± 8.26 cm of actual stature for 95% of black women. |
| Mex-American Females | Stature (cm) = [Knee Height (cm) x 1.82 – 0.26 age) + 84.25 | |

**Source:** Ross Laboratories, 1990.

**2. Stature from knee height (cont.)**

If a calculator is not available, an elderly person's stature can be estimated from the nomogram. To use this nomogram, locate the person's age on the left column and knee height on the middle column. Connect these two points; where the connecting line crosses the stature column for the appropriate sex is the estimated stature.



**Elbow Breadth**: Elbow breadth on the right arm is measured with the forearm upward at a 90 ° angle. The distance between the outer aspects of the two prominent bones on either side of the elbow is considered to be the elbow breadth. Elbow breadth less than that listed for medium frame indicates a small frame. Elbow breadth greater than that listed for medium frame indicates a large frame. (3, 4)

| Frame Size for Women | | Frame Size for Men | |
|---|---|---|---|
| **Height in 1 inch heels** | **Elbow breadth for medium frames** | **Height in 1 inch heels** | **Elbow breadth for medium frames** |
| 4'10" to 4'11" | 2-1/4" to 2-1/2" | 5'2" to 5'3" | 2-1/2" to 2-7/8" |
| 5'0" to 5'3" | 2-1/4" to 2-1/2" | 5'4" to 5'7" | 2-5/8" to 2-7/8" |
| 5'4" to 5'7" | 2-3/8" to 2-5/8" | 5'8" to 5'11" | 2-3/4" to 3" |
| 5'8" to 5'11" | 2-3/8" to 2-5/8" | 6'0" to 6'3" | 2-3/4" to 3-1/8" |
| 6'0" | 2-1/2" to 2-3/4" | 6'4" | 2-7/8" to 3-1/4" |

**Usual Body Weight (UBW)**

The 2008 CMS F325 Interpretive Guidelines for Surveyors states that "usual body weight prior to decline or admission is the most relevant basis for weight related interventions." (5). Usual Body Weight (UBW) is the preferred standard, when assessing the elderly.

Usual body weight has no definitive time reference. Recommendations vary as to what time reference to use to determine usual weight. CMS recommends before admission into an acute or skilled facility or before a noticeable decline in health occurs. Determine admission weight, history of past weights from patient/resident medical history, recall or from family. Consider usual weight for a period of 6 months to 12 months before assessment.

Weight stability in the older adult, for a period of 6 months or more, is important to attain (6).

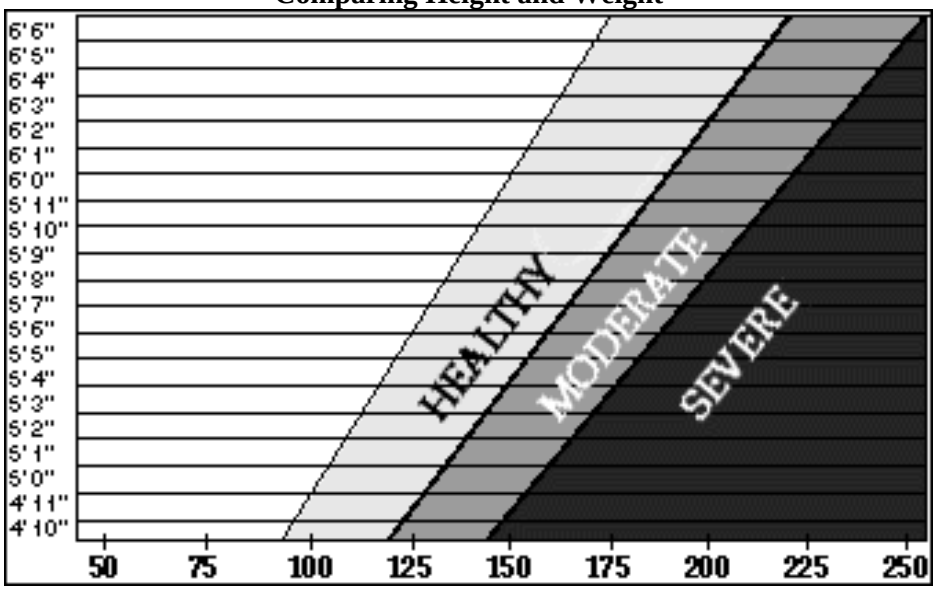
**Ideal Body Weight (IBW)**

IBW can be approximated using the Hamwi Formula. It is sometimes referred to as Recommended Body Weight, Desired Body Weight, Ideal Weight Range or Optimal Body Weight.

- Women: 100 lbs for first 5' plus 5 lbs for every inch over 5' +/- 10% (Depending on frame size)
- Men:106 lbs. for first 5' plus 6 lbs for every inch over 5' +/- 10% (Depending on frame size)

| Men | | Women | |
|---|---|---|---|
| Height w/out shoes | Ideal Weight Range | Height w/out shoes | Ideal Weight Range |
| 4'11" | 90 - 110 100+ | 4'11" | 85 – 105 95+ |
| 5'0" | 95 – 117 106+ | 5'0" | 90 – 110 100+ |
| 5'1" | 101 – 123 112+ | 5'1" | 94 – 116 105+ |
| 5'2" | 106 – 130 118+ | 5'2" | 99 – 121 110+ |
| 5'3" | 112 – 136 124+ | 5'3" | 103 – 127 115+ |
| 5'4" | 117 – 143 130+ | 5'4" | 108 – 132 120+ |
| 5'5" | 122 – 150 136+ | 5'5" | 112 – 138 125+ |
| 5'6" | 128 – 156 142+ | 5'6" | 117 – 143 130+ |
| 5'7" | 133 – 163 148+ | 5'7" | 121 – 149 135+ |
| 5'8" | 139 - 169 154+ | 5'8" | 126 – 154 140+ |
| 5'9" | 144 – 176 160+ | 5'9" | 130 – 160 145+ |
| 5'10" | 149 – 183 166+ | 5'10" | 135 – 165 150+ |
| 5'11" | 155 – 189 172+ | 5'11" | 139 – 171 155+ |
| 6'0" | 160 – 196 178+ | 6'0" | 144 – 176 160+ |
| 6'1" | 166 – 202 184+ | 6'1" | 148 – 182 165+ |
| 6'2" | 171 – 209 190+ | 6'2" | 153 – 187 170+ |
| 6'3" | 176 – 216 196+ | 6'3" | 157 – 193 175+ |
| 6'4" | 182 – 222 202+ | 6'4" | 162 – 198 180+ |

**Comparing Height and Weight**




**Determination of Weight Status**

**Percentage Actual Weight**

$$\% \text{ Actual weight} = \frac{\text{Actual Weight}}{\text{Ideal Body Weight}} \times 100$$

| | |
|---|---|
| Morbidly Obese | > 200% |
| Obese | > 130% |
| Overweight | 110 – 120% |
| Mild Malnutrition | 80 – 90% |
| Moderate Malnutrition | 70 – 79% |
| Severe Malnutrition | < 69% |

**Percent Usual Weight**

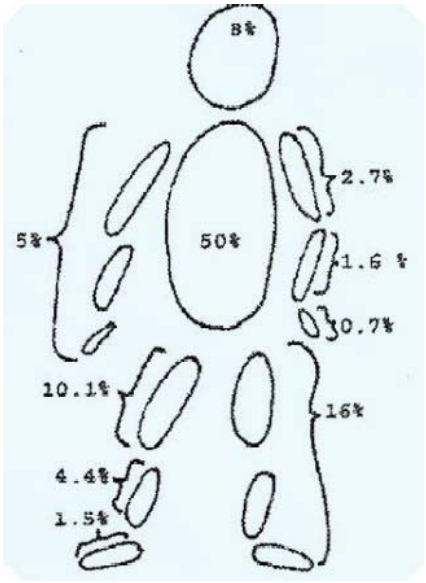
Percent usual weight is commonly found in the assessment and is often a more reliable factor to represent severity of malnutrition.

$$\% \text{ Ideal weight} = \frac{\text{Actual Weight}}{\text{Usual Body Weight}} \times 100$$

| | | | |
|---|---|---|---|
| Mild Malnutrition | 85 – 90% | Moderate Malnutrition | 75 – 84% |
| Severe Malnutrition | <74% | | |

## PERCENTAGE OF TOTAL BODY WEIGHT CONTRIBUTED BY INDIVIDUAL BODY PARTS

| | |
|---|---|
| Hand | 0.7% loss |
| Lower arm & hand | 2.3 % loss |
| Entire arm | 5.0% loss |
| Foot | 1.5% loss |
| Lower leg & foot | 5.9% loss |
| Entire leg | 16% loss |




**Source:** Osterkamp LK: Current perspective on assessment of human body proportions of relevance to amputees. © American Dietetic Association. Reprinted with permission from the Journal of the American Dietetic Association, Feb; 95(2):215-8.

### Amputations (7)

For people who can be weighed, an estimate of total body weight ($Wt_E$) including missing limb can be calculated as follows:

$$Wt_E = Wt_O / (1-P)$$

Where, $Wt_O$ is the proportion (percentage) of total body weight represented by the missing limb segment(s) as shown in the figure on the previous page. For example: the estimated weight of a person with one leg amputated at the knee that weighs 70 kg post amputation would be:

70 kg divided by (1-0.059) =
70 kg divided by (0.941) =
74.4 kg = $Wt_E$

**Paraplegics and Quadriplegics**

To calculate the estimated body weight for individuals who are paralyzed, first determine the ideal body weight for the non-paralyzed client then subtract the estimated percentage of weight based upon the degree of paralysis:

Paraplegics: 5% to 10%
Quadriplegics: 10% to 15%.

**Body Mass Index (BMI)**

BMI measures weight in relation to height and is an indicator of body composition. It is commonly used to predict health risk. The BMI ranges shown are for adults and are not exact for predicting healthy and unhealthy weights. Even within the healthy BMI range, weight gains may carry health risks for adults. (8)

BMI is useful as a general guideline to monitor trends in the population, but by itself is not diagnostic of an individual's health status. Limitations of BMI are that very muscular people may fall into the "overweight" category when they are actually healthy and fit and people who have lost muscle mass, such as the elderly, may be in the "healthy weight" category—according to their BMI—when they actually have reduced nutritional reserves. Two recent studies have found that a BMI in the elderly of 22-25 were associated with a decrease in mortality.

NHLBI Clinical Guidelines for BMI (http://www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm) Accessed 23 September 2009 (9)

| | | | |
|---|---|---|---|
| **Underweight:** | <18.5 | | |
| **Normal:** | 18.5 to 24.9 | **Obese II:** | 35 to 39. |
| **Overweight:** | 25 to 29.9 | **Obese III:** | 40 or more |
| **Obese I:** | 30 to 34.9 | | |

BMI can be calculated using one of the following formulas: In the older adult, current height should be used to determine BMI.

BMI = wt. (kg)/ht ($m^2$) [Metric]
BMI = wt (lb)/ht ($in^2$) x 705 [English measure]
*Height Factor (HF) x wt (lbs) [see table below]

| height | HF | height | HF | height | HF | height | HF |
|---|---|---|---|---|---|---|---|
| 4'7" | 0.232 | 5'1" | 0.189 | 5'7" | 0.157 | 6'1" | 0.132 |
| 4'8" | 0.224 | 5'2" | 0.183 | 5'8" | 0.152 | 6'2" | 0.128 |
| 4'9" | 0.216 | 5'3" | 0.177 | 5'9" | 0.148 | 6'3" | 0.125 |
| 4'10" | 0.209 | 5'4" | 0.172 | 5'10" | 0.143 | 6'4" | 0.122 |
| 4'11" | 0.202 | 5'5" | 0.166 | 5'11" | 0.139 | 6'5" | 0.119 |
| 5'0" | 0.195 | 5'6" | 0.161 | 6'0" | 0.136 | 6'6" | 0.116 |

**Body Mass Index Table**

| | Normal | | | | | | Overweight | | | | | Obese | | | | | | | | | | Extreme Obesity | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BMI | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| Height (inches) | Body Weight (pounds) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58 | 91 | 96 | 100 | 105 | 110 | 115 | 119 | 124 | 129 | 134 | 138 | 143 | 148 | 153 | 158 | 162 | 167 | 172 | 177 | 181 | 186 | 191 | 196 | 201 | 205 | 210 | 215 | 220 | 224 | 229 | 234 | 239 | 244 | 248 | 253 | 258 |
| 59 | 94 | 99 | 104 | 109 | 114 | 119 | 124 | 128 | 133 | 138 | 143 | 148 | 153 | 158 | 163 | 168 | 173 | 178 | 183 | 188 | 193 | 198 | 203 | 208 | 212 | 217 | 222 | 227 | 232 | 237 | 242 | 247 | 252 | 257 | 262 | 267 |
| 60 | 97 | 102 | 107 | 112 | 118 | 123 | 128 | 133 | 138 | 143 | 148 | 153 | 158 | 163 | 168 | 174 | 179 | 184 | 189 | 194 | 199 | 204 | 209 | 215 | 220 | 225 | 230 | 235 | 240 | 245 | 250 | 255 | 261 | 266 | 271 | 276 |
| 61 | 100 | 106 | 111 | 116 | 122 | 127 | 132 | 137 | 143 | 148 | 153 | 158 | 164 | 169 | 174 | 180 | 185 | 190 | 195 | 201 | 206 | 211 | 217 | 222 | 227 | 232 | 238 | 243 | 248 | 254 | 259 | 264 | 269 | 275 | 280 | 285 |
| 62 | 104 | 109 | 115 | 120 | 126 | 131 | 136 | 142 | 147 | 153 | 158 | 164 | 169 | 175 | 180 | 186 | 191 | 196 | 202 | 207 | 213 | 218 | 224 | 229 | 235 | 240 | 246 | 251 | 256 | 262 | 267 | 273 | 278 | 284 | 289 | 295 |
| 63 | 107 | 113 | 118 | 124 | 130 | 135 | 141 | 146 | 152 | 158 | 163 | 169 | 175 | 180 | 186 | 191 | 197 | 203 | 208 | 214 | 220 | 225 | 231 | 237 | 242 | 248 | 254 | 259 | 265 | 270 | 278 | 282 | 287 | 293 | 299 | 304 |
| 64 | 110 | 116 | 122 | 128 | 134 | 140 | 145 | 151 | 157 | 163 | 169 | 174 | 180 | 186 | 192 | 197 | 204 | 209 | 215 | 221 | 227 | 232 | 238 | 244 | 250 | 256 | 262 | 267 | 273 | 279 | 285 | 291 | 296 | 302 | 308 | 314 |
| 65 | 114 | 120 | 126 | 132 | 138 | 144 | 150 | 156 | 162 | 168 | 174 | 180 | 186 | 192 | 198 | 204 | 210 | 216 | 222 | 228 | 234 | 240 | 246 | 252 | 258 | 264 | 270 | 276 | 282 | 288 | 294 | 300 | 306 | 312 | 318 | 324 |
| 66 | 118 | 124 | 130 | 136 | 142 | 148 | 155 | 161 | 167 | 173 | 179 | 186 | 192 | 198 | 204 | 210 | 216 | 223 | 229 | 235 | 241 | 247 | 253 | 260 | 266 | 272 | 278 | 284 | 291 | 297 | 303 | 309 | 315 | 322 | 328 | 334 |
| 67 | 121 | 127 | 134 | 140 | 146 | 153 | 159 | 166 | 172 | 178 | 185 | 191 | 198 | 204 | 211 | 217 | 223 | 230 | 236 | 242 | 249 | 255 | 261 | 268 | 274 | 280 | 287 | 293 | 299 | 306 | 312 | 319 | 325 | 331 | 338 | 344 |
| 68 | 125 | 131 | 138 | 144 | 151 | 158 | 164 | 171 | 177 | 184 | 190 | 197 | 203 | 210 | 216 | 223 | 230 | 236 | 243 | 249 | 256 | 262 | 269 | 276 | 282 | 289 | 295 | 302 | 308 | 315 | 322 | 328 | 335 | 341 | 348 | 354 |
| 69 | 128 | 135 | 142 | 149 | 155 | 162 | 169 | 176 | 182 | 189 | 196 | 203 | 209 | 216 | 223 | 230 | 236 | 243 | 250 | 257 | 263 | 270 | 277 | 284 | 291 | 297 | 304 | 311 | 318 | 324 | 331 | 338 | 345 | 351 | 358 | 365 |
| 70 | 132 | 139 | 146 | 153 | 160 | 167 | 174 | 181 | 188 | 195 | 202 | 209 | 216 | 222 | 229 | 236 | 243 | 250 | 257 | 264 | 271 | 278 | 285 | 292 | 299 | 306 | 313 | 320 | 327 | 334 | 341 | 348 | 355 | 362 | 369 | 376 |
| 71 | 136 | 143 | 150 | 157 | 165 | 172 | 179 | 186 | 193 | 200 | 208 | 215 | 222 | 229 | 236 | 243 | 250 | 257 | 265 | 272 | 279 | 286 | 293 | 301 | 308 | 315 | 322 | 329 | 338 | 343 | 351 | 358 | 365 | 372 | 379 | 386 |
| 72 | 140 | 147 | 154 | 162 | 169 | 177 | 184 | 191 | 199 | 206 | 213 | 221 | 228 | 235 | 242 | 250 | 258 | 265 | 272 | 279 | 287 | 294 | 302 | 309 | 316 | 324 | 331 | 338 | 346 | 353 | 361 | 368 | 375 | 383 | 390 | 397 |
| 73 | 144 | 151 | 159 | 166 | 174 | 182 | 189 | 197 | 204 | 212 | 219 | 227 | 235 | 242 | 250 | 257 | 265 | 272 | 280 | 288 | 295 | 302 | 310 | 318 | 325 | 333 | 340 | 348 | 355 | 363 | 371 | 378 | 386 | 393 | 401 | 408 |
| 74 | 148 | 155 | 163 | 171 | 179 | 186 | 194 | 202 | 210 | 218 | 225 | 233 | 241 | 249 | 256 | 264 | 272 | 280 | 287 | 295 | 303 | 311 | 319 | 326 | 334 | 342 | 350 | 358 | 365 | 373 | 381 | 389 | 396 | 404 | 412 | 420 |
| 75 | 152 | 160 | 168 | 176 | 184 | 192 | 200 | 208 | 216 | 224 | 232 | 240 | 248 | 256 | 264 | 272 | 279 | 287 | 295 | 303 | 311 | 319 | 327 | 335 | 343 | 351 | 359 | 367 | 375 | 383 | 391 | 399 | 407 | 415 | 423 | 431 |
| 76 | 156 | 164 | 172 | 180 | 189 | 197 | 205 | 213 | 221 | 230 | 238 | 246 | 254 | 263 | 271 | 279 | 287 | 295 | 304 | 312 | 320 | 328 | 336 | 344 | 353 | 361 | 369 | 377 | 385 | 394 | 402 | 410 | 418 | 426 | 435 | 443 |

Source: Adapted from *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.*

Available at: http://www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.pdf

**References**


1. Clinical Geriatrics, Ed. Isadore Rossman, M.D., Ph.D., Lippincott Co., 1979
2. Reeves SL, Varakamin C, Henry CJK. The relationship between arm-span measurement and height with specific reference to gender and ethnicity. *Eur J Clin Nutr.* 1996; 50:398-400.
3. Lohman TG, Roche AF, Martorell R *Anthropometric Standardization Reference Manual.* Champaign, IL: Human Kinetics Books; 1988
4. Frisancho AR, Flegel PN. Elbow breadth as a measure of frame size for United States males and females. *Am J Clin Nutr.* 1983;37:311-314.
5. CMS F325 Guidance to Surveyors 2008. www.cms.gov
6. Niedert, K and Dorner, B. *Nutrition Care of the Older Adult, 2nd Edition.* American Dietetic Association; 2004:115.
7. White J. Formula for body mass index (BMI) determination in amputees. The Consultant Dietitian. Fall 2000, 22.
8. Escott-Stump, S. *Nutrition and Diagnosis Related Care,* 6th Edition. Baltimore, MD. Lippincott Williams & Wilkins; 2008:551.
9. Heinrichs E, Rokusek C. 1992. *Nutrition and Feeding for Persons with Special Needs.* South Dakota University Affiliated Program (SDUAP) University of South Dakota School of Medicine and the South Dakota Department of Education & Cultural Affairs - Child and Adult Nutrition Services, Pierre, SD.
10. AMERICAN FAMILY PHYSICIAN www.aafp.org/afp VOLUME 65, NUMBER 4 / FEBRUARY 15, 2002
11. **Centers for Medicare & Medicaid Services State Operations Manual Appendix PP - Guidelines to Surveyors for Long Term Care Facilities**, Rev. 48, 6-12-09 Available at: http://cms.hhs.gov/manuals/Downloads/som107ap_pp_guidelines_ltcf.pdf.


## Medical, Social and Dietary History

Food/nutritional, medical and social histories are key elements in assessing the client, in determining the nutrition diagnosis, in formulating the PES statement and in developing the nutritional interventions that lead to an individualized care plan.

Collecting history data depends on the practice setting. For individuals, data can come directly from the patient/client through interview, a medical record, the family or care giver and the referring health care provider. The following information is included in the initial assessment data collection. Refer to Step I of the Nutrition Care Process in the American Dietetic Association. **International Dietetics & Nutrition Terminology (IDNT) Reference Manual – Second Edition**. 2009.

The history should include the following:

1. Primary/secondary diagnoses
2. Past medical/surgical history
3. Weight/height history
4. Applicable laboratory measurements, if available

5. Nutrient related Systems Review
   - Cardiovascular
   - Endocrine
   - Gastrointestinal
   - Genetic
   - Genitourinary
   - Hematology
   - Hepatobiliary
   - Immune
   - Infectious disease
   - Musculoskeletal
   - Neurological
   - Psychiatric
   - Pulmonary

6. Social history including:
   - Cooking ability
   - Food security
   - Living arrangements
   - Religion
   - Shopping arrangements
   - Socioeconomic status
   - Impact of nutrition intervention on quality of life
   - Social interaction

6. Dietary Assessment including:
    - Need for adaptive feeding aids
    - Adequacy of intake
    - Appetite / taste changes
    - Chewing/swallowing ability
    - Cultural/ethnic considerations
    - Dietary restrictions
    - Eating patterns
    - Food intolerances/allergies
    - Hydration status including fluid intake
    - Independence/dependence to obtain adequate nutrition
    - Medications
    - Cognitive status in relation to meal intake
    - Mobility
    - Nutrition risk
    - Understanding of diet restrictions

7. Energy Assessment including:
    - Age
    - Body weight, height, composition
    - Gender
    - Infection and fever
    - Malabsorption
    - Medication effects
    - Nutritional status
    - Physical Activity
    - Presence/severity of illness
    - Trauma and wounds
    - Ventilation

## Nutrition in the Prevention and Treatment of Pressure Ulcers

A pressure ulcer is a localized injury to the skin or underlying tissue, usually over a bony prominence that is a result of pressure or of pressure combined with shear or friction. (NPUAP 2007) The multiple stages of pressure ulcers are identified and described below. The registered dietitian (RD) will screen and assess clients at risk for or who have pressure ulcers per the Standards of Practice/Standards of Professional Performance (SOP/SOPP) of the American Dietetic Association (ADA).

**Stages of a Pressure Ulcer**

**Suspected Deep Tissue Injury**: Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear.

**Deep Tissue Description**: The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark ulcer bed. The ulcer may further evolve and become covered by thin eschar. Evolution may be rapid, exposing additional layers of tissue even with optimal treatment.

**Stage I**: Intact skin with non-blanchable redness of a localized area, usually over a boney prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.
**Stage 1 Description**: The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Stage I may be difficult to detect in individuals with dark skin tones. May indicate 'at risk' persons (a heralding sign of risk)

**Stage II:** Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough*. May also present as an intact or open/ruptured serum-filled blister.
**Stage II Description:** Presents as a shiny or dry shallow ulcer without slough or bruising (bruising indicates suspected deep tissue injury). This stage should not be used to describe skin tears, tape burns, perineal dermatitis, maceration or excoriation.

**Stage III:** Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.
**Stage III Description:** the depth of a Stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and Stage III ulcers can be shallow. In contrast areas of significant adiposity can develop extremely deep Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.

**Stage IV:** Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.
**Stage IV Description:** The depth of a Stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon or joint capsule) making osteomyelitis possible. Exposed bone/tendon is visible or directly palpable.

**Unstageable**: Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.
**Unstageable Description:** Until enough slough and/or eschar is removed to expose the base of the ulcer, the true depth, and therefore stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover: and should not be removed. (NPUAP 2007)

**Pressure Ulcer Prevention**
The nutrition risk factors for pressure ulcer development include: Under nutrition, malnutrition, protein energy malnutrition (PEM), and hydration deficits (CMS 2008). Early screening and assessment is critical in identifying the contributing risk factors and appropriate interventions to remove or modify the nutrition risk. Little specific evidence exists related to nutrition care for preventing pressure ulcers beyond *meeting basic calorie and protein requirements*. (AMDA 2008, NPUAP/EPUAP 2009)

**Nutrition Treatment of Pressure Ulcers**
Residents with pressure ulcers should be screened and assessed by the nutrition professional upon admission, change in condition, and/or when the pressure ulcer is not healing. (NPUAP/EPUAP 2009) The nutrition professional will evaluate the severity of the nutritional problems, rate of weight loss, change in appetite, rationale for altered nutritional status, the resident's prognosis, projected clinical course, food consistencies in relation to their ability to chew/swallow, the resident's wishes and goals. Evaluate the risk versus benefit of liberalizing the diet by the discontinuation of unnecessary dietary restrictions. Over-supplementing resident's who do not have protein, vitamin, or mineral deficiencies is not recommended.

**Calories**
Provide sufficient calories *30 to 35 calories/kg body weight*
Adjust formula based on weight loss, weight gain, or level of obesity

**Protein**
Provide adequate protein for positive nitrogen balance
*1.25 to 1.5 grams protein/kg body weight when compatible with goals of care and reassess as condition changes*
Adjust formula based on renal function, liver function

**Fluids**
Provide and encourage adequate daily fluid intake for hydration
*Individuals consuming high levels of protein may require additional fluid. Total fluid needs include water content of food consumed.*
*1 mL fluid per calorie fed (enteral nutrition)*

Evaluate signs and symptoms of dehydration. Elevated temperature, vomiting, profuse sweating, diarrhea, heavily draining wounds contribute to fluid loss, which must be replaced.

**Vitamins/Minerals**

Encourage consumption of a balanced diet which includes good sources of vitamins and minerals

*Daily multivitamin mineral supplement when daily intake is poor or deficiencies are confirmed or suspected.*

*Prior to recommending additional supplementation, review any vitamin/ mineral supplement, enteral formula, oral nutritional supplement, and/or fortified food offered to determine the micronutrient content*

*Vitamin C, Zinc: Supplement above the RDA/AI if suspected or confirmed deficiency is present. High serum zinc levels may interfere with copper metabolism and induce a copper deficiency.*

**Amino Acids**

Supplemental glutamine has not been shown to improve wound healing (McCauley 1991)

Supplemental arginine does not have a confirmed effect on pressure ulcer healing (Langkamp-Henken 2000) Further research is needed to support the effectiveness of these amino acids alone or combined with other nutrients (Langer 2003)

**Biochemical Data**

Biochemical data is one component of the complete nutrition assessment process. There is not a specific lab value that will confirm a resident's nutritional status. Historically albumin and prealbumin have been referenced, albeit incorrectly, as a reliable marker for visceral protein stores. The reduction in serum albumin and prealbumin may be related to metabolic stress, inflammatory cytokine production, or other comorbidities beyond nutrition. In fact research shows hepatic proteins, such as albumin and prealbumin, correlate with the severity of the underlying disease rather than nutritional status. (Myron-Johnson 2007)

*Continuing weight loss and failure of a pressure ulcer to heal despite reasonable efforts to improve caloric and nutrient intake may indicate the resident is in a multi-system failure or end-stage or end-of-life condition warranting an additional assessment of the resident's overall condition. (CMS 2008)

**Role of Nutrition in Pressure Ulcer Healing**
**(Quick Reference Guide Version)**

1. Screen and assess nutritional status for each individual with a pressure ulcer at admission and with each condition change and/or when progress toward pressure ulcer closure is not observed. (Strength of Evidence = C.)

   1.1. Refer all individuals with a pressure ulcer to the dietitian for early assessment and intervention of nutritional problems. (Strength of Evidence = C.)

   1.2. Assess weight status for each individual to determine weight history and significant weight loss from usual body weight ($\geq$ 5% change in 30 days or $\geq$ 10% in 180 days). (Strength of Evidence = C.)

   1.3. Assess ability to eat independently. (Strength of Evidence = C.)

   1.4. Assess adequacy of nutrient intake (food, fluid, oral supplements, enteral/parenteral feedings). (Strength of Evidence = C.)

2. Provide sufficient calories. (Strength of Evidence = B.)

   2.1. Provide 30-35 Kcalories/kg body weight for individuals under stress with a pressure ulcer. Adjust formula based on weight loss, weight gain or level of obesity. Individuals who are underweight or who have had significant unintentional weight loss may need additional Kcalories to cease weight loss and/or regain lost weight. (Strength of Evidence = C.)

   2.2. Revise and modify (liberalize) dietary restrictions when limitations result in decreased food and fluid intake. This is to be done by a dietitian or medical professional. (Strength of Evidence = C.)

2.3. Provide enhanced foods and/or oral supplements between meals if needed. (Strength of Evidence = B.)

2.4. Consider nutritional support (enteral or parenteral nutrition) when oral intake is inadequate. This must be consistent with individual goals. (Strength of Evidence = C.)

3. Provide adequate protein for positive nitrogen balance for an individual with a pressure ulcer. (Strength of Evidence = B.)

3.1. Offer 1.25 - 1.5 grams protein/kg body weight for an individual with a pressure ulcer when compatible with goals of care, and reassess as condition changes. (Strength of Evidence = C.)

3.2. Assess renal function to ensure high levels of protein are appropriate for the individual. (Strength of Evidence = C.)

4. Provide and encourage adequate daily fluid intake for hydration. (Level of Evidence = C.)

4.1. Monitor individuals for signs and symptoms of dehydration: changes in weight, skin turgor, urine output, elevated serum sodium or calculated serum osmolality. (Strength of Evidence = C.)

4.2. Provide additional fluid for individuals with dehydration, elevated temperature, vomiting, profuse sweating, diarrhea or heavily draining wounds. (Strength of Evidence = C.)

5. Provide adequate vitamins and minerals. (Strength of Evidence = B.)

5.1. Encourage consumption of a balanced diet which includes good sources of vitamin and minerals. (Strength of Evidence = B.)

5.2. Offer vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected. (Strength of Evidence = B.)



**References**


1. American Medical Directors Association. Pressure Ulcers in the Long-Term Care Setting Clinical Practice Guideline. Columbia, MD; AMDA 2008.
2. NPUAP/EPUAP International Guidelines for Pressure Ulcer Prevention and Treatment, 2009
3. Morley JE, Thomas DR, eds. Geriatric Nutrition. 2007: CRC Press Taylor & Francis Group, Boca Raton, 497-510.
4. Dorner B, Posthauer ME, Thomas MD. The Role of Nutrition in Pressure Ulcer Prevention and Treatment: National Pressure Ulcer Advisory Panel White Paper. 2009
5. Centers for Medicare & Medicaid Services. State Operations Manual, Guidance to Surveyors for Long Term Care Facilities, Appendix PP. http:www.cms.hhs.gov/guidanceforlawsandregulations/12_NHS.asp
6. Myron Johnson A, Merlini G, Sheldon J, Ichihara K. Clinical indications for plasma protein assays: transthyretin in inflammation and malnutrition. *Clinical Chemistry and Laboratory Medicine.* 2007: CCLM/FESCC;45(3),419-426.
7. Position Paper of the American Dietetic Association: Liberalization of the diet prescription improves quality of life for older adults in long-term care. J Am Diet Assoc 2005;105(12):1955-1965.
8. McCauley R, Platell C, Hall J, McCulloch R. Effects of glutamine on colonic strength anastomosis in the rat. *J Parenter Enter Nutr* 1991;116:821
9. Langkamp-Henken B, Herrlinger-Garcia KA, Stechmiller JK, Nickerson-Troy JA, Lewis B, Moffatt L. Arginine supplemention is well tolerated but does not enhance mitogen-induced lymhocyte proliferation in elderly nursing home residents with pressure ulcers. *J Parenter Enteral Nutr* 2000;24:280.
10. Langer, G; Schloemer, G; Knerr, A; Kuss, O; Behrens, J. Nutritional interventions for preventing and treating pressure ulcers. The Cochrane Database of Systematic Reviews Volume (1), 2007

## Evaluating the Significance of Weight Loss
## (Unexplained Weight Loss)

**Definitions in Regulations:**
Weight loss as part of a resident's nutritional parameter is evaluated by regulatory agencies as being either avoidable (lack of intervention; preventable) or unavoidable (everything possible was done).

**Avoidable** means that the resident did not maintain acceptable parameters of nutritional status and the the facility did *not* do one or more of the following: (3)

- Evaluate the resident's clinical condition and nutritional risk factors;
- Define and implement interventions that are consistent with resident needs, resident goals, and recognized standards of practice;
- Monitor and evaluate the impact of the interventions; or
- Revise the interventions as appropriate.

**Unavoidable** means that the resident did not maintain acceptable parameters of nutritional status even though the facility

- Had evaluated the resident's clinical condition and nutritional risk factors;
- Defined and implemented interventions that are consistent with resident needs, goals, and recognized standards of practice;
- Monitored and evaluated the impact of the interventions; and
- Revised the approaches as appropriate.

**Insidious weight loss** refers to a gradual, unintended, progressive weight loss over time

**Usual body weight** refers to the resident's usual weight through adult life or a stable weight over time.

**Identifying Risks and Assessing Weight Loss**
Weight loss with aging is common. Research concludes most weight changes in older adults can be addressed and interventions put in place if the interdisciplinary team is involved. (2) Weight has proven to be the reliable marker of nutritional status for long term care populations. This weight loss is associated with increased risk for infection, depression and death. (1, 2) Early identification of weight loss or the risk of weight loss is essential to help prevent additional complications from the weight loss. Per regulations, weight loss risks need to be assessed timely, have aggressive efforts/interventions and facilities should have systems in place for carrying out approaches and evaluating effectiveness.

Involuntary weight loss can be unavoidable or avoidable. It is often caused by depression, cancer, cardiac disorders and gastrointestinal disease. (1) Additional weight loss risks are malnutrition, dehydration, taste and sensory changes, dependence for eating and dysphagia. (3) Identify these and other factors that would increase the resident's risks in the nutrition assessment while considering the following:

- Physical appearance and signs of recent weight changes
- Receiving mechanically altered diet or therapeutic diet
- Ability to chew, eating
- Dining location and seating companions
- Disease processes (dementia, COPD, CHF can increase energy needs)
- Sensory losses (taste, sight, hearing; ability to smell and to feel/hold utensils) (2)
- Side effects of medications and/or too many medications
- Depression and other psychological concerns
- Lab values
- Medication changes , including decrease/elimination of some psychotropic medications
- Acceptance of the fortified foods or supplements

When actual weight loss occurs, identify why and document weight changes and trends as part of the nutritional assessment. Usual body weight, weight changes prior to admission, edema, amputations/prosthetics and changes with intake patterns should be included. (3) Any changes in the resident's weight should be clearly noted with possible etiology

including fluid weight changes or terminal, progressive conditions. Any new conditions that could affect weight stability should be discussed.

Sudden weight changes may indicate fluid loss and electrolyte imbalance. Determine if there is a change in mental status, onset of poor intake, trends in lab values and adjustment of medications indicating a possible fluid weight loss.

Facilities should have a plan in place to reweigh those with any suspicious weight change. Weights should be redone within 48 hours of the first finding. If there is a significant weight change, weekly weights should be done for four (4) weeks. An initial note and follow-up note should be done by the registered dietitian (RD).

It is important to involve the health care team when investigating weight changes. Include the physician to help evaluate and manage possible causes. The pharmacist consultant can provide invaluable input on medication side affects related to nutrition and intake.

A specific cause of unintentional weight loss in the elderly is not identified in approximately one quarter of elderly patients. These are "unexplained" weight losses. (This means that despite all interventions and physical work up, the weight loss continues and cannot be attributed to anything specific.) If there is a physical cause (unavoidable) of weight loss, it would surface within six months. Therefore, monitoring of continued weight loss is essential. (1) Ensure that all possible interventions are in place. Make adjustments as needed to the care provided during this waiting period.

Unexplained weight loss should be documented in the nutrition assessment/reassessment in regards to advancing chronic conditions, end of life situations and the honoring of the Living Will. Unknown etiology and decline in conditions should be documented by the physician.

**Calculating Percentage of Weight Loss**

Determining the significance of weight loss as well as actual weight loss in pounds is specified in the requirements for participation in Medicare/Medicaid Facilities (OBRA).

$$\text{Percent weight change} = \frac{\text{(usual weight – actual weight)}}{\text{Usual weight}} \times 100$$

| Time Interval | Significant Weight Loss (%) | Severe Weight Loss (%) |
|---|---|---|
| 1 week | 1.0 – 2.0 | Greater than 2.0 |
| 1 month | 5.0 | Greater than 5.0 |
| 3 months | 7.5 | Greater than 7.5 |
| 6 months | 10 | Greater than 10.0 |

## SIGNIFICANT WEIGHT CHANGES

| Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | 62 | 60 | 59 | 85 | 81 | 79 | 77 | 105 | 100 | 97 | 95 | 125 | 119 | 116 | 113 |
| 66 | 63 | 61 | 59 | 86 | 82 | 80 | 77 | 106 | 101 | 98 | 95 | 126 | 120 | 117 | 113 |
| 67 | 64 | 62 | 60 | 87 | 83 | 81 | 78 | 107 | 102 | 99 | 96 | 127 | 121 | 118 | 114 |
| 68 | 65 | 63 | 61 | 88 | 84 | 82 | 79 | 108 | 103 | 100 | 97 | 128 | 122 | 118 | 115 |
| 69 | 66 | 64 | 62 | 89 | 85 | 83 | 80 | 109 | 104 | 101 | 98 | 129 | 123 | 119 | 116 |
| 70 | 67 | 65 | 63 | 90 | 86 | 84 | 81 | 110 | 105 | 102 | 99 | 130 | 124 | 120 | 117 |
| 71 | 67 | 66 | 64 | 91 | 86 | 85 | 82 | 111 | 105 | 103 | 100 | 131 | 124 | 121 | 118 |
| 72 | 68 | 67 | 65 | 92 | 87 | 86 | 83 | 112 | 106 | 104 | 101 | 132 | 125 | 122 | 119 |
| 73 | 69 | 68 | 66 | 93 | 88 | 87 | 84 | 113 | 107 | 105 | 102 | 133 | 126 | 123 | 120 |
| 74 | 70 | 68 | 67 | 94 | 89 | 87 | 85 | 114 | 108 | 105 | 103 | 134 | 127 | 124 | 121 |
| 75 | 71 | 69 | 68 | 95 | 90 | 88 | 86 | 115 | 109 | 106 | 104 | 135 | 128 | 125 | 122 |
| 76 | 72 | 70 | 68 | 96 | 91 | 89 | 86 | 116 | 110 | 107 | 104 | 136 | 129 | 126 | 122 |
| 77 | 73 | 71 | 69 | 97 | 92 | 90 | 87 | 117 | 111 | 108 | 105 | 137 | 130 | 127 | 123 |
| 78 | 74 | 72 | 70 | 98 | 93 | 91 | 88 | 118 | 112 | 109 | 106 | 138 | 131 | 128 | 124 |
| 79 | 75 | 73 | 71 | 99 | 94 | 92 | 89 | 119 | 113 | 110 | 107 | 139 | 132 | 129 | 125 |
| 80 | 76 | 74 | 72 | 100 | 95 | 93 | 90 | 120 | 114 | 111 | 108 | 140 | 133 | 130 | 126 |
| 81 | 77 | 75 | 73 | 101 | 96 | 93 | 91 | 121 | 115 | 112 | 109 | 141 | 134 | 130 | 127 |
| 82 | 78 | 76 | 74 | 102 | 97 | 94 | 92 | 122 | 116 | 113 | 110 | 142 | 135 | 131 | 128 |
| 83 | 79 | 77 | 75 | 103 | 98 | 95 | 93 | 123 | 117 | 114 | 111 | 143 | 136 | 132 | 129 |
| 84 | 80 | 78 | 76 | 104 | 99 | 96 | 94 | 124 | 118 | 115 | 112 | 144 | 137 | 133 | 130 |

| Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% | Initial Weight | 5% | 7.5% | 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 145 | 138 | 134 | 131 | 165 | 157 | 153 | 149 | 185 | 176 | 171 | 167 | 205 | 195 | 190 | 185 |
| 146 | 139 | 135 | 131 | 166 | 158 | 154 | 149 | 186 | 177 | 172 | 167 | 206 | 196 | 191 | 185 |
| 147 | 140 | 136 | 132 | 167 | 159 | 155 | 150 | 187 | 178 | 173 | 168 | 207 | 197 | 192 | 186 |
| 148 | 141 | 137 | 133 | 168 | 160 | 155 | 151 | 188 | 179 | 174 | 169 | 208 | 198 | 192 | 187 |
| 149 | 142 | 138 | 134 | 169 | 161 | 156 | 152 | 189 | 180 | 175 | 170 | 209 | 199 | 193 | 188 |
| 150 | 143 | 139 | 135 | 170 | 162 | 157 | 153 | 190 | 181 | 176 | 171 | 210 | 200 | 194 | 189 |
| 151 | 143 | 140 | 136 | 171 | 162 | 158 | 154 | 191 | 181 | 177 | 172 | 211 | 200 | 195 | 190 |
| 152 | 144 | 141 | 137 | 172 | 163 | 159 | 155 | 192 | 182 | 178 | 173 | 212 | 201 | 196 | 191 |
| 153 | 145 | 142 | 138 | 173 | 164 | 160 | 156 | 193 | 183 | 179 | 174 | 213 | 202 | 197 | 192 |
| 154 | 146 | 142 | 139 | 174 | 165 | 161 | 157 | 194 | 184 | 179 | 175 | 214 | 203 | 198 | 193 |
| 155 | 147 | 143 | 140 | 175 | 166 | 162 | 158 | 195 | 185 | 180 | 176 | 215 | 204 | 199 | 194 |
| 156 | 148 | 144 | 140 | 176 | 167 | 163 | 158 | 196 | 186 | 181 | 176 | 216 | 205 | 200 | 194 |
| 157 | 149 | 145 | 141 | 177 | 168 | 164 | 159 | 197 | 187 | 182 | 177 | 217 | 206 | 201 | 195 |
| 158 | 150 | 146 | 142 | 178 | 169 | 165 | 160 | 198 | 188 | 183 | 178 | 218 | 207 | 202 | 196 |
| 159 | 151 | 147 | 143 | 179 | 170 | 166 | 161 | 199 | 189 | 184 | 179 | 219 | 208 | 203 | 197 |
| 160 | 152 | 148 | 144 | 180 | 171 | 167 | 162 | 200 | 190 | 185 | 180 | 220 | 209 | 204 | 198 |
| 161 | 153 | 149 | 145 | 181 | 172 | 167 | 163 | 201 | 191 | 186 | 181 | | | | |
| 162 | 154 | 150 | 146 | 182 | 173 | 168 | 164 | 202 | 192 | 187 | 182 | | | | |
| 163 | 155 | 151 | 147 | 183 | 174 | 169 | 165 | 203 | 193 | 188 | 183 | | | | |
| 164 | 156 | 152 | 148 | 184 | 175 | 170 | 166 | 204 | 194 | 189 | 184 | | | | |

**Tools to Utilize to Assess Weight Trends and Significant Weight Changes**

1. QI reports
2. Facility weight records and computerized weight change reports
3. Nutrition care alerts to assess warning signs of unintentional weight loss
4. Investigative protocols for nutritional status, hydration and dining

**Interventions**

After assessing weight change, decide which interventions may reverse or stop the trend. The ADA Position paper on the liberalization of diets states that using a liberalized diet approach can produce benefits of improved intake, less weight loss and better quality of life of the residents. Unintended weight loss has been shown in residents who have inadequate intake at just a few meals per week. Therefore, intake should be maximized at each meal, snack and hydration opportunity. (2)

Examples of interventions:

- Notify physician of weight loss; communicate and document.
- Update food preferences including cultural and religious preferences; involve family members.
- Add favorite snacks, choice of fortified foods or/and supplements, increase portions of favorite foods. Consider nontraditional supplements to increase intake, i.e.: peanut butter/chocolate cups, soft drink floats with ice cream or sherbet, homemade cookies or cake squares.
- Observe ability to feed self and amount of spillage; involve nursing and occupational therapy (OT); increase assistance as needed; refer to OT for screening.
- Change location of dining: encourage having meals in the day room or dining room; discourage dining alone in their room; change resident's table mates; assure comfortable position during dining/being fed.
- Monitor chewing and swallowing ability and involve speech therapy.
- If there is poor acceptance of mechanically altered diet or resident verbalizes refusal, assess potential for upgrade with Speech Therapist.
- Weigh more frequently.
- Assess with team for potential medication changes to improve appetite:
    - Involve the family or responsible party for ideas or answers to improve intake patterns
    - Determine resident's usual body weight and weight history pattern from family members if possible.
    - Reevaluate intake and meal time histories.
    - Determine family wishes and resident's wishes for tube feeding and IV therapy; document these wishes.

**When Weight Loss Cannot Be Corrected**

If a resident cannot maintain acceptable parameters of nutritional status, which includes weight, despite appropriate interventions, then this must be identified in the documentation. The physician should be involved with this conclusion and document as well. Continued weight loss may be an expected outcome. (3)

Continue to provide all interventions the resident is willing to accept; assess if weighing the resident can be discontinued depending on comfort and resident/family wishes; update the care plan, include hospice care input; and document multidisciplinary team/family meeting regarding tube feeding options.

**Monitor and Evaluate Interventions**

The dining and food service Centers for Medicare & Medicaid Services (CMS) protocol seeks to determine if the nourishing, palatable attractive meals are served; that services are provided to maintain or improve eating skills; and that dining experience enhances the quality of life. (2) There should also be a facility system in place to identify and monitor residents at nutrition risk which includes those showing undesirable weight trends.

Facility interventions to explore include:

- Weighing procedures, methods of recording/comparing; frequency, and accuracy of weights.
- Improving presentation of meal and dining experience.
- Assuring service of food at acceptable temperatures.
- Providing education to nursing/staff on positive atmosphere when presenting food or assisting with meals; on strategies to encourage intake; and best practices for assisting residents during meal times.

- Increasing appropriate exercise opportunities through therapy and recreation departments.
- Designing quality assurance audits and studies related to nutrition risks.
- Implementing weight committee to review weekly, monthly, six month, yearly changes.

The following quote from the Journal of American Medical Directors Association summarizes the importance of nutrition assessment in regards to weight loss. *"Quality nutritional practice in long term care involves careful assessment of barriers to adequate nutrition; reduction of risk factors; attention to specialized diets; food presentation; and supplements, when appropriate; awareness of the importance of psychosocial and environmental issues; and consideration of the role of medication both as a cause and a therapeutic adjunct". (4)*

Be concerned about trends in both weight losses and gains. Addressing trends in weight loss can decrease the impact of other significant changes. Addressing trends in weight gains can decrease worsening medical conditions, abrupt changes in meal or dietary patterns and increases in medication needs.
Utilize the Interdisclipinary Team (IDT) to review medications, activities, behaviors and changes in daily routines.

**References**


1. Huffman G B. Evaluating and treating unintentional weight loss in the elderly. Am Fam Physician. 2002 Feb 15;65(4):640-50.
2. Niedert KC, American Dietetic Association. Position of the American Dietetic Association: Liberalization of the diet prescription improves quality of life for older adults in long-term care. J Am Diet Assoc. 2005; 105(12):1955-1965.
3. CMS Manual System, DHHS, CMS. August 1, 2008. Revisions to Appendix PP – "Interpretive Guidelines for Long Term Care Facilities," Tags F325 and F371.
4. Sloane PD, Ivey J, Helton M, Barrick AL, Cerna A. Nutritional issues in long-term care. J Am Med Dir Assoc. 2008 Sep;9(7):476-85.


**Additional Resources**


1. CMS. Quality Indicator Survey, Critical Elements for Nutrition, Hydration, and Tube feeding Status. 12/06/2006.
2. Handy L. Surveyor M.O. For Nutritional Status (F 325) Training Manual. Handy Dietary Consulting. www.handydietaryconsulting.com.

## NUTRITION CARE PROCESS

**Nutrition Care Process (NCP)**
The purpose of the nutrition care process is to provide a standardized process for providing nutrition care. The care itself remains individualized.

"*Providing high-quality nutrition care means doing the right thing at the right time, in the right way, for the right person, and achieving the best possible results*." (1)

The NCP is a four-step process that helps the registered dietitian (RD) to think critically and make decisions in a consistent and systematic manner. It is the standard of practice for nutrition documentation. The NCP promotes a higher probability of good outcomes and helps the dietitian track and document those outcomes. The components of each step of the process are to be tailored to the type of service. Within a medical setting this may involve medical nutrition therapy (MNT); in community or wellness settings it may focus on services such as nutrition education or weight loss.

The NCP consists of 4 steps:

1. **Nutrition Assessment** – a method of obtaining, verifying, and interpreting data to identify a nutrition-related problem.
2. **Nutrition Diagnosis** – Consistently describe nutrition problems so that they are clear within and outside the profession. The registered dietitian identifies and labels a specific nutrition diagnosis that she or he is responsible for treating independently.
3. **Nutrition Intervention** – the diagnosis ideally resolves or at least the signs and symptoms improve. Specific actions used to remedy a nutrition diagnosis. The interventions should be aimed at the etiology of the problem.
4. **Nutrition Monitoring and Evaluation** – Determine the amount of progress made. Track the patient outcomes relevant to the diagnosis, intervention, plans and goals.

**Nutrition Assessment**
Nutrition assessment is a "*systematic process of obtaining, verifying, and interpreting data in order to make decisions about the nature and cause of nutrition-related problems.…Nutrition assessment requires making comparisons between the information obtained and reliable standards (ideal goals).*" [It is] "*an on-going, dynamic process that involves not only initial data collection, but also continual reassessment and analysis of needs*." (1)

**Five Domains for Assessment:**

1. Food/Nutrition – Related History
2. Biochemical Data, Medical Tests, and Procedures
3. Anthropometric Measurements
4. Nutrition – Focused Physical Findings
5. Client History

Assessment organizes and evaluates information in order to declare a professional judgment. Nutrition assessment precedes a nutrition diagnosis, intervention (including the care plan), monitoring and evaluation.

**Three Domains for Nutrition Diagnosis:**

1. Intake
2. Clinical
3. Behavioral-environmental

In healthcare communities, the terminology under the intake domain will be used more frequently.

The nutrition diagnosis is written in the form of a PES statement which is derived from the synthesis of information from the assessment data.

(P)Problem _____related to (E)Etiology _____as evidenced by (S)Signs/Symptoms_____

Sample PES statements are on page 63. There may be one or more PES statements. If the patient is stable, a PES statement may not be required.

There are six questions to help evaluate the PES statement:

1. Can the dietitian resolve or improve the nutrition diagnosis?
2. Does the nutrition assessment data support the nutrition diagnosis, etiology, and signs and symptoms?
3. Is the etiology listed the root cause?
    a. The cause needs to be something that dietitians can change or improve.
    b. Diabetes is not an etiology as it cannot be changed.
4. Will measuring the signs and symptoms tell if the problem is resolved or improved?
5. Are the signs and symptoms specific enough to measure/evaluate changes at the next visit/next planned evaluation to document resolution or improvement of the nutrition diagnosis?
6. When all things are equal and there is a choice between the PES statement using two nutrition diagnosis labels in different domains, was the diagnosis chosen from the intake domain?

**Four Domains of Intervention:**

1. Food and/or Nutrient Delivery
2. Nutrition Education
3. Nutrition Counseling
4. Coordination of Care

In healthcare communities, the intervention terminology under the Food and/or Nutrient Delivery domain will be used more frequently.

**Four Domains of Monitoring and Evaluating:**

1. Food/Nutrition – Related History
2. Anthropometric Measurements
3. Biochemical Data, Medical Tests, and Procedures
4. Nutrition – Focused Physical Findings

In healthcare communities, the monitoring and evaluation terminology under Food/Nutrition Related History and Anthropometric Measurements is likely to be used more frequently.

In-depth information on NCP is available online at the ADA website www.eatright.org and in the **Journal of the American Dietetic Association**. (See reference at end of this section.)

**NCP and Medical Nutrition Therapy (MNT)**

The NCP and MNT are not synonymous terms. MNT is one type of nutrition care, whereas the NCP describes the approach to a spectrum of nutrition care. The NCP defines specific steps an RD uses when providing MNT.

**NCP in Skilled Nursing Facilities**

The steps of the NCP work well with the provision of care practices used by skilled nursing facilities, as well as, the directives in Medicare regulations. To complete the MDS, all disciplines complete: an initial assessment, Triggers and Resident Assessment Protocols (RAPS), care planning with interventions, monitoring, evaluation and re-assessment as needed, essentially the same steps used in the NCP.

NCP Terminology is found in the **International Dietetics & Nutrition Terminology (IDNT) Reference Manual**; American Dietetic Association, 2009.

**References**

1. International Dietetics & Nutrition Terminology (IDNT) Reference Manual, Second Edition; American Dietetic Association, 2008.
2. Long-Term Care Toolkit; American Dietetic Association; 2008.

3. Johnson J, Roberts L. Quick Reference; Long-Term Care, Nutrition Care Process, Regulations, and Care Plans. Available at www.RDoffice.net
4. Roberts L, Johnson J. The nutrition care process simplified for long term care. The Consultant Dietitian; Spring 2008, Volume 32, Number 4.
5. Elliott C. The new nutrition care process basics. The Consultant Dietitian; Fall 2006, Volume 31, Number 2.
6. Lacey K, Pritchett E. Nutrition care process and model: ADA adopts road map to quality care and outcomes management. J Am Diet Assoc. 2003 Aug; 103(8):1061-72.
7. Niedert K, Dorner B. *Nutrition Care of the Older Adult 2nd Edition*. American Dietetic Association. 2004.
8. Appetite Questionnaire in community-dwelling seniors. J Amer Geriatr Soc 2004; 52(Supp 4): S184.
9. Anderson SJ, Baxi AS, Wilson MG, Thomas DR. Assessment of the reliability of a consensus based questionnaire for appetite evaluation in long-term care residents. J Amer Geriatr Soc 2003; 51(4): S206.

## Potential PES Statements with Potential Interventions and Indicator

| Potential PES | Potential Intervention | Indicator for M & E |
|---|---|---|
| Referral: Weight loss/ Insidious weight loss<br><br>Inadequate oral food/beverage intake related to lack of appetite as evidenced by <50% of meals consumed, Prozac recently ordered, and weight loss/insidious weight loss (x lbs in y days) | Meals and Snacks<br>Medical Food Supplements<br>Nutrition-Related Medication Management<br>Vitamin and Mineral Supplements | Weight<br>Food and Beverage Intake |
| Referral: Weight loss<br><br>Inadequate energy intake related to poor intake following surgery as evidenced by weight loss (x lbs in y days) | Meals and Snacks<br>Medical Food Supplements<br>Vitamin and Mineral Supplements<br>Nutrition-Related Medication Management | Weight<br>Energy Intake |
| Referral: Poor fluid intake<br><br>Inadequate fluid intake related to disliking thickened liquids as evidenced by <50% of beverages consumed at meals | Coordination of other care during nutrition care (Speech Language Pathologist)<br>Medical Food Supplements (per facility policy) | Fluid/Beverage Intake<br>Biochemical Data, Medical Tests, and Procedures (electrolyte and renal profile)<br>Nutrition-Focused Physical Findings (digestive system) |
| Referral: Pressure Ulcer<br><br>Inadequate protein-energy intake related to increased nutrient needs as evidenced by stage III pressure ulcer on coccyx | Meals and Snacks<br>Medical Food Supplements<br>Vitamin and Mineral Supplements<br>Nutrition-Related Medication Management | Nutrition-Focused Physical Findings (Skin)<br>Weight<br>Biochemical Data, Medical Tests and Procedures (Labs)<br>Protein and Energy Intake |
| Referral: Elevated Blood Glucose<br><br>Excessive carbohydrate intake at breakfast related to food preferences/choices (specify) as evidenced by elevated accu check level at 11am. | Meals and Snacks<br>Nutrition Education<br>(undesirable food choices)<br>Nutrition-Related Medication Management | Biochemical Data, Medical Tests and Procedures (accu checks, HgbA1c %)<br>Food and Beverage Intake |
| Referral: Tube Feeding<br><br>Inadequate intake from enteral nutrition related to initial enteral feeding order less than calculated needs as evidenced by weight loss (x lbs in y days) | Modify rate, concentration, composition or schedule | Weight<br>Enteral Nutrition Intake (rate/schedule) |
| Referral: Dialysis<br><br>Excessive mineral intake related to snacking 2-3 times per day from the vending machine as evidenced by increased sodium and potassium lab values | Meals and Snacks<br>Nutrition Education<br>(undesirable food/beverage choices)<br><br>Coordination of Care (dialysis RD) | Biochemical Data, Medical Tests and Procedures (electrolyte and renal profile)<br>Weight (pre and post dialysis weight)<br>Mineral Intake |

| Potential PES | Potential Intervention | Indicator for M & E |
|---|---|---|
| Referral: Weight loss/ Insidious Weight Loss<br><br>Inadequate oral food/beverage intake related to self feeding difficulty as evidenced by tremors, food on floor, in resident's lap and weight loss/insidious weight loss (x lbs in y days) | Feeding Assistance<br>Coordination of other care during nutrition care (occupational therapy/adaptive equipment needs) | Food and Beverage Intake<br>Weight<br>Mealtime Behavior |
| Referral: Weight Gain<br><br>Excessive oral food/beverage intake related to limited adherence to nutrition-related recommendations as evidenced by resident snacking from vending machine, consuming foods brought in by family/friends and intake of 75-100% at meals (x lbs in y days) | Nutrition Education (Purpose of the nutrition education)<br>Comprehensive Nutrition Education (Recommended modifications)<br>Coordination of Nutrition Care (physical therapy/increase activity) | Biochemical Data, Medical Tests and Procedures (Labs)<br>Weight<br>Food Intake<br>Physical activity |
| Referral: Underweight<br><br>Underweight related to inadequate energy intake prior to admission as evidenced by BMI of 17 | Meals and Snacks: (General/healthful diet)<br>Medical Food Supplements<br>Vitamin and Mineral Supplements<br>Other: specify | Weight<br>BMI |
| Referral: End of Life<br><br>No nutritional interventions needed. Therefore, there is: No nutritional diagnosis/problem at this time. | Nutritional interventions are in place.<br>Honor resident's wishes for care. | Food and Beverage Intake (favorite/comfort foods) |
| Referral: Hospice Care/Weight loss<br><br>Increased nutrient needs related to RMR greater than intake as evidenced by decreased appetite and weight loss (x lbs in y days) | Meals and Snacks<br>Medical Food Supplements (per resident desires) | Food and Beverage Intake (favorite/comfort foods, supplement acceptance) |
| Referral: Dialysis/Weight Gain<br><br>Excessive fluid intake related to consuming more fluids than allowed on fluid restriction as evidenced by an increase of 5kg between dialysis sessions | Meals and Snacks (specific food/beverages or groups)<br>Nutrition Education (purpose of nutrition education)<br>Comprehensive Nutrition Education (recommended modifications)<br>Coordination of Care (dialysis RD) | Fluid Intake<br>Biochemical Data, Medical Tests and Procedures (electrolytes and renal profile)<br>Weight (pre and post dialysis weight) |

For more PES Statement examples refer to the American Dietetic Association: **Long Term Care Tool Kit, A Practical Application of the Nutrition Care Process and Standardized Language to the Long-Term Care Setting**, 2011.

## PHYSICAL SIGNS OF MALNUTRITION

| SIGNS | POSSIBLE NUTRITION-RELATED CAUSES |
|---|---|
| **Hair** | |
| Dull, dry; lack of natural shine, easily plucked | Protein-energy deficiency<br>Essential fatty acid deficiency (EFA) |
| Thin, sparse; alopecia | Zinc, biotin, protein deficiency |
| Color changes, depigmentation, lack luster | Other nutrient deficiencies: manganese, copper |
| Easily plucked with no pain | Protein deficiency, seen in kwashiorkor and occasionally in marasmus |
| Corkscrew hair; unemerged, coiled hairs | Vitamin C deficiency |
| **Eyes** | |
| Small, yellowish lumps around eyes<br>White rings around both eyes | Hyperlipidemia |
| Angular inflammation of eyelids, "grittiness" under eyelids, superficial vascularization, ulcerations of cornea | Riboflavin deficiency |
| Pale eye and mucous membranes | Vitamin $B_{12}$, folate, and/or iron deficiency |
| Night blindness, dry membranes, dull or soft cornea | Vitamin A, zinc deficiency |
| Redness and fissures of eyelid corners; red and inflamed conjunctiva, swollen and sticky eyelids | Niacin deficiency Riboflavin / Pyridoxine deficiency |
| Ring of fine blood vessels around cornea | General poor nutrition |
| Bitot's spots (white spots in eyes) | Vitamin A deficiency |
| Ophthalmoplegia | Thiamin, Phosphorus deficiency |
| **Lips** | |
| Redness and swelling of mouth, stomatitis | Niacin, riboflavin, iron, and/or pyridoxine deficiency |
| Angular fissures, scars at corner of mouth (Cheilosis) | Niacin, riboflavin, iron, and/or pyridoxine deficiency |
| Soreness, burning lips, pallor | Riboflavin deficiency |
| **Gums** | |
| Spongy, swollen, bleeds easily, redness (Swollen, bleeding gums; retracted gums with teeth) | Vitamin C deficiency |
| Gingivitis | Folate, pyridoxine, Vitamin C, Zinc deficiency<br>Vitamin A excess |
| **Mouth** | |
| Cheilosis, angular scars | Riboflavin, iron, pyridoxine, niacin deficiency |
| Soreness, burning | Riboflavin deficiency |
| **Tongue** | |
| Sores, swollen, scarlet, raw, "beef tongue" | Folate, niacin deficiency |
| Smooth, beefy red tongue | Vitamin B12, niacin deficiency |
| Soreness, burning tongue<br>Purplish/magenta color | Riboflavin deficiency |
| Smooth with papillae (small projections) | Riboflavin, vitamin $B_{12}$, pyridoxine, niacin, folate, protein, iron deficiency |
| Glossitis | Riboflavin, iron, zinc, pyridoxine deficiency |
| **Taste** | |
| Sense of taste diminished | Zinc deficiency |
| **Teeth** | |
| Gray-brown spots; mottling; | Increased fluoride intake |
| Missing or erupting abnormally | General poor nutrition |
| | |
| | |
| **Face** | |
| Skin color loss, dark cheeks and eyes; enlarged parotid glands, scaling of skin around nostrils | Protein-energy deficiency; specifically niacin, riboflavin and pyridoxine deficiencies |
| Pallor | Iron, folate, vitamin $B_{12}$ and vitamin C deficiencies |
| Hyperpigmentation | Niacin deficiency |
| **Neck** | |
| Thyroid enlargement | Iodine deficiency |
| Symptoms of hypothyroidism | Iodine deficiency |
| **Nails** | |
| Fragility, banding | Protein deficiency |

| SIGNS | POSSIBLE NUTRITION-RELATED CAUSES |
|---|---|
| Spoon-shaped; concave | Iron deficiency |
| **Skin** | |
| Slow wound healing, decubitus ulcers | Zinc, Vitamin C, Protein deficiency; Kwashiorkor |
| Psoriasis | Biotin deficiency |
| Eczema; lesions | Riboflavin, zinc deficiency |
| Scaling of the scalp, dandruff, oiliness of the scalp, lips and nose | Biotin deficiency, pyridoxine, zinc, riboflavin, essential fatty acids deficiency; Vitamin A excess or deficiency |
| Purple or Red spots due to skin bleeding | Vitamin C and/or K deficiency |
| Dryness, mosaic, sandpaper feel, flakiness | Increased or decreased vitamin A |
| Dark, dry, scaly skin | Niacin deficiency |
| Lack of fat under skin, cellophane appearance | Protein-energy deficiency, Vitamin C deficiency |
| Bilateral edema | Protein-energy, Vitamin C deficiency |
| Yellow colored | Beta Carotene excess, vitamin B12 deficiency |
| Cutaneous flushing, desquamation | Niacin |
| Body edema; round swollen face | Protein, Thiamin deficiencies |
| Pallor, fatigue, depression, apathy | Iron, folic acid deficiencies |
| **Gastrointestinal** | |
| Anorexia, flatulence, diarrhea | Vitamin $B_{12}$ deficiency |
| **Muscular System** | |
| Weakness | Phosphorus or potassium deficiency, Vitamin C deficiency, Vitamin D deficiency |
| Wasted appearance | Protein-energy deficiency |
| **Muscular System, cont.** | |
| Calf tenderness, absent knee jerks, foot and wrist drop | Thiamin deficiency |
| Peripheral neuropathy, tingling, “pins and needles” | Folate, pyridoxine, pantothenic acid, phosphate, thiamine deficiencies, vitamin B12 deficiency |
| Muscle twitching, convulsions, tetany | Magnesium or pyridoxine excess or deficiency; Calcium, Vitamin D deficiencies |
| Muscle cramps | Chloride decreased, sodium deficiency; Calcium, Vitamin D, Magnesium deficiencies |
| Muscle pain | Biotin deficiency |
| **Skeletal System** | |
| Demineralization of bone | Calcium, phosphorus, Vitamin D deficiencies |
| Epiphyseal enlargement of leg and knee, Bowed legs | Vitamin D deficiency |
| Bone Tenderness | Vitamin D deficiency |
| **Nervous System** | |
| Listlessness | Protein-energy deficiency |
| Loss of position and vibratory sense, decrease and loss of ankle and knee reflexes, depression, inability to concentrate, defective memory, confabulation, delirium | Thiamin, pyridoxine, vitamin $B_{12}$ deficiencies |
| Seizures, memory impairment, and behavioral disturbances | Magnesium, zinc deficiencies |
| Peripheral neuropathy, dementia | Pyridoxine deficiency |
| Dementia | Niacin, Vitamin $B_{12}$ deficiencies |

## Resources


1. Chernoff R. Geriatric Nutrition: The Health Professional's Handbook. Jones & Bartlett. 2006
2. Journal of the American Medical Association, February 11, 2004.
3. Hetzel BS, Clugston GA. Iodine. In: Shils M, Olson JA, Shike M, Ross AC, eds. Nutrition in Health and Disease. Vol 9th. Baltimore: Williams & Wilkins; 1999:253-264.
4. The Merck Manual. Available at http://www.merck.com/pubs/mmanual_ha/tables/tb17_1.html. Accessed 26 August 2009.

# SELECTED LABORATORY VALUES FOR ADULTS*

| Test | Normal values | Some implications |
|---|---|---|
| Albumin – Serum<br>ALB | 3.5 - 5.0 g/dl<br>(35-50 g/L SI units)<br><br>>60 years 3.4-4.8 g/dl<br>(34-48 g/L SI units) | **Function:** Maintain colloidal osmotic pressure; transport molecule for enzymes, fatty acids, hormones, bilirubin, and some drugs.<br>**Site of synthesis:** Liver<br>**Half Life:** 12-18 days<br>**Increased:** Dehydration; also diarrhea, Hodgkin's disease, , metastatic carcinomatosis, non-Hodgkin's lymphoma, , ulcerative colitis, uremia, and vomiting.<br>**Decreased:** Overhydration; also acute infection and chronic inflammation, alcohol abuse, ascites, beriberi, burns, cholecystitis, CHF, cirrhosis, Crohn's, Cushing's, cystic fibrosis, dementia, diabetes mellitus, essential HTN, liver disease, leukemia, lymphoma, malabsorption syndrome, malnutrition, meningitis, myasthenia, myeloma, MI, neoplasms, nephrotic syndrome, nephrosis, osteomyelitis, peptic ulcer, pneumonia, pregnancy, protein losing enteropathies and protein losing nephropathies, rheumatic fever, rheumatoid arthritis, sarcoidosis, scleroderma, sprue, steatorrhea, stress, surgery, systemic lupus erythematosus, thyrotoxicosis, trauma, tuberculosis and ulcerative bowel disease. |
| Alkaline phosphatase-Serum<br>ALP | 30 - 120 Units/L<br>0.5-2.0 µKat/L<br><br>Elderly: slightly higher | **Function:** Enzyme found in bone, liver, biliary tract, intestine, and placenta; it rises during periods of bone formation/reparation or hepatic disease.<br>**Site of synthesis:** Liver<br>**Increased:** Alcohol abuse, amyloidosis, biliary obstruction, cholelithiasis in sickle cell disease, cirrhosis, cytomegalovirus, diabetes mellitus, excessive carbohydrate ingestion (large amounts), Fanconi syndrome, dysplasia, healing fracture, histiocytosis, Hodgkin's, hyperalimentation, hyperparathyroidism (with Paget's disease), hyperthyroidism, hypophosphatemia, intestinal infarction or ischemia, kidney rejection, liver abscess, cancer or disease, lung cancer, lymphoma, metastatic cancer to the bone, mononucleosis (infectious), myeloma, MI, osteosarcoma, primary or metastatic liver tumor, pulmonary or renal infarction, recent meal ingestion, rheumatoid arthritis, rickets, sarcoidosis, sickle cell crisis, ulcerative colitis.<br>**Decreased:** Blood transfusions (massive), Burnett's syndrome, celiac disease, cretinism, excessive Vitamin D, excessive Vitamin B, hypophosphatasia, hypothyroidism, malnutrition, pernicious anemia, placental insufficiency, nephritis, scurvy, zinc deficiency. |
| Blood Urea Nitrogen-<br>BUN | 10-20 mg/dl<br>3.6-7.1 mmol/L<br>(SI Units)<br><br>>60 years:<br>8-21mg/dl<br>2.9-7.5mmol/L<br>(SI Units) | **Function:** End product of protein metabolism converted in the liver to form urea.<br>**Site of synthesis:** Liver<br>**Increased:** Addison's disease, allergic purpura, amyloidosis, anabolic steroid use, analgesic abuse, blood transfusions, burns, cachexia, cardiac failure, congenital hypoplastic kidneys, CHF, dehydration, DM with diabetic ketoacidosis, Fanconi syndrome, excessive fluids, excessive protein intake, GI bleed, glomerulonephritis, Goodpasture's syndrome, gout, heavy-metal poisoning, hemoglobinurias, hypovolemia, infection, intestinal obstruction, MI, nephritis, nephropathy, nephrosclerosis, nephrotoxic drugs, pancreatitis, peritonitis, pneumonia, polyarteritis nodosa, polycystic disease, post-surgical state, pregnancy, protein catabolism, pyelonephritis, renal arterial stenosis or thrombosis, renal insufficiency or failure, scleroderma, sepsis, shock, sickle cell anemia, starvation, stress, subacute bacterial endocarditits, suppuration, systemic lupus erythematosus, thyrotoxicosis, tumor necrosis, uremia and urinary tract obstruction.<br>**Decreased:** Acromegaly, alcohol abuse, amyloidosis, celiac, cirrhosis, hemodialysis, hepatitis, insufficient protein intake, overhydration, liver damage or failure, malabsorption, malnutrition, nephrotic syndrome, pregnancy (advanced), and syndrome of inappropriate antidiuretic hormone. |
| Calcium, Serum<br>Ca<br><br><br><br><br><br><br><br><br><br>Calcium, Ionized<br>Serum | 8.2-10.7 mg/dl 2.1-2.7 mmol/L (SI units)<br><br>>60 yrs<br>8.8-10.2 mg/dL<br>2.2-2.5 mmol/L<br>(SI units)<br><br>>90 yrs<br>8.2-9.6 mg/dl<br>2.05-2.4 mmol/L (SI units)<br><br>4.45-5.3 mg/dl<br>1.1-1.3 mmol/L<br>(SI units) | **Function:** Cation responsible for bone formation, nerve transmission, contraction of cardiac and skeletal muscle and in the conversion of prothrombin to thrombin in blood clotting. Ionized calcium is unaffected by changes in albumin and reflects bioavailable pool.<br>**Site of synthesis**: N/A<br>**Increased:** Acidosis (respiratory), acromegaly, acute tubular necrosis, Addison's disease, bacteremia, berylliosis, Burnett's syndrome, coccidiomycosis, ectopic neoplasms, endocrine neoplasia ,excessive milk ingestion, familial hypocalciuric hypercalcemia, hepatic disease (chronic end stage), high calcium intake, histoplasmosis, hyperparathyroidism, hyperthyroidism, hypervitaminosis (excessive vitamin D or A), prolonged immobility, leukemia, lymphoma, malignancy, metastatic bone cancer, multiple myeloma, mycoses, osteoporosis, Paget's disease, pheochromocytoma, polycythemia vera, porphyria, renal calculi or osteomalacia (aluminum induced), renal transplantation, respiratory disease, rhabdomyolysis, sarcoidosis, and tuberculosis.<br>**Decreased:** Alkalosis, bacteremia, blood transfusions (without calcium replacement), burns, cachexia, celiac, chronic renal disease, CF of pancreas, diarrhea, Fanconi syndrome, hypomagnesemia, hypoparathyroidism, hypoalbuminemia (drops 0.8 for every 1 gm/dL drop in albumin), infection, malabsorption, malaria, milkman syndrome, nephritis, nephrosis, nephrotic syndrome, obstructive jaundice, osteomalacia, pancreatitis, parathyroidectomy, pregnancy (late), pseudohypoparathyroidism, renal insufficiency or failure, renal tubular acidosis, rickets, sprue, starvation, toxic shock syndrome, thyroidectomy with removal of parathyroid gland and vitamin D deficiency. |
| Chloride –<br>Blood/Serum<br>Cl | 98-106 mEq/L<br>98-106 mmol/L (SI units) | **Function:** Maintain electrical neutrality, body fluid, and acid/base balance.<br>**Site of synthesis**: N/A<br>**Increased:** Acidosis (metabolic and nephrotic), acute renal failure, alcohol abuse, alkalosis (respiratory), anemia, bromism, CHF, Cushing's, dehydration, diabetes insipidus, diarrhea, eclampsia, excessive normal saline administration, fever, trauma to head, hyperaldosteronism, hypercorticoadrenalism, hypernatremia, hyperparathyroidism, hyperventilation, hypoproteinemia, intestinal fistula, kidney dysfunction, multiple myeloma, nephritis, nephrosis, ostomies, prostatic obstruction, salicylate toxicity, seawater aspiration, serum sickness, uremia and urinary obstruction.<br>**Decreased:** Acidosis (DKA, lactic, metabolic, renal, respiratory-chronic), Addison's,, amyotrophic lateral sclerosis, anesthesia, burns, CNS disorder, chronic diarrhea, CHF, edema, emphysema, fasting, fever, freshwater aspiration, gastric suctioning, heat exhaustion, heavy-metal poisoning, hypertrophic pyloric stenosis, hypokalemia, hyponatremia, hypoventilation, infection, intestinal obstruction, nephritis (salt-wasting), overhydration, paralytic ileus, pneumonia, pyelonephritis, pyloric obstruction, renal failure, rickets, syndrome of inappropriate antidiuretic hormone, typhoid, ulcerative colitis, uremia, vomiting, Waterhouse-Friderichsen syndrome and water intoxication. |

| Test | Normal values | Some implications |
|---|---|---|
| Cholesterol - Blood<br>Total Chol | < 200 mg/dl<br>< 5.2 mmol/L<br>(SI units)<br><br>200-239 mg/dl<br>Borderline high<br><br>>239 mg/dl<br>High | **Function:** Used to form bile acids and hormones; component of brain and nerve cells and cell membranes throughout the body.<br>**Site of synthesis:** Liver and intestines<br>**Increased:** Aplastic anemia, anorexia nervosa, atherosclerosis, bile duct obstruction, biliary cirrhosis, carbon disulfide exposure (textile workers), CHD, CHF, celiac, cholestasis, Cushing's, DM (uncontrolled), excessive cholesterol, saturated or trans fat consumption, Forbes' disease, glycogen storage diseases, *H. pylori*, hypercholesterolemia, hyperlipidemia, hyperlipoproteinemia, hypertension, hypothyroidism, jaundice, leukemia, lipoidosis, MI, nephrosis, nephrotic syndrome, obesity, oophrectomy, pancreatectomy, pancreatitis (chronic), pregnancy, smoking, stress, and xanthomatosis,<br>**Decreased:** Acanthocytosis, amylopectinosis, Andersen's disease, anemia (hemolytic or pernicious), Bassen-Kornzweig syndrome, brancher deficiency, cancer, cholesterol lowering drugs, chromium enhanced diet, cirrhosis, depression, epilepsy, absent cholesterol esters, gastric bypass surgery, Gaucher's disease, Hansen's disease, hepatic disease, hepatitis, hyperthyroidism, hypolipoproteinemias (Abeta and hypobeta), infections(severe), intestinal obstruction, jaundice, leprosy, liver necrosis, malnutrition, MI (up to 90 days), pancreatic carcinoma, porphyria, premenstrual time phase, steatorrhea, suicidal behavior, Tangier disease, TB, glycogen deposition diseases, and uremia. |
| High density Lipoprotein – Blood<br>HDL | Male: 30-65 mg/dl or 0.8 -1.7 mmol/L (SI units)<br>Goal: >45mg/dl<br>Female: 35-85 mg/dl or 0.91-2.2 mmol/L (SI units)<br>Goal:>55 mg/dl<br>Adult Ideal: >60 mg/dl | **Function:** Carries cholesterol from tissues and transports it to the liver for catabolism and excretion.<br>**Site of synthesis:** Liver and intestines<br>**Increased:** Alcoholism, chronic hepatitis, familial HDL lipoproteinemia, hypothyroidism, increased exercise and primary biliary cirrhosis.<br>**Decreased:** Alcohol intake, arteriosclerosis, bacterial and viral infections, cholestasis, CHD, excessive carbohydrate intake , hypercholesterolemia, hypertriglyceridemia, hypolipoproteinemia (type IV), insufficient exercise, liver disease (hepatitis or cirrhosis), malnutrition, metabolic syndrome, nephrotic syndrome, obesity, polycystic ovary syndrome, renal disease, Tangier disease, smoking, uncontrolled DM, up to 90 days post MI. |
| Low density lipoproteins – Blood<br>LDL | 60-180 mg/dl or <3.37 mmol/L<br>(SI units)<br>Ideal:<br><100 mg/dl<br>2.59 mmol/L<br>(SI units)<br>Near optimal: 100-129mg/dl<br>Optimal:<br>130-159 mg/dl<br>High:<br>160-189 mg/dl<br>Very High:<br>190 or above | **Function:** Carries cholesterol and triglycerides to peripheral tissues.<br>**Site of synthesis:** Liver<br>**Increased:** Acute MI, alcohol intake, anorexia nervosa, apoprotein CII deficiency, chronic anemias, chronic hepatitis or cirrhosis, coronary atherosclerosis, Cushing's, DM, dysglobulinemias, eclampsia, excessive cholesterol ,saturated or trans fat consumption, familial hypolipoproteinemias, glycogen storage diseases (von Gierke's), hepatoma, hypercholesterolemia (type IIa), hyperlipidemia, hypothyroidism, Laennec's cirrhosis, multiple myeloma, nephrotic syndrome, obesity, porphyria, pregnancy and renal failure.<br>**Decreased:** Arteriosclerosis, abetalipoproteinemia, COPD, hyperlipoproteinemia (type I), hyperthyroidism, hypoalbuminemia, inflammatory joint disease, malabsorption, malnutrition, multiple myeloma, lung disease, Reye's syndrome, severe burns, stress, and Tangier disease. |
| Creatinine-Serum | Male:<br>0.6 - 1.2 mg/dl<br>53-106 µmol/L<br>(SI units)<br>Female:<br>0.5 - 1.1 mg/dl<br>44 - 97 µmol/L<br>(SI units) | **Function:** Nitrogenous by-product in the breakdown of muscle creatine phosphate for energy metabolism.<br>**Site of synthesis:** N/A<br>**Increased:** Acromegaly, allergic purpura, amyloidosis, analgesic abuse, azotemia, congenital hypoplastic kidneys, CHF, DM, dehydration, high meat intake, gigantism, glomerulonephritis, Goodpasture's syndrome, gout, hemoglobinuria, high dietary intake, hypovolemic shock, hypothyroidism, intestinal obstruction, Kimmelstiel-Wilson syndrome, micro albuminemia, metal poisoning, multiple myeloma, muscle destruction, nephritis, nephropathy, nephrosclerosis, nephro-toxic drugs, pancreatitis (necrotizing), polyarteritis nodosa, polycystic disease, preeclampsia, pyelonephritis, renal artery stenosis or thrombosis, renal failure, rhabdomyolosis, rheumatoid arthritis, scleroderma, sickle cell anemia, subacute bacterial endocarditis,<br>systemic lupus erythematosus, testosterone therapy, toxic shock, uremia, urinary obstruction and vomiting. Values are significantly<br>**Decreased:** DKA(artifactual), overhydration, muscular dystrophy, myasthenia gravis, severe muscle wasting. |
| Ferritin- Serum | Male:<br>12 - 300 ng/ml<br>12-300 mcg/L<br>(SI units)<br><br><100 ng/ml in anemia of chronic disease<br><br>Female:<br>10 - 150 ng/ml<br>10-150 mcg/L<br>(SI units)<br><br><20 ng/ml in anemia of chronic disease | **Function:** Iron storage; correlates well with total body stores except during acute illness.<br>**Site of synthesis:** Formed in the liver, spleen and bone marrow; also in tumor cells and sites of inflammation.<br>**Increased:** Acute or chronic inflammatory disease, alcoholism, anemia (chronic, hemolytic, megaloblastic ,pernicious, sideroblastic), ascorbic acid use (women only), blood transfusions (recent), cancer (advanced), cirrhosis, collagen vascular diseases, hemochromatosis, hemolytic disease, hemosiderosis, hepatitis (chronic), Hodgkin's disease, hyperthyroidism, iron overload, liver illness and disease, leukemia, multiple myeloma, polycythemia, renal disease (ESRD), respiratory infection with fever, rheumatoid arthritis, thalassemia, tissue trauma.<br>**Decreased:** Acid peptic disease (GI), anemia [iron deficiency with low serum iron (Fe) and high TIBC],colon cancer, hemodialysis, IgG-positive people, inflammatory bowel disease, intense athletic training, pregnancy, severe protein deficiency, and surgery (GI). |
| Gamma - glutamyl transferase or GGT<br>Gamma - glutamyl transpeptidase-GGTP | > 45 yrs:<br>8-38 units/L :<br>8-38 International Units/L<br>(SI units) | **Function:** Transfer of amino acids and peptides into cells across cell membranes and involved in glutathione metabolism<br>**Site of synthesis:** The liver is the source of this biliary excretory enzyme, but it is also found in the kidneys, pancreas, brain, heart, salivary and prostate glands.<br>**Increased:** Acetaminophen toxicity, acute MI (7-14 days post), alcoholism, biliary atresia, cholecystitis (due to biliary obstruction), cholestasis, cirrhosis, CHF, Epstein-Barr, excessive meat consumption, fatty liver, hepatitis, liver tumor or bile duct metastasis, hepato-toxic drugs, jaundice (obstructive), Kawasaki disease, lipoid nephrosis, metabolic syndrome, mononucleosis like syndrome, nephrotic syndrome, obesity (extreme), pancreatitis (acute), pancreatic or renal carcinoma, parenteral nutrition (long term associated with cholestasis),Reye's syndrome, and systemic lupus erythematosus.<br>**Decreased:** Improving cardiovascular risk factors and late pregnancy. |

| Test | Normal values | Some implications |
|---|---|---|
| Glycosylated Hemoglobin – Blood<br>Hgb A1C | 4-5.9%<br>(nondiabetic)<br><br>good 6-6.9%<br>fair 7-8.9%<br>poor >9% | **Function:** The predominant glucose bonded hemoglobin (others are A1A, A1B) within the red blood cells during their circulating lifespan<br>**Site of synthesis:** Circulating glucose binds to hemoglobin in the bloodstream<br>**Increased:** Acromegaly, cortocosteroid treatment, fetal-maternal transfusion, hemodialysis, hemoglobinopathies, inadequate blood glucose control 2-4 months prior, newly diagnosed diabetes, non-diabetic hyperglycemia, pregnancy, splenectomy.<br>**Decreased:** Low RBC (chronic blood loss), chronic renal failure, hemolytic or pernicious anemia, , sickle cell anemia, splenectomy, thalassemias, acromegaly, vitamin E supplementation, pregnancy |
| Glucose- Plasma | 65-99 mg/dl<br>3.6- 5.5 mmol/L<br>(SI units)<br><br>100-125 mg/dl<br>Impaired Fasting Glu<br><br>>125 mg/dl<br>Provisional DM diagnosis<br><br>GDM – at least 2 elevated levels after load<br>100 g glucose<br>Fasting 95<br>1 hr 180<br>2 hrs 155<br>3 hrs 140<br>(mg/dl) | **Function:** Preferred fuel source for the body<br><br>**Site of synthesis:** End product of carbohydrate (primarily) digestion; conversion of stored glycogen to glucose by the liver or peripheral muscles.<br><br>**Increased:** Acromegaly, burns, carbon monoxide poisoning, CVA, convulsions, corticosteroid medications, Cushing's, CF, CRF, DM, diuretic drugs, eclampsia, encephalitis, erectile dysfunction, gestational DM, gigantism, hemochromatosis, hemorrhage, hyperosmolar hyperglycemic nonketotic coma, hyperadrenalism, hyperpituitarism, hypertension, hyperthyroidism, vitamin A (excessive), infection, IV glucose, malnutrition, meningitis, MI, obesity, pancreatic carcinoma, pancreatitis, pheochromocytoma, pituitary adenoma, pregnancy, shock, subarachnoid hemorrhage, stress, trauma and Wernicke's encephalopathy.<br><br>**Decreased:** Addison's, adrenal medulla unresponsiveness, alcoholism, carcinoma (adrenal gland, stomach, fibrosarcoma), cirrhosis, cretinism, DM (early), dumping syndrome, exercise, fever, fructose intolerance, galactocemia, glycagon deficiency, glycogen storage diseases, hepatic phosphorylase deficiency, hepatitis, hyperinsulinemia, hypopituitarism, hypothermia, hypothyroidism, insulin overdose, insulinoma, kwashiorkor, malnutrition, myxedema, islet cell tumor, post op gastrectomy or gastroenterostomy, hypoglycemia, Reye's syndrome, and vomiting. |
| Hematocrit – Blood<br>Hct | Male: 40-54%<br>0.40-0.54<br>volume fraction<br>(SI units)<br><br>Female:<br>37-47%<br>0.37-0.47<br>volume fraction (SI units)<br>Elderly: slight decrease | **Function:** Percent of packed red cells in volume of whole blood<br>**Site of synthesis:** Red blood cells are produced in stem cells of the bone marrow.<br>**Increased:** Addison's disease, blood transfusions to increase athletic performance (doping), burns (severe), dehydration (severe), COPD, congenital heart disease, DM, diarrhea, eclampsia, erythrocytosis, hemorrhage (blood loss), hemoconcentration, high altitudes, pancreatitis (acute), polycythemia, shock, surgery, and tetralogy of Fallot.<br>**Decreased:** Anemia (hemolytic), bone marrow hyperplasia, burns (severe), cirrhosis, CHF, CF, dietary deficiency, fatty liver, fluid overload, hemolytic reaction, hemorrhage, hyperthyroidism, hypothyroidism, idiopathic steatorrhea, intestinal obstruction (late), leukemia, malnutrition, multiple myeloma, overhydration, pancreatitis (hemorrhagic), pneumonia, pregnancy, and rheumatoid arthritis. |
| Hemoglobin – Blood<br>Hgb | Male:<br>13.6 - 18 g/dl<br>8.4-11.2 mmol/L<br>(SI units)<br><br>Female:<br>12 - 16 g/dl<br>7.4-9.9 mmol/L (SI units) | **Function:** Oxygen and carbon dioxide transport, acid / base balance along with Cl<br><br>**Site of synthesis**: Main component of red blood cells produced in the stem cells of the bone marrow.<br><br>**Increased:** Burns (severe), CHF, COPD, congenital heart disease, dehydration, diarrhea, erythrocytosis, hemorrhage, hemoconcentration, high altitudes, intestinal obstruction (late), polycythemia vera, snorers (chronic hypoxia), and thrombotic thrombocytopenic purpura.<br><br>**Decreased:** Andersen's disease, anemia ( iron , megaloblastic, or pernicious), carcinomatosis, cirrhosis, CF, fat emboli, fatty liver, fluid retention, hemorrhage, hemolysis, hemolytic reaction, Hodgkin's disease, hyperthyroidism, hypervitaminosis A, hypothyroidism, idiopathic steatorrhea, intravenous overload, kidney disease, leukemia, lymphoma, malnutrition, neoplasia, overhydration, platelet apheresis, pregnancy, renal cortical necrosis, sarcoidosis, severe hemorrhage, Sickle cell anemia, splenomegaly, systemic lupus erythematosus, tetralogy of Fallot, and transfusion of incompatible blood. |
| Iron- Serum<br>Fe | Male:<br>50 – 160 mcg/dl<br>8.9-28.7µmol/L<br>(SI units)<br>Female: 40 – 150 mcg/dL<br>7.2-26.9µmol/L<br>(SI units) | **Function:** Aids in the transport of $O_2$ by hemoglobin and indirectly in return of $CO_2$ to the lungs<br>**Site of synthesis:** primary source is ingestion through diet<br>**Increased:** Alcohol ingestion, anemias (aplastic, hemolytic, pernicious, sideroblastic), blood transfusion, folic acid deficiency, hemochromatosis, hemosiderosis, hepatic necrosis, hepatitis, high iron intake, iron toxicity, lead poisoning, nephritis, polycythemia, and thalassemia..<br>**Decreased:** Blood loss (chronic and GI), burns, carcinoma, gastrectomy, heavy menstruation, infection, insufficient dietary iron, iron deficiency anemia, kwashiorkor, malabsorption of iron, neoplasia, nephrosis, post-operative state, pregnancy (late), rheumatoid arthritis, schizophrenia (chronic), tetralogy of Fallot, and uremia. |
| Mean Corpuscular Hemoglobin – Blood<br>MCH | 27-31 pg/cell | **Function:** Measure of the average weight of hemoglobin in a red blood cell<br>**Site of synthesis:** RBCs are produced in the stem cells of the bone marrow<br>**Increased:** Anemia (macrocytic, pernicious), cold agglutinin conditions, cigarette smokers, dysproteinemia, infants, newborns, and presence of monoclonal blood proteins.<br>**Decreased:** Anemia (iron deficiency, microcytic, normocytic), cyanotic congenital heart disease. |
| Mean Corpuscular Hemoglobin Concentration – Blood<br>MCHC | 32 - 36 g/dl or % | **Function:** Measures the average concentration of hemoglobin in red blood cells<br>**Site of synthesis:** RBCs are produced in the stem cells of the bone marrow<br>**Increased:** High titer of cold agglutinins, dehydrated hereditary stomatocytosis, hereditary spherocytosis, intravascular hemolysis, lipemia, and obesity.<br>**Decreased:**Aluminum intoxication, anemias (iron deficiency, chronic, hypochromic, megaloblastic, microcytic, sideroblastic), benzene exposure, colorectal cancer, and thalassemia. |

| Test | Normal values | Some implications |
|---|---|---|
| Mean Corpuscular Volume – Blood MCV | 80 – 95 $\mu m^3$ | **Function:** Measure of individual red blood cell size: microcytic: <87, macrocytic: >103<br>**Site of synthesis:** RBCs are produced in the stem cells of the bone marrow<br>**Increased:** Alcoholism (chronic), anemia (acquired hemolytic, aplastic, immune hemolytic, macrocytic induced by megaloblastic anemias, pernicious [early]), benzene exposure, cigarette smokers, cirrhosis, chronic lymphocytic leukemia, cytomegalovirus, DKA, DM, DNA synthesis disorders, folate deficiency, gastrectomy, hepatic disease, hyperthyroidism, ileal resection, leukocytosis, methanol poisoning, obesity, pancreatitis, PAD, preleukemia, reticulocytosis, celiac sprue, and vitamin B12 deficiency.<br>**Decreased:** Anemia (of chronic disease, dyserythropoietic, hypochromic, iron deficiency, microcytic, pyridoxine responsive, sickle cell), Brunner's gland hamartoma, chlorosis, chronic disease colorectal cancer, diverticulitis, diverticulosis, endocarditis, G6PD deficiency, gangrene, hemoglobin E, hemoglobin H, lead poisoning, leukocytosis, malaria, myocarditis, nephropathy, pruritus, radiation therapy, red blood cell fragmentation, subacute bacterial endocarditis, thalassemia, and warm auto antibodies. |
| Parathyroid Hormone- intact Serum PTH | 10-65 pg/ml<br>10-65 ng/L<br>(SI units)<br><br>Increases in aging. | **Function:** Regulation of calcium and phosphorus homeostasis; causes calcium release from the bones and increases calcium and decreases phosphorus reabsorption in renal tubules.<br>**Site of synthesis**: Parathyroid gland<br>**Increased:** CRF, ectopic PTH production, hypocalcemia, lactation, osteomalacia, parathyroid adenoma, parathyroid carcinoma, parathyroid hyperplasia, pregnancy, primary hyperparathyroidism, renal hypercalciuria, rickets, secondary hyperparathyroidism, squamous cell carcinoma (kidney, lung, pancreas), vitamin D deficiency.<br>**Decreased:** autoimmune disease, cancer, Graves' disease, hypomagnesemia, hypoparathyroidism, hypercalcemia, parathyroidectomy (transient), sarcoidosis, and vitamin A or vitamin D toxicity. |
| Potassium – Serum K | 3.5 - 5.0 mEq/L<br>3.5-5.0 mmol/L<br>(SI units) | **Function:** Electrical conduction in muscle cells, acid / base balance, and cellular water balance.<br>**Site of synthesis:** Ingested through diet and located in the intracellular fluid of the cells<br>**Increased:** Acidosis (keto-, metabolic), Addison's, adrenocortical insufficiency, anemia (hemolytic), anxiety, asthma, burns, dehydration, dialysis, excessive K in diet or IV , dysrhythmia, hemolysis, hypoventilation, elevated osmolality, infection, leukocytosis, malignant hyperthermia, massive rapid RBCl transfusion, muscle necrosis, near-drowning, obstruction (intestinal), ostomies, pneumonia, pseudohypoaldosteronism, renal failure, renal HTN, sepsis, shock, status epilepticus, SIADHS, thrombocytosis, tissue trauma, uremia and Waterhouse-Friderichsen syndrome.<br>**Decreased:** Acute tubular necrosis, alcoholism, aldosteronism, alkalosis, anorexia, barium intoxication, Bartter syndrome, bradycardia, burns, colon cancer, CP, cholera, cirrhosis, CHF, Crohn's, crushed tissue trauma, Cushing's, dehydration, diabetes insipidus, DM, diarrhea, diuretics, dumping syndrome, dysrhythmias, Fanconi syndrome, fever, fistulas, folic acid deficiency, gastric suction, hyper aldosteronism, hyperalimentation, hypercorticoadrenalism, HTN, hypomagnesemia, hypothermia, hypovolemia, hysterectomy, insufficient K in diet or IV, insulin or glucose administration, kwashiorkor, ketoacidosis, laxative abuse, licorice ingestion, lymphoma, malabsorption, malignant hyperthermia, metabolic alkalosis, nephritis, organic brain syndrome, ostomies, pancreatitis, paralytic ileus, pseudoaldosteronism, pyelonephritis, pyloric obstruction, renal tubular acidosis, salicylate toxicity, salt-losing nephropathy, post sigmoidoscopy, sweating, surgery (post-op), starvation, stress, toxic shock, syndrome, ureterosigmoidostomy, villous adenoma, VIPoma (a type of watery diarrhea), vomiting, , and Zollinger-Ellison syndrome (with diarrhea). |
| Prealbumin – Serum PAB | 15-36 mg/dl<br>150-360 mg/L<br>(SI units) | **Function:** Transport protein that carries thyroxine, and retinol in the body.<br>**Site of synthesis:** Liver<br>**Half-Life:** 2-4 days<br>**Increased:** Adrenal hyperfunction, CKD, dehydration, Hodgkin's disease, nephrotic syndrome, pregnancy, shigellosis.<br>**Decreased:** Abdominal peritoneal dialysis, burns, cirrhosis, chronic illness (with concomitant subnormal nutritional status), CF, DM, disseminated malignant disease, epithelial ovarian carcinoma, hereditary amyloidosis, infection, inflammation, liver damage, overhydration, protein and calorie malnutrition, salicylate poisoning. |
| Prothrombin Time – PT | 11 – 12.5 seconds | **Function:** Vitamin K dependent clotting time of blood<br>**Site of synthesis:** N/A<br>**Increased:** Alcoholism, blood transfusion (massive), cancer, celiac disease (same thing as sprue – omitted below), chronic diarrhea, circulating anticoagulants, colitis, collagen disease, CHF, factor deficiency (hereditary), fibrinogenemias (a-, dis-, hypo), , fever, fistula, hepatic damage (abscess, cirrhosis, biliary obstruction, failure, jaundice, infectious, hepatitis) hypernephroma, hyperthyroidism, hypervitaminosis A, hypoprothrombinemia, leukemia, malabsorption, malnutrition, myelofibrosis, obstetric complications, pancreatic carcinoma, pancreatitis (chronic), polycythemia vera, prolonged hot weather, PT deficiency, Reye's syndrome, salicylate intoxication, snakebite, steatorrhea, toxic shock, vitamin K deficiency and vomiting.<br>**Decreased:** Arterial occlusion, DVT, edema, coumarin resistance, high fat diet, hyperlipidemia, hyperthyroidism, hypothyroidism, multiple myeloma, MI, peripheral vascular disease, pulmonary embolism, spinal cord injury, thromboembolism, transplant rejection. |
| Sodium – Plasma Na | 136 - 145 mEq/L<br><br>136-145 mmol/L<br>(SI units) | **Function:** Conduct nerve impulses, maintain osmotic pressure, and acid / base balance.<br>**Site of synthesis:** Source is dietary intake.<br>**Increased:** CHF, Cushing's, dehydration, diabetes insipidus, diaphoresis, diarrhea, hyperaldosteronism, HTN, hypovolemia, insensible water loss, ostomies salicylate toxicity, toxemia, vomiting, Zollinger-Ellison syndrome with diarrhea.<br>**Decreased:** Addison's disease, adrenal insufficiency, aminoglycoside toxicity, ascites, bowel obstruction, burns, CP, CRF, cirrhosis, congenital adrenal hyperplasia, DM, emphysema, glomerulonephritis, hyperglycemia, hyperosmolality, hyperthermia, hypophosphatemia, hypotension, hypothyroidism, hysterectomy, malabsorption, malnutrition, meningitis, metabolic acidosis, myxedema, nephrotic syndrome, ostomies, overhydration, pain (abdominal), paracentesis, paralytic ileus, psychogenic polydipsia, pyelonephritis (chronic), renal HTN, sigmoidoscopy, sprue, SIADHS, toxemia, toxic shock syndrome, and vomiting. |
| Specific gravity of urine | 1.005-1.030 | **Function:** Ratio of the density of urine compared to the density of an equal volume of water (1.000).<br>**Increased:** Adrenal insufficiency, bacteruria, CHF, dehydration, DM, diarrhea, fever, glomerulonephritis, obstruction uropathy, proteinuria, SIADHS, toxemia of pregnancy, and vomiting.<br>**Decreased:** Chronic renal insufficiency, diabetes insipidus, hypothermia, intracranial pressure increase, malignant hypertension and overhydration. |

| Test | Normal values | Some implications |
|---|---|---|
| Total lymphocyte count (TLC) | 2500 - 3300 cells/$mm^3$<br><br>2500-3300 x $10^6$ | **Function:** Fight infection and fight against foreign bodies (both bacterial and viral).<br>**Site of synthesis**: Bone marrow stem cells<br>**Increased:** Chronic bacterial infection, infectious hepatitis, infectious mononucleosis, lymphocytosis, lymphocytic leukemia, multiple myeloma, mumps, rubella, and radiation.<br>**Decreased:** Adenocorticosteroid therapy, antineoplastic therapy, HIV (late stage), immunodeficiency diseases, leukemia, lymphocytopenia, radiation therapy, sepsis, systemic lupus erythematosus. cancer, chemotherapy, radiotherapy, surgery, lymphopenia, malnutrition, AIDS, bone marrow failure, Cushing's syndrome, renal failure |
| Transferrin | Males<br>215 - 365 mg/dl<br>2.15-3.65 g/L<br>(SI units)<br>Females<br>250-380 mg/L<br>2.5-3.8 g/L<br>(SI units) | **Function:** Largest quantity of iron binding proteins for transporting iron<br>**Site of synthesis:** Liver<br>**Half-Life:** 9 days<br>**Increased:** Hepatitis, microcytic anemia (Fe deficient), oral contraceptives, polycythemia, pregnancy (late).<br>**Decreased:** Anemia (hemolytic, pernicious, and sickle cell), cirrhosis, corticosteroid therapy, dysmenorrheal, hemochromatosis, hemorrhage, hepatitis, hypoproteinemia, hypothyroidism, inflammatory diseases, kwashiorkor, microcytic anemia, MI, neoplasm, nephrosis, thalassemia, and uremia. |
| Triiodothyronine -Blood $T_3$ | 20-50 yr<br>70-205 ng/dl<br>1.2-3.4 nmol/L<br>(SI units)<br>>50 yr<br>40-180 ng/dl<br>0.6-2.8 nmol/L<br>(SI units) | **Function:** Thyroid hormone found in small quantities bound to serum proteins in the blood<br>**Site of synthesis**: Thyroid (as stimulated by TSH from pituitary) and liver (conversion of $T_4$)<br>**Increased:** Graves' disease, hepatitis, hyperthyroidism (factitious), hyperproteinemia, increased TBG (factitious), Plummer's disease, struma ovarii, pregnancy, thyroiditis (acute), and toxic thyroid adenoma.<br>**Decreased**: Cirrhosis, cretinism, Cushing's, endocrine secreting tumors, hepatitis (acute), hypothalamic failure, hypothyroidism, increased TBG, iodine insufficiency, liver disease, malnutrition (protein), myxedema, nephrotic syndrome, pituitary insufficiency, pregnancy, renal disease, and surgical thyroid ablation. |
| Thyroxine – Blood $T_4$ | Males<br>4-12 mcg/dl<br>51-154 nmol/L<br>(SI units)<br><br>Females<br>5-12 mcg/dl<br>64-154 nmol/L<br>(SI units)<br><br>Adult >60:<br>5-11 mcg/dL<br>64-142 nmol/L<br>(SI units) | **Function:** Primary component of thyroid hormone bound to serum proteins in the blood<br>**Site of synthesis:** Thyroid (as stimulated by TSH released from pituitary gland)<br>**Increased:** Graves' disease, hepatitis, hyperproteinemia (congenital), hyperthyroidism (factitious), byperthyroxinemia (familial dysalbuminemic), increase TBG (factitious), Plummer's disease, post-radiographic iodinated contrast studies, oral contraceptives, pregnancy,struma ovarii, thyroiditis (acute), and toxic thyroid adenoma<br>**Decreased:** Cirrhosis, cretinism, Cushing's, hypothalamic failure, iodine deficiency, myxedema, pituitary insufficiency, protein depletion or wasting diseases, renal failure, and surgical ablation. |
| Triglycerides – Blood TG<br><br>Triglycerides – Blood TG | Male: 40-160 mg/dl,0.45-1.81 mmol/L<br>(SI units)<br><br>Female: 35-135 mg/dl; 0.4-1.52 mmol/L<br>(SI units)<br><br>Borderline High: 150-199 mg/dL: 1.7-2.25 mmol/L<br>High: 200-499 mg/dL; 2.26-5.64 mmol/L<br>Very High: > 500 mg/dL: > 5.65 mmol/L | **Function:** Fat within the bloodstream (primarily VLDL with <10% LDL) stored as an energy source in fatty tissues. High triglycerides (> 400 mg/dl) may make LDL unreadable/ unreliable.<br><br>**Site of synthesis**: Liver<br><br>**Increased:** Alcoholism, aortic aneurysm, aortitis, arteriosclerosis, DM (poorly controlled), familial hypertriglyceridemia, fat embolism, glycogen storage diseases, gout, hepatic cholesterol ester storage disease, high CHO and prolonged high fat intake, hypercholesterolemia, hyperlipoproteinemia, hypothyroidism, metabolic syndrome (>150 mg/dl), MI (up to 1 year post), myxedema, nephrotic syndrome, obesity, pancreatitis, pregnancy, renal insufficiency, starvation (early), stress, Tangier disease, tobacco use, and von Gierke's disease.<br><br>**Decreased:** Abetalipoproteinemia, acanthocytosis, cirrhosis, COPD, hyperalimentation, hyperthyroidism, malabsorption, and malnutrition. |
| Uric Acid-Serum | Male:<br>4.0-8.5 mg/dL<br>0.24-0.51 mmol/L<br>(SI units)<br>Female:<br>2.7 – 7.3 mg/dL<br>0.16-0.43 mmol/L<br>(SI units)<br>Elderly: may be elevated | **Function:** RNA and DNA formation and degradation<br>**Site of synthesis:** End product of purine catabolism<br>**Increased:** Acidosis (ketotic or lactic), alcoholism, anemia (hemolytic, pernicious, sickle cell), arteriosclerosis, arthritis, berylliosis, Blackfoot Indians, body size (larger than average), calcinosis universalis and circumscripta, CHF, chemotherapy, CRD, dehydration, DM, down syndrome, eclampsia, exercise, fasting, Filipinos, generic inborn error in purine metabolism, glomerulonephritis (chronic), gout, Graves' disease, hemolysis (prolonged), hepatic disease, high protein intake, high purine diet, HTN, hyperlipoproteinemia, hyperuricemia, hypoparathyroidism, hypothyroidism, infections (acute), intestinal obstruction, ketoacidosis,ketosis, lead poisoning, Lesch-Nyhan syndrome, leukemia, lipoproteinemia (Type III), lymphoma, metastatic cancer, mononucleosis (infectious), multiple myeloma, neoplasm, nephritis, nephropathy, New Zealand Maoris, Pima Indians (Akimel O'odham), pneumonia (resolving), polycystic kidneys, polycythemia vera, pregnancy (labor onset), psoriasis, renal failure, rhabdomyolosis (burns, crush injury, MI, heavy exercise), sarcoidosis, starvation, stress, toxemia of pregnancy, uremia, urinary obstruction and von Gierke's disease.<br>**Decreased:** Acromegaly, anemia (pernicious), bronchogenic carcinoma, celiac disease, Dalmation dog mutation, Fanconi syndrome, Hodgkin's disease, lead poisoning, myeloma, Wilson's disease, xanthinuria, xray contrast agents, and yellow atrophy of liver. |

| Test | Normal values | Some implications |
|---|---|---|
| Vitamin D (Cholecalciferol)<br><br>Serum vitamin $D_3$ (1,25-dihydroxy-)<br><br>Plasma vitamin $D_3$ (25-hydroxy-)<br>Summer<br><br><br>Winter | <br><br>15-75 pg/ml<br>39-195 nmol/L<br>(SI units)<br><br><br>15-80 ng/ml<br>37-200 nmol/L<br>(SI units)<br>14-42 ng/ml<br>35-105 nmol/L | **Function:** Fat soluble vitamin synthesized from stored cholesterol in the body when body is exposed to sunlight or through dietary intake from fortified foods. Allows for adequate dietary calcium absorption for regulating skeletal calcium.<br><br>**Site of synthesis**: Liver and kidneys<br><br>**Increased:** Hyperparathyroidism, hypervitaminosis D and sarcoidosis.<br><br>**Decreased**: Gastric bypass, hepatic failure, hypoparathyroidism, malabsorption, osteomalacia, pseudohypoparathyroidism, renal failure, renal osteodystrophy, and rickets. |
| White Blood Cells – Blood WBC | 5,000-10,000 $mm^3$<br><br>5-10 x $10^9$<br>(SI units) | **Function:** Fight infection, defend body against invasion by foreign organisms, produce, transport and distribute antibodies<br>**Site of synthesis:** Bone marrow<br>**Increased:** Abcess, actinomycosis, acute infection, amebiasis, Andersen's disease, anemia (acquired hemolytic), anorexia, anoxia, anthrax, appendicitis, blastomycosis, bronchitis, burns, chickenpox, cholecystitis, choledocholithiasis, cholera, cirrhosis, colon cancer, Crohn's, Cushing's, cytomegalovirus, dehydration, diphtheria, inflammation, leukemic neoplasma, physical activity, pregnancy (late/labor), RBC hemolysis, splenectomy, sepsis, stress, surgery, tissue necrosis, trauma or tissue injury after surgery.<br>**Decreased:** AIDS, alcoholism, anemia (aplastic, pernicious), anorexia nervosa, arsenic poisoning, autoimmune disease, bone marrow depression/failure (congenital aplasia, myelofibrosis), cachexia, drug toxicity (Chloramphenicol), hematopoietic disease, hypersplenism, leukemia, lymphoma, radiation therapy, sepsis, shock, stomatitis, viral or severe bacterial infection, systemic lupus erythematosus and TB. |
| * Each laboratory may use different standards to establish normal values; therefore, figures may vary among different sources. | | |

**Guide to Anemias**

| Laboratory Test | Normal Values | Iron Deficiency Anemia | Megaloblastic Anemia (Folate Deficiency) | Pernicious Anemia (B-12 Deficiency) | Anemia of Chronic Disease |
|---|---|---|---|---|---|
| Hgb (g/dL)<br>Females<br>Males | <br>12-16<br>14-18 | <br>< 12<br>< 14 | <br>< 12<br>< 14 | <br>< 12<br>< 4 | <br>< 12<br>< 14 |
| Hct (%)<br>Females<br>Males | <br>37-47<br>42-52 | <br>< 37<br>< 42 | <br>< 37<br>< 42 | <br>< 37<br>< 42 | <br>< 37<br>< 42 |
| MCV ($\mu m^3$) | 80-95 | < 80 | > 95 | > 95 or normal | Normal |
| Serum Fe (mcg/dL) | 60-160 | < 60 | > 160 | > 160 | < 60 |
| TIBC (mcg/dL) | 250-460 | > 460 | Normal | Normal | < 250 |
| Serum B-12 (pg/mL) | 160-950 | Normal | Decreased | Decreased | Normal |
| Folate (ng/mL) | 5-25 | Normal | < 5 | > 25 | Normal or decreased |

Abbreviations: Hgb, hemoglobin; Hct, hematocrit; MCV, mean corpuscular volume; TIBC, total iron binding capacity.

*Source:* Adapted with permission from Litchford MD. *Practical Applications in Laboratory Assessment of Nutritional Status.* Greensboro, NC: CASE Software; 2010.

## References


1. Chernecky & Berger (2008) *Laboratory Tests & Diagnostic Procedures*. 5th ed. Philadelphia, PA: Saunders.
2. Litchford (2006) *Practical Applications in Laboratory Assessment of Nutritional Status*. Greensboro, NC: CASE Software.
3. Pagana & Pagana (2009) *Diagnostic and Laboratory Test Reference.* 9th edition. St. Louis, MO: Mosby.
4. US Dept Health & Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute. (2005) *Your Guide to Lowering your Cholesterol with TLC (Therapeutic Lifestyle Changes)*. Bethesda, MD: NHLBI Health Information Center.
5. American Diabetes Association (2009) Clinical Practice Recommendations. *Diabetes Care* 32: 1. Accessed online April 8, 2009. http://care.diabetesjournals.org/content/vol32/Supplement_1/

## SPECIFIC MEDICAL CONDITIONS

The Registered Dietitian (RD) sees clients of all ages and conditions. This manual cannot cover all of these. The RD is encouraged to include the ADA **Pocket Resource for Nutrition Assessment**, Second Edition as a reference as well as the ADA **Nutrition Care Manual** as a resource and the Evidence Analysis Library (http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/home_21231_ENU_HTML.htm). Emphasis in this chapter will be placed on the most common medical conditions seen in institutional care and on specific populations

### DIABETES

Diabetes Mellitus is defined as a state of chronic hyperglycemia resulting from a lack of insulin or a resistance to the action of insulin. Current criteria for the diagnosis of diabetes is outlined below.

**Criteria for the Diagnosis of Diabetes**

| Blood Test | Normoglycemia | Pre-Diabetes (IFG or IGT*) | Diabetes** |
|---|---|---|---|
| Fasting Plasma Glucose (FPG) | <100 mg/dl | ≥ 100 and < 126 mg/dl (IFG) | ≥ 126 mg/dl |
| 2-hour Postload Glucose (PG) | <140 mg/dl | ≥ 140 and < 200 mg/dl (IGT) | ≥ 200 mg/dl |
| Casual Blood Glucose | | | ≥ 200 mg/dl with symptoms of diabetes |

* IFG – Impaired Fasting Glucose, IGT – Impaired Glucose Tolerance
**In the absence of unequivocal hyperglycemia, a diagnosis of diabetes must be confirmed, on a subsequent day, by measurement of FPG, 2-hr PG, or random plasma glucose (if symptoms are present). The FPG is greatly preferred because of ease of administration, convenience, acceptability to patients, and lower cost. Fasting is defined as no caloric intake for at least 8 hours. The PG test requires the use of a glucose load containing the equivalent of 75 grams anhydrous glucose dissolved in water.

Reference: American Diabetic Association. Clinical Practice Recommendations. Diabetes Care, 28 (suppl 1), S37, January, 2005.

**Diagnosis of Impaired Glucose Tolerance and Diabetes Mellitus**

| | Pre-Diabetes | Diabetes Mellitus |
|---|---|---|
| Fasting Plasma Glucose* | > 110-125 mg/dL | > 126 mg/dL |
| Casual Blood Glucose** | | > 200 mg/dL plus symptoms of diabetes such as polyuria, polydispsia, unexplained weight loss |
| Oral glucose tolerance test*** | 140-199 mg/dL | > 200 mg/dL |

*no caloric intake for > 8 hours
** that taken at any time of the day without regard to time since last meal.
***t Plasma glucose 2 h after 75-g test dose; test less commonly used in clinical practice.

**Reference:** American Diabetic Association. Clinical Practice Recommendations. Diabetes Care, 28 (suppl 1), S37, January, 2005.

**American Diabetes Association Glucose Goals for People with Diabetes**

| | Normal | Goal | Additional Action Suggested |
|---|---|---|---|
| Whole Blood Values | | | |
| Average preprandial glucose (mg/dL) † | < 100 | 80 to 120 | < 80/ > 140 |
| Average bedtime glucose (mg/dL) † | < 110 | 100 to 140 | < 100/ > 160 |
| Plasma Values | | | |
| Average preprandial glucose (mg/dL) ‡ | < 110 | 90 to 130 | < 90/ > 150 |
| Average bedtime glucose (mg/dL) ‡ | < 120 | 110 to 150 | < 110/ > 180 |
| Postprandial whole blood glucose (mg/dL) ✖ | < 140 | 140 to 160 | > 180 |
| Postprandial plasma glucose (mg/dL) ✖ | < 150 | 150 to 170 | > 190 |
| HbA1c (%)** | < 6 | < 7 | > 8 |

The values shown are generalized to the entire population of individuals with diabetes. Patients with co-morbid diseases, the very young, older adults and others with unusual conditions or circumstances may require different goals.
† Measurement of capillary blood glucose from finger sticks, however, many glucose meters convert the test into plasma glucose values. Plasma is more concentrated in glucose than whole blood and the reading is ~15% higher.
‡ Values calibrated to plasma glucose drawn from a vein. Most of the newer meters and test strips are calibrated to yield a plasma glucose value. The box of strips should note if the strip values are for blood glucose or plasma glucose.
✖Postprandial glucose measurements should be taken 1-2 hr after the beginning of the meal (generally peak level times)
** HbA1c is the average blood glucose over a 3 month period. A1c of 4.0 to 6.0 % is normal for the non-diabetic.

**Reference**: American Diabetic Association. Clinical Practice Recommendations. Diabetes Care, 28 (suppl 1), S37, January, 2005.

**Comparing HbA1c to Whole Blood or Plasma Glucose***

| A1c Test | Whole Blood Glucose | Plasma Glucose |
|---|---|---|
| 4% | 60 | 65 |
| 5% | 90 | 100 |
| 6% | 120 | 135 |
| 7% | 150 | 170 |
| 8% | 180 | 205 |
| 9% | 210 | 240 |
| 10% | 240 | 275 |
| 11% | 270 | 310 |
| 12% | 300 | 345 |
| 13% | 330 | 380 |

***NOTE:** Whole-blood readings are 15% lower than plasma glucose. Most glucometers are calibrated to read as plasma glucose.

**Reference:** American Diabetic Association. Clinical Practice Recommendations. Diabetes Care, 28 (suppl 1), S11, January, 2005.

**Liberalizing Diets in Long Term Care**
The American Dietetic Association Position Paper on Liberalization of the Diet Prescription Improves Quality of Life for Older Adults in Long-Term Care strongly emphasizes the importance of a well balanced, adequate diet. The emphasis should be placed on a well balanced diet instead of a restricted calorie diet for those individuals in institutionalized settings. Pressure ulcers, weight loss and abnormal laboratory values are common in many of these individuals. The dietitian is the primary source for progressive nutrition information and intervention to improve quality of life.

**Resources for Diabetes:**

1. American Diabetes Association. Diabetes Forecast Resource Guide 2005. American Diabetes Association, Alexandria, VA.
2. Franz MJ, et al, A Core Curriculum for Diabetes Education, 5th Edition, American Association of Diabetes Educators, Chicago, IL, 2004

3. American Diabetic Association. Clinical Practice Recommendations. Diabetes Care, 28 (suppl 1). January, 2005.
4. Charney P. **ADA Pocket Guide to Nutrition Assessment.** Second Edition. ADA, Chicago Illinois 2009.
5. Position of the American Dietetic Association: Liberalization of the Diet Prescription Improves Quality of Life for Older Adults in Long-Term Care, Journal of the American Dietetic Association, 2005, pages 1955 to 1965

**For additional information:**
www.diabetes.org
http://diabetes.diabetesjournals.org/
http://www.niddk.nih.gov/
http://www.cdc.gov/diabetes/
http://www.jdrf.org/index.cfm
http://www.aadenet.org/
http://www.idf.org/home/

## DYSPHAGIA

Swallowing difficulty, known as dysphagia, can occur at any age as a result of various medical conditions including:

- Cerebrovascular accident (CVA)
- Cancer with associated radiation and/or chemotherapy treatment
- Dementia
- Head injury or severe trauma
- Medications
- Neuromuscular disorders (Multiple sclerosis, Huntington's chorea, Parkinson's disease, etc.)
- Scleroderma
- Xerostomia

Dysphagia can result in serious health consequences as it interferes with adequate nutrition and hydration. In some cases, dysphagia can cause aspiration leading to choking episodes, shortness of breath and physical discomfort. Aspiration may lead to pneumonia which can be fatal.

Normal swallowing has 4 phases

1. Anticipatory – salivation occurs; decisions are made regarding the type, rate, and size of bite, voluntarily controlled
2. Oral stage - consists of *preparatory* phase in which food is chewed and formed into a bolus and *lingual* phase in which the tongue moves the bolus to the back of the mouth, both phases are voluntarily controlled
3. Pharyngeal state – airway is protected as bolus moved past the pharynx and into the esophagus, involuntary control
4. Esophageal stage – the bolus passes through the esophagus and into the stomach, involuntary control

Dysphagia problems may be localized into one or more areas: the oral cavity, the pharyngeal region and the esophagus. Dysphagia may encompass more than one area, such as oropharyngeal.

### Oral Dysphagia

Includes weak tongue and lip muscles, difficulty propelling food to the throat, difficulty initiating a swallow.

| | |
|---|---|
| **Signs of Oral Dysphagia** | • Drooling<br>• Spillage of food or liquid from the mouth<br>• Slow eating<br>• Inability to complete meal due to weakness or fatigue<br>• Pocketing food in the mouth<br>• Repetitive rocking of tongue from front to back |

**Pharyngeal Dysphagia**
Includes delayed swallow reflex, swallow does not clear bolus from the throat; bolus may penetrate the larynx causing aspiration.

| | |
|---|---|
| **Signs of Pharyngeal Dysphagia** | • Repeated swallowing<br>• Frequent throat clearing<br>• Wet sounding voice<br>• Complaints of food or liquid stuck in the throat<br>• Coughing before, during or after swallowing food, liquids or medications<br>• Repeated pneumonia<br>• Increased temperature<br>• Chest/lung congestion |

**Esophageal Dysphagia**
Includes structural blockages, stenosis, strictures due to GERD, esophageal dysmotility.

| | |
|---|---|
| **Signs of Esophageal Dysphagia** | • Pressure or discomfort in the chest<br>• Lump or fullness in the throat<br>• Chronic heartburn |

When any of these signs and symptoms are observed, an initial assessment for oral-motor skills during mealtime is necessary. Follow-up mealtime assessment is also needed to monitor appropriateness of diet modification, client's intake, and assistance offered to client once dysphagia is diagnosed and treated.

The Speech Language Pathologist (SLP) will provide an individualized client assessment based on bedside evaluation, barium swallow and/or video fluoroscopy of swallowing. Based on the assessment, the SLP and RD will collaborate on diet recommendations. The healthcare team will then develop an interdisciplinary plan of care.

To minimize swallowing problems, and maximize nutrition, hydration and quality of life for the client consider the following:

**General Guidelines** for positioning a client with a swallowing problem:
- Feet flat on the floor
- Hips and knees at 90º angles with *hips to the back of chair*
- Head tipped slightly forward; lowering chin to chest
- Table close to body with approximately 12 inches from plate to mouth
- Elbows supported on chair or table surface
- Calm environment (no loud music or TV, increased traffic in dining area)

**Nutrition Care Plan** will be developed based on:
- Recommendations from the SLP regarding food consistency and feeding techniques
- Client's nutrient requirements
- Client's food preferences
- Other medical, psychological or social factors affecting the client's eating

**Treatment Goals** will be individualized with timely reassessments of the plan of care including:
- **Compensatory activities**: compensation for a deficit such as changes in posture, head position, sensory input, food placement, etc**.,** used during feeding. Also includes helping devices such as specially designed cups and spoons.
- **Facilitory/therapeutic techniques**: designed to improve function and used during therapy, such as exercises or cold food items to stimulate swallowing.
- **Dietary modifications:** changes in food and/or liquid texture to help compensate for loss of function, to maintain appropriate nutritional and hydration status, and prevent to prevent aspiration. These may include temperature changes and order of food/liquid presentation changes such as moisten and provide cohesive

bolus by adding gravy or sauce. Persons with severe dysphagia may require enteral tube feeding for nutrition/hydration support.

**Food Texture Modifications for Dysphagia**
Clients who have been evaluated for dysphagia usually have specific recommendations related to food and liquid textures, bite size and positioning along with staff procedures to reduce risk of aspiration. There is no uniform standard of care for diagnosis and treatment of dysphagia. Many health care facilities have developed their own dysphagia texture modification guidelines which should be followed by practitioners in those facilities.

**National Dysphagia Diet**
The National Dysphagia Diet Task Force developed the National Dysphagia Diet (NDD) as a work toward standardization based on scientific and rheological properties of foods and fluids. The NDD has not been peer-reviewed or approved by representatives of the American Speech-Language Hearing Association.

The NDD guidelines are offered here as an example of a diet that can be prescribed and prepared to address the needs of dysphagia clients.

**NDD Level 1: Dysphagia Pureed**
1. Pureed, homogenous and cohesive foods, pudding-like consistency.
2. No coarse textures, raw fruits or vegetables, nuts etc
3. Requires very little chewing ability, used with moderate to severe dysphagia, poor oral phase and reduced ability to protect airway

**NDD Level 2: Dysphagia Mechanically Altered**
1. Cohesive, moist, semisolid, fork-mashable fruits and vegetables, meats are ground or minced no larger than ¼ inch pieces, includes some mixed textures, excludes most bread product, crackers, and other dry foods
2. Requires some ability to chew, used with mild to moderate oral and/or pharyngeal dysphagia, assess for tolerance to mixed textures.

**NDD Level 3: Dysphagia Advanced**
1. Soft – solid textured foods, including thin-sliced, tender or ground meat, soft fruits and vegetables, foods need to be moist and in bite-sized pieces, includes mixed textures, excludes hard, crunchy fruits and vegetables, sticky foods, and very dry foods.
2. Requires adequate chewing ability, used as transition to regular diet, adequate dentition is needed, used with mild oral and/or pharyngeal phase dysphagia, assess for tolerance of mixed textures.

**NDD Level 4: Regular: All foods allowed**

**Standards for Thickened Liquids**
Many dysphagia clients also benefit from the use of thickened liquids. Recommendations for thickened liquids are included in swallowing evaluations from SLP. There are no nationally recognized standards for thickened liquids. Dietetics professionals need to be aware that there is wide variation in viscosity of commercially prepared thickened beverages and many product labels do not include viscosity. The use of dry starch thickeners added to thin liquids also results in wide variations in viscosity. The NDD Task Force has suggested the following viscosity borders and ranges:

**Viscosity Borders and Ranges for Thickened Liquids**

| | |
|---|---|
| Thin | 1-50 cP |
| Nectar-like | 51-350 cP |
| Honey-like | 351-1750 cP |
| Spoon Thick | >1750 cP |

Note: All measurements are at Shear Rate of 50 s-1 and 25 C.
cP = centipoise, a measurement of the thickness of a liquid

**Thin Liquids**: Includes all unthickened beverages and supplements, clear juices, frozen yogurt, clear liquids, milk, water, tea, coffee, soda, broth, plain gelatin and fruit with thin liquid properties such as watermelon, grapefruit and orange sections, anything that will liquefy in the mouth within a few seconds.

**Nectar-like Liquids**: Includes nectars, vegetable juices, chocolate milk, buttermilk, thin milkshakes, cream soups, gelatin, or other beverages properly thickened.
**Honey-like Liquids**: thickened to honey consistency

**Spoon-thick Liquids**: thickened to pudding consistency, these products will have to be eaten with a spoon, pudding, custard, hot cereal

**Foods that May Cause Choking**

(Be aware that dentures can make it difficult to tell if food is chewed properly.)

| | | |
|---|---|---|
| Hot dogs & sausages | Round or hard candy | Popcorn |
| Large pieces of fruit | Nuts and seeds | Grapes |
| Raw vegetables | Cherries with pits | Fruit seeds |
| Corn | Raisins | Caramels |
| Chips | Marshmallows | Chewing gum |
| Chunks of meat | Peanut butter | Hamburger |

**Tips to Prevent Choking**

- Change the form – i.e., cut hot dogs into lengthwise pieces; avoid round items that can become lodged easily
- Cook or mash carrots, corn
- Spread peanut butter thinly or mix with jelly
- Cut item into small pieces
- Eat slowly and chew food well
- Supervise client while eating
- Discourage talking while food is in the mouth
- Position properly: seated upright; prevent tilting head backward while eating or drinking

**References:**


1. National Dysphagia Diet: Standardization for Optimal Care. National Dysphagia Diet Task Force. American Dietetic Association.2002.
2. Dining Skills: Practical Interventions for the Caregivers of Older Adults with Eating Problems. Carlene Russell, editor. Consultant Dietitians in Health Care Facilities, 2001.
3. *Nutrition Care of the Older Adult*, 2nd Edition. 2004. American Dietetic Association. Niedert, K. and Dorner, B. editors.


## COLOSTOMY OR ILEOSTOMY DIETS

Individualize to client's tolerance. Follow normal diet and only avoid those foods that bother the individual. Encourage two quarts of water daily. Vitamin $B_{12}$ supplement is needed for clients who have had resection of the terminal ileum. They may also need vitamin C supplementation due to a low intake of fruits and vegetables.

**Potential Gas Producing Foods**

- Apples
- Asparagus
- Beans
- Beer
- Bran
- Broccoli
- Brussels sprouts
- Cabbage
- Carbonated beverages
- Cauliflower
- Chinese vegetables
- Cucumbers
- Fatty foods
- Melons
- Milk
- Nuts
- Onions
- Peas
- Pickles
- Radishes
- Wheat
- Yeast

**Potential Odor Causing Foods**

- Asparagus
- Beans
- Beets
- Cabbage
- Cheese
- Corn
- Dried beans
- Eggs
- Fish
- Garlic
- Green peppers
- Medications
- Mustard
- Onions
- Radishes
- Spicy foods
- Turnips
- Vitamins

**Foods That May Reduce Odors (Ileostomy, Colostomy, Uriostomy)**

- Buttermilk
- Cranberry juice
- Parsley
- Yogurt

**Foods That May Be Incompletely Digested or Cause Blockage**

- Cabbage
- Celery
- Chinese vegetables
- Coconut
- Corn
- Cucumbers
- Dried fruit
- Fried foods
- Fruit and vegetable skin
- Grapefruit
- Green pepper
- Lettuce
- Nuts
- Olives
- Peas
- Pickles
- Pineapple
- Popcorn
- Raisins
- Seeds
- Spinach

**Foods to Avoid During Diarrhea**

- Apples
- Caffeinated beverages
- Carbonated beverages
- Fatty or fried foods
- Grapes
- Greasy foods
- High fiber foods
- Prune juice
- Raw fruits & vegetables
- Spicy foods
- Very hot or very cold beverages

Foods That May Help Control Diarrhea

- Applesauce
- Bananas
- Breads
- Cheese
- Creamy peanut butter
- Potatoes
- Rice

## PARKINSON'S DISEASE

Parkinson's Disease (PD) is a slow, progressive chronic disease of the nervous system that affects the neurons in the *substantia nigra* area of the brain. The condition results in a loss of dopamine-producing cells in the brain which affects muscle movements of the body. PD can occur at any age; with ~15% of cases in those under 60 years of age and 80-85% in those who are 60 years or older. Not everyone will experience exactly the same Parkinson's disease symptoms at the same time. The disease can affect everyone very differently and in some cases it may be many years before there is any disability or significant limitation of daily activities.

Physical manifestations of PD include:

- Slowed movements, rigidity, tremor, gait and balance problems, that disable and escalate as PD advances, raising risk for bone thinning, falls, and fractures.
- Slowed peristalsis of the gastrointestinal tract with delayed colon transit time leading to constipation, hemorrhoids, and fecal impaction.
- Diminished tongue movement, incomplete lip closure, weakening of the lower esophageal sphincter, gastroparesis, resulting in difficulty chewing/swallowing, choking, aspiration pneumonia, acid reflux, Barret's esophagus, delayed medication absorption, constipation, hemorrhoids.

**Hoehn and Yahr Stages of PD:** The Hoehn and Yahr scale, developed in 1967, is one method used to measure the degree of disability experienced by Parkinson's patients. This rating system has been largely supplanted by the Unified Parkinson's Disease Rating Scale, which is much more complicated.

| Hoehn & Yahr Stage | Symptoms | Related Nutrition Concerns |
|---|---|---|
| **1** | mild, one side only, not disabling, changes in posture, locomotion, facial expression | medication-induced nausea, constipation, loss of senses of taste and smell |
| **2** | symptoms bilateral; posture and gait affected; minimal disability | above, plus unplanned weight loss, gastroparesis / GERD; most will overcome nausea unless new medications are introduced |
| **3** | significant slowing of body movements, early impairment of equilibrium on walking or standing; moderately severe generalized dysfunction | above, plus may develop dysphagia |
| **4** | symptoms severe; walking is limited; rigidity and bradykinesia; unable to live alone | above, plus decreased manual dexterity; difficulty self-feeding, dehydration |
| **5** | invalidism complete, requires constant nursing care; cachectic stage; cannot stand or walk | above, plus may require nutrition support |

http://neurosurgery.mgh.harvard.edu/Functional/pdstages.htm#HoehnandYahr accessed 2-21-05

**United Parkinson's Disease Rating Scale (UPDRS):** Since 1987 the UPDRS has been used extensively by clinicians around the world for tracking Parkinson's disease progress and response to therapy. The UPDRS consists of 42 questions and is subdivided into three scales including cognitive and mood aspects, motor aspects, and activities of daily living (ADL). A lower score indicates a better condition than a higher score.

The UPDRS is available at www.mdvu.org/library/ratingscales/pd/.

**Medications**

Common adverse side effects include: constipation, nausea, anorexia, confusion, hallucinations (often from overmedication or polypharmacy, especially in older adults), dry mouth, dyskinesia, gastroparesis, GERD, orthostatic hypotension, weakness, fatigue, daytime sleepiness, depression, edema

PD medications initially help control symptoms, but with progression to final stages, more medications in greater amounts are needed to combat symptoms. Increased medications bring increased risk for adverse effects, including dry mouth, constipation, anorexia, and hallucinations.

**Medications for Parkinson's disease meds found in medications chapter**

| Drug Classification | Generic name | Trade names | Effect |
|---|---|---|---|
| **Levodopa** combination drugs | **Levodopa**-carbidopa | Sinemet, Sinemet CR, Atamet, Co-careldopa, and generic versions | Levodopa crosses blood-brain barrier, converted to dopamine. Must be taken 30-60 minutes prior to meals |
| | Levodopa-carbidopa-entacapone | Stalevo | Levodopa competes with various amino acids for absorption. Need to limit protein containing foods |
| | Levodopa-benserazide | Madopar, Madopar CR, | during daytime hours for |

| Drug Classification | Generic name | Trade names | Effect |
|---|---|---|---|
| | | Prolopa, Syndopa, Syndopa CR | optimal absorbtion and greatest effect of drug. Not effective for all patients. |
| **COMT-Inhibitor** | entacapone | Comtan | Extends half-life of levodopa. In small number of patients, may cause intractable diarrhea. |
| **Dopamine Agonists** | pergolide mesylate<br>bromocriptine<br>pramipexole<br>ropinirole HCL | Permax<br>Parlodel<br>Mirapex, Sifrol<br>Requip | Mimic action of dopamine; may be used as mono-therapy or in combination with levodopa. May lead to hallucinations in older adults. May lead to obsessive-compulsive behavior in a few people |
| **Anticholinergics** | benztropine<br>trihexyphenidyl HCL<br>diphenhydramine<br>procyclidine<br>biperiden HCL<br>ethopropazine | Cogentin<br>Artane<br>Benadryl<br>Kemadrin<br>Akineton<br>Parsidol, Parsitan | Produce mild antiparkinson effect; balance loss of dopamine by decreasing acetylcholine. May be used in combination with levodopa or selegeline. |
| **MAO-B Inhibitor** | selegeline | Eldepryl | Helps prevent breakdown of dopamine in brain, extending useful life of dopamine in brain. Usual dose is 5-10 mg/day; a low-tyramine diet is not generally necessary at 10 mg or less daily. |
| **Antiviral Agent** | amantadine | Symmetrel | Increases dopamine release; may decrease dyskinesia in some patients. |

**Goals of MNT for Parkinson's disease**

Symptoms of PD and side effects of medications can result in obstacles to nutrient repletion and deterioration of health, especially as PD advances.

Assess clients for:

- medications used
- patient's food preferences, allergies, aversions
- stage of PD
- weight changes, if any
- ability to self-feed
- hydration state
- presence of dysphagia
- gastroparesis
- need for dietary modifications
- co-occuring diagnosed conditions (such as diabetes, hyper- or hypotension, CHD, etc.)

Nutrition needs:

1. Management of conditions related to effects of PD on the gastrointestinal tract
    - Assess for dysphagia, gastroparesis, GERD, constipation
    - Slowed peristalsis delays effectiveness of medication, aggravates GI complications
    - Constipation, fecal impaction and need for increased fiber are common
    - Plan appropriate nutrition interventions for symptoms that are present
2. Provide adequate energy to prevent weight loss or gain
    - Assess ability to consume adequate calories,
        - May need assistance or adaptive equipment due to loss of manual dexterity
        - May not be able to chew or swallow adequately
    - Assess level of physical activity, lack of movement can lead to weight gain
    - Assess food preferences, allergies, aversions
    - Plan high or low calorie meals and snacks as appropriate

- Consider need for texture modification

3. Maintain adequate hydration
    - Assess for ability to consume liquids
    - Provide appropriate adaptive equipment and textures
4. Manage side effects of medication
    - Adjust or redistribute protein to evening meal or snack to reduce interaction with levodopa. Not effective for all clients, some may need medication at night as well to facilitate self care and turning in bed
    - Optimize absorption of levodopa by giving 30-60 minutes prior to meals/snacks that contain protein
5. Prevent bone thinning and vitamin D deficiency
    - Milk may be limited since it contains protein thus reducing intake of calcium and vitamin D.
    - Disabilities limit ability to exercise, time spent outdoors and exposure to sunlight.

**References:**

For detailed information, see *Parkinson's Disease: Guidelines for Medical Nutrition Therapy,* www.nutritionucanlivewith.com 877-565-2665

*Nutrition Care of the Older Adult*, 2nd Edition. 2004. American Dietetic Association. Niedert, K. and Dorner, B. editors. Pp 81-82

## CHRONIC KIDNEY DISEASE

Chronic Kidney disease (CKD) requires careful nutrition assessment and individualization of nutrition prescription. Residents with CKD benefit from monitoring of compliance and practicality of nutrition prescription as well as ongoing assessment of nutritional status (outcomes). If the resident is undergoing dialysis, coordination of nutritional care should be in conjunction with the dietitian at the dialysis unit. There is evidence that preventive measures and treatment can prevent or delay some of the adverse outcomes of CKD. (1, 3)

While assessing a resident with CKD, consider the following common nutritional complications associated with this disease:

**Protein Energy Malnutrition (PEM)**. PEM is caused not only by inadequate intake but due to the dialysis procedure, loss of blood, uremia, inflammatory state and protein catabolism. Adequate nutrition is essential for its prevention and treatment. (2, 3)

**Anemia** This nutritional concern affects quality of life yet is often very responsive to treatment. Residents with CKD may develop anemia due to a decrease in EPO production. For further explanation and to view "Anemia in CKD Decision-Making Algorithm", visit www.kidney.org/professionals/kis/images/1

**Renal osteodystrophy** There are changes in the metabolism of calcium, phosphorus and vitamin D which results in hyperparathyroidism as outlined below. (3, 4)

| | |
|---|---|
| **Renal Osteodystrophy** | • As kidney function decreases, the kidney loses its ability to activate Vitamin D and may cause calcium and phosphorus to get out of balance.<br>• As calcium, phosphorus, imbalance progresses, parathyroid hormone (PTH) is released and causes calcium to leach from the bones to supply calcium to the blood.<br>• This may lead to weak bones and/or calcification of the soft tissues.<br>• To prevent this, most residents require a low phosphorus diet, and or/phosphate binding medication.<br>• Active form of vitamin D may also need to be given. (usually as part of HD treatment) |

**Electrolyte and fluid balance** Control of hypertension, fluid balance and electrolytes can be challenging. Diet interventions are almost always required and should be coordinated with the health care team.

**Additional Risks** Residents with CKD often have elevated lipid levels, hypertension and are at increased risk to develop cardiovascular disease. Please also see the section on **Diabetes and CKD** (see page ).

## CKD Classification and Glomerular Filtration Rate (GFR)

The best indicator of renal function is glomerular filtration rate (GFR). If GFR is not available, an estimate may be calculated using the blood creatinine level, age, gender, race and weight. (See Table 1.) An online calculator of GFR is available at www.kidney.org/kls/professionals/gfr_calculator.cfm

**Table 1: Cockraft-Gault Equation** (5)

**Formula to determine estimated creatinine clearance**

Men: $\frac{\text{wt(kg) x (140-age)}}{\text{72 x serum creatinine (mg/dL)}}$

Women: $\frac{\text{wt(kg) x (140-age) x 0.85}}{\text{72 x serum creatinine (mg/dL)}}$

Alpers, R: Manual of Medical Therapeutics. Boston: Little, Brown & Co., 345, 1983.

The National Kidney Foundation Kidney Disease Outcome Quality Initiative (NKF KOQI) has classified each stage of CKD based on GFR as seen in Table 2. It has been shown that appropriate interventions can prevent the advancement of CKD. Therefore, it is important to identify the stage of CKD when assessing nutritional status, determining nutrition prescription and when monitoring effectiveness of interventions.

**Table 2: Classification of CKD**

| | **GFR ($mL/min/1.73m^2$)** | **Description** | **Action *** |
|---|---|---|---|
| At increased risk | ≥ 90 | Risk factors present; without markers of kidney damage | Periodically test for CKD; treat changeable risk factors |
| Stage 1 | ≥ 90 | Kidney damage; normal or increased GFR | • Diagnose and treat type<br>• Treat comorbid conditions<br>• Progression – slow<br>• Treat changeable risk factors<br>• Restage occasionally |
| Stage 2 | 60-89 | Kidney damage; mild reduction of GFR | Adjust medication dosages for GFR |
| Stage 3 | 30-59 | Kidney damage; moderate reduction of GFR | • Assess for and treat complications<br>• Avoid nephrotoxic drugs |
| Stage 4 | 15-29 | Kidney damage; severe reduction of GFR | Prepare for kidney replacement therapy<br>Dialysis |
| Stage 5 | <15 or on dialysis | Kidney failure | Begin kidney replacement therapy when uremia is present |

* Action for all stages should include actions from previous stages
Adapted from National Kidney Foundation *K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification*. Am J Kidney Dis 39:S19, 2002 (suppl 1)

**Nutrition Assessment in CKD**

**Determining body weight for nutrient calculations. KDOQI Clinical Practice Guidelines for Nutrition in CRF** recommends using standard and adjusted body weight, referring to NHANES II, when calculating nutrient levels. For residents between 95-115% of the SBW or if they are at their BMI weight goal, actual edema free weight may be used. (#5, Page 1-23; #2, guideline 12). BMI goal weight can also be used to estimate nutrient needs for those who are outside the desired weight goal.

1. Determine body weight using "standard body weight"; refer to NHANES II data.
2. Use "adjusted body weight" for obese or lean residents who are <95% or > 115% of standard body weight. Adjusted body weight (BW) = edema-free BW +{(standard BW – edema-free BW) x 0.25}
    a. Example of adjusted BW (page 1-23)
    Actual BW 80, standard BW 60; = 80 + {(60-80) x .025}
    Adjusted BW = 80 + {-20 x 0.25}
    Adjusted BW = 80 – 5 or 75

3. BMI: KDOQI recommendations are 23.6 for women and 24.0 for men and are associated with increased survival in HD patients By comparing the BMI ranges with the normal adult weight, a realistic weight to base nutritional needs can be determined. (#2,#3,#4)
    a. Calculate desirable body weight from BMI (see table) *needs one page
    b. Upper 50$^{th}$ percentile BMI may be best for survival in maintenance dialysis (MD) residents. Further studies are needed to determine the safety of weight loss for residents with BMI > 30.

**CKD and Laboratory Values: Table 3**

It is important to recognize "normal" versus "acceptable" labs for residents with CKD and to assess trends.
***Adapted from (#5 reference)*** **Handbook of Nutrition and the Kidney**.

| Lab/Indicator | Reference Range | CKD Range | Significance of Variation |
|---|---|---|---|
| Albumin | 3.5-5.0 g/dL | Ideal is > 4.0 | **High:** severe dehydration, albumin infusion<br>**Low:** chronic liver or pancreatic disease, fluid overload, infection, inflammatory GI disease, nephrotic syndrome, protein-energy malnutrition, steatorrhea |
| Alkaline Phosphatase | 30-85 IU/L | WNL(within normal limits) | High: healing of fx, malignancies, renal osteodystrophy, Low: congenital hypophosphatemia, possibly in kwashiorkor, anemia, nephritic syndrome. |
| Blood Urea Nitrogen (BUN) | 10-20 mg/dL | 60-80 mg/dL (anuric, well dialyzed , eating adequate protein) | High: excessive protein intake, GI bleeding, dehydration, inadequate dialysis, hypercatabolism, transplant rejection.Low: hepatic failure, over-hydration, acute low protein intake, malabsorption. |
| Serum Calcium<br><br>(Adjust for low albumin but value is questionable) | 9.0-10.5 mg/dL | WNL (low end) | High: excessive vit D/calcium, osteolytic disease, excess vit A, carcinoma, immobilization, dehydration, increased GI absorption.<br><br>Low: insufficient Vit D, long term Dilantin therapy, during bone building, hypoparathyroidism with low albumin (lack of carrier) |
| Carbon Dioxide ($CO_2$) | 25-30 mEq/L | WNL $\geq$ 22 | High: Metabolic alkalosis<br>Low: Metabolic acidosis |
| Cholesterol | < 200 mg | WNL < 150-180 mg/dL | High: high chol/saturated fat diet, nephrotic syndrome, disorders of lipid metabolism, glucocorticoid use.<br>Low: acute infection, starvation, PEM |
| Creatinine | Female:<br>0.5-1.1 mg/dL<br>Male:<br>0.6-1.2 mg/dL | 2-15 mg/dL | High: muscle damage, catabolism, MI, muscular dystrophy, ARF/CKD, excess protein intake, inadequate dialysis, transplant rejection<br><br>Low: in chronic dialysis < 10 may indicate PEM/wasting of muscle. |

| Lab/Indicator | Reference Range | CKD Range | Significance of Variation |
|---|---|---|---|
| Ferritin | Female:<br>10-150 ng/mL<br>Male:12-300 nd/ml | Male & Female:<br>HD: > 200 ng/mL<br>PD/CKD: > 100ng/ml; > 500 unknown benefit/harm | High: iron overload, many transfusions, dehydration, inflammatory state, falsely high in active liver disease.<br>Low: iron deficiency. |
| Glucose (fasting) | 70-105 mg/dL | WNL<br>< 200 non- fasting | High: DM, chronic hepatic disease, hyperthyroidism, malignancy, diabetic acidosis, glucose intolerance.<br><br>Low: hyperinsulinemia, ETOH abuse, liver failure, malnutrition. |
| Hematocrit | Female: 37-47%<br>Male: 42-52% | 33-36%<br><39% | High: dehydration<br><br>Low: anemia, blood loss (endogenous & dialysis), CKD, insufficient ESA. |
| Hemoglobin | Female:<br>12-16 g/dL<br>Male:<br>14-18 g/dL | Variable<br>10-12 g/dl<br>< 13 g/dl | High: dehydration<br><br>Low: over hydration, prolonged iron deficiency, anemias, blood loss, CKD. |
| Hemoglobin $A_{1c}$<br>(glycosolted hemoglobin GHb, GHB) | Adult: 4-8%<br>Good - < 7%<br>Fair - 10%<br><6 not desirable | WNL, <7% | High: newly diagnosed/poorly controlled DM.<br><br>Low: chronic blood loss, early CKD, hemolytic anemia. |
| Intact PTH | 10-65 pg/ml | 150-300 pg/ml | High: hyperparathyroidism, lung or kidney disease, hypocalcemia, malabsorption, vit D deficiency.<br><br>Low: hypercalcemia, metastatic bone tumor, vit D intoxication, hypmagnesium, hypoparathyroidism, sarcoidosis. |
| Phosphorus | 3.0-4.5 mg/dL | 3.5-5.5 | High: CKD, osteodystrophy, vit D intoxication, excessive intake, inadequate P binder<br>Low: Vit D deficiency, low intake, excess P binding, malabsorption/ diarrhea/vomiting, diuretic therapy, alcoholism, diabetic acidosis. |
| Potassium | 3.5-5.0 mEq/L | 3.5-6.0 mEq/L | High: CKD, tissue distruction, acidosis, dehydration, hyperglycemia, diuretics, excessive oral intake, inadequate dialysis, inappropriate dialysate K+.<br>Low: diuretics, ETOH abuse, diarrhea/vomiting/laxative or enema abuse, malabsorption. |
| Pre-albumin | 15-36 mg/dL | > or = 30 mg/dL (Due to kidneys impaired ability to breakdown pre-albumin, expect to see higher levels.) | High: administration of corticoids.<br>Low: liver disease, malnutrition, inflammation. |

## Determining the Nutrition Prescription

### MNT for Extended Care Residents with CKD

Whether a resident has early CKD or is on dialysis, older adults pose special nutritional issues. Protecting the resident from hyperkalemia or fluid overload while providing adequate calories and protein to prevent protein energy malnutrition is a challenge. The diet order should be individualized with the least amount of restrictions yet effective to prevent further renal impairment. The diet order may only have some of the restrictions listed in Table 3. Considerations when determining the diet order include:

- HD (hemodialysis) residents have an increased need for protein and require a sodium, phosphorus, potassium and fluid restriction.
- PD (peritoneal) residents require an increase need for protein and require sodium and phosphorus restrictions; but often allowed a more liberal potassium restriction.
- Diabetic residents may require less insulin and/or oral agents for diabetes control.

- Other nutritional risks and/or co-morbidities to be considered including diabetes, cardiac disease, cancer, etc.
- If resident is unable to meet their protein and energy needs with the current food intake, assess for nutritional support (p6-10 #5)

**Table 4. DAILY NUTRIENT RECOMMENDATIONS FOR CKD**
**Adapted from the National Kidney Foundation. Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th[rd] Edition.** National Kidney Foundation, New York, NY. 2009. © National Kidney Foundation

| | Acute | CKD | Nephrotic Syndrome | HD | PD |
|---|---|---|---|---|---|
| **Protein gm/kg[3]** | 0.6-0.8<br>Based on renal function/treatment | 0.60-0.75 gm/kg<br>≥50% HBV | 0.8-1.0<br>Replacing urine loss is controversial | ≥ 1.2<br>≥ 50% HBV | ≥ 1.2-1.3<br>≥ 50% HBV |
| **Energy kcal/ kg[3]** | 35-50 depends on stress/ nutrition status | ***K/DOQI:***<br>30-35 > 60 yrs<br>35 < 60 yrs | 35 unless obese; complex CHO; low cholesterol; < 30% fat | 30-35 > 60 yrs<br>35 < 60 yrs | 30-35 > 60 yrs<br>35 < 60 yrs including dialysate |
| **$Na^+$ gm/day2** | 1-2 based on BP, edema; replace losses in diuretic phase | Varies from 1-3 to no added salt | 1-2 | 2 | 2<br>Monitor fluid balance |
| **$K^+$ gm/day** | Maintain serum <5 mEq/L. Replace losses in diuretic phase | Usually unrestricted unless serum level is high | Usually unrestricted | 2-3 Adjust to serum levels | 3-4 Adjust to serum levels |
| **Phosphorus mg/g pro or mg/day** | Maintain serum P WNL | 800-1000 mg/d<br>10-12 mg/gm pro<br>Maintain serum P and PTH WNL | Maintain serum P WNL | 800-1000 mg/d adjust to meet pro needs; 10-12 mg/g pro | 800-1000 mg/d adjust to meet pro needs; 10-12 mg/g pro |
| **Calcium g/day** | Maintain serum WNL | DRI; maintain serum levels WNL | Same as predialysis | < 2.0 g including binder load; maintain serum levels WNL | < 2.0 g including binder load; maintain serum level WNL |
| **Fluid cc/day** | Output plus 500 cc | Usually unlimited | Maintain balance | Output + 1000 cc<br>Limit ID wt gain | Maintain balance |
| **Vitamins/ Minerals (Daily)** | DRI: adjust to degree of catabolism, TPN may require MVT and minerals | DRI: B-complex & C; ensure adequate nutritional vitamin D;give 1,25 vitamin D as needed to control PTH; individualize iron and zinc | Same as CKD | C: 60-100 mg<br>$B_6$ – 2 mg<br>folate – 1 – 5 mg;<br>$B_{12}$ – 3 µg/d;<br>RDA others;<br>vit E – 15 IU/d;<br>zinc 15 mg/d;<br>individualize iron and vit D; replete nutritional D | Same as HD but may need 1.5 to 2 mg of $B_1$ due to dialysis loss; replete nutritional vitamin D; individualize 1,25 vitamin D as needed for control of SHPT |
| **Fiber** | | | | | |

CKD Stage 4 = CFR 15-29 mL/min/1.73 m2
1 Parenteral Nutrition recommendations are in Chapter 6
2 **Note:** A 1 gm sodium restriction is generally difficult to achieve in an outpatient setting.
3 Based on standard or adjusted body weight

**References:** Kopple JD and Massry SG, Eds. **Nutritional Management of Renal Disease.** Philadelphia: Lippincott Williams & Wilkins; 2004. Mitch WE, Klahr S, Eds. **Handbook of Nutrition and the Kidney**, 5th Ed. Philadelphia: Lippincott Williams & Wilkins, 2005.

***NKF K/DOQI*** Clinical Practice Guidelines for Nutrition in Chronic Renal Failure. Am J. Kidney Dis. 2000; 36:6(Suppl 2), S1-S140.***NKF K/DOQI*** Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease. Am J Kidney Dis. 2003;42:4(suppl 3)S1-S201.

**Diabetes and CKD**

Diabetes is one of the leading causes of CKD. Adequate nutritional management may reduce the progression of the CKD. The amount and quality of dietary protein, carbohydrate and fats should be considered. Evidence has shown that limiting dietary protein can slow the progression of abluminuria and CKD. (#6)

**Table 5 Recommended Daily Dietary Modification in Diabetic Nephropathy**

| Stage | CHO % kcal | Fat % kcal | Protein | Na g | Phos g | K+ g |
|---|---|---|---|---|---|---|
| **Pre-Clinical Nephropathy Stage 1-2** | 50-60%; up to 40 gm fiber Achieve/maintain Normal BMI | <30% Kcal as fat <10% saturated fat 6-8% polyunsaturated fat <200 mg cholesterol/day | .08 g/kg 10% kcal Avoid > 20% Kcal | <2.3* | 1.7 | >4 |
| **Progressive Nephropathy Stage 3-4** | 50-60% Up to 40 gm fiber Achieve/maintain Normal BMI | <30% kcal as fat <10% saturated fat <200 mg cholesterol/day | 0.6-0.8 g/kg 8-10% kcal | <2.3* | 0.8-1.0 | 2-4 |
| **Stage 5 HD** | 50-60% Low GI, High fiber | <30% kcal as fat <10% saturated fat | 1.2 g/kg | 2-3* | 0.8-1.0 | 2-3 |
| **Stage 5 PD** | 35-40% oral 15% dialysate | <30% kcal as fat | 1.2-1.3 g/kg | 2-3* | 0.8-1.0 | 3-4 |

**Hypoglycemia Protocol for Diabetic Hemodialysis Resident/Patient (**6, 7)

**Note:** Hemodialysis increases the effectiveness of insulin and diabetic patients on hemodialysis are at risk for hypoglycemia. New dialysis patients may not recognize symptoms of hypoglycemia. Facility staff needs to be alert and monitor blood sugar regularly. Check facility protocol on monitoring and treating of low blood glucose levels and assess need for resident education.

Examples of 15 grams of CHO exchange that are low in potassium:

a. ½ to 1 cup regular soda pop – 7 UP, ginger ale, etc.
b. ½ cup apple juice, cranberry, or grape juice (not orange)
c. 3 sugar cubes or 3 packets of sugar
d. 3 glucose tablets
e. 1 tube Gluctose™ 15 or glucose gel
f. Avoid using high potassium foods!!
g. Remember to give Phosphate binder (i.e., Tums®, PhosLo®, Renagel) as prescribed since these are needed whenever food (protein in particular) is consumed

**Do Not** use orange juice or Gatorade® due to high potassium levels

**Do Not** use milk, yogurt, or cheese products due to high potassium and high phosphorus levels

**NOTE:** Residents on Precose® must be treated with glucose. Precose® inhibits the breakdown of sugar to glucose and slows absorption of sucrose or fructose. (#5)

**Common Medications in CKD**

The actions of medications and herbal supplements may be altered in CKD because of impaired urinary excretion. All of these medications have the potential to interact with each other. Many side effects of these medications can interfere with nutritional intake and nutrient adequacy. (#5)

1. Renal Vitamins
    a. Renal patients are to avoid "house" or one-a-day type vitamin/ mineral supplements due to high content of fat soluble vitamins and minerals with potential for toxicity or overload. (Vitamins A, D, K, phosphorus, magnesium, potassium)
    b. Commonly prescribed renal vitamins: Diatx®, Nephrovite®, Nephrocaps, Renaltab, Dialyvite®

2. Phosphate Binders
   PhosLo®, Renagel (slowly being replaced by Renzela, due to less GI side effects) and Fosrenol® (now approved to be crushed) are commonly used phosphate binders. They must be taken with meals and snacks to be effective, ideally given when tray is passed. Check with nursing to assure proper administration.

3. Be Alert! Check the Medication Administration Record (MAR)!
   Dialysis patients **are not** to be given Milk of Magnesia, Citracal® or calcium citrate, PeptoBismol®, KCL supplements or PRN calcium or aluminum based antacids (Amphogel®) unless specifically ordered by the Nephrologist. Usually renal patients are taken off Lasix, Bumex® or other diuretics when starting HD. The RD can be very helpful in alerting the physician if any of these meds still on the MAR.

4. Herbal supplements in CKD: Herbal supplements can interact with many drugs and may be contraindicated in CKD. Below is a partial listing of common herbal supplements and their potential affects. As part of the assessment process, determine if any herbal supplements are being used. Each herbal supplement should be assessed fully by the health care team to determine if it is beneficial or contraindicated.

   Can affect potassium levels: Alfalfa, Dandelion, Licorice root, Noni fruit/juice, and St John's wort.
   Has Diuretic properties/electrolyte imbalance: Goldenrod, Juniper berries, and Parsley,
   Can affect blood thinning agents: Garlic, and Ginger.
   Do not use in CKD: Ginseng.

Reference: **Adapted from the National Kidney Foundation. Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th^rd^ Edition.** National Kidney Foundation, New York, NY. 2009. © National Kidney Foundation

**General Dietary Guidelines for Planning Nutrition Prescriptions**

1. For residents not on dialysis, whose intake/appetite is adequate, a general No added salt diet with avoidance of salty meats/foods may be adequate. Additional restrictions of protein may be indicated as noted in previous charts. Monitor potassium and phosphorus levels for need of restrictions. When initiating additional dietary restrictions, begin slowly and monitor adherence for best compliance.

2. If a resident's intake is poor and is not on dialysis, a more liberal diet approach is appropriate. Individualize nutrition prescription, provide supplementation as indicated, and monitor lab values. If intake improves, re-evaluate.

3. For residents on dialysis, additional restrictions of potassium, phosphorus and fluid are most likely needed. However, protein needs are increased. Refer to following tables as a guide when potassium or phosphorus is limited. Also, consult the facility's diet manual for diet order language and content.

**Additional Notes for residents on dialysis**

1. Bag Lunch/Snack Guidelines
   Most dialysis units prefer residents to have a snack or meal before going for their scheduled time for dialysis. Eating during dialysis treatment can lead to lower blood pressure and can increase risk of choking. However, standard practices can vary from one dialysis center to another. It is important for the dietitian to communicate with the dialysis unit team's dietitian to determine how to meet the resident's nutritional needs, especially on dialysis days. Residents may need to be sent with a light snack or can of approved supplement if instructed. Additionally, ongoing communication with the multidisciplinary team at the facility will assure consumption and practicality of the nutritional plan. Consider:

   - Communicate and document dialysis day meal changes
   - Consider how to provide foods needed at unusual times (cold cereal and bread to toast for early breakfast)
   - Observe individual fluid restrictions as per schedule and diet order.
   - If food is required to be sent, use an insulated food carrier and properly package food to ensure freshness and food safety.

2. Communication book
   Communication with the dialysis team is key: include the following when establishing a communication book:

- Name and contact information for Nursing center, nurse manger, food service manager and dietitian
- Nutrition prescription, including supplements
- List of medications
- Chewing or swallowing concerns
- Bowel pattern and regimes
- Frequency for dialysis center to send copy of lab results

**Translating Nutrition Prescription into Menu planning**

| AVOID | SUBSTITUTE | COMMENT |
|---|---|---|
| Salt substitutes containing K+ | Herb blends | Can have 300-800 mg K+ per serving |
| Orange, tomato, V-8, prune juices | Cranberry, cranberry blends, apple, pineapple, grape juices; apricot nectar, papaya nectar | High in potassium |
| Apricots, bananas, oranges (fresh), nectarines, prunes, raisins, | Apples, applesauce, fruit cocktail, peaches, pineapple, strawberries, watermelon; mandarin oranges are low K+ and are acceptable. | Check with Activities to make sure bananas & oranges are not given as treats or prizes. |
| Avocado, brussels sprouts, greens (beet, collard, mustard), kohlrabi, okra, parsnips, potatoes, pumpkin, rutabagas, spinach, sweet potatoes, tomatoes/sauces, was beans, winter squashes, yams | Beets (canned), cabbage, carrots, cauliflower, corn, cucumbers, eggplant, green beans, lettuce, summer squashes; | May have 1-2 slices of tomato in salad or sandwich |
| Whole wheat bread, bran cereal, bran muffins, oatmeal, salted crackers, pancakes, waffles | White bread, cinnamon bread, Danishes, bagels, low salt crackers, Cream of Wheat or Rice, Malt-O-Meal, Rice or corn based cold cereals, French toast made with white bread | Pancakes & waffles limited to once a week due to phosphorus |
| Soup beans and legumes including lima beans. Baked beans, Ham & beans | Green & yellow beans are acceptable | Too much potassium, phosphorus, sodium |
| Low sodium soups containing KCl to flavor, vegetable soups | Beef or chicken noodle, chicken rice | Vegetable soup is high in potassium |
| Milk limited to ½ c per day | Non-dairy creamer for cereal, diet pudding, cream pie, substituted for milk | Small servings since milk is a rich source of Na, K, P, and fluids; all of which must be limited on renal diets |
| Cheese limited to 1 oz per week | To serve Mac& Cheese or grilled cheese, discontinue milk and use non-dairy creamer Double portion of eggs, low cholesterol egg substitute, 1½ portions of meats | High in phosphorus<br><br>Provides high proteins of high biological value |
| Cottage cheese limited to ¼ c | | High in phosphorus |

| AVOID | SUBSTITUTE | COMMENT |
|---|---|---|
| Potatoes may be limited to ¼ c (#16 scoop) mashed or boiled per day<br><br>Presoaked, drained and boiled potato for potassium removal. May have up to 1/2 cup per day of treated potato.<br>Baked potato<br>Convenience potato mixes | Rice, noodles with extra margarine | <br><br><br>High potassium<br>High sodium |
| Peanut butter limited to 2-3T per week | | High in phosphorus |

**Foods High in Phosphorus**

Biscuits/muffins
Baking Powder
Beer (whole grain)
Caramel
Cake
Cheeses
Chocolate
Cola beverages (cola bean & phosphoric acid additives)
Corn, peas, dried peas & beans
Egg yolks
Legumes: all (includes kidney, pinto and red beans)
Meats (especially organ meats, canned salmon, processed meats); sardines
Milk and milk products (pudding, custard, ice cream, cream pies)
Nuts and nut butters
Peanut butter – limit to 2-3 tbsp/wk (1-2 tsp/day)
Quick Breads, pancakes, waffles
Seeds (i.e., sunflower, poppy, sesame, etc.)
Whole grain breads and cereals (i.e., oatmeal, bran, whole wheat, etc

**Ideas for Fortifying Renal Diets**

- Protein powders such as Resource® protein, Promod®, or egg white powders may be mixed in hot cereal, applesauce, and individual portions of mashed potatoes. Avoid milk-based or soy-based powders that are high in phosphorus.
- Cream cheese, butter or margarine, half and half, whipping cream, sour cream may be used to add calories.
- Mayonnaise or salad dressing may be used in sandwiches, salads.
- Extra deviled eggs, hard cooked eggs; cottage cheese/fruit may be used.

**Snack List ideas for Renal Diabetic Diets**

- 1/4 cup cottage cheese with drained canned fruit, toast, salt free crackers
- Bread, butter or cream cheese and diet jelly sandwiches
- Corn or rice based cereal with Vitamite® 100 Non-Dairy Beverage or non-dairy creamer
- Half of meat/protein sandwich (tuna, chicken, egg salad, **non-processed** meat)
- Hard boiled or deviled eggs
- Peanut butter (1-2 tsp only) and diet jelly on toast, bread, salt free crackers
- Angel food cake, crisp rice treats, shortbread cookies, diet cookies, fruit Newton cookie, pound cake
- Grapes, applesauce, apple slices or drained canned diet fruit
- Popcorn with unsalted butter, ,animal crackers, graham crackers ,vanilla wafers
- Protein bars such as Zone or Balance bars

**References**


1. National Kidney Foundation. *KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Anemia in Chronic Kidney Disease.* Am J Kidney Dis 47:S1-S146, 2006 (sppl 3).
2. National Kidney Foundation. *KDOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification.* Am J Kidney Dis 39:S1-S000 2002 (suppl 1).
3. American Dietetic Association. Nutrition Care Manual. http://nutritioncaremanual.org. Accessed July 15, 2009.

4. National Kidney Foundation. KDOQI Clinical Practice Guidelines for Bone Metabolism and Disease in Chronic Kidney Disease. Am J Kidney Dis. 2003;42:(suppl 3)S1-S202.
5. National Kidney Foundation. Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th[rd] Edition. National Kidney Foundation, New York, NY. 2009. © National Kidney Foundation
6. National Kidney foundation. KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Diabetes and Chronic Kidney Disease. Am J Kidney Dis 49:S1-S180, 2007 (suppl 2)

**Additional Resources**

1. Beto JA, Bansal VK. Medical nutrition therapy in chronic kidney failure: integrating clinical practice guidelines. J Am Diet Assoc. 2004 Mar;104(3):404-9.
2. Lacquaniti A, Bolignano D, Campo S, Perrone C, Donato V, Fazio MR, Buemi A, Sturiale A, Buemi M. Malnutrition in the elderly patient on dialysis. Ren Fail. 2009;31(3):239-45. Review.

## THE VENTILATOR DEPENDENT PATIENT

Respiratory distress is a condition in which the patient suffers from a deficit in the body's overall oxygen content and / or a decrease in alveolar ventilation, which results in the retention of carbon dioxide. These abnormalities (whether existing alone or concurrently) can also cause profound changes in the patient's acid-base balance. Untreated or unsuccessfully treated respiratory distress will ultimately result in respiratory failure, which represents a potentially fatal triad of hypoxia ($O_2$ lack), hypercarbia ($CO_2$ retention), and respiratory acidosis (increased blood carbonic acid levels). Therefore the patient in clinically observed respiratory distress or respiratory failure requires careful evaluation by the registered dietitian. In a patient with these types of respiratory compromise, excessive caloric oxidation of carbohydrate calories may lead to artificially increased carbon dioxide production and possible acidemia. (pH < 7.35)

The treatment of choice for respiratory insufficiency and failure is generally mechanical ventilation. Mechanical ventilation provides the physiologic support to help the patient achieve temporary homeostatic levels of $O_2$, $CO_2$, and pH while the underlying pathology is identified, treated, and reversed.

Patients on mechanical ventilation may not able to eat by the normal oral route. For those requiring ventilator support for less than 48 hours this lack of nutrients usually is not a concern. For those requiring more than 48 hours or long term ventilator support an alternate form of nutrition support such as enteral or TPN may be needed. Disease states associated with respiratory failure are characterized by a hypermetabolic response with increased resting energy expenditure and increased protein catabolism. It is important to supply nutrition support as early as possible to prevent the loss of lean body mass and to supply adequate energy for metabolic support. (3)

Potential problems during mechanical ventilation may include the following:

- CO2 retention with respiratory acidemia
- Hypoxia with increased lactic acid tissue levels
- Delayed weaning
- Refeeding syndrome
- Liver dysfunction
- Cardiac dysfunction
- Malnutrition
- Hyperglycemia
- Renal insufficiency or failure with azotemia
- Lipemic serum
- Primary and accessory respiratory muscle wasting

Successful feeding of the mechanically ventilated patient must mirror the physiologic status of the patient as well as the stage they currently occupy in the mechanical ventilation timeline. This timeline begins with the acute initiation phase when the patient is first placed on the ventilator and ends when the postweaning phase marks the complete independence of the patient from ventilator.

**Ventilator Dependency Feeding Stages:**

1. **Acute repletion**: replenish muscle glycogen stores and reverse catabolism.
2. **Pre weaning**: maintain positive nitrogen balance, improve visceral protein stores and promote weight gain.
3. **Weaning**: provide extra energy substrates to meet the increased metabolic requirements of both primary and accessory respiratory musculature and attempt to minimize increased $CO_2$ production by avoiding large carbohydrate components in the patient dietary intake.

4. **Postweaning:** maintain nutrient needs despite anorexia or dysphagia; support anabolism. Carefully evaluate daily caloric needs, and readjust them as the patient's rehabilitation becomes more and more intense and energy demanding.

A planned feeding strategy should be initiated as soon as the patient's condition is stable enough to support effective nutritional intervention. The postweaning nutritional planning must begin as soon as the patient is placed on the ventilator. Early feedings should be limited in scope and volume, but may emphasize dextrose and fat calories as an option to reduce $CO_2$ production. As a caution, however, each ventilator patient requires individual care planning as the presenting factors vary widely from patient to patient. For example, dextrose and fat calorie substitution may be very helpful during repletion or when patient is temporarily failing weaning attempts, but may not be the most appropriate therapy during other feeding stages.

**Nutrient Requirements** (1)

**Calories:** Caloric needs may be estimated several ways. When determining calories, total calories must be taken into consideration (i.e., protein, fat, and carbohydrate). Indirect calorimetry is the standard for determination of resting metabolic rate. When indirect calorimetry cannot be performed, predictive formulas may be necessary. Some of the various methods for calculating energy needs are:

- Maintenance: 1.0 – 1.2 x REE or 25 – 35 kCal/kg/day
- Anabolism: 1.4 – 1.6 x REE or 35 – 45 kCal/kg/day
- BEE x activity factor x injury factor
- Ireton-Jones Energy Equation

  Spontaneously breathing patients: EEE(s) = 629 - 11(A) + 25(W) - 609(O)

  Ventilator-dependent patients: EEE(v) = 1784 – 11(A) + 5(W) + 244(S) + 238(T) – 804(B)

  Whereas EEE = Estimated Energy Expenditure (kCal/day)
  A = Age (years)
  W = body weight (kg)
  O = obesity (present = 1, absent =0)
  S = Sex (male = 1, female = 0)
  T = diagnosis of trauma (present = 1, absent = 0)

  B = diagnosis of burn (present = 1, absent – 0)

**Protein:** Metabolic rate, body protein reserves, calorie intake, nutritional status and age must be considered when estimating protein needs. The following are guidelines for estimating protein requirements:

- 1.2 - 1.6 gm protein/kg body weight for maintenance
- 1.6 - 2.0 gm protein/kg body weight for repletion
- Adjust for renal and liver dysfunction as appropriate

**Lipids:** Fat solutions are calorically dense, isotonic solutions. They are available in either 10 or 20 % solutions and may be given through central or peripheral veins. For best utilization, lipids should be infused along with carbohydrates and protein.

- 30 – 50% kCal as lipids (lipids not to exceed 2.5 g/kg) Adjust for propofol sedative because of **decreased energy expenditure overall due to the sedative component.**

**Carbohydrates:** Carbon dioxide production and oxygen consumption may be increased by high carbohydrate loads which can or may lead to respiratory distress. Replacing part of the carbohydrate calories with fat may decrease $CO_2$ production by lowering the respiratory quotient.

- 35 – 50% kCal as CHO

**Monitoring:** It is extremely important to understand all aspects of fluid balance and imbalance; this includes both arterial blood gases as well as selected types of electrolytes.

The ability to modify blood gas values is dependent on:

- Ventilatory (air moving) ability of the lungs
- Diffusion of respiratory gases ($O_2$ & $CO_2$) across the alveolar-capillary membrane into the blood
- Absorption and transport of $O_2$ by hemoglobin and plasma to and from tissue
- Uptake and utilization of $O_2$ and production and removal of CO2 by cells

These functions are all made possible or impossible by nutritional elements or lack of them.

It is also important to monitor relevant electrolyte levels

- Phosphorus - abnormal levels affect delivery of oxygen to tissues and contractility of diaphragm muscle
- Magnesium - deficiency affects respiratory muscle strength
- Hypocalcemia is associated with decreased diaphragmatic function
- Sodium depletion leads to appetite depression and then slowing of the ventilatory drive

**Arterial Blood Gases**

Because blood gas values can be affected by various nutritional elements, the dietitian should have at least a general understanding of the blood gases. The measure of acidity and alkalinity is pH. The lower the pH, the higher the acidity of the substance being measured. Conversely, the higher the pH, the higher the alkalinity of the substance being measured. $PaCO_2$ is a measure of ventilatory function. For example, muscle weakening caused by lack of potassium would cause ventilation to decrease and $PaCO_2$ will rise. Elevated $PaCO_2$ levels are treated by increasing the patient's ventilatory level. $PaO_2$ is primarily a measure of environmental levels of inhaled and blood borne oxygen. Low oxygen levels are treated by administration of oxygen to the patient.

$HCO_3$ and $H_2CO_3$ are a major buffer system [20 parts of bicarbonate ($HCO_3$) to one part of carbonic acid H2$CO_3$)] The bicarbonate retention/excretion is controlled by the kidneys and is an alkaline substance (pH > 7.45). Carbonic acid is formed by the mixture of $CO_2$ and water. It is an acidic substance (pH< 7.35) and is formed in proportion to the efficiency of ventilation (higher $PaCO_2$ equals more carbonic acid) Therefore, the more bicarbonate, the more alkaline the pH; and the more carbonic acid, the more acidic the pH. The pH of the blood is constantly balanced by both the kidneys and the lungs.

$SaO_2$ is a measurement of the relative saturation of hemoglobin with oxygen and is not always perfectly predictive of core oxygen content and should be viewed only as reference of limited value to the dietitian.

**Normal Values for Arterial Blood Gases**

| | | | |
|---|---|---|---|
| pH: | 7.35 - 7.45 | $HCO_3$: | 22 - 26 mEq/L |
| $PaCO_2$: | 35 - 45 mm Hg | $H_2CO_3$: | 1.2 mEq/L |
| $PaO_2$: | 80 - 100 mm Hg | $SaO_2$: | 96 - 98% |

Arterial blood gases measure the status of the body's respiratory environment. Acid base imbalance results when either bicarbonate or carbonic acid is increased or decreased. There are four primary acid-base disturbances: metabolic acidosis, metabolic alkalosis, respiratory acidosis, and respiratory acidosis. The following are normal values:

| Balance | Change/Ratio | pH |
|---|---|---|
| Metabolic Acidosis | $HCO_3$ = 12mEq/L<br>$H_2CO_3$ = 1.2 mEq/L<br>Ratio = 10:1 | 7.1 |
| Metabolic Alkalosis | $HC0_3$ = 36 mEq/L<br>$H_2C0_3$ = 1.2<br>Ratio = 30:1 | 7.58 |
| Respiratory Acidosis | $HCO_3$ = 24 mEq/L<br>$H_2CO_3$ = 1.84<br>Ratio 13:1 | 7.21 |
| Respiratory Alkalosis | $HCO_3$ = 21 mEq/L<br>$H_2CO_3$ = 0.6<br>Ratio 40:1 | 7.7 |

**Respiratory Quotient (RQs) Of Various Substrates/Conditions**

RQ is the ratio of $CO_2$ expired to $O_2$ inspired ($VCO_2/VO_2$). Maintain RQ of $\leq$ 0.85. Variations in the RQ may reflect over or underfeeding or inappropriate nutrient mix. Seriously ill patients may have a decreased ability to utilize carbohydrates.

To avoid an increase in $CO_2$ production, excess calories and high carbohydrate load may need to be avoided. However, the clinical utility of using RQ to determine substrate metabolism has been shown to not be as reliable a marker of over or underfeeding as originally thought. (2)

| Substrate/Condition | RQ |
|---|---|
| Ethanol | 0.67 |
| Fat | 0.71 |
| Protein | 0.82 |
| Mixed fuels | 0.85 |
| Carbohydrate | 1.00 |
| Lipogenesis | 1.00 - 1.20 |
| Hyperventilation (transient, unequilibrated) | > 1.00 |
| Prolonged ketosis | 0.68 |

**Goals for Nutrition Support in the Ventilator Dependent Patient**

1. Provide adequate calories and protein and avoid overfeeding and underfeeding.
2. Replete electrolytes, especially $PO_4$, Mg, Ca, K.
3. Prevent overfeeding as excess kCal and/or high CHO formulas may contribute to $CO_2$ retention and should be avoided.
4. Determine needs using indirect calorimetry providing a measure of a patient's REE (resting energy expenditure including stress) and the RQ (see above regarding RQ)
5. Maintain RQ of $\leq$ 0.85. Higher RQ may indicate overfeeding or excess CHO in nutritional support formula.
6. Reduce $CO_2$ production up to 50% if non-protein kCal may be provided as fat. (See section in Enteral Formulas for pulmonary formulas.)
7. Restrict fluids as needed in patients with cardiopulmonary disease.

**References**


1. Escott-Stump E. in **Nutrition and Diagnosis-Related Care**, 6th edition, Section 5, Pulmonary Disorders. 2008.
2. McClave SA, Lowen CC, Kleber MJ, McConnell JW, Jung LY, Goldsmith LJ. Clinical use of the respiratory quotient obtained from indirect calorimetry. JPEN J Parenter Enteral Nutr. 2003 Jan-Feb;27(1):21-6.
3. Malone AM. Nutritional management of ventilated patients. RT April/May 2001. Available at: http://www.rtmagazine.com/issues/articles/2001-04_07.asp. Accessed 23 September 2009
4. American Dietetic Association. Evidence Analysis Library, Critical Illness.


**Additional Resources**


1. American Dietetic Association, Nutrition Care Manual, 2009. (Online reference)
2. Escott-Stump, Sylvia, **Nutrition and Diagnosis Related Care**. Philadelphia, Lippincott Williams and Wilkins. 2008.
3. ASPEN Clinical Guidelines; www.nutritioncare.org
4. National Heart Lung and Blood Institute www.nhlbi.nih.gov
5. American Lung Association www.lungusa.org
6. H.-C. Lo, C.-H. Lin, and L.-J. Tsai. Effects of Hypercaloric Feeding on Nutrition Status and Carbon Dioxide Production in Patients With Long-Term Mechanical Ventilation. JPEN J Parenter Enteral Nutr, September 1, 2005; 29(5): 380 - 387.
7. N. Barak. Assessment of resting energy expenditure in mechanically ventilated patients. Am. J. Clinical Nutrition, February 1, 2004; 79(2): 341 - 342.
8. Ireton-Jones C, Jones JD**.** Improved Equation for predicting Energy Expenditures in Patients. Nutrition in Clinical Practice, Vol 17 No 1 pg 29-31, 2002.

## SPECIFIC POPULATIONS

**Nutrient Guidelines**
There are three sets of references in determining nutrient needs for these special populations:

1. USDA 2005 Dietary Guidelines (www.health.gov/DietaryGuidelines/)
2. MyPyramid Food Guidance System (www.mypyramid.gov)
3. Dietary Reference Intakes (DRIs)

The DRIs are the most recent set of dietary recommendations established by the Food and Nutrition Board (FNB) of the Institute of Medicine (IOM). DRIs include four types of reference values:

1. Estimated average requirements (EAR)
2. Recommended dietary allowances (RDA)
3. Adequate intakes (AI)
4. Tolerable upper intake levels (UL)

In combination, these science-based guidelines address nutritional needs by age and gender, activity recommendations and safe food preparation for a healthy lifestyle.

For more information on DRIs, Visit:
http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=2&tax_subject=256&topic_id=1342

**Children**
The American Dietetic Association recommends that children *"achieve optimal physical and cognitive development, attain a healthy weight, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity."* (1)

**Estimated Calories** per Day **for Children by Age and** G**ender***
*Based on a sedentary activity

Moderately active - increase calories 0-200 kCal/day Very active increase calories 200–400 kCal/day

| | **1 Year** | **2–3 Years** | **4–8 Years** | **9–13 Years** | **14–18 Years** |
|---|---|---|---|---|---|
| **Calories†** | 900 kcal | 1000 kcal | | | |
| Female | | | 1200 kcal | 1600 kcal | 1800 kcal |
| Male | | | 1400 kcal | 1800 kcal | 2200 kcal |

SOURCE : http://www.americanheart.org/presenter.jhtml?identifier=3033999

**Protein – Current DRI Recommendations** (3)
Based on 0.8 g/kg body weight for the reference body weight

**Infants**
0-6 months: 9.1 g/day
7 months-1 year: 11 g/day

**Children & Adolescents**
1-3 years: 13 g/day
4-8 years: 19 g/day
9-13 years (male): 34 g/day
9-13 years (female): 34 g/day
14-18 years (male): 52 g/day
14-18 years (female): 46 g/day

**Total Water (adequate intake)**
Current DRI Recommendations (3)
Total water includes all water contained in food, beverages and drinking water.

**Infants**

| | |
|---|---|
| 0-6 months: | 0.7 liters/day |
| 7 months-1 year: | 0.8 liters/day |

**Children & Adolescents**

| | |
|---|---|
| 1-3 years: | 1.3 liters/day |
| 4-8 years: | 1.7 liters/day |
| 9-13 years (male): | 2.4 liters/day |
| 9-13 years (female): | 2.1 liters/day |
| 14-18 years (male): | 3.3 liters/day |
| 14-18 years (female): | 2.3 liters/day |

**Basic Food Guide for Children**
To ensure that children receive adequate amounts of nutrients to promote growth and weight gain, MyPyramid was developed and released in 2005. Information can be accessed at www.MyPyramid.gov. (Children 2-5 years: http://www.mypyramid.gov/preschoolers/index.html; children 6-11 years: http://www.mypyramid.gov/kids/index.html) MyPyramid Food Guidance System reflects the USDA 2005 Dietary Guidelines.

MyPyramid for children 2-5 years is individualized with an interactive link; for older children, there is a pyramid available.

**USDA 2005 Dietary Guidelines**

- *Children and adolescents.* Consume whole-grain products often; at least half the grains should be whole grains. Children 2 to 8 years should consume 2 cups per day of fat-free or low-fat milk or equivalent milk products. Children 9 years of age and older should consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.
- *Children and adolescents.* Keep total fat intake between 30 to 35 percent of calories for children 2 to 3 years of age and between 25 to 35 percent of calories for children and adolescents 4 to 18 years of age, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- *Children and adolescents.* Engage in at least 60 minutes of physical activity on most, preferably all, days of the week.
- *Infants and young children, pregnant women, older adults, and those who are immunocompromised.* Do not eat or drink raw (unpasteurized) milk or any products made from unpasteurized milk, raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, raw or undercooked fish or shellfish, unpasteurized juices, and raw sprouts.

**Dietary Reference Intakes (DRI) for Children**

**Percentage of energy intake for carbohydrate, fat and protein**

- Carbohydrates – 45 to 65% of total calories
- Fat – 30 % to 40% (age 1year) per American Heart Association (AHA)
  30% to 35% (ages 2-3 years) per AHA
  25% to 35% (ages 4-18)
- Protein - 5% to 20% (ages 1-3)
  10% to 30% (ages 4-18)

**Fiber**

- Infants < 12 months – not determined
- 1-3 years 19g/ day
- 4-8 years 25 g/day
- 9-13 years (male) 31 g/day
- 9-13 years (female) 26 g/day
- 14-18 years (male) 38 g/day
- 14-18 years (female) 26 g/day

## PREGNANCY and BREAST FEEDING

**Dietary Guidelines for Pregnancy – USDA 2005 Dietary Guidelines**

- *Women of childbearing age who may become pregnant.* Eat foods high in heme-iron and/or consume iron-rich plant foods or iron-fortified foods with an enhancer of iron absorption, such as vitamin C-rich foods.
- *Women of childbearing age who may become pregnant and those in the first trimester of pregnancy.* Consume adequate synthetic folic acid daily (from fortified foods or supplements) in addition to food forms of folate from a varied diet.

MyPyramid.gov is personalized for women who are pregnant or breastfeeding. This resource is invaluable and can be found at http://www.mypyramid.gov/mypyramidmoms/index.html.

## GUIDES FOR NUTRITIONAL ASSESSMENT OF ADULTS WITH MENTAL RETARDATION AND DEVELOPMENT DISABILITIES

ADA states in the position paper for Providing Nutrition Services for Infants, Children, and Adults with Developmental Disabilities and Special Health Care Needs, *"nutrition services are essential components of comprehensive care for infants, children, and adults with developmental disabilities and special health needs.* (6)

| | **Minimal** | **In-depth** |
|---|---|---|
| **Anthropometrics** | Weight - no shoes, light clothing<br>Height - standing height, knee height | Skinfold - triceps and sub-scapular<br>Arm Circumference |
| **Clinical** | Review of past and present records of medical and dental examinations. | Health history to include consumer or family history of:<br>• Chronic disease<br>• Diabetes<br>• Cardiac disease<br>• Infections<br>• Anemia<br>• Constipation<br>• Diarrhea<br>• Food intolerance<br>• Pica<br>• Inborn errors of metabolism<br>• Malabsorption syndrome<br>Observation of general appearances, speech, oral hygiene |
| **Biochemical** | Complete blood count, cholesterol | Serum total protein, albumin, and pre-albumin, fasting blood glucose, serum urea nitrogen, transferrin saturation, quantitative urinary and amino acid screening<br>Other tests for special conditions, i.e.,<br>**Anticonvulsant treatment:** levels for folic acid, vitamin D, ascorbic acid, $B_6$.<br>**Prader-Willi syndrome**: glucose tolerance test.<br>**Pica**: lead, hemoglobin |
| **Dietary** | Intake history questionnaire<br>Food preferences | • 3 day dietary record kept by consumer/ parent / caregiver<br>• Activity record (as needed)<br>• Pertinent historical information related to eating habits<br>• Present influences on dietary intake |
| **Behavioral and Feeding Skill** | Consumer/parent/caregiver perception of eating skills and behavior | • Interview to determine eating skill and present level of functioning |

| | Minimal | In-depth |
|---|---|---|
| **Development** | Professional perception of eating skills and behavior | • Observation of oral structure and function.<br>• Observation of neuromuscular development including gross motor skills, head and trunk control, eye-hand coordination and position for feeding<br>• Observation of family/caregiver interaction, reinforcement patterns, and environmental influences |

**Determinants of Reasonable Body Weight for Adults with Mental Retardation / Developmental Disabilities**

**Steps to Determining Reasonable Weight**

1. Use the BMI or other method (Metropolitan Height and Weight Tables, the "rule of thumb" determination, NRC table of Suggested Weights for Adults or other) substituting the knee height factor for the height of people who cannot stand upright to be measured. Also see section on Anthropometric Measurement.

2. Use the table, "Determinants of Reasonable Body Weight" on the following pages to modify expectations of desirable weight for the specific individual.

**Note:** Because people with little or no mobility have little muscle mass, they can have a normal, but extremely low BMI. Look at other indicators of nutritional health status before deciding what desirable body weight is for these individuals (e.g., rate of infection, incidence of decubiti, etc.).

**Determinants of Reasonable Body Weight**

| Consideration | Energy Need | Comment |
|---|---|---|
| **Neurological status** | | |
| Hypotonia | - | ↓ muscle tone; ↓ calories used; ↓ physical activity |
| Hypertonia | + | ↑ muscle tone; ↑ calories |
| Oral motor dysfunction | + | Interferes with adequate nutrition: change texture to assist in obtaining adequate nutrients; energy cost for eating |
| Poor head control | + | Interferes with ability to eat / drink |
| Drooling | | Can contribute to sore lips and result in difficulty in eating / drinking; can contribute to fluid / electrolyte imbalance |
| **Medical conditions** | | |
| Seizure disorder | + | ↑ involuntary movements, medications can ↓ appetite/alter taste |
| Cerebral palsy, athetoid | - | ↓ muscle tone |
| Cerebral palsy, spastic | + | ↑ muscle tone |
| Reduced muscle mass | - | ↓ "expected" weight for height |
| Down's syndrome | - | Hypotonia, short stature, ↓ resting metabolic rate, possible hypothyroidism, ↓ pulmonary function, cardiac malformations, premature aging |
| Prader-Willi syndrome | - | Insatiable appetite; ↓ linear growth; behaviors include food seeking, sneaking and gorging; little to no gag reflex |
| GI disturbances (GERD, vomiting, constipation) | + | Pain / aversion to eating / drinking |
| Chronic infections | + | |

| Consideration | Energy Need | Comment |
|---|---|---|
| **Health History** | | |
| Weight history, long term (>6 mo) | | Over and under: if consistent, with no change after intervention and without other health problems, then that is the person's reasonable body weight |
| Weight history, short term (<6 mo) | | Loss / gain > 10 lb. - indicative of acute problem and must be addressed immediately |
| Ambulation:<br>self ambulates<br>nonambulatory<br><br>assisted self ambulation | <br>+<br>-<br><br>+ / - | <br>The more active, the more energy needed (true in reverse also) Less energy needed, ↓ muscle mass<br><br>With electric wheelchairs expend little energy; use of mechanical wheelchairs, crutches, walkers, canes expend energy |
| Dental status; poor | + | Dental caries / periodontal disease can interfere with adequate intake |
| Drug Nutrient Interactions | + / - | Can result in nausea, vomiting, constipation, anorexia, altered taste / smell sensations, vitamin / mineral deficiencies, lethargy, mouth discomfort (gum hyperplasia / dry mouth), etc. See Drug-Nutrient Interaction Handbook for specifics. |
| **Behavioral issues** | | |
| Food used as reward | | Is there a non-food reward that can be substituted? If not, is the food used appropriate for the client's health status? |
| Diet compliance | | Does the client understand the reason for the meal changes? Is the diet recommendation reasonable, achievable, and culturally appropriate? |
| Stealing / hoarding | | Is behavior a result of the living situation (threat by room / house mate) / new to community setting / attention getting behavior / inadequate time for meals - recommend behavior intervention |
| Rumination | + | Possible inadequate intake because sensation of satiety distorted |
| Self stimulating behaviors | + | Expend extra energy, recommend behavior intervention |

Key to Symbols: + high calorie needs ↑ increase
- low calorie needs ↓ decrease

**TRADITIONAL CLASSIFICATION OF VEGETARIAN DIETS**

| Classification | Foods Included | Foods Excluded |
|---|---|---|
| Lacto-ovo vegetarian | Fruits, grains, legumes, nuts, seeds, vegetables, milk, milk products, eggs | Meat, poultry, fish, seafood |
| Lacto-vegetarian | Fruits, grains, legumes, nuts, seeds, vegetables, milk, milk products | Meat, poultry, fish, seafood, eggs |
| Ovo-vegetarian | Fruits, grains, legumes, nuts, seeds, vegetables, eggs | Meat, poultry, fish, seafood, milk, milk products |
| Vegan | Fruits, grains, legumes, nuts, seeds, vegetables | Meat, poultry, fish, seafood, eggs, milk, milk products, honey |
| Macrobiotic | Unrefined/unprocessed grains, commonly brown rice, with smaller amounts of fruits, vegetables and legumes; milk and milk products optional | Meat, poultry, fish (by some), eggs, processed foods, *Solanace* species (i.e., tomatoes, eggplants and potatoes), supplements (by some) |
| Fruitarians | Raw fruits, nuts, seeds, berries | All other foods |

**FINGER FOOD DIET**

**Objective:** To provide food which is of a consistency that can easily be eaten by hand.

**Indications:** For residents who are unable or will not use silverware to feed themselves or who may do harm to oneself or others.

**General Information:**

1. All foods can be eaten without the aid of utensils.
2. The sodium and sugar content of this diet may make it difficult to combine with all type of therapeutic diets.
3. This texture modification cannot be combined with any other texture modifications (i.e., pureed or mechanical soft).

**Nutritional Adequacy:** This diet can be planned to meet the DRI guidelines.

**Specifics of the Diet**

| FOOD GROUP | FOODS ALLOWED | FOODS TO AVOID |
|---|---|---|
| Beverages | All | None |
| Bread and Cereals | Any breads or rolls which can be picked up to eat by hand.<br>Cold cereals that are formed in large pieces, served without milk. | Hot cereals |
| Desserts | Cookies, cake cut into pieces prior to meal service, ice cream bars, pudding pops, gelatin cubes, bar cookies, tarts, eclairs, donuts, ice cream cones, popsicles, turnovers. | Pies, pudding, gelatin-based desserts, crisps, cobblers. |
| Eggs | Scrambled, poached, fried, omelets cut into small pieces, hard-boiled. | None |
| Fats | All | None |
| Fruits | Canned fruits cut into bite-sized pieces or slices. Any fresh fruit cut into pieces or served whole if able to bite off pieces. | Canned halves of fruits, applesauce or other pureed fruits. |
| Meat, fish, poultry, cheese, legumes | Meats are sliced and placed between bread to serve as a sandwich cut into fourths prior to meal service. Meat patties, cut into bite-sized pieces. Chicken legs, thighs, wings and breasts if not in a sauce. Slices or chunks of cheese. Peanut butter on crackers. Any chicken or fish nuggets, fish sticks. | Cottage cheese, meats covered with gravy or thick sauces, large pieces of meats. Casseroles |
| Potatoes or substitute | Tater tots, boiled or baked potatoes cut into pieces. | Rice, mashed, creamed, scalloped or au gratin potatoes, pasta, spaghetti, macaroni and cheese, tuna noodle, etc. and other casseroles, stuffing and dressing. |
| Soups | All if served in a mug. Avoid adding too many crackers or it will be necessary to use a spoon to eat. | None if served in a mug |
| Vegetables | Raw vegetable pieces, any vegetables cooked to crisp-tender texture, corn on the cob, large slices of vegetables, corn nuggets, butter dipped vegetables, vegetable juices. | Vegetable casseroles, spinach, very soft vegetables, corn, peas, mixtures of small vegetable pieces may be very tiresome to eat. Vegetable salads with sauces. |
| Sugars, sweets | All | Any that are gooey or need to be eaten by spoon. |
| Miscellaneous | Popcorn, pickles, olives, nuts, salt, pepper | Relish only if on a food, cream sauces, gravies. |

Diet developed by: Mary Auch, MS, RD. May be copied for facility use. For more information www.dhccdpg.org

**References**


1. Nicklas T, Hayes, D. American Dietetic Association. Position of the American Dietetic Association: Nutritional guidance for healthy children ages 2 to 11 years. J Am Diet Assoc. 2008 Apr;108:1038-1047
2. Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals. Available at www.iom.edu/Object.File/Master/21/372/0.pdf (accessed 18 July 2009
3. James DC, Dobson B. American Dietetic Association. Position of the American Dietetic Association: Promoting and supporting breastfeeding. J Am Diet Assoc. 2005 May;105(5):810-818.
4. American Dietetic Association. Providing nutrition services for infants, children, and adults with developmental disabilities and special health care needs. J Am Diet Assoc. 2004 Jan;104(1):97-107.
5. Heinrichs, E, Rokusek, C. Nutrition and Feeding for Persons with Special Needs. South Dakota University Affiliated Program (SDUAP) University of South Dakota School of Medicine and the South Dakota Department of Education & Cultural Affairs - Child and Adult Nutrition Services, Pierre, SD. 1992.

# MEDICATIONS

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *Acetaminophen* Tylenol [1], [4] | Analgesic, antipyretic | Glass of water; with or without food; normal diet | avoid alcohol | Swelling of tongue, GI distress | Liver disease, frequent alcohol use; any serious medical condition |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a681004.html | | | | |
| *Albuterol* VoSpire ER [4] | Bronchodilator | With water or other liquid; normal diet | | GI distress; appetite changes | Irregular heartbeat, heart disease, high blood pressure, hyperthyroidism, diabetes, seizures |
| **Caution:** **URL:** | **Caution:** Pregnancy, breast-feeding **URL:** http://www.nlm.nih.gov/medlineplus/druginfo/meds/a607004.html | | | | |
| *Alendronate* Fosamax [4] | Biphosphenate Osteoporosis | Take with 1c (8oz) of plain water; follow with at least 1/4c (2oz) of water; avoid food or any other fluids for 30min. | Do not take with any liquid other than plain water | GI distress; taste changes | Any esophageal disorder; anemia; vitamin D deficiency; swallowing difficulty; heartburn; ulcers; disease of mouth, teeth, or gums; kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601011.html | | | | |
| *Allopurinol* Aloprim [4] Zyloprim [4] | Xanthine oxidase inhibitor Hyperuricemia Gout | After meal; drink at least 8 glasses of water or other fluids daily unless otherwise instructed | | GI distress | Kidney/liver disease, heart failure |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682673.html | | | | |
| *Alprazolam* Xanax XR CIV (extended-release) [4] | Benzodiazepine Depression Anxiety | Taking Xanax XR within 2h of high fat meal may affect bioavailability | | | Alcoholism, liver and renal disease, obesity, glaucoma, pregnancy |
| **Caution:** **URL:** | Caution with older adult http://www.pfizer.com/files/products/uspi_xanax_xr.pdf | | | | |
| *Aluminum hydroxide* Aluminum hydroxide [4] | Antacid Heart Burn Acid Indigestion | Depends on form: follow prescription or dosing instructions on the med | | Constipation, loss of appetite | History of hypertension, heart/kidney disease, GI bleed |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699048.html | | | | |
| *Amaryl* Glimepiride [4] | Oral hypoglycemic | Take with food; follow a diabetic appropriate diet | Avoid alcohol | Hypoglycemia, dyspepsia, nausea, diarrhea, constipation | Kidney disease or ketoacidosis |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a696016.html | | | | |
| *Amitriptyline [4]* Elavil | Antidepressant | Take with food | Increased fiber, decreases effect of drug, limit caffeine | GI Distress, weight gain, increased appetite | heart attack, ETOH abuse, glaucoma, DM, schizophrenia, liver, kidney or heart disease |
| **Caution:** **URL:** | Pregnancy, older adult, cardiac disorder, children 18 and younger, surgery http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682388.html | | | | |
| *Amoxicillin* Amoxil [4] | Penicillin-like antibiotic | With or without food; with full glass of water; normal diet | | GI distress | Kidney disease, allergies, asthma, hives, phenylketonuria |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a685001.html | | | | |
| *Aspirin and Extended-Release Dipyridamole* Aggrenox [4] | Antiplatelet Analgesic | Follow regular diet | | GI distress | Liver, kidney, or heart disease; history of heart attack; low blood pressure; vitamin K deficiency; ulcers; pregnancy; asthma, rhinitis, nasal polyps; alcohol consumption >3 drinks/day |
| **Caution:** **URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699053.html | | | | |
| *Atenolol* Tenormin [4] | Beta-blocker Cardiac Arrhythmias | Follow low salt diet if ordered by physician | | Nausea, diarrhea, swelling of extremities, unusual weight gain | Lung disease, diabetes, severe allergies, hyperthyroidism, pheochromocytoma, heart failure, slow heart rate, circulatory problems, heart or kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684031.html | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *Atorvastatin* Lipitor [4] | Statin Hyperlipidemia | With or without food; low cholesterol, low fat diet | Excessive amount grapefruit juice (more than 1 quart/day); avoid alcohol | GI distress | Liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a600045.html | | | | |
| *Azithromycin* Zithromax [4] | Macrolid antibiotic | With or without food; with full glass of water; normal diet | | GI distress | Cystic fibrosis, HIV, irregular heartbeat, kidney/liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697037.html | | | | |
| *Benztropine mesylate* Cogentin [4] | Anticholinergic, Akathisia Parkinson's | With food or milk | Avoid alcohol | GI distress | Kidney/liver disease, glaucoma, heart or blood pressure problems, myasthenia gravis, problems with urinary system, prostate, or stomach |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682155.html | | | | |
| *Bupropion* Wellbutrin [4] | Anti-depressant | With food if stomach upset occurs; normal diet | | GI distress | Seizure, anorexia nervosa or bulimia, alcohol use |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a695033.html | | | | |
| *Calcitonin [4]* Miacalcin | Prevents bone breakdown and increases bone density Osteoporosis | With or without food | Increase Calcium and Vit D | GI distress, joint pain, runny nose | |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601031.html | | | | |
| *Calcium Carbonate* Calcichew [4] Titralac [4] *Calcium Acetate* Phos Lo [4] Phosex *(4)* *Lanthanum* Fosrenol [4] *Sevelamer* Renvela [4] Renagel [4] | Phosphate binder Renal Dialysis | Take with meals and or snacks, follow prescription for dosing | Low iron absorption; ineffective if taken with calcium supplement | GI distress | Ulcer, ulcerative colitis, Crohn's or bowel obstruction |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a605015.html | | | | |
| *Carbidopa-Levodopa* Sinemet [2], [3], [4] | Anti-Parkinson's | Glass of water, 30 minutes before or 1 hour after meals | High protein diet; iron supplement. Avoid foods high in fat or fiber at time carbidopa levodopa is taken. | GI distress, appetite loss, dry mouth | Diabetes, kidney/liver/ circulatory/lung/ heart disease, GI disease, food allergies; hormone problems, asthma, emphysema, mental illness, ulcers, heart attack, irregular heartbeat; phenylketonuria |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601068.html | | | | |
| *Carvedilol* Coreg [4] | Beta-blocker Cardiac Arrhythmias | Take with food; normal diet | Avoid alcohol | Hyperglycemia, extreme hunger and/or thirst; GI distress; swelling of extremities | Circulatory problems, diabetes, low blood sugar, hyperthyroidism, low blood pressure, angina, asthma, pheochromocytoma |
| **Caution:** **URL:** | Pregnancy, breast-feeding; alcohol use http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697042.html | | | | |
| *Celecoxib* Celebrex [4] | NSAID Cox-2 inhibitors analgesic | With or without food, unless taking more than 200mg take with food | | GI distress, heart attack, stroke | Edema, CHF, HTN |
| **Caution:** **URL:** | Asthma, pregnancy, breast-feeding, surgery; caution use with the older adult http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699022.html | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *Chlorothiazide*<br>Diuril [4] | Diuretic<br>CHF<br>HTN | With meals or a snack; ask physician about using low salt diet and adding foods high in potassium | | GI distress, appetite loss | Diabetes, gout, kidney/liver/thyroid/parathyroid disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682341.html | | | | |
| *Chlorthalidone*<br>Hygroton [4] | Antihypertensive | Take in am with milk or food | Avoid licorice, alcohol, may need decreased NA, kcal and increased K diet | Increased glucose, decreased BP, loss of appetite | DM, gout, kidney, liver, thyroid or parathyroid disease |
| **Caution:**<br>**URL:** | Pregnancy<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682342.html | | | | |
| *Cimetidine*<br>Tagamet [4] | $H_2$ blocker<br>Heart Burn<br>Peptic Ulcers | With meals, with glass of water; normal diet | If using antacids, digoxin, ketoconazole, or iron salts, take them 2hrs before cimetidine | Diarrhea | HIV, AIDS, kidney, liver disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682256.html | | | | |
| *Ciprofloxacin*<br>Cipro [4] | Antibiotics (fluoroquinolones) | Do not take with dairy products or calcium-fortified juices except when taking with meal | Limit caffeine-containing products to mitigate stimulant effect of caffeine | GI distress | Irregular heartbeat, low level of potassium in blood, cerebral arteriosclerosis, seizures, liver disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a688016.html | | | | |
| *Citalopram*<br>Celexa [4] | SSRI<br>Antidepressant<br>Depression<br>Mood Disorders | With or without food; normal diet | Certain nutritional supplements and herbal products (ex, St. John's Wort or tryptophan), avoid alcohol | GI distress, dry mouth, appetite loss | Heart attack, seizures, liver/kidney/heart disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding;<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699001.html | | | | |
| *Clonidine*<br>Catapres [4] | Centrally acting alpha-agonist hypotensive agent | Low-salt or low-sodium diet if prescribed by physician | | GI distress | Stroke, recent heart attack, heart/kidney disease |
| **Caution:**<br>**URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682243.html | | | | |
| *Sulfamethoxazole-Trimethoprim*<br>Bactrim [4]<br>Septra | Sulfa drug<br>Bactericidal | With full glass of water and with food | | GI distress; loss of appetite | Liver/kidney disease, asthma, severe allergies, glucose-6-phosphate dehydrogenase, or G6PD deficiency |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684026.html | | | | |
| *Cyproheptadine HCL*<br>Periactin [4] | Antihistamine | Normal diet | Avoid alcohol | Dy mouth, nausea, drowsiness | Asthma, glaucoma, ulcers, enlarged prostate, heart disease, high blood pressure, seizures, overactive thyroid gland |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding, not recommended for use in the older adult due to anticholinergenic effects<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682541.html | | | | |
| *Desipramine HCL*<br>Norpramin [4] | Tricyclic antidepressant | With or without food; normal diet | Avoid alcohol | GI distress, appetite or weight changes | Recent heart attack, glaucoma, enlarged prostate, difficulty urinating, seizures, overactive thyroid gland, schizophrenia; |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| | | | | | liver, kidney, or heart disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682387.html | | | | |
| *Digoxin* Lanoxin [3] [4] | Antiarrhythmia | Glass of water without food, 1 hour before or 2 hours after meals; low salt and/or high potassium diet if instructed by doctor | Potassium, diet pills; high fiber diet, avoid alcohol | Swelling of tongue, GI distress | Kidney/liver disease, food allergies, thyroid problems, heart arrhythmia, cancer |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682301.html | | | | |
| *Diltiazem* Cardizem [4] | Calcium-channel blocker<br>HTN | Depends on form | Hawthorn herbal supplement, red yeast rice; grapefruit (There are differing opinions on grapefruit) | Swelling of tongue, bleeding, GI distress, constipation | Liver/heart/kidney disease, heart attack, narrowing of esophagus, low blood pressure |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684027.html | | | | |
| *Docusate sodium* D.O.S. [3], [4] | Stool-softener | Glass of water; stay hydrated to prevent constipation | | Swelling of tongue, GI distress | GI disease, food allergies |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601113.html | | | | |
| *Donepezil hydrochloride* Aricept [3], [4] | Dementia | Glass of water; with or without food; normal diet [4] | | Swelling of tongue, GI distress, weight loss, heart burn, appetite loss, dehydration | Liver disease, GI disease, food allergies, asthma, COPD, heart disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697032.html | | | | |
| *Dronabinol* Marinol [4] | Cannabinoids<br>Analgesic | | Alcohol | GI distress, appetite stimulant<br>Cautions with geriatrics | Substance abuse, heavy alcohol use, heart disease, high blood pressure, seizures, dementia, mental illness, depression |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a607054.html | | | | |
| *Enalapril Maleate* Vasotec [3], [4] | ACE inhibitor<br>HTN<br>CHF | With or without food; with glass of water; low salt diet if ordered by physician | Potassium supplement, salt substitute, alcohol use | Blistering of skin inside mouth | Heart or kidney disease, lupus, scleroderma, diabetes, angioedema |
| **Caution:**<br>**URL:** | Pregnancy or breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a686022.html | | | | |
| *Famotidine* Pepcid [4] | H2 blocker<br>Heart Burn<br>Peptic Ulcers | With full glass of water; normal diet | | Constipation, diarrhea | Phenylketonuria, impaired swallow, kidney disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a687011.html | | | | |
| *Fexofenadine* Allegra [4] | Antihistamine | With water; normal diet | Fruit juice | GI distress | Kidney disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697035.html | | | | |
| *Furosemide* Lasix [3], [4] | Diuretic | With water; with food if you have GI distress; low salt/high potassium diet if ordered by doctor | Avoid alcohol | Dry mouth, GI distress, loss of appetite | GI disease, kidney/liver disease, food allergies, diabetes, gout |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682858.html | | | | |
| *Gabapentin* Neurontin [4] | Anticonvulsant | Full glass of water; normal diet | Avoid alcohol | GI distress, dry mouth, weight gain, swelling of extremities | Kidney disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a694007.html | | | | |
| *Galantamine HBr*<br>*Nivalin*<br>*Reminyl*<br>Razadyne [4] | Acetylcholinesterase inhibitor<br>Alzheimer's Disease | With food; drink 6-8 glasses of water every day; normal diet | | GI distress, loss of appetite, weight loss | Asthma, other lung disease, enlarged prostate, ulcers, seizures, irregular heartbeat, heart/kidney/liver disease |
| **Caution:** | Pregnancy, breast-feeding | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| **URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699058.html | | | | |
| *Glipizide* [4] Glucotrol | Oral hypoglycemic, stimulates pancreas to lower blood sugar, DM II | Take 30 minutes before breakfast; follow a diabetic appropriate diet | Avoid alcohol | Hypoglycermia, GI distress, dermatitis, discoloration of urine or BM | Kidney, liver, heart, or thyroid disease or a severe infection |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684060.html | | | | |
| Glyburide Micronase [4], Diabeta [4], Glynase Prestab [4] | Oral hypoglycemic, stimulates pancreas to lower blood sugar, DM II | Take with food; follow a diabetic appropriate diet | Avoid alcohol | Hypoglycemia, dyspepsia, nausea, diarrhea, constipation | Kidney, liver, heart, or thyroid disease or a severe infection |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684058.html | | | | |
| *Hydromorphone HCL* Dilaudid [4] | Pain-reliever | With food or milk | Avoid alcohol | GI distress | Liver or kidney disease, history of alcoholism, lung or thyroid disease, heart disease, prostatic hypertrophy, urinary problems |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682013.html | | | | |
| *Ibuprofen* Advil [4] | NSAIDs | With food or milk; normal diet | | Diarrhea or constipation | Family history or personal history of heart disease, heart attack, stroke; personal history of smoking, high cholesterol, high blood pressure, diabetes; asthma, swelling of extremities, lupus, liver/kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding, phenylketonuria http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682159.html | | | | |
| *Lactulose* [4] Cholac Constulose Enulose Evalose Generlac Heptalac Kristalose | Laxative Remove ammonia from blood in liver patients | With or without food | Do not take antacids | GI distress, gas, diarrhea | DM, lactose or galactose intolerant |
| **Caution:** **URL:** | Long term use in older adult may decrease electrolytes http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682338.html | | | | |
| *Levofloxacin Oral tablet* Levaquin [1], [2], [4] | Quinolone antibiotic | Take with 8 oz water; with or without food. Avoid calcium, iron, and zinc sources for 4 hours before and 2 hours after dose; increase fluid intake; drink at least 8 -10 cups per day | Dairy, multivitamin, all foods rich in calcium and iron; enteral feedings; avoid caffeine | Swelling of tongue, diarrhea, dry mouth, GI distress | Diabetes Decreased renal function Seizure disorders |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697040.html | | | | |
| *Levothyroxine* Synthroid [4] | Thyroid hormone | On an empty stomach; 1/2-1hour before breakfast; normal diet | Take fiber, iron, calcium, magnesium or folate supplements separate by 4 hours and soy products by 2-3 hours | Weight changes | Diabetes, atherosclerosis, kidney disease, hepatitis, high blood pressure, angina, arrhythmia, heart attack, under active adrenal or pituitary |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682461.html | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *linezolid* Zyvox [4] | Oxazolidinone Antibiotic | With or without food | High tyramine foods (alcoholic beverages, alcohol-free beer, aged or processed cheeses, sauerkraut, yogurt, raisins, bananas, sour cream, pickled herring, liver, dry sausage, canned figs, avocados, soy sauce, turkey, yeast extracts, papaya products, meat tenderizers, fava beans, broad bean pods) | GI distress | High blood pressure, carcinoids, pheochromocytoma, overactive thyroid, phenylketonuria |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a602004.html | | | | |
| *Lorazepam* Ativan [4] | Anti-anxiety | | Avoid alcohol | Dry mouth, diarrhea, nausea, changes in appetite | Glaucoma; seizures; lung, heart, or kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682053.html | | | | |
| *Lovastatin* Mevacor [4] | Statin Hyperlipidemia | With meals; follow low fat, low cholesterol diet | Excessive amount grapefruit juice (more than 1 quart/day); avoid alcohol | Constipation | Liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a688006.html | | | | |
| *Magnesium Gluconate* [4] Almora Magtrate Magnoate | Supplement for low blood magnesium | Take with food, take with 8 oz water; increase fluid and fiber intake | Take fiber, iron or folate supplements separately by at least 2 hours | GI discomfort, diarrhea | Kidney disease, stomach problems, or intestinal disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601072.html | | | | |
| *Magnesium hydroxide* Magnesium hydroxide [4] | Laxative | | | GI distress | Kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601073.html | | | | |
| *Magnesium oxide* Magnesium oxide [4] | Antacid, laxative, or magnesium supplement | | | Cramping, diarrhea | Heart, kidney, liver, or intestinal disease; high blood pressure |
| **Caution:** **URL:** | Pregnancy or breast-feeding; any special diet http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601074.html | | | | |
| *Megestrol* Megace, megace ES [4] | Appetite Stimulant in cancer patients | Normal diet; take with food to decrease GI distress | | GI distress | Blood clot, stroke, diabetes, kidney or liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682003.html | | | | |
| *Memantine HCl* Namenda [4] | NMDA receptor antagonist Alzheimer's Disease | With or without food | Vegetarian diet; large amounts of citrus fruits, vegetables, beans, or peas | GI distress | Asthma, seizures, kidney disease, repeated urinary tract infections |

| *Generic Name* Trade/brand name | Class of Drug / Indication / Use | How to take | Possible nutrient interactions | Side-effects related to nutrition | Pre-existing condition alert (associated with nutrition) |
|---|---|---|---|---|---|
| **Caution:** **URL:** | Pregnancy, breast-feeding; use of tobacco products http://www.nlm.nih.gov/medlineplus/druginfo/meds/a604006.html | | | | |
| *Meperidine* Demerol [4] | Narcotic analgesic | With or without food; normal diet | | GI distress; dry mouth | History of alcohol abuse, recent surgery, Addison's disease, head injury, mental illness, asthma, COPD, sickle cell anemia, pheochromocytoma, curvature of spine, enlarged prostate, urethral stricture, irregular heartbeat, seizures, GI distress; thyroid, liver, kidney, or lung disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682117.html | | | | |
| *Metformin* [4] Glucophage Glucophage XR Fortamet Glumetza Riomet | Oral hypoglycemic | Take with food; follow a diabetic appropriate diet | avoid alcohol | Lactic acidosis, GI distress, chest pain, loss of appetite | Heart attack; stroke; high blood pressure; diabetic ketoacidosis, heart, kidney, lung, or liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding | | | | |
| *Methotrexate (MTX)* Rheumatrex [4] | Antimetabolite Cancer/ Chemotherapy Autoimmune disorders | Depends on condition being treated; normal diet unless otherwise directed | | Sensitive gums; loss of appetite, anemia, neutropenia | History of fluid in abdomen or around lungs, kidney/liver/lung disease; folate deficiency; alcohol abuse |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/ency/article/002586.htm | | | | |
| *Methylcellulose* Citrucel [4] | Fiber supplement | Take with 8 oz of water, may mix in juice for increased acceptance, increase fluid and fiber intake | | GI discomfort | Diabetes mellitus, heart disease, high blood pressure, kidney disease, rectal bleeding, intestinal blockage, or difficulty swallowing. |
| **Caution:** **URL:** | | | | | |
| *Metoclopramide* Reglan [4] | Antiemetic Nausea/Vomiting | Take ½ hour before meals and at bedtime | Avoid alcohol | Constipation, diarrhea | Adrenal tumor, seizures, Parkinson's disease, high blood pressure, depression, heart/liver/kidney disease, intestinal blockage or bleeding; history of mental illness, suspected bowel obstruction |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a684035.html | | | | |
| *Metoprolol* Lopressor [3], [4] | Beta-blocker Cardiac Arrhythmias | With or immediately after meals | Avoid alcohol | Weight gain, GI distress, dry mouth | Diabetes, kidney disease, liver disease, thyroid disease, food allergies; slow heart rate, heart failure, problems with blood circulation, pheochromocytoma, lung/heart disease, diabetes |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682019.html | | | | |
| *Metronidazole* Anamet [4] | Antibiotic | | Avoid alcohol | GI distress, appetite and taste changes, dry mouth, irritation of mouth | Blood, kidney, liver disease; Crohn's disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding, http://www.nlm.nih.gov/medlineplus/druginfo/meds/a689011.html | | | | |
| *Mirtazapine* Remeron [3], [4] | Anti-depressant | Full glass of water | St. John's Wort, foods high in tryptophan (meat, dairy, soy); avoid alcohol | Swelling of tongue, GI distress, constipation, appetite increase, weight gain, dry mouth | Kidney/liver/heart disease, food allergies, heart attack, low blood pressure, high cholesterol |
| **Caution:** **URL:** | Pregnancy, breast-feeding; http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697009.html | | | | |
| *Morphine* Morphine [1], [4] | Opiate analgesic | Glass of water; with food if you have GI distress; plenty of fluids daily | Avoid alcohol | GI distress, constipation | Frequent alcohol-use, GI disease, liver disease, food allergies, history of major surgery, difficulty swallowing, head injury, lung disease, seizures, mental illness, enlarged prostate, low blood pressure, irregular heartbeat, Addison's disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *Nateglinude* Starlix [4] | Oral hypoglycemic, stimulates pancreas to lower blood sugar, DM II | Take with food; follow a diabetic appropriate diet | Avoid alcohol | GI distress, nasal congestion, runny nose | liver or pituitary disease, adrenal insufficiency, diabetic ketoacidosis, neuropathy |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699057.html | | | | |
| *Nitroglyceri n* Nitrotab [4] | Vasodialator angina CHF HTN | Extended-release form: take on empty stomach with full glass of water | | Upset stomach | Anemia |
| **Caution:** **URL:** | Pregnancy, breast-feeding; alcohol http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601086.html | | | | |
| *Olanzapine* Zyprexa [4] | Atypical antipsychotics | Plenty of water daily; with or without food | Avoid alcohol; grapefruit and grapefruit juice (mixed evidence) | Constipation, weight gain, dry mouth, high blood sugar | Phenylketonuria; history of substance abuse; stroke, mini-stroke, heart disease, heart attack, irregular heartbeat, seizures, breast cancer, impaired swallow, high or low blood pressure, liver or prostate disease, intestinal blockage, glaucoma; personal or family history of diabetes; side effects caused by medication used for mental illness |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601213.html | | | | |
| *Omeprazole* Prilosec [4] | Proton-pump inhibitor Dyspepsia PUD GERD | Depends on form: usually on empty stomach with water (no other liquid) 1hour before breakfast | Limit high-calcium foods | GI distress | Liver disease, history of low salt diet or low blood potassium |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a693050.html | | | | |
| *Oxybutinin* Ditropan [4] | Anticholinergenic Urinary Incontinence | With or without food | Grapefruit and grapefruit juice (mixed evidence); avoid alcohol | Dry mouth, GI distress, taste changes | Ulcerative colitis, GERD, hiatal hernia, hyperthyroidism, irregular heartbeat, high blood pressure, heart/liver/kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682141.html | | | | |
| *Paroxetine* Paxil [4] | SSRI Antidepressant Depression Mood Disorders | With or without food; normal diet | Herbal products and nutritional supplements (ex., St. John's Wort, tryptophan); avoid alcohol | GI distress, appetite loss, weight changes, dry mouth, dental problems | Substance abuse, heart attack, glaucoma, seizures, bleeding from stomach or esophagus, liver/kidney/heart disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a698032.html | | | | |
| *Phenytoin* Dilantin [4] | Anticonvulsant | Normal diet | | Nausea, vomiting | History of extreme alcohol use; diabetes; porphyria; kidney or liver disease |
| **Caution:** **URL:** | Tube-feeding; pregnancy http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682022.html#why | | | | |
| *Phosphate, phosphorus* Phosphate, phosphorus [4] | Mineral supplement | | Calcium, vitamin D, pumpkin seeds, potassium supplement, alcohol | Altered mineral levels, dehydration, metabolic acidosis, acute kidney failure, GI distress, swelling of extremities | |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-phosphorus.html | | | | |
| *Pioglitazone* Actos [4] | Thiazolidinediones improve glucose control DM | With or without food; healthy diet with exercise | | Increased appetite | CHF, heart defect at birth, swelling of extremities, heart disease, high cholesterol or fat, high blood pressure, coronary artery disease, heart attack, irregular heartbeat, liver disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a699016.html | | | | |
| *Polyethylene glycol 3350* Miralax [4] | Osmotic laxative | Follow high fiber diet; consume at least 1500ml fluid daily. | | GI distress | Bowel obstruction |
| **Caution:** | Pregnancy, breast-feeding | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| **URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a603032.html | | | | |
| *Potassium*<br>Klor-Con [4]<br>Klotrix [4] | Mineral supplement | Full glass of water or fruit juice | Ask physician about use of salt substitutes | GI distress | Heart, kidney, or Addison's disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601099.html | | | | |
| *Potassium chloride* K-Tab [2], [3], [4] | Mineral supplement | Full glass of water or fruit juice; with food. | High potassium foods | Swelling of tongue, painful swallow, heartburn, GI distress | Dehydration, diabetes, heart/kidney disease, GI disease, food allergies; Addison's disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601099.html | | | | |
| *Pramipexole*<br>Mirapex [4] | Dopamine agonist<br>Parkinson's Disease<br>RLS | With or without food; normal diet | Avoid alcohol | GI distress; appetite/weight loss; dry mouth | Low blood pressure; heart or kidney disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697029.html | | | | |
| *Prednisone*<br>Prednisone [4] | Corticosteroid | With food | Herbals (esp St. John's Wort); grapefruit and grapefruit juice (mixed evidence); diet as prescribed by physician | GI distress, weight gain, swelling | Eye infection, threadworm, diabetes, high blood pressure, myasthenia gravis, osteoporosis, seizures, ulcers, liver/kidney/GI/heart/thyroid disease |
| **Caution:**<br>**URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601102.html | | | | |
| *Psyllium* [4] Metamucil | Bulk-forming laxative | Take with 8 oz of water, may mix in juice for increased acceptance, increase fluid and fiber intake | Low sugar or low sodium diet | GI discomfort | Diabetes mellitus, heart disease, high blood pressure, kidney disease, rectal bleeding, intestinal blockage, or difficulty swallowing. |
| **Caution:**<br>**URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601104.html | | | | |
| *Quetiapine*<br>Seroquel [4]<br>Ketipinor[4] | Atypical antipsychotics<br>Schizophrenia<br>Bipolar OCD | Increase fluid intake; drink at least 8-10 cups per day | Alcohol; grapefruit and grapefruit juice | High blood sugar, extreme thirst | Phenylketonuria; personal or family history of diabetes; substance abuse, impaired swallow, seizures, high cholesterol, high or low blood pressure, heart attack, stroke, breast cancer, thyroid/heart/liver disease, side effects with medication for mental illness |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a698019.html | | | | |
| *Risedronate*<br>Actonel [4] | Biphosphenate<br>prevent Osteoporosis<br>Paget's Disease of bone | On an empty stomach, with 6-8oz of water (follow schedule doctor provides) | Avoid alcohol | GI distress | Impaired swallow, heartburn, ulcers or other GI disease, anemia, cancer, infection, gum or mouth disease, blood clotting disorder, kidney disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601247.html | | | | |
| *Rivastigmine*<br>Exelon [4] | Cholinesterase inhibitor<br>Dementia | With meals; normal diet | | GI distress, appetite loss | Asthma, ulcers, heart/lung disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a602009.html | | | | |
| *Senna*<br>Bisacodyl [4] | Stimulant laxative | With 8oz of water, on an empty stomach; high fiber diet with 6-8 glasses of fluid daily | Low-sugar, low-calorie, low-sodium diet may interfere | GI distress | Diabetes, heart disease, high blood pressure, GI disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601112.html | | | | |
| *Sertraline*<br>Zoloft [4] | SSRI<br>Antidepressant<br>Depression<br>Mood Disorders | Normal diet; mix concentrate form with 4oz (1/2c) of water, ginger ale, lemon or lime soda, lemonade, or orange juice. | | GI distress, dry mouth, appetite loss, weight changes | Heart attack, seizures, liver/heart disease |
| **Caution:**<br>**URL:** | Pregnancy, breast-feeding; alcohol<br>http://www.nlm.nih.gov/medlineplus/druginfo/meds/a697048.html | | | | |

| *Generic Name* **Trade/brand name** | **Class of Drug / Indication / Use** | **How to take** | **Possible nutrient interactions** | **Side-effects related to nutrition** | **Pre-existing condition alert (associated with nutrition)** |
|---|---|---|---|---|---|
| *Spironolactone* Aldactone [4] | Aldosterone receptor antagonist Potassium Sparing Diuretic | Reduced salt diet, regular exercise | Potassium supplement and high potassium foods (bananas, prunes, raisin, orange juice, potassium-containing salt sub); avoid alcohol | GI distress, dry mouth, thirst | Liver and kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682627.html | | | | |
| *Trazodone* Trazodone [4] Desyrel [4] | Serotonin modulator antidepressant | With a meal or light snack | Grapefruit and grapefruit juice (mixed evidence); avoid alcohol; herbals, esp. St. John's Wort; | GI distress, appetite/taste/weight changes, dry mouth | Electroshock therapy, cancer, heart attack, irregular heartbeat, high blood pressure, HIV, AIDS, heart disease, low white blood cell count |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a681038.html#special-dietary | | | | |
| *Valproic acid* Depakene [4] | Anticonvulsant | Depends on form; normal diet; increase fluid intake; drink at least 8-10 cups per day | Avoid alcohol | GI distress, appetite or weight changes | Family history of urea cycle disorder or sudden unexplained death; personal history of vomiting, extreme fatigue/irritability, confusion, loss of consciousness, difficulty coordinating movements, HIV, cytomegalovirus, hyperlipidemia, kidney disease |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682412.html | | | | |
| *Valproic acid* Depakote [4] | Anticonvulsant | Normal diet; adequate fluids | Avoid alcohol | GI distress, weight and appetite changes | Urea cycle disorder, vomiting, HIV, hyperlipidemia, kidney disease |
| **Caution:** **URL:** | Breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682412.html#why | | | | |
| *Warfarin* Coumadin [4] | Anticoagulant | Follow normal healthy diet with consistent amounts of vitamin K foods | Avoid alcohol; avoid large portions of green leafy vegetables, soybean and canola oils, cranberry products including juice, Licorice, herbals and botanicals; nutritional supplements by mouth or through feeding tube | Swelling, GI distress, loss of appetite | Thyroid disease, diabetes, GI disease, sprue, in-dwelling catheter |
| **Caution:** **URL:** | Pregnancy, breast-feeding http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682277.html | | | | |
| *Wheat Dextrin* Benefiber [4] | Fiber supplement | Take with 8 oz of water, may mix in juice for increased acceptance, increase fluid and fiber intake | | GI discomfort | Diabetes mellitus, heart disease, high blood pressure, kidney disease, rectal bleeding, intestinal blockage, or difficulty swallowing. |
| **Caution:** **URL:** | http://www.nlm.nih.gov/medlineplus/ency/article/002586.htm | | | | |
| *Zolpidem* Ambien [4] | Sedative hypnotic | On empty stomach; normal diet | | GI distress, dry mouth, appetite changes | Substance abuse, depression, snoring, sleep apnea or other breathing problems, bronchitis, myasthenia gravis, liver/kidney disease |

| *Generic Name* Trade/brand name | Class of Drug / Indication / Use | How to take | Possible nutrient interactions | Side-effects related to nutrition | Pre-existing condition alert (associated with nutrition) |
|---|---|---|---|---|---|
| **Caution:** | Pregnancy, breast-feeding | | | | |
| **URL:** | http://www.nlm.nih.gov/medlineplus/druginfo/meds/a693025.html | | | | |

| Herb (Common Name) | Commonly Used For | What the Science Says | Potential Health Issues and Side Effects |
|---|---|---|---|
| **Aloe Vera (oral)** | Diabetes<br>Asthma<br>Epilepsy<br>Osteoarthritis | Not enough scientific evidence to support the oral use of aloe vera for these indications. | Abdominal cramps and diarrhea. Diarrhea, caused by the laxative effect, can decrease the absorption of many drugs.<br><br>Preliminary studies suggest aloe may lower blood glucose levels, so individuals using glucose lower medication should be cautious. |
| **Asian Ginseng** | To support overall health and boost the immune system.<br>Lower blood glucose<br>Control blood pressure. | Some studies show Asian ginseng may lower blood glucose and indicate potentially positive effects on immune function.<br><br>Research results are not conclusive enough to prove health claims associated with the herb. | Some sources suggest that use be limited to 3 months because of concerns of side effects.<br><br>Headaches, sleep, gastrointestinal problems, allergic reactions, breast tenderness, menstrual irregularities, high blood pressure.<br><br>Preliminary studies suggest ginseng may lower blood glucose levels, so individuals using glucose lower medication should be cautious. |
| **Bilberry** | The fruit is used to treat diarrhea, menstrual cramps, eye problems, varicose veins, and other circulatory problems.<br>The leaf is sometimes used for diabetes. | There is not enough scientific evidence to support the use of bilberry fruit or leaf for any health conditions | High doses of the leaf or leaf extract are considered unsafe due to possible toxic side effects. |
| **Bitter Orange** | Heartburn<br>Loss of appetite<br>Nasal congestion<br>Weight loss. | There is not enough scientific evidence to support the use of bitter orange for health purposes.<br><br>Bitter orange contains the chemical synephrine, which is similar to the main chemical in ephedra. The USDA banned ephedra due to serious side effects; it is unclear if bitter orange has similar effects. There is little evidence that it is safer to use than ephedra. | Use may speed up the heart rate and raise blood pressure. Some reported side effects include fainting, heart attack, and stroke.<br><br>People should avoid taking bitter orange supplements if they have a heart condition or high blood pressure, or if they are taking medications (such as MAO inhibitors), caffeine, or other herbs/supplements that speed up the heart rate. |
| **Cat's Claw** | To support treatment for a variety of health conditions, including Alzheimer's disease, cancer, viral infections, and arthritis.<br><br>To support the immune system and promote kidney health | There is not enough scientific evidence to determine whether cat's claw works for any of the indicated uses.<br><br>Small studies show a possible benefit in arthritis. It has not been proven to boost the immune system.<br><br>Additional studies may point to new avenues for research in Alzheimer's disease treatment. | Only rare and mild side effects are reported and may include headaches, dizziness, and vomiting.<br><br>Pregnant women should avoid using it due to its past use for preventing and aborting pregnancy.<br><br>Cat's claw may stimulate the immune system, therefore it is unclear whether it is safe for people with conditions affecting the immune system. |
| **Cranberry** | To prevent or treat urinary tract infections or Helicobacter pylori infections that can lead to stomach ulcers. Cranberry has also been reported to have antioxidant and anticancer activity. | Cranberry components may prevent bacteria, such as E. coli, from clinging to the cells of the urinary tract and causing infection. | Drinking excessive amounts of juice could cause gastrointestinal irritation or diarrhea |
| **Echinacea** | To help fight infections by stimulating the immune system. | Some studies have shown that it may be beneficial in treating upper respiratory infections, but results are mixed. There is no significant data to support use for prevention of infections. | Gastrointestinal side effects were reported in clinical trials.<br><br>Allergic reaction (i.e., rash, asthma, and anaphylaxis) occurs in some users. Allergic reaction is more likely for those that have asthma or are allergic to plants in the daisy family (including ragweed). |
| **Fenugreek** | To stimulate milk production in breastfeeding women, lower blood sugar and stimulate appetite. | A few studies demonstrated that fenugreek may help lower blood sugar levels in people with diabetes.<br><br>There is not enough scientific evidence to support the other indicated uses. | Side effects when taken by mouth may include gas, bloating and diarrhea. |

| Herb (Common Name) | Commonly Used For | What the Science Says | Potential Health Issues and Side Effects |
|---|---|---|---|
| **Feverfew** | To treat migraine headaches and rheumatoid arthritis.<br><br>Feverfew has also been used for nausea, vomiting, psoriasis, allergies, asthma, tinnitus and dizziness. | Some studies suggest that feverfew may help in preventing migraine headaches.<br><br>There is not enough scientific evidence to support the other indicated uses. | Side effects can include canker sores, swelling and irritation of the lips and tongue, loss of taste, nausea, digestive problems, and bloating.<br><br>Pregnant women should not use feverfew because it may increase the risk of miscarriage or premature delivery.<br><br>Those who are allergic to the daisy family (including ragweed and chrysanthemums) are more likely to be allergic to feverfew. |
| **Flaxseed and Flaxseed Oil** | Flaxseed is most commonly used as a laxative. Other uses include for hot flashes and breast pain<br><br>Flaxseed oil is most commonly used to for relief of arthritis symptoms.<br><br>Flaxseed and flaxseed oil have been used to treat high cholesterol levels and to prevent cancer. | Flaxseed contains soluble fiber and is proven to act as an effective laxative.<br><br>Research on flaxseed effectiveness to lower cholesterol levels report mixed results. | Flaxseed and flaxseed oil supplements have very few reported side effects. Use of flaxseed without appropriate water intake could worsen constipation.<br><br>High fiber content in flaxseed may lower the body's ability to absorb oral medications. |
| **Garlic** | Most commonly used for high cholesterol, heart disease, and high blood pressure.<br><br>Also used to prevent certain types of cancer, including stomach and colon cancers. | Limited evidence shows garlic can slightly lower blood cholesterol, slightly lower blood pressure, slow development of atherosclerosis, and may reduce risk of stomach cancer, but results are inconclusive. | Only minor side effects reported, including breath and body odor, heartburn, upset stomach, and allergic reactions.<br><br>The blood thinning effect of garlic contraindicates use before, during or after surgery. |
| **Ginger** | To treat nausea, stomach aches, and diarrhea<br><br>To treat symptoms of rheumatoid arthritis, osteoarthritis and joint and muscle pain. | Studies are mixed on whether it is effective for nausea caused by motion, chemotherapy, or surgery, however there some studies do show that short-term use can safely relieve pregnancy-related nausea and vomiting.<br><br>Effectiveness on the other listed uses in unclear. | Most commonly reported side effects include gas, bloating, heartburn, and nausea (most often associated with powdered ginger). |
| **Ginkgo** | To improve memory and to treat or prevent dementia<br><br>To decrease intermittent claudication (leg pain caused by narrowing arteries); and to treat sexual dysfunction, multiple sclerosis, tinnitus, and other health conditions. | Some promising results have been seen for intermittent claudication.<br><br>Studies are inconclusive on its effectiveness in improving memory and lowering the overall incidence of dementia. | Uncooked ginkgo seeds can cause seizures. Consuming large quantities of seeds over time can cause death.<br><br>Most common side effects include gastrointestinal side effects, headache, dizziness, and allergic skin reactions. Severe allergic reaction is a less commonly reported side effect.<br><br>Some research shows increased bleeding risk, therefore people who take anticoagulant drugs, have bleeding disorders, or have scheduled surgery or dental procedures should use caution. |
| **Green Tea** | Green tea has been used to prevent and treat a variety of cancers, including breast, stomach, and skin cancers.<br><br>Green tea has also been used to lower cholesterol levels, aid in weight loss, improve mental alertness, and protect skin from sun damage. | Studies show green tea may help protect against or slow the growth of certain cancers, but show mixed results. | Green tea is generally safe for adults in moderate amounts. Caffeine in green tea and green tea extracts can cause insomnia, anxiety, irritability, upset stomach, nausea, diarrhea, or frequent urination in some people.<br><br>Vitamin K content of green tea can make anticoagulant drugs less effective.<br><br>Concentrated extracts could exacerbate liver problems. Discontinue use and consult a heath care practitioner if they have a liver disorder or develop symptoms of liver trouble, such as abdominal pain, dark urine, or jaundice. |
| **Hoodia** | To suppress the appetite for weight loss. | There is no reliable research to support use. | Unknown (not studied) |

| Herb (Common Name) | Commonly Used For | What the Science Says | Potential Health Issues and Side Effects |
|---|---|---|---|
| **Licorice Root** | To treat stomach ulcers, bronchitis, and sore throat, as well as infections caused by viruses, such as hepatitis. | Limited reliable information available. | People with heart disease or high blood pressure should be cautious.<br><br>In large amounts, licorice containing glycyrrhizin can cause high blood pressure, salt and water retention, and low potassium levels. Large doses can also affect the body's levels of cortisol. Licorice taken with diuretics could cause dangerously low potassium levels.<br><br>Pregnant women should avoid using licorice as some research suggests it could increase the risk of preterm labor.<br><br>The safety of long term use has not been thoroughly studied. |
| **Milk Thistle** | To treat liver cirrhosis, chronic hepatitis, and gallbladder disorders.<br><br>To lower cholesterol levels.<br><br>To reducing insulin resistance in people with type 2 diabetes who also have cirrhosis<br><br>To reduce the growth of cancer cells in breast, cervical, and prostate cancers | Some promising data have been reported for use of milk thistle on liver disease, however results are mixed. | Clinical trials show few minor gastrointestinal side effects. People who are allergic to plants in the Milk Thistle family (i.e., ragweed, chrysanthemum, marigold, and daisy) are more prone to allergic reaction. |
| **Noni** | As a general health tonic.<br><br>To treat cancer and chronic conditions such as cardiovascular disease and diabetes. | Noni has not been well studied in people for any health condition. | Noni is high in potassium. Some users have reported liver damage. People with kidney issues should avoid using noni. Its safety has not been adequately studied. |
| **Peppermint Oil** | To treat nausea, indigestion, cold symptoms, headaches, muscle/nerve pain, and stomach and bowel conditions such as irritable bowel syndrome. | Several studies show it may improve symptoms of irritable bowel syndrome.<br><br>Other studies show promising results with additional health conditions; however there is not enough scientific evidence to support the use. | Use is safe in small doses. Possible side effects include allergic reactions and heartburn. |
| **Soy** | To prevent or treat a variety of health conditions, including high cholesterol levels, menopausal symptoms, osteoporosis, memory problems, high blood pressure, breast cancer, and prostate cancer. | Some studies indicate daily intake of soy protein may slightly lower levels of LDL cholesterol.<br><br>Some studies show soy isoflavone supplements may reduce hot flashes after menopause, results have been inconsistent.<br><br>There is not enough scientific evidence to support the use of soy for other uses. | Soy foods or short term use of soy as a dietary supplement is considered safe for most people.<br><br>Minor side effects include gastrointestinal issues. Allergic reaction can occur on rare occasion.<br><br>Studies show no effect of dietary soy on risk for endometrial hyperplasia.<br><br>The potential role of soy in breast cancer risk is uncertain. Women who have or who are at increased risk of developing breast cancer or other hormone-sensitive conditions (such as ovarian or uterine cancer) should be particularly careful about using soy until more is known about its effect on estrogen levels. |

| Herb (Common Name) | Commonly Used For | What the Science Says | Potential Health Issues and Side Effects |
|---|---|---|---|
| **St. John's Wort** | To help treat sleep disorders, depression, and anxiety<br><br>• St. John's wort has been used for centuries to treat mental disorders and nerve pain.<br>• St. John's wort has also been used as a sedative and a treatment for malaria, as well as a balm for wounds, burns, and insect bites.<br>• Today, St. John's wort is used by some for depression, anxiety, and/or sleep disorders. | Some research supports usefulness in treating moderate depression. It is not a proven therapy for depression. | Side effects can include anxiety, dry mouth, dizziness, gastrointestinal symptoms, fatigue, headache, sexual dysfunction, sensitivity to sunlight.<br><br>Research shows that use may speed or slow several medical drug's breakdown, with serious side effects. See http://nccam.nih.gov/health/stjohnswort/ataglance.htm for a list of drugs.<br><br>• When combined with certain antidepressants, St. John's wort may increase side effects such as nausea, anxiety, headache, and confusion.<br>• St. John's wort is not a proven therapy for depression. If depression is not adequately treated, it can become severe. Anyone who may have depression should see a health care provider. There are effective proven therapies available.<br>• Tell your health care providers about any complementary and alternative practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care. |
| To ensure safety and coordination of treatment, those using alternative medicine should discuss all personal practices with their health care providers. | | | |

**References:**


1. National Center for Complementary and Alternative Medicine. Available at: http://nccam.nih.gov/health/. Accessed 22 September 2009.
2. Dietitians in Integrative and Functional Medicine. Available at: www.complementarynutrition.org. Accessed 22 September 2009.
3. Medline Plus. Complementary and Alternative Medicines. Available at: http://www.nlm.nih.gov/medlineplus/complementaryandalternativemedicine.html. Accessed 22 September 2009.
4. Burke B, Roche-Dudek M, Roche-Klemma K. Drug-Nutrient Interactions and Herbal Use: Learning Resource for Classroom and Independent Study (2002)
5. Burke B, Roche-Dudek M, Roche-Klemma K. Drug-Nutrient Resource, 5th edition (2003)
6. Pronsky, Z.. Food-Medication Interactions Handbook 15th Edition. 2008.


**REVIEW OF INSULIN PREPARATIONS**

| Product | Duration of Action in Hours | Onset of Action in Hours | Peak in Hours | Brand Names |
|---|---|---|---|---|
| **Short Acting** | | | | |
| Insulin Regular | 0.5-1 | 2.5-5 | 8-12<br>8-12<br>up to 24 hours | Novolin R<br>Humulin R<br>Humulin R U-500 (500 units/mL) |
| Insulin Lispro | 0.25-0.5 | 0.5-1.5 | 3-5 | Humalog |
| Insulin Aspart | 0.25 | 0.6-0.8 | 3-5 | Novolog |
| Insulin Glulisine | 0.3 | 1 | 5 | Apidra |
| **Intermediate Acting** | | | | |
| Insulin NPH | 1-4 | 5 | 10-24 | Humulin N<br>Novolin N |
| **Long Acting** | | | | |
| Insulin Glargine | 1.5 | None | 24 | Lantus |
| Insulin Detemir | 3-4 | 6-8 | Up to 24(variable) | Levemir |
| **Short Acting-Intermediate Acting Combination Products** | | | | |
| NPH & Insulin Regular | 0.5 | 1.5-16 | 10-24 | Humulin 70/30<br>Humulin 50/50<br>Novolin 70/30 |
| Insulin Lispro &<br>Insulin Lispro Protamine | 0.25-0.5 | 1-6.5 | 12-24 | Humalog Mix 50/50<br>Humalog Mix 75/25 |
| Insulin Aspart &<br>Insulin Aspart Protamine | 0.25 | 1-4 | up to 24 | Novolog Mix 70/30 |

**NOTE:** Variability among individuals exists. The above time frames should be considered as a general guideline only
**Reference:** Clinical Pharmacology (version April 2009) [database on CD-ROM]. Tampa, FL: Gold Standard Inc.; 2009.
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| STANDARDS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Product** | | **Packaging** | **kcal/mL** | **PRO/L** | **PRO Source** | **CHO/L** | **Fat/L** | **Fiber/L** | **Fiber Source**ΔΔ** | % Free H2O | **Osmolality** |
| ENSURE | Abbott | 8 oz can/8 oz bottle | 1.06 | 37 | Milk protein/Soy | 167 | 25 | 0 | N/A | 83 | 590/600 |
| ENSURE FIBER | Abbott | 8 oz can | 1.06 | 37 | Casein/Soy | 175 | 25 | 12 | Soy fiber / NutraFlora scFOS | 81 | 500 |
| ENSURE PLUS | Abbott | 8 oz can/8 oz bottle/32 oz bottle | 1.5 | 54 | Milk protein/Whey/Soy | 208 | 46 | 12.5 | Soy fiber / NutraFlora scFOS | 75 | 680 |
| ENSURE POWDER | Abbott | 397 gm can | 1 | 37.5 | Casein/Soy | 141.6 | 37.5 | 0 | N/A | 74 | 470 |
| JEVITY 1 CAL | Abbott | 8 oz can/1.0 L/1.5 L | 1.06 | 44.3 | Casein/Soy | 155 | 35 | 14.4 | Soy | 84 | 300 |
| JEVITY 1.2 CAL | Abbott | 8 oz can/1.0 L/1.5 L | 1.2 | 55.5 | Casein/Soy | 169.4 | 39.3 | 18 | Soluble/insoluble; NutraFlora scFOS | 81 | 450 |
| JEVITY 1.5 CAL | Abbott | 8 oz can/1.0 L/1.5 L | 1.5 | 64 | Casein/Soy | 215.7 | 50 | 22 | Soluble/Insoluble; NutraFlora scFOS | 76 | 525 |
| OSMOLITE 1 CAL | Abbott | 8 oz can/1.0 L/1.5 L | 1.06 | 44.3 | Casein/Soy | 144 | 34.7 | 0 | N/A | 84 | 300 |
| OSMOLITE 1.2 CAL | Abbott | 8 oz can/1.0 L/1.5 L | 1.2 | 55.5 | Casein | 157.5 | 39.3 | 0 | N/A | 82 | 360 |
| OSMOLITE 1.5 CAL | Abbott | 8 oz can/1.0 L | 1.5 | 62.7 | Casein/Soy | 203.6 | 49.1 | 0 | N/A | 76 | 525 |
| COMPLEAT® | Nestle | 250 mL can/1.0 L, 1.5L | 1.07 | 48 | Chicken/Casein | 128 | 40 | 6 | Benefiber®/vegetables | 85 | 340 |
| FIBERSOURCE® HN | Nestle | 250 mL can/1.0 L, 1.5L | 1.2 | 53 | Soy | 160 | 39 | 10 | Benefiber®/soy | 81 | 490 |
| ISOSOURCE® HN | Nestle | 250 mL can/1.0 L, 1.5L | 1.2 | 53 | Soy | 160 | 39 | 0 | N/A | 82 | 490 |
| ISOSOURCE® 1.5 CAL | Nestle | 250 mL can/1.0 L, 1.5L | 1.5 | 68 | Casein | 170 | 65 | 8 | Benefiber®/soy | 78 | 650 |
| NUTREN® 1.0 | Nestle | 250 mL can | 1 | 40 | Casein | 127 | 38 | 0 | N/A | 85 | 370 |
| NUTREN® 1.0 FIBER | Nestle | 250 mL can | 1 | 40 | Casein | 127 | 38 | 14 | Pea/Prebio1™ | 84 | 410 |
| NUTREN® 1.5 | Nestle | 250 mL can/1.0 L | 1.5 | 60 | Casein | 169 | 67.6 | 0 | N/A | 78 | 510/430 |

Oral and Enteral Supplements

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NUTREN® 2.0 | Nestle | 250mL can/1.0 L | 2 | 80 | Casein | 196 | 104 | 0 | N/A | 70 | 745 |
| NUTREN® REPLETE® | Nestle | 250 mL can/1.0 L | 1 | 62.4 | Casein | 113 | 34 | 0 | N/A | 85 | 350/300 |
| NUTREN® REPLETE® FIBER | Nestle | 250 mL can/1.0 L, 1.5 L | 1 | 62.4 | Casein | 113 | 34 | 14 | Soy | 84 | 390/310 |
| *RESOURCE® 2.0 | Nestle | 237 mL brik / 948 mL brik | 2 | 20 | Casein | 52 | 21 | 0 | N/A | 70 | 790 |
| **CONDITION SPECIFIC** | | | | | | | | | | | |
| **Product** | | **Packaging** | **kcal/mL** | **PRO/L** | **PRO Source** | **CHO/L** | **Fat/L** | **Fiber/L** | **Fiber Source**^Δ** | % Free H2O | **Osmolality** |
| **Diabetes** | | | | | | | | | | | |
| **GLUCERNA** | Abbott | 8 oz can/1.0 L, 1.5 L | 1 | 41.8 | Casein | 95.6 | 54.4 | 14.4 | Soy fiber | 85 | 355 |
| GLUCERNA 1.2 CAL | Abbott | 8 oz can/1.0 L, 1.5 L | 1.2 | 60 | Casein/Soy | 114.5 | 60 | 17 | Soy fiber/Oat fiber/ Nutra Flora scFOS | 80.5 | 720 |
| **GLUCERNA 1.5 CAL** | Abbott | 8 oz can/1.0 L | 1.5 | 82.5 | Casein/Soy | 133.1 | 75 | 17 | Soy fiber / NutraFlora scFOS | 76 | 875 |
| **GLUCERNA SELECT** | Abbott | 8 oz can/1.0 L/1.5 L | 1 | 50 | Casein/Soy | 95.7 | 54.4 | 21.1 | Soy fiber / NutraFlora scFOS | 84 | 470 |
| DIABETISOURCE® AC | Nestle | 250 mL can/1.0 L, 1.5 L | 1.2 | 60 | Soy/Arginine | 100 | 59 | 15 | FOS/Benefiber®/soy/ fruit/ vegetables | 82 | 450 |
| NUTREN® GLYTROL® | Nestle | 250 mL can/1.0 L, 1.5 L | 1 | 45.2 | Casein | 100 | 47.6 | 15.2 | Pea/gum arabic/ Prebio1™ | 84 | 280 |
| **Pulmonary** | | | | | | | | | | | |
| PULMOCARE | Abbott | 8 oz can/1.0 L | 1.5 | 62.6 | Casein | 105.7 | 93.3 | 0 | N/A | 78.5 | 475 |
| **OXEPA** | Abbott | 8 oz can/1.0 L | 1.5 | 62.7 | Casein | 105.3 | 93.8 | 0 | N/A | 78.5 | 535 |
| NUTREN® PULMONARY | Nestle | 250 mL can/1.0 L | 1.5 | 68 | Casein | 100 | 94.8 | 0 | N/A | 78 | 450/330 |
| **Renal** | | | | | | | | | | | |
| NEPRO | Abbott | 8 oz bottle/1.0 L | 1.8 | 81 | Casein/Milk protein isolate | 186.8 | 96 | 15.6 | Soluble/Insoluble; NutraFlora scFOS | 72.5 | 585 |
| SUPLENA® | Abbott | 8 oz bottle | 1.8 | 45 | Casein/Milk protein isolate | 205 | 96 | 16 | Soluble/Insoluble; NutraFlora scFOS | 73.5 | 600 |
| NOVASOURCE® RENAL | Nestle | 237mL brik/1.0 L | 2 | 74 | Casein/Arginine | 200 | 100 | 0 | N/A | 71 | 700/960 |
| RENALCAL® | Nestle | 250 mL can | 2 | 34.4 | FAA/Whey | 290.4 | 82.4 | 0 | N/A | 70 | 600 |

| **Hepatic** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NUTRIHEP® | Nestle | 250 mL can | 1.5 | 40 | FAA/Whey | 290 | 21.2 | 0 | N/A | 76 | 790 |

| **CRITICAL CARE/ HEALING SUPPORT** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Product** | | **Packaging** | **kcal/mL** | **PRO/L** | **PRO Source** | **CHO/L** | **Fat/L** | **Fiber/L** | **Fiber Source**ΔΔ** | % Free H2O | **Osmolality** |
| **JUVEN** | Abbott | 24 gm packet | 78/pkt | 7 gm L-Arginine and 7 gmL-Glutamine per svg | L-Arginine/L-Glutamine | 7.7 gm/pkt | 0 | 0 | N/A | --- | 451/469 |
| PERATIVE | Abbott | 8 oz can/1.0 L/1.5 L | 1.3 | 66.7 | Partially hydrolyzed sodium caseinate/Whey protein hydrolysate | 180.3 | 37.3 | 6.5 | NutraFlora scFOS | 79 | 460 |
| PROMOTE | Abbott | 8 oz can/1.0 L/1.5 L | 1 | 62.5 | Casein/Soy | 130 | 26 | 0 | N/A | 84 | 340 |
| PROMOTE FIBER | Abbott | 8 oz can/1.0 L/1.5 L | 1 | 62.5 | Casein/Soy | 138.3 | 26.2 | 14.4 | Oat fiber/Soy fiber | 83 | 380 |
| TWOCAL HN | Abbott | 8 oz can/1.0 L | 2 | 83.5 | Casein | 218.5 | 90.5 | 5 | NutraFlora sc FOS | 70 | 725 |
| CRUCIAL® | Nestle | 250 mL can/1.0 L | 1.5 | 94 | Enzymatically hydrolyzed casein/Arginine | 134 | 67.6 | 0 | N/A | 77 | 490 |
| IMPACT® | Nestle | 250 mL can/1.0 L | 1 | 56 | Casein/Arginine | 130 | 28 | 0 | N/A | 85 | 375 |
| IMPACT® WITH FIBER | Nestle | 250 mL can/1.0 L | 1 | 56 | Casein/Arginine | 140 | 28 | 10 | Benefiber®/soy | 87 | 375 |
| IMPACT® 1.5 | Nestle | 250 mL can | 1.5 | 84 | Casein/Arginine | 140 | 69 | 0 | N/A | 78 | 550 |
| IMPACT® GLUTAMINE | Nestle | 250 mL can/1.0 L | 1.3 | 78 | Wheat hydrolysate/ Casein/FAA | 150 | 43 | 10 | Benefiber®/soy | 81 | 630 |
| PEPTAMEN® 1.5 | Nestle | 250 mL can/1.0 L | 1.5 | 67.6 | Enzymatically hydrolyzed whey | 188 | 56 | 0 | N/A | 77 | 550 |
| PEPTAMEN AF™ | Nestle | 250 mL can/1.0 L | 1.2 | 75.6 | Enzymatically hydrolyzed whey | 107 | 54.8 | 5.2 | Prebio1™ | 81 | 390 |
| NUTREN® REPLETE® | Nestle | 250 mL can/1.0 L | 1 | 62.4 | Casein | 113 | 34 | 0 | N/A | 85 | 350/300 |
| NUTREN® REPLETE® FIBER | Nestle | 250 mL can/1.0 L, 1.5 L | 1 | 62.4 | Casein | 113 | 34 | 14 | Soy | 84 | 390/310 |
| **GI/ ELEMENTAL** | | | | | | | | | | | |

| Product | | Packaging | kcal/mL | PRO/L | PRO Source | CHO/L | Fat/L | Fiber/L | Fiber Source**Δ | % Free H2O | Osmolality |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OPTIMENTAL | Abbott | 8 oz can/1.0 L | 1 | 51.3 | Soy protein hydrolysate/part hydrolyzed sodium caseinate/arginine | 138.7 | 28.4 | 5 | NutraFlora scFOS | 83 | 540 |
| PIVOT 1.5 | Abbott | 8 oz can/1.0 L | 1.5 | 93.8 | Part. Hydrolyzed sodium caseintate/ Whey protein hydrolysate/arginine | 172.4 | 50.8 | 7.5 | NutraFlora scFOS | 76 | 595 |
| VITAL HN | Abbott | 79 gm packet | 1 | 41.7 | Part. Hydrolyzed protein blend/ free amino acids | 185 | 10.8 | 0 | N/A | 87 | 500 |
| PEPTAMEN® | Nestle | 250 mL can | 1 | 40 | Enzymatically hydrolyzed whey | 127 | 39 | 0 | N/A | 85 | 270-380 |
| PEPTAMEN® WITH PREBIO1™ | Nestle | 250 mL can/1.0 L, 1.5 L | 1 | 40 | Enzymatically hydrolyzed whey | 127 | 39.2 | 4 | Prebio1™ | 85 | 300 |
| PEPTAMEN® 1.5 | Nestle | 250 mL can/1.0 L | 1.5 | 67.6 | Enzymatically hydrolyzed whey | 188 | 56 | 0 | N/A | 77 | 550 |
| PEPTAMEN AF™ | Nestle | 250 mL can/1.0 L | 1.2 | 75.6 | Enzymatically hydrolyzed whey | 107 | 54.8 | 5.2 | Prebio1™ | 81 | 390 |
| *PEPTAMEN® OS | Nestle | 237 mL brik | 1 | 11.9 | Whey hydrolysate | 38.6 | 4 | 0 | N/A | -- | 600 |
| *PEPTAMEN® OS 1.5 | Nestle | 237 mL brik | 1.5 | 18 | Whey hydrolysate | 49 | 10 | 0 | N/A | -- | 550 |
| TOLEREX® | Nestle | 2.82 oz packet | 1 | 21 | FAA | 230 | 1.5 | 0 | N/A | 86 | 550 |
| VIVONEX® PLUS | Nestle | 2.8 oz packet | 1 | 45 | FAA | 190 | 6.7 | 0 | N/A | 85 | 650 |
| VIVONEX® RTF | Nestle | 250 mL can/1.0 L, 1.5 L | 1 | 50 | FAA | 175 | 12 | 0 | N/A | 85 | 630 |
| VIVONEX® T.E.N. | Nestle | 2.84 oz packet | 1 | 38 | FAA | 210 | 2.8 | 0 | N/A | 85 | 630 |

## TOTAL PARENTERAL NUTRITION

Parenteral Nutrition (PN) is the provision of macronutrients, vitamins, minerals, electrolytes and fluids via a central or peripheral vein. The route of administration depends on the length of therapy, nutrient requirements, available intravenous access and fluid requirements. Parenteral nutrition may be infused via central venous access (primary indications include: chemotherapy, antibiotic administration or TPN) or via peripheral catheters (including standard peripheral cannulas, midline catheters, and midclavicular catheters). Peripheral venous catheters are best when patients with normal renal function need short-term access (≤10-14 days). However, midclavicular catheters can be used for 2-3 months.

PN solutions that are infused via central venous access are generally dextrose based whereas solutions that are peripherally infused are lipid based. Dextrose has a high osmolarity and causes irritation and thrombophlebitis to peripheral veins. Lipids are isotonic and therefore less irritating to peripheral veins.

**Indications**

1. Parenteral nutrition is indicated when the GI tract is not available, access cannot be obtained or the patient has failed to tolerate enteral nutrition Examples of situations requiring PN are: need for prolonged bowel rest with severe pancreatitis or ileus, inadequate absorption resulting from short bowel syndrome, gastrointestinal fistula, bowel obstruction, severe malnutrition, significant weight loss and/or hypoproteinemia when enteral therapy is not possible, any other disease state or condition in which oral or enteral feedings are not an option.

**Estimating Nutrient Requirements**

a. Basal energy needs are calculated from patient's weight, height, and age. Additional energy needs are based on an assessment of diagnosis, activity and metabolic needs. The older adult can present additional challenges due to co-morbidities.
b. Protein needs are determined by the patient's weight and metabolic state (e.g., burn, sepsis, renal disease)
c. Fluid requirements are 30 — 35 cc/kg (average sized adults), or 25 cc/kg (65 years of age or older)
d. Assess vitamin and mineral requirements to identify additional supplementation needs.

**Composition of Parenteral Formulas**

**Dextrose**- provides carbohydrate and available in 5%, 10%, 20%, 50% and 70% concentrations. To calculate the calories from dextrose: multiply the ml of dextrose by the concentration of the solution to obtain the grams of dextrose, then multiply by 3.4 to obtain kCals.

1000 ml x 70% = 700 gm of dextrose x 3.4 = 2380 kCals

**Protein** is provided in the form of amino acids and is available in 3%, 7%, 8.5%, 10% and 15% concentrations. To calculate the calories from protein: multiply the ml of protein by the concentration of the solution to obtain the grams of protein, then multiply by 4.0 to obtain kCals

500 ml x 8.5% = 42.5 gms of protein x 4 = 170 kCals

**Lipids** are provided as Long Chain Triglycerides (LCT), available in 10%, 20% and 30% concentrations, provide a source of Essential Fatty Acids and may be admixed with the dextrose and protein or infused separately.

10% lipids provides 1.1 kCal/ml
20% lipids provides 2.0 kCal/ml
30% lipids provides 3.0 kCal/ml (used in admixtures only)

**Monitoring**

Careful monitoring of PN is essential to prevent complications. Electrolyte, weight, fluid intake and output and vital signs should be monitored daily. An initial baseline triglyceride level should be established for patients receiving lipids, and then monitored weekly while on TPN. Once electrolytes are stable weekly labs should be monitored. A catheter care policy should be in place at every institution and strictly adhered to in order to prevent catheter associated infections.If nocturnal TPN is running, the first hour sand last hours should be lower rate. The rationale for this is to prevent initial hyperglycemia and then an immediate hypoglycemia at the end of the cycle...

Complications that develop can be metabolic and non-metabolic in nature. Metabolic issues are related to the formula and how the patient responds to the therapy. Non-metabolic relates to the failure in delivery technique.

| | |
|---|---|
| **Daily** | CMP (Na, K, Cl, $CO_2$, Glu, BUN, Cr, Ca), $PO_4$,Mg, (first 2-3 days or until stable) – the following are obtained at baseline then weekly; LFT's, Prealbumin, (Albumin, monthly if resident in long-term care is stable), & CBC (Until stable) |
| | Blood glucose q 6 hrs (until stable), then once per day |
| | Weight |
| | Intake and Output |
| | Vital signs |
| | Catheter care |
| **Weekly** | CMP, Albumin, CBC |

For more information on monitoring Parenteral Nutrition consult:

- Dietitians in Nutrition Support, a dietetic practice group of the American Dietetic Association www.dnsdpg.org

- The American Society for Parenteral and Enteral Nutrition (ASPEN). 8630 Fenton Street, Suite 412; Silver Spring, MD 20910; 1-800-727- 4567 or 301-587-6315; E-mail address: aspen@nutr.org; www.clinnutr.org

**Refeeding Syndrome**

Refeeding syndrome is a complication which can occur in severely malnourished patients who are aggressively administered parenteral (or enteral) nutrition. It is characterized by large electrolyte shifts leading to metabolic, neuromuscular and hematologic abnormalities which can be life-threatening. The rapid shift of several electrolytes including potassium, phosphorus and magnesium from the extracellular to intracellular space along with sodium and water retention are the result of excessive glucose administration.

Patients with the following conditions are at risk:

- Chronic/severe malnutrition
- Significant weight loss
- Alcoholism
- Eating disorders
- Cancer cachexia
- Prolonged fasting
- Phosphorus-deficient TPN
- Unfed 7-10 days
- Morbid obesity with significant weight loss

Nutrition should be started at half of energy requirements with a conservative amount of carbohydrate(150-200 gm for first 24 hours) . Electrolytes and fluid balance should be monitored very closely.

**Calculating TPN formulations**

A starting point for calculating parenteral solutions is as follows:

**Dextrose**: Calories from carbohydrates generally provide between 45% to 60% of the total daily calories. However, to avoid the deleterious effects of hyperglycemia, the amount of carbohydrate provided should not exceed 5-7 mg/kg/min (minimum requirement = 1 mg/kg/min). Carbohydrates provide 3.4 kcal/gram.

**Protein:** Calories provided from protein are generally from 10% to 20%. Excessive protein administration increases the metabolic load on the body for utilizing and disposing the metabolic byproducts. This is typically illustrated by a rising BUN. Protein provides 4 kcal/gm.

**Lipid**: Needed to avoid essential fatty acid deficiency, lipids also contribute to the total daily intake of calories. When TPN is devoid of fat, lipids should be provided 3 times per week (500 ml of 10% lipid or 250 ml of 20%). To avoid overwhelming the immune system with fat and resulting in immunosuppression, the administration of lipids generally should not exceed 30% of the total calories or 1 g/kg/d.

**Caution** with use of lipids for patients with egg allergy.

To ensure that all substrates mixed together fit into a one liter container, final concentrations must add up to 1000 mL or less.
The following calculations illustrate how to determine the milliliters provided by each substrate:

> ***Example:*** To obtain a desired 3-in-1 final concentration of 22% dextrose, 3% lipid and 4.0% amino acids using 70% dextrose, 10% amino acid, and 20% lipid emulsion stock solution, the following calculation will help you determine if this will fit into a one liter container for the TPN solution:

Note: 3-in-1 TPN admixtures are recommended to only hang for 24 hours.

**Desired final concentration: 22% dextrose**

**Dextrose:** $\frac{70 \text{ g dextrose}}{22} = \frac{100 \text{ ml } D_{70} \text{ stock solution}}{X \text{ (= ml of dextrose needed)}}$

$$\frac{22 \text{ g dextrose} \times 100 \text{ ml } D_{70}}{70 \text{ g dextrose}} = 31.42 \text{ ml}$$

For one liter (1000 ml) of TPN, 314.2 ml will be provided by dextrose.

**Desired final concentration: 4.0% amino acids**

**Amino acids:** $\frac{10 \text{ g amino acids}}{4.0 \text{ g}} = \frac{100 \text{ ml amino acid 10 stock solution}}{X \text{ (= mL of amino acids needed)}}$

$$\frac{4.0 \text{ g amino acids} \times 100 \text{ ml } AA_{10}}{10 \text{ g amino acids}} = 40 \text{ ml}$$

For one liter of TPN, 400 mL will be provided by amino acids**.**

**Desired final concentration: 3% lipid**

**Lipids:** $\frac{20 \text{ g lipid}}{3\text{g}} = \frac{100 \text{ ml lipid}}{X \text{ (= ml of lipid needed)}}$

$$\frac{3 \text{ g lipid} \times 100 \text{ ml 20\% Lipid}}{20 \text{ g lipid}} = 15 \text{ ml lipid}$$

In one liter of TPN, 150 ml will be provided from lipids.

314.2 ml Dextrose + 400 ml amino acids + 150 ml lipids = ~865 ml. This formulation will fit into a one liter container allowing room for sterile water and other additives (electrolytes, vitamins, minerals, etc.). Additives generally make up < 10% of the total volume. In fluid restricted patients, the amount of sterile water added to the solution can be decreased to "concentrate" the solution and allowing a high provision of the macronutrients.

Another way of looking at this example is that 22% dextrose will provide 220 grams of carbohydrate/liter; and 4% amino acid will provide 40 gms protein/liter.

**TOTAL PARENTERAL NUTRITION (TPN)**

| Rate | 24 hr total volume | D50W + 5.5% AA | D70W + 5.5% AA | D50W + 8.5% AA | D70W + 8.5% AA | D50W + 10% AA | D70W + 10% AA | D50W + 15% AA | D70W + 15% AA |
|---|---|---|---|---|---|---|---|---|---|
| 50 ccq° | 1200 cc | 1152 kCal | 1560 kCal | 1224 kCal | 1632 kCal | 1260 kCal | 1668 kCal | 1380 kCal | 1584 kCal |
| | | 33 gm pro | 33 gm pro | 51 gm pro | 51 gm pro | 60 gm pro | 60 gm pro | 90 gm pro | 90 gm pro |
| | | 5.3 gm N2 | 5.3 gm N2 | 8 gm N2 | 8 gm N2 | 9.5 gm N2 | 9.5 gm N2 | 14.4 gm N2 | 14.4 gm N2 |
| | | | | | | | | | |
| 75 ccq° | 1800 cc | 1730 kCal | 2342 kCal | 1838 kCal | 2450 kCal | 1944 kCal | 2502 kCal | 2070 kCal | 2376 kCal |
| | | 50 gm pro | 50 gm pro | 77 gm pro | 77 gm pro | 90 gm pro | 90 gm pro | 135 gm pro | 135 gm pro |
| | | 8 gm N2 | 8 gm N2 | 12.3 gm N2 | 12.3 gm N2 | 14.4 gm N2 | 14.4 gm N2 | 21.6 gm N2 | 21.6 gm N2 |
| | | | | | | | | | |
| 85 ccq° | 2040 cc | 1957 kCal | 2651 kCal | 2082 kCal | 2776 kCal | 2142 kCal | 2835 kCal | 2346 kCal | 2693 kCal |
| | | 56 gm pro | 56 gm pro | 87 gm pro | 87 gm pro | 102 gm pro | 102 gm pro | 153 gm pro | 153 gm pro |
| | | 9 gm N2 | 9 gm N2 | 14 gm N2 | 14 gm N2 | 16.3 gm N2 | 16.3 gm N2 | 24.5 gm N2 | 24.5 gm N2 |
| | | | | | | | | | |
| 100 ccq° | 2400 cc | 2305 kCal | 3119 kCal | 2447 kCal | 3264 kCal | 2520 kCal | 3336 kCal | 2760 kCal | 3368 kCal |
| | | 66 gm pro | 66 gm pro | 102 gm pro | 102 gm pro | 120 gm pro | 120 gm pro | 180 gm pro | 180 gm pro |
| | | 10.6 gm N2 | 10.6 gm N2 | 16.3 gm N2 | 16.3 gm N2 | 19.2 gm N2 | 19.2 gm N2 | 28 gm N2 | 28 gm N2 |
| | | | | | | | | | |
| 125 ccq° | 3000 cc | 2882 kCal | 3901 kCal | 3062 kCal | 4081 kCal | 3150 kCal | 4170 kCal | 3450 kCal | 3960 kCal |
| | | 83 gm pro | 83 gm pro | 128 gm pro | 128 gm pro | 150 gm pro | 150 gm pro | 225 gm pro | 225 gm pro |
| | | 13.3 gm N2 | 13.3 gm N2 | 20.4 gm N2 | 20.4 gm N2 | 24 gm N2 | 24 gm N2 | 36 gm N2 | 36 gm N2 |
| | | | | | | | | | |
| 150 ccq° | 3600 cc | 3456 kCal | 4679 kCal | 3672 kCal | 4895 kCal | 3780 kCal | 5004 kCal | 4140 kCal | 4752 kCal |
| | | 99 gm pro | 99 gm pro | 153 gm pro | 153 gm pro | 180 gm pro | 180 gm pro | 252 gm pro | 252 gm pro |
| | | 15.8 gm N2 | 15.8 gm N2 | 24.5 gm N2 | 24.5 gm N2 | 28.8 gm N2 | 28.8 gm N2 | 40.3 gm N2 | 40.3 gm N2 |

Note: The above caloric levels are based on total (CHO and pro) kCal; generally non-protein calories are used.

For Reference:

D5W = 0.17 kCal/cc
D10W = 0.34 kCal/cc
D20W = 0.68 kCal/cc
D50W = 1.70 kCal/cc
D70W = 2.38 kCal/cc

1 liter 10% amino acids = 100 gram pro
1 liter 8.5% amino acids = 85 gram pro
1 liter 5.5% amino acids = 55 gram pro

Note: The above dextrose and amino acid solutions are usually mixed 500 cc each in a one-liter bottle.

20% lipid is 2.0 kCal/cc
10% lipid is 1.1 kCal/cc

Standard amino acids (gm) ÷ 6.25 = gm nitrogen

Successful outcomes of TPN, PN or PPN are a result of teamwork. Patient, family, nutrition support team and pharmacy all working together. Several items to consider when working with your pharmacist (especially if they are not on site).

- Notify the pharmacy before making mixture recommendation. Enlist their expertise.
- Some pharmacies can prepare the TPN mixture in a bag that may hold up to 4 liters.
- Review recommended TPN solution with pharmacy to see if the mixture meets their solubility requirements. This step will ensure there are not any precipitates being administered into the patient.
- Include the pharmacist in the review process.

**Resource**

Beers MH, Berkow R, ed. **The Merck Manual of Diagnosis and Therapy- 17th Edition**.
Merck Research Laboratories, Division of Merck & Co., Inc. Whitehouse Station, N.J. 1999.
*"Guidelines for the Use of Parenteral and Enteral Nutrition in Adult and Pediatric Patients"*
Journal of Parenteral and Enteral Nutrition, Volume 26, Number 1, Supplement, January-February 2002, page 40SA

**Protein Supplements**

| Poduct | Manufacturer | Kcal per serving | Protein Per Serving | Serving Size | Feature | Form |
|---|---|---|---|---|---|---|
| Pro-Stat™ 64 | Medical Nutrition USA, Inc | 60 | 15 | 1 oz | 15 g hydrolyzed protein/serving | Liquid |
| Pro-Stat™ 101 | Medical Nutrition USA, Inc | 101 | 15 | 1 oz | 15 g hydrolyzed protein/serving | Liquid |
| Pro-Stat™ AWC | Medical Nutrition USA, Inc | 108 | 17 | 1 oz | 17 g hydrolyzed protein/serving with added L-Arginine, L-Cystine, Vitamin C and zinc | Liquid |
| Pro-Stat™ RC | Medical Nutrition USA, Inc | 60 | 15 | 1 oz | 15 g hydrolyzed protein/serving. High N mix of all essential conditionally essential and non-essential amino acids with 8 vitamin, vitamin C, zinc and FOS | Liquid |
| Provide Regular | Provide Nutrition | 100 | 15 | 1 oz | 15 g hydrolyzed protein/serving | Liquid |
| Provide Sugar Free | Provide Nutrition | 60 | 15 | 1 oz | 15 g hydrolyzed protein/serving | Liquid |
| Promod Liquid Protein Unjury, Unflavored (also comes in Choc, Van, Straw, and Chicken Soup) | Abbott Nutrition | 115 | 10 | 1 oz | 10 g hydrolyzed protein/ serving | Liquid |
| | ProSynthesis Laboratories | 80 | 20 | 1 scoop | 20 g hydrolyzed protein/serving made of whey protein isolate | powder |
| ProCel | Global | 28 | 5 | 1 scoop | 5.3 g hydrolyzed whey protein/ serving | powder |
| Beneprotein | Nestle | 25 | 6 | 1 scoop | 6 g hydrolyzed whey protein isolate/ serving | powder |

## Evaluating Protein Supplements

Protein supplements are ordered to improve the quality of an inadequate diet, to compensate for increased losses or to meet increased needs. It is the only macronutrient that is not stored in the body for later use. Every molecule of protein incorporated into the body has a specific job to do. About half of the body protein is in the form of skeletal muscle. The rest is part of vital organs, blood, enzymes and hormones.

Protein is composed of amino acids joined together by chains to form specific proteins. There are 21 amino acids categorized into 3 groups:

- Indispensable or essential amino acids (IAA)- must come from dietary sources
- Dispensable or nonessential amino acids (DAA) - synthesized by the body provided there is enough nitrogen in diet
- Conditionally indispensable amino acids (CIAA)- may be required during serious illness, surgery or injury due to insufficient synthesis

## Categories of Amino Acids

| Indispensable AA | Dispensable AA | Conditionally Indispensable AA |
|---|---|---|
| Histidine<br>Isoleucine<br>Leucine<br>Lysine<br>Methionine<br>Phenylalanine<br>Threonine<br>Tryptophan<br>Valine | Alanine<br>Aspartic acid<br>Asparagine<br>Glutamic acid<br>Serine | Arginine<br>Cysteine<br>Glutamine<br>Glycine<br>Proline<br>Tyrosine |

Adapted from Institute of Medicine of the National Academies, (2005) Protein and amino acids, In: DRI for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids: FNB: NAS. Washington, DC: National Academy Press.

### Cycle of Protein Exchanges

Protein nutrition involves both dietary protein and body protein reserves. Protein reserves are different from stores in that reserves need to be recycled each day to maintain a healthy body. During illness or metabolic stress due to surgery or injury, the protein losses from normal protein exchanges are considerable.

The overall turnover of protein in the body is almost 3 times greater than the usual protein intake. When the diet is inadequate in one or more IAA or there is insufficient nitrogen to synthesize required amounts of DAA. The body compensates by breaking down more body protein for the missing IAA. Over time, inadequate protein intake results in depletion of protein reserves because less is recycled each day.

#### Evaluating Quality of Protein Supplements

Registered dietitians (RDs) have the responsibility to know the nutrient density of products they recommend. Protein supplements are not nutritionally equivalent. Different products meet diverse resident needs.

Castellanos, et al (2006) categorized modular protein supplements as follows:

- Complete Protein- products made from milk(casein, whey), egg, or soy that naturally contain sufficient amounts of all IAAs
- Collagen Based- products made from animal skin that may or may not be fortified to contain sufficient amounts of all IAAs
- Amino Acid Dose- products with fairly large doses of one or more DAAs
- Protein plus Amino Acid Dose- products made from complete protein, collagen or a combination of complete and collagen protein with additional dose of one or more DAAs

Food and Nutrition Board of the Institute of Medicine recommends protein digestibility corrected amino acid score" (PDCAAS) as the international standard to evaluate the quality of protein supplements (FAO, 1991; IOM, 2005). The PDCAAS represents the quality of the protein in terms of its most limiting IAA using a reference standard based on the EAR (meets the needs of 50% of the healthy population).

| Amino Acid | 2005 Adult Reference Pattern mg/gm PRO |
|---|---|
| Histidine | 17 |
| Isoleucine | 23 |
| Leucine | 52 |
| Lysine | 47 |
| Methionine + Cysteine | 23 |
| Phenylalanine + Tyrosine | 41 |
| Threonine | 24 |
| Tryptophan | 6 |
| Valine | 29 |

Adapted from Institute of Medicine of the National Academies, (2005) Protein and amino acids, In: DRI for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids: FNB: NAS. Washington, DC: National Academy Press.

The calculation of the PDCAAS differs from the traditional amino acid score by the additional step of multiplying the lowest amino acid ratio by the true protein digestibility.

| Protein Source | True Digestibility |
|---|---|
| Milk | 95% |
| Casein | 99% |
| Whey | 99% |
| Egg white | 98% |
| Soy | 95-98% |
| Collagen or Gelatin | 95% |

Adapted from Institute of Medicine of the National Academies, (2005) Protein and amino acids, In: DRI for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids: FNB: NAS. Washington, DC: National Academy Press.

**Steps to Calculate PDCAAS**

1. Convert the amino acid profile provided by the manufacturer to mg/g protein.
2. Calculate amino acid score by dividing the milligrams of each IAA per gram of protein by the requirement for each IAA.
   mg IAA/gm protein
   mg IAA/gm reference protein
3. Determine digestibility using data from manufacturer or source protein data from IOM.
4. Multiply the true digestibility by lowest uncorrected ratio amino acid score = PDCAAS.

The PDCAAS tells you the amount of total protein available for tissue synthesis without drawing IAA from other dietary sources or lean body reserves. A PDCAAS of 100% means that the protein supplement contains sufficient amounts of all the IAA. Protein supplements made from casein, whey, soy and egg white have PDCAAS of 100%. Collagen based products must be fortified to have a PDCAAS of 100% because the source protein is naturally devoid of tryptophan and low in other IAAs. Protein plus Amino Acid Dose products made from casein, whey, soy and egg white have PDCAAS of 100%. However, Protein plus Amino Acid Dose products made from collagen protein must be fortified to have a PCDAAS of 100%. PDCAAS does not apply to Amino Acid Dose products because these supplements are not sources of total dietary protein.

**References**

1. Castellanos VH, Litchford MD, Campbell W. An evaluation of modular protein supplements and their application to long term care. *Nutrition in Clinical Practice* 2006; 21:485-504.
2. FAO/WHO Expert Consultation Protein Quality Evaluation: Food and Agriculture Organization of the United Nations. Rome: Food

and Agriculture Organization; FAO Food and Nutrition Paper, 1991; No. 51.
3. Institute of Medicine of the National Academies, Protein and amino acids, In: DRI for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids: FNB: NAS. Washington, DC: National Academy Press; 2005
4. Litchford MD, *Protein Powders, Potions & Elixirs*. Greensboro, NC: CASE Software & Books; 2007.
5. Shils, ME. *Modern Nutrition in Health and Disease, 9th ed*. Baltimore: Williams and Wilkins; 2006.
6. WHO/ FAO//UNU Joint Expert Consultation, Protein and Amino Acid Requirements in Human Nutrition, Geneva, Switzerland: World Health Organization Technical Report; 2007, No. 935.

## THE REGULATORY PROCESS

**BACKGROUND INFORMATION:**
All nursing facilities are subject to inspection or survey by virtue of their certification to participate in Medicare and Medicaid, and/or licensure by the state in which they operate.

State licensure standards, generally, have followed Federal certification standards, and state personnel perform the vast majority of surveys - simultaneously assessing compliance with both licensure and certification requirements. The Federal government also provides training for state surveyors and periodically conducts inspections with federal surveyors as a check on the performance of state surveyors. These are called Federal Oversight and Support Surveys (FOSS). Compliance with the survey process and requirements established by the Centers for Medicare & Medicaid Services (CMS) and published in the State Operations Manual (SOM) is the primary regulatory focus for nursing facilities and all health care providers receiving Medicare and Medicaid funding. CMS is an agency within the federal government's Department of Health and Human Services. CMS administers the federal government's two health insurance programs: Medicare and Medicaid.).

State governments also have their own regulations which are used for licensing healthcare facilities.. These regulations are enforced by survey agencies, which are most often part of the state's health department. State regulations can build on the federal regulations, since federal regulations are essentially the lowest common denominator for facilities to receive payment. Some states, however, have not issued their own regulations and adopt the federal regulations for their licensing. CMS requires that healthcare facilities hold a current state license in order to be certified to receive federal insurance payments.

CMS contracts with these state survey agencies to conduct unannounced surveys of Medicare- and/or Medicaid-certified facilities to determine whether or not the facilities are in compliance with the federal regulations. Onsite surveys (inspections) are conducted to determine if the quality and performance standards set forth by CMS are being met.

This chapter gives a brief overview of the survey process according to these mandates. Remember, regulations are continually under review and can be changed at any time. The registered dietitian (RD) must have access to, read and know current federal, state and local regulations. Since regulations are subject to revision, RDs should know how to monitor the regulatory process and be prepared to work with their state affiliate to provide public comment and advocate for optimum resident nutrition services.

**The RD Role in the Regulatory Process**
CMS regulations require each nursing facility to employ a qualified dietitian either full-time, part-time, or on a consultant basis. §483.35(a)(1) If a qualified dietitian is not employed full-time, the facility must designate a person to serve as the director of food service who receives frequently scheduled consultation from a qualified dietitian. §483.35(a)(2) A qualified dietitian is one who is qualified based upon either registration by the Commission on Dietetic Registration of the American Dietetic Association, or on the basis of education, training, or experience in identification of dietary needs, planning, and implementation of dietary programs. Intent: §483.35(a) **The intent of this regulation is to ensure that a qualified dietitian is utilized in planning, managing and implementing dietary service activities in order to assure that the residents receive adequate nutrition.** A director of food services has no required minimum qualifications, but must be able to function collaboratively with a qualified dietitian in meeting the nutritional needs of the residents.

Surveyors are provided the following Interpretive Guidelines to assist in determining if the dietitian is utilized appropriately:

> §483.35(a) A dietitian qualified on the basis of education, training, or experience in identification of dietary needs, planning and implementation of dietary programs has experience or training which includes: • Assessing special nutritional needs of geriatric and physically impaired persons; • Developing therapeutic diets; • Developing "regular diets" to meet the specialized needs of geriatric and physically impaired persons; • Developing and implementing continuing education programs for dietary services and nursing personnel; • Participating in interdisciplinary care planning; • Budgeting and purchasing food and supplies; and • Supervising institutional food preparation, service and storage.

Procedures: §483.35(a) If resident reviews determine that residents have nutritional problems, the surveyor(s) will determine if these nutritional problems relate to inadequate or inappropriate diet nutrition/assessment and monitoring, and if these are related to dietitian qualifications. If the survey team finds problems in resident nutritional status the surveyor is advised to use the following Probes: §483.35(a): • Do practices of the dietitian or food services director contribute to the identified problems in residents' nutritional status? If yes, what are they? • What are the educational, training, and experience qualifications of the facility's dietitian?

**The State Operations Manual (SOM)**
Surveyors use the CMS **State Operations Manual (SOM)** as the guide for the surveys. Every facility should have a copy of the SOM; and RDs should have a copy of the SOM.

The SOM is available on the CMS website at http://www.cms.hhs.gov/center/snf.asp . Click on CMS Internet-only Manuals and then click on Publication # 100-07 with the Title: State Operations Manual.

The SOM has multiple components and sections. Appendices P, PP, and R of the SOM are the three appendices related to nursing facilities. (These are available by following the above instructions for the SOM, and then clicking on the Appendix section of the SOM Table of Contents. There are also appendices for home health agencies, hospitals, hospice and other facilities.)

- Appendix P contains the Survey Protocol for Long-Term Care Facilities
- Appendix PP contains the Interpretive Guidelines for Long-Term Care Facilities
- Appendix R describes the Resident Assessment Instrument (which includes the Minimum Data Set or MDS)

These Appendices include the following:

- Survey protocol and procedures
- Links to relevant CMS transmittals
- Regulations, including the regulatory citation from the Code of Federal Regulations (CFR),
- Tag numbers (the alpha-numeric indexing system used to reference specific sections in each SOM Appendix), and
- Interpretive Guidelines, also known as "Guidance to Surveyors."

It is essential that the RD have access to the reports generated during previous surveys. Request a copy of the last survey report, including any deficiencies and/or citations, from your facility's administrator. Information is also available at www.medicare.gov/nhcompare/home.asp.

**Facility Reports Generated by Minimum Data Set (MDS)**
Three reports are generated regularly through CMS'MDS. These reports are Facility Characteristics, Facility Quality Measure/ Indicator Profile and the Resident Level Summary. It is important that the RD have copies of these reports to be aware of any problems or possible problems that exist. Surveyors use these reports in Task 1 of the Traditional Survey described below..

**The Survey Process**
Skilled nursing facilities (SNFs) and nursing facilities (NFs) are required to be in compliance with the requirements at 42 CFR Part 483, Subpart B, to receive payment under the Medicare or Medicaid programs. To certify as a SNF or NF, a facility must complete at least a:

- Life Safety Code (LSC) survey; and
- Standard Survey. There are two types of Standard Surveys, the Traditional Survey and the Quality Indicator Survey (QIS). CMS deems both as surveys of record to evaluate compliance of nursing homes with the requirements at 42 CFR 483.5-483.75:

CMS is in the process of a staged implementation of the QIS as a replacement for the current (Traditional) survey process. The QIS is a two-staged, computer-assisted survey process with Stage 1 consisting of both computer analysis of offsite data as well as data collected by surveyors onsite from observations, interviews, and record reviews of large computer-selected resident samples. Stage 2 consists of systematic surveyor investigations of triggered issues and residents using the Guidance to Surveyors as well as a set of investigative tools known as critical elements protocols. In addition to the Stage 1 and Stage 2 sample-based investigations, the QIS also contains several facility-level tasks that are

unstaged and are completed either on every survey or when triggered as areas of concern. reviews of large computer-selected resident samples. The information collected throughout Stage 1 is analyzed by computer to derive a set of approximately 160 Quality of Care Indicators (QCIs) that are used to compare the facility being surveyed to national norms. QCIs that score beyond a statistical threshold are computer-selected for Stage 2 review, and the relevant residents are also computer selected. Stage 2 consists of systematic surveyor investigations of triggered issues and residents using a set of detailed investigative tools known as critical elements protocols. In addition to the Stage 1 and Stage 2 sample-based investigations, the QIS also contains several facility-level tasks that are unstaged and are completed either on every survey or when triggered as areas of concern.

**THE TRADITIONAL SURVEY:**

**Task 1 – Offsite survey preparations**
The objective of Task 1 is to analyze various sources of information about the facility, to identify and pre-select concerns and potential residents for Phase 1 of the survey, to note concerns about the facility from other sources listed below and to determine potential concerns that may require additional survey team members.

The surveyors will review all of the following information and determine potential areas of concern for focus during the survey process. They will identify specific residents for the review sample with specific attention being given to the weight loss, dehydration and pressure ulcer groups especially if the QI is triggered at or above 75% and determine if specialty surveyors are needed.

- Quality Measure/Indicator (QM/I) Reports from the Standard Analytic Reporting System of the CMS National Resident Assessment Data Base Using Quality Measures/Indicators (QM/Is) as a Guide:
    - Facility Characteristics
    - Facility Quality Measure/ Indicator Profile
    - Resident Level Summary
- Statement of Deficiencies (Form CMS-2567) and Statement of Isolated Deficiencies Which Cause No Actual Harm With Only Potential for Minimal Harm
- OSCAR (Online Survey and Certification Reporting System) Report 3, History Facility Profile and OSCAR Report 4, Full Facility Profile
- Results of Complaint Investigations
- Information About Waivers and Variances
- Information from State Ombudsman Office
- Preadmission Screening and Resident Review Reports (PASRR)
- Other Pertinent Information

The 27 QM/Is include 12 categories known as Domains: Accidents, Behavioral / Emotional Patterns, Clinical Management, Cognitive Patterns, Elimination / Continence, Infection Control, Nutrition / Eating, Pain Management, Physical Functioning, Psychotropic Drugs, Quality of Life, Skin Care. They are a critical part of the survey process that was developed as a part of CMS' National Nursing Home Care-mix and Quality Demonstration Project. These are powerful sources of information based upon responses to the MDS 2.0. QM/I's are reflective of MDS assessment currently on file in state databases. They *are not* the judge and jury of facility performance but are used for quality assurance. QM/Is are used as an indicator of potential problems or concerns that warrant further investigation. Over half of the QM/I's relate to nutrition.

**Task 2 – Entrance Conference and Onsite Preparatory Activities**
Surveyors will introduce themselves to the facility administrator. Other team members will begin the initial tour (Task 3) while the team coordinator does the following:

- Request copies of menus – both general and therapeutic
- Request copy of work schedules for licensed and registered nursing staff
- Inform the facility staff that the survey team will communicate with them throughout the survey
- Explain the survey process and answer any questions from the staff
- Give the administrator copies of the 3 QI reports and the OSCAR 3 & 4 reports

- Ask the administrator to describe any special features of the facility's care and treatment programs, organization and case mix
- Inform the administrator that there will be interviews with individual residents, groups of residents, family members, friends and legal representatives and that interviews are conducted privately unless the interviewee requests otherwise
- Ask that the following information be provided within one hour of the conclusion of the Entrance Conference:
  - List of key facility personnel and their locations
  - Copy of written information provided to residents regarding their rights
  - Meal times, dining locations, copies of all menus (including therapeutic menus) that will be served during the survey
  - Medication pass times
  - List of admissions for the past month and a list of residents transferred or discharged during the last 3 months with destinations.
  - Copy of the facility's layout
  - Copy of facility admission contract(s) for all residents
  - Facility policies and procedures to prohibit and investigate allegations of abuse
  - Evidence that the facility monitors accidents and other incidents
  - Current activity calendar
  - Names of residents age 55 and under
  - Names of residents who communicate with non-oral communication devices, sign language or who speak a language other that the dominant language of the facility
- Ask the facility to complete the Roster/Sample Matrix (CMS- 802)
- Ask the administrator about procedures to ensure that water is available in the event of loss of normal supply

**Task 3 – Initial Tour**

The objective of the Initial Tour is to provide an initial review of the facility, residents and staff; obtain an initial evaluation of the environment of the facility (including the kitchen), and confirm or invalidate the pre-selected concerns and add concerns discovered onsite.

The initial tour focuses on the following:

- Quality of life
- Emotional and behavioral conduct of the residents and the reactions and interventions by the staff
- Care issues, how care is provided and prevalence of special care needs (including, but not necessarily limited to, dehydration, weight loss, pressure ulcers/sores, feeding tubes)
- Impact of the facility environment and safety issues

The initial kitchen tour is a brief observation and overview of the kitchen, not an in-depth study. Surveyors will examine the sanitation practices and cleanliness of the kitchen including observing employee practices to prevent foodborne illness (i.e., handwashing, clean and appropriate attire, sanitary practices, no potentially hazardous foods left on the counter or thawing in the sink, no food in steam table at unsafe temperatures.)

**Task 4 – Sample Selection**

Surveyors will select a sample of residents for review of care, using CMS 802 or Roster/Sample Matrix Worksheet and other information gathered to identify residents. Residents will be chosen for Phase 1 Sample and as the survey is conducted, Phase 2 sample residents will be chosen based on those concerns the surveyors have (i.e., weight loss or pressure sores/ulcers). The number of residents chosen for review depends on the facility size. Surveyors will talk with residents, families and staff; and review current and closed medical records. Half of the sample is selected from the weight loss, dehydration and pressure ulcer/sore resident group.

This surveyor task is to select a case-mix stratified sample of facility residents to assess compliance with the resident-centered long term care requirements.

- Phase 1 Offsite Sample is done during Task 1 – Offsite Survey Preparation
  - Initial concerns noted during off-site survey preparation and tour
- Phase 2 Sample Selection is done after the Tour, using the Offsite Sample and the Tour notes
- Phase 2 Sample Selection is done part way through the survey. Select concerns for Phase 2 are based on:

- Currently unreviewed concerns – This is Phase 2
- Current concerns for which information gathered is inconclusive – This is Phase 2

- Special factors to consider include:
  - New Admissions
  - Residents most at risk for neglect and abuse
  - Residents in rooms in which variances have been granted
  - Residents receiving hospice services
  - Residents with end-state renal disease
  - Residents under the age of 55
  - Residents with mental illness or mental retardation
  - Residents who communicate with non-oral communication devices, sign language, or speak a language other than the dominant language of the facility

**Task 5 – Information Gathering**: This task includes the following sub-tasks, once the sample has be selected in Task 4.:

- **Sub Task 5A General Observations of the Facility:** Assessment of the environment of the facility affecting the resident's life, health and safety
  - Condition of the environment
  - Proper and safe storage of drugs, biologicals, housekeeping compounds and equipment
- **Sub Task 5B Kitchen/Food Service Observations (Form CMS 804)**
  - Availability of food in relation to the number of residents
  - Whether food being prepared is consistent with the written, planned menu
  - If recipes are available, consistent with the menu and followed by employees
  - If appropriate equipment is available and used to prepare and serve foods
  - If food is being held for > 30 minutes prior to food service (e.g., in steam table, oven, refrigerator rather than freezer, etc.)
  - If leftovers used were stored and used within the appropriate time frames and reheated to at least 165° F
- **Dining Observations**
  - Resident complaints
  - Unplanned weight loss
  - Mechanically altered diets
- **Sub Task 5C Resident Review**
  - How resident outcomes and quality of life are related to the provision of care by the facility
  - If the care has enabled residents to reach or maintain their highest practicable physical, mental and psychosocial well-being
  - If residents are assisted to have the best quality of life that is possible
  - If the facility has properly assessed its residents through the RAI
  - If there are additional areas of concern that need to be investigated
  - Presence of pressure ulcers / sores
  - Review of residents receiving hospice or dialysis
- **Sub Task 5D Quality of Life Assessment**
  - Resident interview
  - Group interview
  - Interview with family member or friend of the non-interviewable resident
- **Sub Task 5E Medication Pass Observation**
  - Observe the actual preparation and administration of medications
- **Sub Task 5F Quality Assessment and Assurance Review**
  - Determine if the facility has a Quality Assessment and Assurance Committee

    - That the committee consists of the Director of Nursing, a physician designated by the facility and 3 members of the facility staff (minimum requirements)

    - The committee meets at least quarterly

    - The committee has a formal method to identify issues that require quality assessment and assurance activities

    - The committee has a formal method to respond to identified quality deficiencies and evaluate the effectiveness of that response

- For facilities with identified actual or probable quality deficiencies, determine if the facility:
  - Has identified quality deficiencies
  - Has developed and implemented a plan to address those deficiencies
  - Has evaluated, or has a plan to evaluate, the effectiveness of the planned implementation

- **Sub Task 5G Abuse Prohibition Review**
  - Includes policies and procedures to prohibit abuse, neglect, involuntary seclusion and misappropriation of property for the following
    - Screening of potential hires
    - Training of employees (both new and ongoing)
    - Prevention policies and procedures
    - Identification of possible incidents or allegations which need investigation
    - Investigation of incidents and allegations
    - Protection of residents during investigations
    - Reporting of incidents, investigations and facility response to the results of their investigations

**Task 6 – Determination of Compliance**

Surveyors will review and analyze all data to determine whether the facility has failed to meet one of more of the regulatory requirements. Depending on the findings, the surveyors may choose to extend the survey. Deficiencies are cited under the various "F" tags noted in the federal regulations (see listing in this section.) Surveyors will determine the severity of the deficiency dependent on whether the deficiency caused immediate harm to a resident or residents. (Refer to Scope and Severity Grid in this section for more information.)

Consistent documentation in medical records is essential. Emphasis will be placed on weight loss, dehydration and pressure ulcer/sore and sentinel event residents (i.e., dehydration, fecal impaction and pressure ulcers on low risk residents). The determination of avoidable / unavoidable will be made and the deficiency stated.

Evidence evaluation includes two categories:

- Potential or actual physical, mental or psychosocial injury or deterioration to a resident including violation of residents' rights. Examples may include:
  - Development or worsening of a pressure ulcer
  - Loss of dignity due to lying in a urine-saturated bed for a prolonged period
  - Social isolation caused by staff failure to assist resident in participating in scheduled activities
- Lack of (or the potential for lack of) reaching the highest practicable level of physical, mental or psychosocial well-being. Examples may include:
  - Facility identified the resident's desire to reach a higher level of ability but failed to implement or consistently implement the plan of care
  - Facility identified a need in the comprehensive assessment but failed to develop a care plan to meet the resident's needs and therefore the resident was not given the opportunity to reach his/her highest practicable well-being
  - Facility failed to identify the resident's need/problem/ability to improve (e.g., the ability to eat independently if given assistive devices) therefore the resident was not given the opportunity to reach his/her highest practicable well-being
  - Facilities written procedures or oral explanations do not provide information about which residents are supposed to be fully informed

**Task 7 – Exit Conference**

The objective of the exit conference is to inform the facility of the survey team's observations and preliminary findings. The surveyors describe the team's preliminary deficiency findings and let the facility know they will receive a report of the survey, which will contain any deficiencies that have been cited against the facility (CMS-2567). The surveyors should provide the facility the opportunity to discuss and supply additional information that they believe is pertinent to the identified findings.

The RD should request that he/she be involved in the Exit Conference if at all possible. When the report is received, the RD should be involved in the response to any cites and in writing the Plan of Correction (PoC).

Survey results are posted on the CMS website and must also be posted in the facility for anyone to review.

**II. - The Quality Indicators Survey (QIS)**

The QIS standard survey consists of the following Tasks (complete details are available at the CMS website listed with resources at the end of this chapter)

- Task 1: Offsite Survey Preparation: Offsite Survey Preparation and Initial Sampling
- Task 2: Onsite Preparatory Activities and Entrance Conference
- Task 3: Initial Tour
- Task 4: Stage I Survey Tasks : Finalize Sample Selection , Stage I Sample Selection, Stage I Team Meetings (first meeting), Stage I Information Gathering, Stage I Admission Sample Review, Medical Record Review, Stage I Census Sample Review, Resident Interviews, Resident Unavailable for Interviews, Resident Observations, Staff Interviews, Medical Record Review, Family Interviews
- Task 5: Non-Staged Survey Tasks: Resident Council President/Representative Interview, Dining Observation, Kitchen/Food Service Observation, Infection Control Policies and Procedures, Demand Billing Review, Abuse Prohibition Review, Quality Assessment and Assurance (QA & A) Review
- Task 6: Transition From Stage I to Stage II: Updating of the Resident Pool, Review Completion of Stage I, Review Surveyor-Initiated Residents and/or Care Areas, Import All Data into the Primary Laptop, Review the Relevant Findings Report, Review the QCI Results Report
- Task 7: Stage II Survey Tasks: Introduction, Team Meetings, Stage II Sample Selection, Substituting Residents, Supplementing the Sample, Staff Assignments, Stage II Information Gathering, Stage II Critical Element Pathways, Medication Administration Observation and Unnecessary Drug Review, Facility-Level Investigations, Environmental Observation, Resident Funds, Admission, Transfer, and Discharge Review, Sufficient Staff
- Task 8: Analysis and Decision-Making: Integration of Information, Integration of Facility-Level Information, Integration of Critical Element Pathways, Analysis of Information Gained Analysis of Scope and Severity and Team Decision-Making
- Task 9: Exit Conference: Prior to the exit conference, in which case the facility will be provided with findings from the standard and extended survey; or Subsequent to the standard survey, but no longer than 2 weeks after the completion of the standard survey, if the survey team is unable to complete the extended survey prior to the exit conference.

**Statement of Deficiencies (Form CMS2567)**

The Statement of Deficiencies (SOD) has several functions: it is the document that cites the specific deficiencies incurred during the standard or complaint survey; it contains the PoC written by the facility; it is disclosed to the public. The SOD is mailed within 10 **working** days after the survey and if deficiencies are present, the PoC is due back to the state after 10 **calendar** days.

**Writing a Plan of Correction (PoC)**

An acceptable PoC **must**:

- Address how the corrective action will be accomplished for those residents found to have been affected by the deficient practice;
- Address how the facility will identify other residents having the potential to be affected by the same deficient practice;
- Address what measures will be put into place or systemic changes made to ensure that the deficient practice will not recur;
- Indicate how the facility plans to monitor its performance to make sure that solutions are sustained. The facility must develop a plan for ensuring that the correction is achieved and sustained. It must be implemented and the corrective action evaluated for its effectiveness. The PoC is integrated into the quality assurance system; and
- Includes dates when corrective action will be completed. The corrective action completion dates must be acceptable to the State. If unacceptable, the State notifies the facility in writing and the PoC is revised. If accepted, the State will notify the facility by phone, e-mail, etc.

**Informal Dispute Resolution (IDR)**
The purpose of the IDR is to give the facility one opportunity to refute cited deficiencies after any survey. The request must be submitted in writing along with an explanation of the specific deficiencies that are being disputed. The request must be made within the 10 calendar day period the facility has for submitting the PoC.

In writing an IDR, be specific regarding what deficiencies are being disputed and reasons for this. Include supporting documentation. These may include statements in the medical record that refutes the facts as stated in the deficiency. Be factual, do not offer opinions. Be concise and organized.
NOTE: Surveyors can make errors related to not having enough information, not being informed, or not having a clear understanding of the particular areas related to nutrition or dietary. Be sure to represent the facility and hold surveyors accountable for the legitimacy of the process including accuracy and reliability of conclusions.

If an IDR is successful, deficiencies will be deleted, any enforcement action(s) imposed solely because of that deficiency will be rescinded and the scope and severity may be adjusted to reflect the elimination of the citation.

Included below is the Scope and Severity grid for rating nursing home deficiencies, followed by a brief description of the grid components. Please refer to the SOM from CMS for more detailed information.

**Scope and Severity Grid for Rating Nursing Home Deficiencies**

| | | | |
|---|---|---|---|
| Level 4: Immediate jeopardy to Resident Health and Safety | J<br>PoC<br>Required: Cat. 3 (must impose temporary management and/or termination; CMP is optional)<br>Optional: Cat. 1<br>Optional: Cat. 2 | K PoC<br>Required: Cat. 3 (must impose temporary management and/or termination; CMP is optional)<br>Optional: Cat. 1<br>Optional: Cat. 2 | L PoC<br>Required: Cat. 3 (must impose temporary management and/or termination; CMP is optional)<br>Optional: Cat. 1<br>Optional: Cat. 2 |
| Level 3: Actual Harm that is not Immediate Jeopardy | G<br>PoC<br>Required: Cat 2<br>Optional: Cat. 1 | H PoC<br>Required: Cat. 2*<br>Optional: Cat. 1 | I PoC<br>Required: Cat 2*<br>Optional: Cat. 1<br>Optional: Temp. Mgt. |
| Level 2: No Actual Harm with Potential for More than Minimal Harm that is not Immediate Jeopardy | D<br>PoC<br>Required: Cat 1*<br>Optional: Cat 2 | E PoC<br>Required: Cat 1*<br>Optional: Cat 2 | F PoC<br>Required: Cat 2<br>Optional: Cat. 1 |
| Level 1:No Actual Harm with Potential for Minimal Harm | A<br>No PoC<br>Not on CMS-2567 | B PoC | C PoC |
| | **Isolated** | **Pattern** | **Widespread** |

**Level 4: Immediate Jeopardy to resident health or safety. (J, K, L)**
Noncompliance that results in immediate jeopardy, a situation in which immediate corrective action is necessary because the facility's noncompliance with one or more requirements of participation has caused, or is likely to cause, serious injury, harm, impairment, or death to a resident receiving care in a facility.

**Level 3: Actual Harm that is not Immediate Jeopardy. (G, H, I)**
Noncompliance that results in a negative outcome that has compromised the resident's ability to maintain and/or reach his/her highest practicable physical, mental, and psychosocial well-being.

**Level 2: No Actual Harm with potential for more than minimal harm that is not Immediate Jeopardy**. **(D, E, F)**
Noncompliance that results in no more than minimal physical, mental and/or psychosocial discomfort to the resident and/or has the potential, (not yet realized) to compromise the resident's ability to maintain and/or reach his/her highest practicable physical, mental and/or psychosocial well-being.

**Level 1: No Actual Harm with the potential for minimal harm. (A, B, C)**
A deficiency that has the potential for causing no more than a minor negative impact on the resident(s).

Substandard quality of care: any deficiency in § 483.13 Resident Behavior and Facility Practices, § 483.15 Quality of Life, or in
§ 483.25 Quality of Care that constitutes immediate jeopardy to resident health or safety; or, a pattern of, or widespread actual harm that is not immediate jeopardy; or a widespread potential for more that minimal harm that is not immediate jeopardy, with no actual harm.

[redacted] Deemed to be in substantial compliance

**REMEDY CATEGORIES**

| Category 1 (Cat. 1) | Category 2 (Cat. 2) | Category 3 (Cat. 3) |
|---|---|---|
| Directed Plan of Correction (PoC) | Denial of Payment for New Admissions | Temporary Management |
| State Monitor; and / or | Denial of Payment for All Individuals (imposed by HCFA only); and / or | Termination |
| Directed In-Service Training | Civil Money Penalties: $50 - $3,000 / day | Civil Money Penalties $ 3,050 - $ 10,000 / day |

**NOTE:**
1. **Denial of Payment for New Admissions** must be imposed when a facility is not in substantial compliance within 3 months after being found out of compliance.
2. **Denial of Payment and State Monitoring** must be imposed when a facility has been found to have provided substandard quality of care on three (3) consecutive standard surveys. Only HCFA may impose denial of all payments.
3. **Termination** may be imposed by the State or HCFA at any time when appropriate.

**As of January 14, 2000**, regulations include the following:
**"Double G."** If the facility receives a "G" level deficiency or higher and if another "G" level deficiency or higher was received at the time of the last full survey or since the last full survey, a remedy or fine can be assessed immediately without an "opportunity to correct."

**Per-Instance CMP:** In addition to the traditional per-day Civil Money Penalties, a single CMP ranging from $1,000 to $10,000 on a per-instance basis for non-compliance may be imposed with no "opportunity to correct."

***IMPORTANT: Regulations constantly change. It is imperative that the RD be aware of all changes, amendments and updates to federal, state and local regulations.***

**F325 Nutrition §483.25(i) was revised with an Effective/Implementation Date of 09-01-08.**

It is important to understand all regulations and interpretive guidelines applied to facilities, especially those that relate specifically to nutrition. F-Tag 325 Nutrition is included in detail since it had significant revisions in 2008. There is also a listing of other FTags related to nutrition that can be found beginning on page 226.

**Based on a resident's comprehensive assessment, the facility must ensure that a resident-- §483.25(i)**
**(1) Maintains acceptable parameters of nutritional status, such as body weight and protein levels, unless the resident's clinical condition demonstrates that this is not possible; and §483.25(i)**
**(2) Receives a therapeutic diet when there is a nutritional problem. INTENT: §483.25(i) Nutritional Status**

**The intent of this requirement is that the resident maintains, to the extent possible, acceptable parameters of nutritional status and that the facility:**
• Provides nutritional care and services to each resident, consistent with the resident's comprehensive assessment;
• Recognizes, evaluates, and addresses the needs of every resident, including but not limited to, the resident at risk or already experiencing impaired nutrition; and

• Provides a therapeutic diet that takes into account the resident's clinical condition, and preferences, when there is a nutritional indication.

**DEFINITIONS: Definitions are provided to clarify clinical terms related to nutritional status.**

• "Acceptable parameters of nutritional status" refers to factors that reflect that an individual's nutritional status is adequate, relative to his/her overall condition and prognosis.

• "Albumin" is the body's major plasma protein, essential for maintaining osmotic pressure and also serving as a transport protein.

• "Anemia" refers to a condition of low hemoglobin concentration caused by decreased production, increased loss, or destruction of red blood cells.

• "Anorexia" refers to loss of appetite, including loss of interest in seeking and consuming food.

• "Artificial nutrition" refers to nutrition that is provided through routes other than the usual oral route, typically by placing a tube directly into the stomach, the intestine or a vein.

• "Avoidable/Unavoidable" failure to maintain acceptable parameters of nutritional status:

o "Avoidable" means that the resident did not maintain acceptable parameters of nutritional status and that the facility did not do one or more of the following: evaluate the resident's clinical condition and nutritional risk factors; define and implement interventions that are consistent with resident needs, resident goals and recognized standards of practice; monitor and evaluate the impact of the interventions; or revise the interventions as appropriate.

o "Unavoidable" means that the resident did not maintain acceptable parameters of nutritional status even though the facility had evaluated the resident's clinical condition and nutritional risk factors; defined and implemented interventions that are consistent with resident needs, goals and recognized standards of practice; monitored and evaluated the impact of the interventions; and revised the approaches as appropriate.

• "Clinically significant" refers to effects, results, or consequences that materially affect or are likely to affect an individual's physical, mental, or psychosocial well-being either positively by preventing, stabilizing, or improving a condition or reducing a risk, or negatively by exacerbating, causing, or contributing to a symptom, illness, or decline in status.

• "Current standards of practice" refers to approaches to care, procedures, techniques, treatments, etc., that are based on research or expert consensus and that are contained in current manuals, textbooks, or publications, or that are accepted, adopted or promulgated by recognized professional organizations or national accrediting bodies.

• "Dietary supplements" refers to nutrients (e.g., vitamins, minerals, amino acids, and herbs) that are added to a person's diet when they are missing or not consumed in enough quantity.

• "Insidious weight loss" refers to a gradual, unintended, progressive weight loss over time.

• "Nutritional Supplements" refers to products that are used to complement a resident's dietary needs (e.g., total parenteral products, enteral products, and meal replacement products).

• "Parameters of nutritional status" refers to factors (e.g., weight, food/fluid intake, and pertinent laboratory values) that reflect the resident's nutritional status.

• "Qualified dietitian" refers to one who is qualified based upon either registration by the Commission on Dietetic Registration of the American Dietetic Association or as permitted by State law, on the basis of education, training, or experience in identification of dietary needs, planning, and implementation of dietary programs.

• "Therapeutic diet" refers to a diet ordered by a health care practitioner as part of the treatment for a disease or clinical condition, to eliminate, decrease, or increase certain substances in the diet (e.g., sodium or potassium), or to provide mechanically altered food when indicated.

• "Usual body weight" refers to the resident's usual weight through adult life or a stable weight over time.

**Overview of Nutrition:** The early identification of residents with, or at risk for, impaired nutrition, may allow the interdisciplinary team to develop and implement interventions to stabilize or improve nutritional status before additional complications arise. However, since intake is not the only factor that affects nutritional status, nutrition-related interventions only sometimes improve markers of nutritional status such as body weight and laboratory results. While they can often be stabilized or improved, nutritional deficits and imbalances may take time to improve or they may not be fully correctable in some individuals. A systematic approach can help staff's efforts to optimize a resident's nutritional status. This process includes identifying and assessing each resident's nutritional status and risk factors, evaluating/analyzing the assessment information, developing and consistently implementing pertinent approaches, and monitoring the effectiveness of interventions and revising them as necessary.

**ASSESSMENT** According to the American Dietetic Association, "Nutritional assessment is a systematic process of obtaining, verifying and interpreting data in order to make decisions about the nature and cause of nutrition-related problems." The assessment also provides information that helps to define meaningful interventions to address any nutrition-related problems. The interdisciplinary team clarifies nutritional issues, needs, and goals in the context of the resident's overall condition, by using observation and gathering and considering information relevant to each resident's eating and nutritional status. Pertinent sources of such information may include interview of the resident or resident representative, and review of information (e.g., past history of eating patterns and weight and a summary of any recent hospitalizations) from other sources. The facility identifies key individuals who should participate in the assessment of nutritional status and related causes and consequences. Qualified dietitians help identify nutritional risk factors and recommend nutritional interventions, based on each resident's medical condition, needs, desires, and goals. Although the Resident Assessment Instrument (RAI) is the only assessment tool specifically required, a more in-depth nutritional assessment may be needed to identify the nature and causes of impaired nutrition and nutrition-related risks. Completion of the RAI does not remove the facility's responsibility to document a more detailed resident assessment, where applicable. The in-depth nutritional assessment may utilize existing information from sources, such as the RAI, assessments from other disciplines, observation, and resident and family interviews. The assessment will identify usual body weight, a history of reduced appetite or progressive weight loss or gain prior to admission, medical conditions such as a cerebrovascular accident, and events such as recent surgery, which may have affected a resident's nutritional status and risks.

The in-depth nutritional assessment may also include the following information:

- General Appearance - General appearance includes a description of the resident's overall appearance (e.g., robust, thin, obese, or cachectic) and other findings (e.g., level of consciousness, responsiveness, affect, oral health and dentition, ability to use the hands and arms, and the condition of hair, nails, and skin) that may affect or reflect nutritional status.

- Height - Measuring a resident's height provides information that is relevant (in conjunction with his or her weight) to his/her nutritional status. There are various ways to estimate height if standing height cannot be readily measured. A protocol for determining height helps to ensure that it will be measured as consistently as possible.

- Weight - Weight can be a useful indicator of nutritional status, when evaluated within the context of the individual's personal history and overall condition. When weighing a resident, adjustment for amputations or prostheses may be indicated. Significant unintended changes in weight (loss or gain) or insidious weight loss may indicate a nutritional problem. Current standards of practice recommend weighing the resident on admission or readmission (to establish a baseline weight), weekly for the first 4 weeks after admission and at least monthly thereafter to help identify and document trends such as insidious weight loss. Weighing may also be pertinent if there is a significant change in condition, food intake has declined and persisted (e.g., for more than a week), or there is other evidence of altered nutritional status or fluid and electrolyte imbalance. In some cases, weight monitoring is not indicated (e.g., the individual is terminally ill and requests only comfort care).

  Obtaining accurate weights for each resident may be aided by having staff follow a consistent approach to weighing and by using an appropriately calibrated and functioning scale (e.g., wheelchair scale or bed scale). Since weight varies throughout the day, a consistent process and technique (e.g., weighing the resident wearing a similar type of clothing, at approximately the same time of the day, using the same scale, either consistently wearing or not wearing orthotics or prostheses, and verifying scale accuracy) can help make weight comparisons more reliable. A system to verify weights can help to ensure accuracy. Weights obtained in different settings may differ substantially. For example, the last weight obtained in the hospital may differ markedly from the initial weight upon admission to the facility, and is not to be used in lieu of actually weighing the resident. Approaches to improving the accuracy of weights may include reweighing the resident and recording the current weight, reviewing approaches to obtaining and verifying weight, and modifying those approaches as needed.

Examples of other factors that may impact weight and the significance of apparent weight changes include: • The resident's usual weight through adult life; • Current medical conditions; • Calorie restricted diet; • Recent changes in dietary intake; and • Edema. Food and fluid intake –

The nutritional assessment includes an estimate of calorie, nutrient and fluid needs, and whether intake is adequate to meet those needs. It also includes information such as the route (oral, enteral or parenteral) of intake, any special food formulation, meal and snack patterns (including the time of supplement or medication consumption in relation to the meals), dislikes, and preferences (including ethnic foods and form of foods such as finger foods); meal/snack patterns, and preferred portion sizes. Fluid loss or retention can cause short term weight change.

Much of a resident's daily fluid intake comes from meals; therefore, when a resident has decreased appetite, it can result in fluid/electrolyte imbalance. Abrupt weight changes, change in food intake, or altered level of consciousness are some of the clinical manifestations of fluid and electrolyte imbalance. Laboratory tests (e.g., electrolytes, BUN, creatinine and serum osmolality) can help greatly to identify, manage, and monitor fluid and electrolyte status. Altered Nutrient intake, absorption, and utilization. Poor intake, continuing or unabated hunger, or a change in the resident's usual intake that persists for multiple meals, may indicate an underlying problem or illness.

Examples of causes include: • The inability to consume meals provided (e.g., as a result of the form or consistency of food/fluid, cognitive or functional decline, arthritis-related impaired movement, neuropathic pain, or insufficient assistance); • Insufficient availability of food and fluid (e.g., inadequate amount of food or fluid or inadequate tube feedings); • Environmental factors affecting food intake or appetite (e.g., comfort and level of disruption in the dining environment); • Adverse consequences related to medications; and • Diseases and conditions such as cancer, diabetes mellitus, advanced or uncontrolled heart or lung disease, infection and fever, liver disease, hyperthyroidism, mood disorders, and repetitive movement disorders (e.g., wandering, pacing, or rocking).

The use of diuretics and other medications may cause weight loss that is not associated with nutritional issues, but can also cause fluid and electrolyte imbalance/dehydration that causes a loss of appetite and weight. Various gastrointestinal disorders such as pancreatitis, gastritis, motility disorders, small bowel dysfunction, gall bladder disease, and liver dysfunction may affect digestion or absorption of food. Prolonged diarrhea or vomiting may increase nutritional requirements due to nutrient and fluid losses. Constipation or fecal impaction may affect appetite and excretion. Pressure ulcers and some other wounds and other health impairments may also affect nutritional requirements. A hypermetabolic state results from an increased demand for energy and protein and may increase the risk of weight loss or under-nutrition. Examples of causes include advanced chronic obstructive pulmonary disease (COPD), pneumonia and other infections, cancer, hyperthyroidism, and fever. Early identification of these factors, regardless of the presence of any associated weight changes, can help the facility choose appropriate interventions to minimize any subsequent complications. Often, several of these factors affecting nutrition coexist.

Chewing abnormalities - Many conditions of the mouth, teeth, and gums can affect the resident's ability to chew foods. For example, oral pain, dry mouth, gingivitis, periodontal disease, ill-fitting dentures, and broken, decayed or missing teeth can impair oral intake. Swallowing abnormalities - Various direct and indirect causes can affect the resident's ability to swallow. These include but are not limited to stroke, pain, lethargy, confusion, dry mouth, and diseases of the oropharynx and esophagus. Swallowing ability may fluctuate from day to day or over time. In some individuals, aspiration pneumonia can complicate swallowing abnormalities.

NOTE: Swallowing studies are not always required in order to assess eating and swallowing; however, when they are indicated, it is essential to interpret any such tests in the proper context. A clinical evaluation of swallowing may be used to evaluate average daily oral function. Functional ability - The ability to eat independently may be helped by addressing factors that impair function or by providing appropriate individual assistance, supervision, or assistive devices. Conditions affecting functional ability to eat and drink

include impaired upper extremity motor coordination and strength or reduced range of motion (any of which may be hampered by stroke, Parkinson's disease, multiple sclerosis, tardive dyskinesia, or other neuromuscular disorders or by sensory limitations (e.g., blindness)). Cognitive impairment may also affect a resident's ability to use a fork, or to eat, chew, and swallow effectively. Medications - Medications and nutritional supplements may affect, or be affected by, the intake or utilization of nutrients (e.g., liquid phenytoin taken with tube feedings or grapefruit juice taken with some antihyperlipidemics). Medications from almost every pharmaceutical class can affect nutritional status, directly or indirectly; for example, by causing or exacerbating anorexia, lethargy, confusion, nausea, constipation, impairing taste, or altering gastrointestinal function. Inhaled or ingested medications can affect food intake by causing pharyngitis, dry mouth, esophagitis, or gastritis.

To the extent possible, consideration of medication/nutrient interactions and adverse consequences should be individualized. Goals and prognosis - Goals and prognosis refer to a resident's projected personal and clinical outcomes. These are influenced by the resident's preferences (e.g., willingness to participate in weight management interventions or desire for nutritional support at end-of-life), anticipated course of a resident's overall condition and progression of a disease (e.g., end-stage, terminal, or other irreversible conditions affecting food intake, nutritional status, and weight goals), and by the resident's willingness and capacity to permit additional diagnostic testing, monitoring and treatment.

Laboratory/Diagnostic Evaluation Laboratory tests are sometimes useful to help identify underlying causes of impaired nutrition or when the clinical assessment alone is not enough to define someone's nutritional status. Abnormal laboratory values may, but do not necessarily, imply that treatable clinical problems exist or that interventions are needed. Confirmation is generally desirable through additional clinical evaluation and evidence such as food intake, underlying medical condition, etc. For example, serum albumin may help establish prognosis but is only sometimes helpful in identifying impaired nutrition or guiding interventions. Serum albumin may drop significantly during an acute illness for reasons unrelated to nutrition; therefore, albumin may not improve, or may fall further, despite consumption of adequate amounts of calories and protein. The decision to order laboratory tests, and the interpretation of subsequent results, is best done in light of a resident's overall condition and prognosis. Before ordering laboratory tests it is appropriate for the health care practitioner to determine and indicate whether the tests would potentially change the resident's diagnosis, management, outcome or quality of life or otherwise add to what is already known. Although laboratory tests such as albumin and pre-albumin may help in some cases in deciding to initiate nutritional interventions, there is no evidence that they are useful for the serial follow-up of undernourished individuals. NOTE: If laboratory tests were done prior to or after admission to the facility and the test results are abnormal, the physician or other licensed health care practitioner, in collaboration with the interdisciplinary team, reviews the information and determines whether to intervene or order additional diagnostic testing.

**ANALYSIS:** Analysis refers to using the information from multiple sources to include, but not limited to, the Resident Assessment Instrument (RAI), and additional nutritional assessments as indicated to determine a resident's nutritional status and develop an individualized care plan. Resultant conclusions may include, but are not limited to: a target range for weight based on the individual's overall condition, goals, prognosis, usual body weight, etc; approximate calorie, protein, and other nutrient needs; whether and to what extent weight stabilization or improvement can be anticipated; and whether altered weight or nutritional status could be related to an underlying medical condition (e.g., fluid and electrolyte imbalance, medication-related anorexia, or an infection). Suggested parameters for evaluating significance of unplanned and undesired weight loss are: Interval Significant Loss Severe Loss 1 month 5% Greater than 5% 3 months 7.5% Greater than 7.5% 6 months 10% Greater than 10% The following formula determines percentage of weight loss: % of body weight loss = (usual weight - actual weight) / (usual weight) x 100 Based on analysis of relevant information, the facility identifies a clinically pertinent basis for any conclusions that a resident could not attain or maintain acceptable parameters of nutritional status.

Specification of the Nutritional Concern: A clear statement of the nature of the nutritional concern provides the basis for resident-specific interventions. Many residents have multiple coexisting issues. For example: • Poor food and fluid intake: The resident has poor intake, is not consuming specific food groups, and has increased nutritional needs specific to clinical conditions. The resident also has lost significant weight over a few days while taking medications that may affect

appetite. • Specific clinical conditions: The resident has an infection with fever and is in a hyper-metabolic state associated with an increased demand for energy and protein. The resident also has a neuromuscular disorder affecting the ability to eat or swallow, and has impaired cognition affecting attention and appetite.

**CARE PLANNING AND INTERVENTIONS: The** management of nutrition in nursing homes involves various medical, psychosocial, ethical, and functional considerations. Based on information generated by the comprehensive assessment and any pertinent additional nutritional assessment, the interdisciplinary team (including a physician or other licensed health care practitioner and the resident or the resident's representative) develops an individualized care plan.

The care plan addresses, to the extent possible, identified causes of impaired nutritional status, reflects the resident's goals and choices, and identifies resident-specific interventions and a time frame and parameters for monitoring. The care plan is updated as needed; e.g., as conditions change, goals are met, interventions are determined to be ineffective, or as specific treatable causes of nutrition-related problems (anorexia, impaired chewing, etc.) are identified. If nutritional goals are not achieved, different or additional pertinent approaches are considered and implemented as indicated. Pertinent documentation can help identify the basis (e.g., current resident status, comorbid conditions, prognosis, and resident choices) for nutrition-related goals and interventions.

**Resident Choice** A resident or resident representative has the right to make informed choices about accepting or declining care and treatment. The facility can help the resident exercise those rights effectively by discussing with the resident (or the resident's representative) the resident's condition, treatment options (including related risks and benefits, and expected outcomes), personal preferences, and any potential consequences of accepting or refusing treatment. If the resident declines specific interventions, the facility must address the resident's concerns and offer relevant alternatives. The facility's care reflects a resident's choices, either as offered by the resident directly or via a valid advance directive, or based on a decision made by the resident's surrogate or representative in accordance with state law. The presence of care instructions, such as an advance directive, declining some interventions does not necessarily imply that other support and care was declined or is not pertinent. When preferences are not specified beforehand, decisions related to the possible provision of supplemental or artificial nutrition should be made in conjunction with the resident or resident's representative in accordance with state law, taking into account relevant considerations such as condition, prognosis, and a resident's known values and choices.

NOTE: The presence of a "Do Not Resuscitate" (DNR) order does not by itself indicate that the resident is declining other appropriate treatment and services. It only indicates that the resident has chosen not to be resuscitated if cardiopulmonary functions cease.

**Meeting Nutritional Needs:** The scope of interventions to meet residents' nutritional needs depends on many factors, including, but not limited to a resident's current food intake, the degree of nutritional impairment or risk, resident choices, the response to initial interventions, and the feasibility of addressing underlying conditions and causes. Basic energy needs can generally be met by providing a diet that includes enough calories to stabilize current body weight. Adjustments may be necessary when factors exist such as those discussed within this document. For example, limits on dairy products may be desirable in individuals with lactose intolerance, and additional amounts of nutrients and calories may be needed for individuals with hypermetabolic states (e.g., fever, hyperthyroidism, acute wounds, or heart or lung disease), to try to keep the body from using lean body mass for energy and wound repair. **Diet Liberalization**: Research suggests that a liberalized diet can enhance the quality of life and nutritional status of older adults in long-term care facilities. Thus, it is often beneficial to minimize restrictions, consistent with a resident's condition, prognosis, and choices before using supplementation. It may also be helpful to provide the residents their food preferences, before using supplementation. This pertains to newly developed meal plans as well as to the review of existing diets. Dietary restrictions, therapeutic (e.g., low fat or sodium restricted) diets, and mechanically altered diets may help in select situations. At other times, they may impair adequate nutrition and lead to further decline in nutritional status, especially in already undernourished or at-risk individuals. When a resident is not eating well or is losing weight, the interdisciplinary team may temporarily abate dietary restrictions and liberalize the diet to improve the resident's food intake to try to stabilize their weight. Sometimes, a resident or resident's representative decides to decline medically relevant dietary restrictions. In such circumstances, the resident, facility and practitioner collaborate to identify pertinent alternatives.

**Weight-Related Interventions** For many residents (including overweight individuals), the resident's usual body weight prior to decline or admission is the most relevant basis for weight-related interventions. Basing interventions on ideal body weight can be misleading, because ideal body weight has not been definitively established for the frail elderly and

those with chronic illnesses and disabilities. The care plan includes nutritional interventions that address underlying risks and causes of weight loss (e.g., the need for eating assistance, reduction of medication side effects, and additional food that the resident will eat) or unplanned weight gain. It is important that the care plan address insidious, abrupt, or sudden decline in intake or insidious weight loss that does not trigger review of the Nutritional Status Resident Assessment Protocol (RAP); for example, by intensifying observation of intake and eating patterns, monitoring for complications related to poor intake, and seeking underlying cause(s). Many risk factors and some causes of weight loss can be addressed, at least partially, while others may not be modifiable. In some cases, certain interventions may not be indicated or appropriate, based on individual goals and prognosis. Weight stability, rather than weight gain, may sometimes be the most pertinent short-term or long-term objective for the nutritionally at-risk or compromised resident. After an acute illness or as part of an advanced or end-stage medical condition, the resident's weight and other nutritional parameters may not return to previous levels and may stabilize at a lower level, sometimes indefinitely. NOTE: There should be a documented clinical basis for any conclusion that nutritional status or significant weight change are unlikely to stabilize or improve (e.g., physician's documentation as to why weight loss is medically unavoidable).

**Weight Gain:** Unplanned weight gain in a resident may have significant health implications. Rapid or abrupt increases in weight may also indicate significant fluid excess. After assessing the resident for the cause of the weight gain, care plan interventions may include dietary alterations based on the resident's medical condition, choices, and needs. If the resident exercises his/her right to choose and declines dietary restrictions, the facility discusses with the resident the benefits of maintaining a lower weight and the possible consequences of not doing so. A health care practitioner can help inform the resident about the rationale for the recommended plan of care**.**

**Environmental Factors**: Appetite is often enhanced by the appealing aroma, flavor, form, and appearance of food. Resident-specific facility practices that may help improve intake include providing a pleasant dining experience (e.g., flexible dining environments, styles and schedules), providing meals that are palatable, attractive and nutritious (e.g., prepare food with seasonings, serve food at proper temperatures, etc.), and making sure that the environment where residents eat (e.g., dining room and/or resident's room) is conducive to dining. **Anorexia**: The facility, in consultation with the practitioner, identifies and addresses treatable causes of anorexia. For example, the practitioner may consider adjusting or stopping medications that may have caused the resident to have dyspepsia or become lethargic, constipated, or confused, and reevaluate the resident to determine whether the effects of the medications are the reasons for the anorexia and subsequent weight loss. Where psychosis or a mood disorder such as depression has been identified as a cause of anorexia or weight change, treatment of the underlying disorder (based on an appropriate diagnostic evaluation) may improve appetite. However, other coexisting conditions or factors instead of, or in addition to, depression, may cause or contribute to anorexia. In addition, the use of antidepressants is not generally considered to be an adequate substitute for appropriately investigating and addressing modifiable risk factors or other underlying causes of anorexia and weight loss.

**Wound Healing:** Healing of acute (e.g., postoperative) and chronic (e.g., pressure ulcer) wounds requires enough calories and protein so that the body will not use lean body mass (muscle) for energy and wound repair. However, to date, no routinely beneficial wound-specific nutritional measures have been identified. Care plan interventions for a resident who has a wound or is at risk of developing a wound may include providing enough calories to maintain a stable weight and a daily protein intake of approximately 1.2-1.5 gm protein/Kg body weight. The recommended daily protein intake may be adjusted according to clinical need and standards of clinical practice for situations in which more calories and protein are indicated. Sometimes, it may be most appropriate to try to encourage the resident to eat as many calories and as much protein as tolerated, because he/she does not desire or cannot tolerate more aggressive nutritional interventions. Additional strategies for wound healing may be considered when indicated. A multivitamin/mineral supplement may be prescribed, however current evidence does not definitively support any specific dietary supplementation (e.g., Vitamin C and Zinc) unless the resident has a specific vitamin or mineral deficiency.

**Functional Factors** Based on the comprehensive interdisciplinary assessment, the facility provides the necessary assistance to allow the resident to eat and drink adequately. A resident with functional impairment may need help with eating. Examples of such interventions may include, but are not limited to: ensuring that sensory devices such as eyeglasses, dentures, and hearing aids are in place; providing personal hygiene before and after meals, properly positioning the individual, providing eating assistance where needed, and providing the assistive devices/utensils identified in the assessment.

**Chewing and Swallowing** In deciding whether and how to intervene for chewing and swallowing abnormalities, it is essential to take a holistic approach and look beyond the symptoms to the underlying causes. Pertinent interventions may help address the resident's eating, chewing, and swallowing problems and optimize comfort and enjoyment of meals.

Examples of such interventions may include providing proper positioning for eating; participation in a restorative eating program; use of assistive devices/utensils; and prompt assistance (e.g., supervision, cueing, hand-over-hand) during every meal/snack where assistance is needed. Treating medical conditions (e.g., gastroesophageal reflux disease and oral and dental problems) that can impair swallowing or cause coughing may improve a chewing or swallowing problem. Examples of other relevant interventions include adjusting medications that cause dry mouth or coughing, and providing liquids to moisten the mouth of someone with impaired saliva production. Excessive modification of food and fluid consistency may unnecessarily decrease quality of life and impair nutritional status by affecting appetite and reducing intake. Many factors influence whether a swallowing abnormality eventually results in clinically significant complications such as aspiration pneumonia. Identification of a swallowing abnormality alone does not necessarily warrant dietary restrictions or food texture modifications. No interventions consistently prevent aspiration and no tests consistently predict who will develop aspiration pneumonia. For example, tube feeding may be associated with aspiration, and is not necessarily a desirable alternative to allowing oral intake, even if some swallowing abnormalities are present. Decisions to downgrade or alter the consistency of diets must include the resident (or the resident's representative), consider ethical issues (such as the right to decline treatment), and be based on a careful review of the resident's overall condition, correctable underlying causes of the risk or problem, the benefits and risks of a more liberalized diet, and the resident's preferences to accept risks in favor of a more liberalized food intake.

**Medications** When a resident is eating poorly or losing weight, the immediate need to stabilize weight and improve appetite may supersede long-term medical goals for which medications were previously ordered. It may be appropriate to change, stop, or reduce the doses of medications (e.g., antiepileptics, cholinesterase inhibitors, or iron supplements) that are associated either with anorexia or with symptoms such as lethargy or confusion that can cause or exacerbate weight loss. The medical practitioner in collaboration with the staff and the pharmacist reviews and adjusts medications as appropriate. (For additional Guidance related to medications, refer to SOM 42 CFR 483.25(l)(1), F329, Unnecessary Drugs.)

**Food Fortification and Supplementation** With any nutrition program, improving intake via wholesome foods is generally preferable to adding nutritional supplements. However, if the resident is not able to eat recommended portions at meal times or to consume between-meal snacks/nourishments, or if he/she prefers the nutritional supplement, supplements may be used to try to increase calorie and nutrient intake. Since some research suggests that caloric intake may increase if nutritional supplements are consumed between meals, and may be less effective when given with meals, the use of nutritional supplements is generally recommended between meals instead of with meals. Taking a nutritional supplement during medication administration may also increase caloric intake without reducing the resident's appetite at mealtime.

Examples of interventions to improve food/fluid intake include: • Fortification of foods (e.g., adding protein, fat, and/or carbohydrate to foods such as hot cereal, mashed potatoes, casseroles, and desserts); • Offering smaller, more frequent meals; • Providing between-meal snacks or nourishments; or • Increasing the portion sizes of a resident's favorite foods and meals; and providing nutritional supplements.

**Maintaining Fluid and Electrolyte Balance** If a resident has poor intake or abnormal laboratory values related to fluid/electrolyte balance, the care plan addresses the potential for hydration deficits. Examples of interventions include adjusting or discontinuing medications that affect fluid balance or appetite; offering a variety of fluids (water, fruit juice, milk, etc.) between meals, and encouraging and assisting residents as appropriate. Serving (except to those with fluid restrictions) additional beverages with meals will also help increase fluid intake. Examples of ways to encourage fluid intake include maintaining filled water pitchers and drinking cups easily accessible to residents (except those with fluid restrictions) and offering alternate fluid sources such as popsicles, gelatin, and ice cream.

**Use of Appetite Stimulants** To date, the evidence is limited about benefits from appetite stimulants. While their use may be appropriate in specific circumstances, they are not a substitute for appropriate investigation and management of potentially modifiable risk factors and underlying causes of anorexia and weight loss.

**Feeding Tubes** Feeding tubes have potential benefits and complications, depending on an individual's underlying medical conditions and prognosis, and the causes of his or her anorexia or weight loss. Possible feeding tube use, especially for residents with advanced dementia or at the end-of-life, should be considered carefully. The resident's values and choices regarding artificial nutrition should be identified and considered. The health care practitioner should be involved in reviewing whether potentially modifiable causes of anorexia, weight loss, and eating or swallowing abnormalities have been considered and addressed, to the extent possible. For residents with dementia, studies have shown that tube feeding does not extend life, prevent aspiration pneumonia, improve function or limit suffering.

**End-of-Life** Resident choices and clinical indications affect decisions about the use of a feeding tube at the end-of-life. A resident at the end of life may have an advance directive addressing his or her treatment goals (or the resident's surrogate or representative, in accordance with State law, may have made a decision). Decreased appetite and altered hydration are common at the end of life, and do not require interventions other than for comfort. Multiple organ system failure may impair the body's capacity to accept or digest food or to utilize nutrients. Thus, the inability to maintain acceptable parameters of nutritional status for someone who is at the end-of-life or in the terminal stages of an illness may be an expected outcome. Care and services, including comfort measures, are provided based on the resident's choices and a pertinent nutritional assessment. The facility can help to support intake, to the extent desired and feasible, based on the information from the assessment and on considering the resident's choices. If individualized approaches for end-of-life care are provided in accordance with the care plan and the resident's choices, then the failure to maintain acceptable parameters of nutritional status may be an expected outcome for residents with terminal conditions.

**Monitoring:** Monitoring after care plan implementation is necessary for residents with impaired or at-risk nutritional status, as well as for those whose current nutritional status is stable. Monitoring includes a review of the resident-specific factors identified as part of the comprehensive resident assessment and any supplemental nutrition assessment. Identifying and reporting information about the resident's nutritional status and related issues such as level of consciousness and function are obtainable through various staff observations. For example, nursing assistants may be most familiar with the resident's habits and preferences, symptoms such as pain or discomfort, fluctuating appetite, and nausea or other gastrointestinal symptoms.

More intensive and frequent monitoring may be indicated for residents with impaired or at-risk nutritional status than for those who are currently nutritionally stable. Such monitoring may include, but is not limited to, observing for and recognizing emergence of new risk factors (e.g., acute medical illness, pressure ulcers, or fever), evaluating consumption of between-meal snacks and nutritional supplements, and reviewing the continued relevance of any current nutritional interventions (e.g., therapeutic diets, tube feeding orders or nutritional supplements). Evaluating the care plan to determine if current interventions are being followed and if they are effective in attaining identified nutritional and weight goals allows the facility to make necessary revisions. Subsequent adjustment of interventions will depend on, but are not limited to, progress, underlying causes, overall condition and prognosis. The resident's current nutritional and medical status helps the staff determine the frequency of reweighing the resident. For example, reweighing a resident within a week of initiating or substantially revising nutritional interventions to address anorexia or weight loss assists in monitoring responses to interventions. Monitoring residents who experience unplanned weight loss, including reweighing at least weekly until weight is stable or increasing and then routinely thereafter, helps clarify his/her responses to interventions. However in some residents, subsequent weight monitoring may not be clinically indicated (e.g., palliative care resident). Nutrition-related goals may need to be modified, depending on factors such as further clarification of underlying causes (e.g., when evidence suggests that unmodifiable factors may prevent improved or stabilized nutritional status) and responses to current interventions. In some cases, the current plan of care may need to be modified and new or additional interventions implemented. The facility explains any decisions to continue current interventions when the resident's nutritional status continues to decline. For example, because the goal of care for someone with a terminal, advanced, or irreversible condition has changed to palliation.

**Investigative Protocols**

The Investigative Protocols were developed to provide direction for the investigative process, to assist in consistent application of the regulations and to provide direction for determination of avoidable / unavoidable as appropriate. Investigative Protocols primarily related to nutrition are as follows:

- **NUTRITIONAL STATUS F325:** Used to determine if the facility has practices in place to maintain acceptable parameters of nutritional status for each resident based on his/her comprehensive assessment. • To determine if failure to maintain acceptable parameters of nutritional status for each resident was avoidable or unavoidable (the resident's clinical condition demonstrates that maintaining acceptable parameters is not possible). • To determine if the resident has received a therapeutic diet when there is a nutritional indication. **A more detailed explanation of this investigative protocol follows.**
- **PRESSURE ULCER / SORE F314:** Used to determine if the identified pressure sore / ulcer(s) is avoidable or unavoidable and to determine the adequacy of the facility's pressure sore / ulcer treatment and prevention interventions.
- **USE OF PAID FEEDING ASSISTANTS F373:** Used to determine, for a facility that uses paid feeding assistants: • If individuals used as paid feeding assistants successfully completed a State-approved training course; • If sampled residents who were selected to receive assistance from paid feeding assistants were assessed by the charge nurse and determined to be eligible to receive these services based on the latest assessment and plan of care; and • If the paid feeding assistants are supervised by an RN or LPN. paid feeding assistants, including proper training and supervision of feeding assistants, and proper selection of residents for feeding assistance.
- **MEDICAL DIRECTOR F501:** Used to determine whether the facility has designated a licensed physician to serve as medical director; and • To determine whether the medical director, in collaboration with the facility, coordinates medical care and the implementation of resident care policies.
- **QUALITY ASSESSMENT AND ASSURANCE F520**: Used to determine if the facility has a QAA committee consisting of the director of nursing, a physician designated by the facility, and at least three other staff members; and • To determine if the QAA committee: o Meets at least quarterly (or more often, as necessary); o Identifies quality deficiencies; and o Develops and implements appropriate plans of action to address identified quality deficiencies.

Surveyors will review records including assessments, care planning and interventions; interview resident, staff/care givers and family; and conduct observations to determine compliance with the protocols. Detailed information for all investigative protocols can be found in the SOM.

**INVESTIGATIVE PROTOCOL NUTRITIONAL STATUS**

This protocol is to be used for each sampled resident to determine through interview, observation and record review whether the facility is in compliance with the regulation

**Procedures:** Briefly review the RAI, care plan, and any additional relevant nutritional assessment information that may be available to identify facility evaluations, conclusions, and interventions to guide subsequent observations.
**NOTE:** Record reviews prior to meal observations are conducted to note the resident's therapeutic diet, food texture and level of required assistance with meals.

1. **Observation** Residents are observed during the initial tour of the facility and throughout the survey process. To facilitate the investigation, information is gathered (e.g., dining style, nourishment list, schedules, and policies). During observations, surveyors may see non-traditional or alternate approaches to dining services such as buffet, restaurant style or family style dining. These alternate dining approaches may include more choices in meal options, preparations, dining areas and meal times. Such alternate dining approaches are acceptable and encouraged. While conducting the resident dining observations: • Observe at least two meals during the survey; • Observe a resident's physical appearance for signs that might indicate altered nutritional status (e.g., cachectic) and note any signs of dental and oral problems; • Observe the delivery of care (such as assistance and encouragement during dining) to determine if interventions are consistent with the care plan; • Observe the serving of food as planned with attention to portion sizes, preferences, nutritional supplements, prescribed therapeutic diets and between-meal snacks to determine if the interventions identified in the care plan were implemented; • Follow up and note differences between the care plan and interventions and • Determine if staff responded appropriately to the resident's needs (e.g., for assistance, positioning, and supervision).
2. **Interview the resident, family or resident's representative to identify:** •
    - Whether staff are responsive to the resident's eating abilities and support needs, including the provision of adaptive equipment and personal assistance with meals as indicated; • Whether the resident's food and dining preferences are addressed to the extent possible, e.g., whether the resident is offered substitutions

or choices at meal times as appropriate and in accordance with his/her preferences; • Whether pertinent nutritional interventions, such as snacks, frequent meals, and calorie-dense foods, are provided; and • If the resident refused needed therapeutic approaches, whether treatment options, related risks and benefits, expected outcomes and possible consequences were discussed with the resident or resident's representative, and whether pertinent alternatives or other interventions were offered.

**Interview interdisciplinary team members on various shifts (e.g., certified nursing assistant, registered dietitian, dietary supervisor/manager, charge nurse, social worker, occupational therapist, attending physician, medical director, etc.) to determine, how:**

- Food and fluid intake, and eating ability and weight (and changes to any of these) are monitored and reported; • Nutrition interventions, such as snacks, frequent meals, and calorie-dense foods are provided to prevent or address impaired nutritional status (e.g., unplanned weight changes); • Nutrition-related goals in the care plan are established, implemented, and monitored periodically; • Care plans are modified when indicated to stabilize or improve nutritional status (e.g., reduction in medications, additional assistance with eating, therapeutic diet orders); and • A health care practitioner is involved in evaluating and addressing underlying causes of nutritional risks and impairment (e.g., review of medications or underlying medical causes).

**If the interventions defined, or the care provided, appear to be inconsistent with current standards of practice, interview one or more physicians or other licensed health care practitioners who can provide information about the resident's nutritional risks and needs.** Examples include, but are not limited to: • The rationale for chosen interventions; • How staff evaluated the effectiveness of current interventions; • How staff managed the interventions; • How the interdisciplinary team decided to maintain or change interventions; and • Rationale for decisions not to intervene to address identified needs.

3. **Record Review Review the resident's medical record to determine how the facility has:**
   - evaluated and analyzed nutritional status;
   - identified residents who are at nutritional risk;
   - investigated and identified causes of anorexia and impaired nutritional status;
   - identified and implemented relevant interventions to try to stabilize or improve nutritional status;
   - identified residents' triggered Resident Assessment Instrument (RAI) for nutritional status;
   - evaluated the effectiveness of the interventions; and
   - monitored and modified approaches as indicated.

**NOTE: Documentation** of findings and conclusions related to nutritional status may be found in various locations in the medical record, including but not limited to interdisciplinary progress notes, nutrition progress notes, the RAP summary, care plan, or resident care conference notes.

**Assessment and Monitoring Review information including the RAI, diet and medication orders, activities of daily living worksheets, and nursing, dietitian, rehabilitation, and social service notes.**

- Determine if the resident's weight and nutritional status were assessed in the context of his/her overall condition and prognosis, if nutritional requirements and risk factors were identified, and if causes of the resident's nutritional risks or impairment were sought.
- Determine whether :
  - The facility identified a resident's desirable weight range, and identified weight loss/gain;
  - The facility identified the significance of any weight changes, and what interventions were needed;
  - there have been significant changes in the resident's overall intake;
  - the reasons for the change were identified and if appropriate interventions were implemented;
  - the facility has calculated nutritional needs (i.e., calories, protein and fluid requirements) and identified risk factors for malnutrition;
  - the facility met those needs and if not, why;
  - the resident's weight stabilized or improved as anticipated;

- a need for a therapeutic diet was identified and implemented, consistent with the current standards of practice;
- the facility indicated the basis for dietary restrictions;
- the reasons for dietary changes were identified and appropriate interventions implemented;
- the facility accommodated resident choice, individual food preferences, allergies, food intolerances, and fluid restrictions and if the resident was encouraged to make choices;
- the facility identified and addressed underlying medical and functional causes (e.g., oral cavity lesions, mouth pain, decayed teeth, poorly fitting dentures, refusal to wear dentures, gastroesophageal reflux, or dysphagia) of any chewing or swallowing difficulties to the extent possible;
- the facility identified residents requiring any type of assistance to eat and drink (e.g., assistive devices/utensils, cues, hand-over-hand, and extensive assistance), and provided such assistance;
- the facility has identified residents receiving any medications that are known to cause clinically significant medication/nutrient interactions or that may affect appetite, and determined risk/benefit;
- the facility identified and addressed to the extent possible medical illnesses and psychiatric disorders that may affect overall intake, nutrient utilization, and weight stability; •
- the facility reviewed existing abnormal laboratory test results and either implemented interventions, if appropriate, or provided a clinical justification for not intervening (see note in Laboratory/Diagnostic Evaluation);
- the resident's current nutritional status is either at or improving towards goals established by the care team; and
- alternate interventions were identified when nutritional status is not improving or clinical justification is provided as to why current interventions continue to be appropriate.

**Care Plan** Review the comprehensive care plan to determine if the plan is based on the comprehensive assessment and additional pertinent nutritional assessment information.

- Did the facility developed measurable objectives, approximate time frames, and specific interventions to try to maintain acceptable parameters of nutritional status, based on the resident's overall goals, choices, preferences, prognosis, conditions, assessed risks, and needs. If care plan concerns, related to nutritional status are noted, staff responsible for care planning about the rationale for the current plan of care will be interviewed.

- If questions remain after reviewing available information including documentation in the medical record, the surveyor will interview the resident's attending physician or licensed health care practitioner or the facility's medical director (e.g., if the attending physician or licensed health care practitioner is unavailable) concerning the resident's plan of care. NOTE: Because the physician may not be present in the facility and have immediate access to the resident's medical record when the surveyor has questions, allow the facility the opportunity to first provide any pertinent information to the physician before responding to the interview. **(**This should also apply to the consulting RD.)

**Care Plan Revision** Determine if the staff has evaluated the effectiveness of the care plan related to nutritional status and made revisions if necessary based upon the following: • Evaluation of nutrition-related outcomes; • Identification of changes in the resident's condition that require revised goals and care approaches; and • Involvement of the resident or the resident's representative in reviewing and updating the resident's care plan.

**Review of Facility Practices:** Examples of such activities may include a review of policies, staffing, and staff training, functional responsibilities, and interviews with staff (to include but not limited to management). If there is a pattern of residents who have not maintained acceptable parameters of nutritional status without adequate clinical justification, determine if quality assurance activities were initiated in order to evaluate the facility's approaches to nutrition and weight issues.

- Interviews with Health Care Practitioners **If the interventions defined, or the care provided, appear to be inconsistent with recognized standards of practice, interview one or more health care practitioners as necessary (e.g., physician, hospice nurse, dietitian, charge nurse, director of nursing or medical director). Depending on the issue, ask:** • How it was determined that chosen interventions were appropriate; • Why identified needs had no interventions; • How changes in condition that may justify additional or different interventions were addressed; and • How staff evaluated the effectiveness of current interventions.

**DETERMINATION OF COMPLIANCE (Appendix P) Synopsis of Regulation (Tag F325)** This regulation requires that, based on the resident's comprehensive assessment, the facility ensures that each resident maintains acceptable parameters of nutritional status unless the resident's clinical condition demonstrates that this is not possible, and that to the extent possible the resident receives a therapeutic diet when indicated.

**Criteria for Compliance**

- **The facility is in compliance with 42 CFR 483.25(i), Tag F325, Nutrition, if staff have:** • Assessed the resident's nutritional status and identified factors that put the resident at risk of not maintaining acceptable parameters of nutritional status; • Analyzed the assessment information to identify the medical conditions, causes and problems related to the resident's condition and needs; • Provided a therapeutic diet when indicated; • Defined and implemented interventions to maintain or improve nutritional status that are consistent with the resident's assessed needs, choices, goals, and recognized standards of practice, or provided clinical justification why they did not do so; and • Monitored and evaluated the resident's response to the interventions; and revised the approaches as appropriate, or justified the continuation of current approaches. If not, failure to maintain acceptable parameters of nutritional status is avoidable, cite at Tag F325.
- **Noncompliance with Tag F325 may include (but is not limited to) one or more of the following, including failure to:** • Accurately and consistently assess a resident's nutritional status on admission and as needed thereafter; • Identify a resident at nutritional risk and address risk factors for impaired nutritional status, to the extent possible; • Identify, implement, monitor, and modify interventions (as appropriate), consistent with the resident's assessed needs, choices, goals, and current standards of practice, to maintain acceptable parameters of nutritional status; • Notify the physician as appropriate in evaluating and managing causes of the resident's nutritional risks and impaired nutritional status; • Identify and apply relevant approaches to maintain acceptable parameters of residents' nutritional status; and • Provide a therapeutic diet when indicated.
- **Potential Tags for Additional Investigation** If noncompliance with 42 CFR 483.25(i) has been identified, the survey team may have determined during the investigation of Tag F325 that concerns may also be present with related process and/or structure requirements.

  Examples of related process and/or structure requirements related to noncompliance with Tag F325 may include the following:
  - Tag F150, Resident Rights o Determine if the resident's preferences related to nutrition and food intake were considered. • 42 CFR §483.20(b)(1),
  - Tag F272, Comprehensive Assessments o Determine if the facility assessed the resident's nutritional status and the factors that put the resident at risk for failure to maintain acceptable parameters of nutritional status. • 42 CFR §483.20(k),
  - Tag F279, Comprehensive Care Plans o Determine if the facility developed a comprehensive care plan for each resident that includes measurable objectives, interventions/services, and time frames to meet the resident's needs as identified in the resident's assessment and provided a therapeutic diet when indicated. • 42 CFR §483.20(k)(2)(iii),
  - Tag F280, Comprehensive Care Plan Revision o Determine if the care plan was periodically reviewed and revised as necessary by qualified persons after each assessment to maintain acceptable parameters of nutritional status and provided a therapeutic diet when indicated. • 42 CFR 483.20(k)(3)(ii),
  - Tag F282, Provision of Care in Accordance with the Care Plan o Determine if the services provided or arranged by the facility were provided by qualified persons in accordance with the resident's written plan of care. • 42 CFR 483.25(j),
  - Tag F327, Hydration o Determine if the facility took measures to maintain proper hydration. • 42 CFR 483.25(k)(2),

- F328, Special Needs o Determine if the facility took measures to provide proper treatment and care for Parenteral and Enteral Fluids. • 42 CFR 483.25,
- Tag F329, Unnecessary Medicines o Determine if food and medication interactions are impacting the residents' dietary intake. • 42 CFR 483.30(a),
- Tag F353, Sufficient Staff o Determine if the facility had qualified staff in sufficient numbers to provide necessary care and services, including supervision, based upon the comprehensive assessment and care plan. • 42 CFR 483.35(a)(1)(2),
- F361, Dietary Services - Staffing o Determine if the facility employs or consults with a qualified dietitian. If not employed full-time, determine if the director of food service receives scheduled consultation from the dietitian concerning storage, preparation, distribution and service of food under sanitary conditions. • 42 CFR 483.35(b),
- F362, Standard Sufficient Staff o Determine if the facility employs sufficient support personnel competent to carry out the functions of the dietary service. • 42 CFR 483.40(a)(1)(2),
- Tag F385, Physician Services – Physician Supervision o Determine if a physician supervised the medical aspects of care of each resident, as indicated, as they relate to medical conditions that affect appetite and nutritional status. • 42 CFR 483.75(h)(2)(ii),
- Tag F500, Use of Outsider resources o If the facility does not employ a qualified dietitian, determine if the professional services of a dietitian are furnished by an outside resource, meet professional standards and principles, and are timely. • 42 CFR 483.75(i)(2)(i)(ii),
- Tag F501, Medical Director o Determine if the medical director helped develop and implement resident care policies as they relate to maintaining acceptable parameters of nutritional status and the provision of therapeutic diets when indicated. • 42 CFR 483.75(o),
- Tag F520, Quality Assessment and Assurance o Related concerns may have been identified that would suggest the need for a review of facility practices. Such activities may involve a review of policies, staffing and staff training, contracts, etc. and interviews with management, for example. If there is a pattern of residents who have not maintained acceptable parameters of nutritional status without adequate clinical justification, determine if quality assurance activities address the facility's approaches to nutrition and weight issues.

- **DEFICIENCY CATEGORIZATION (Part IV, Appendix P)** Once the team has completed its investigation, analyzed the data, reviewed the regulatory requirements, and determined that noncompliance exists, the team must determine the severity of each deficiency, based on the resultant effect or potential for harm to the resident.

**The key elements for severity determination for Tag F325 are as follows:**
1. Presence of harm/negative outcome(s) or potential for negative outcomes due to a failure of care and services. Actual or potential harm/negative outcomes for F325 may include, but are not limited to: • Significant unplanned weight change; • Inadequate food/fluid intake; • Impairment of anticipated wound healing; • Failure to provide a therapeutic diet; • Functional decline; and • Fluid/electrolyte imbalance.
2. Degree of harm (actual or potential) related to the noncompliance. Identify how the facility practices caused, resulted in, allowed, or contributed to the actual or potential for harm: • If harm has occurred, determine if the harm is at the level of serious injury, impairment, death, compromise, or discomfort; and • If harm has not yet occurred, determine how likely the potential is for serious injury, impairment, death, compromise or discomfort to occur to the resident.
3. The immediacy of correction required. Determine whether the noncompliance requires immediate correction in order to prevent serious injury, harm, impairment, or death to one or more residents.

**The survey team must evaluate the harm or potential for harm.** This is based upon the levels of severity for Tag F325. First, the team must rule out whether Severity Level 4, Immediate Jeopardy to a resident's health or safety exists by evaluating the deficient practice in relation to immediacy, culpability, and severity. (Guidance in Appendix Q, "Guidelines for Determining Immediate Jeopardy".)

**Federal Nursing Home Regulations for Food & Nutrition Services**
It is important to understand all regulations and interpretive guidelines applied to facilities, especially those that relate specifically to nutrition. The major nutrition-related F-Tags include:

| F-TAG # | REGULATION | INTENT OF REGULATION |
|---|---|---|
| F240 | Quality of Life | Specifies that a facility must care for its residents in a manner and in an environment that promotes maintenance or enhancement of each resident's quality of life. |
| F241 | Dignity | Specifies facility's responsibilities toward creating/maintaining an environment that humanizes and individualizes each resident's dignity including how each resident is treated at mealtime. |
| F252 | Environment | Provide a safe, clean, comfortable and homelike environment |
| F256 | Adequate and comfortable lighting levels in all areas | Includes dining areas and visual enhancements of meals/food. |
| F258 | Sound Levels | Maintain comfortable sound levels (including noise level in the dining room) |
| F272 | Comprehensive Assessment | To provide the facility with information necessary to develop a care plan and to provide appropriate care to each resident The facility must conduct initially and periodically a comprehensive, accurate, standardized reproducible assessment of each resident's functional capacity. |
| F276 | Quarterly Review Assessments | To assure that the resident's assessment is accurate and reflects current status, the resident's assessment is updated on at least a quarterly basis. |
| F278 | Nutritional Status and Requirements Accuracy of Assessment §483.20(b) xi | Resident's nutritional status is assessed by someone who is knowledgeable in nutrition and capable of correctly assessing a resident? Nutritional status refers to weight, height, hematologic and biochemical assessments, clinical observations of nutrition, nutritional intake, resident's eating habits and preferences, dietary restrictions, supplements, and use of appliances. |
| F279 | Comprehensive Care Plans | A facility must use the results of the assessment to develop, review and revise the resident's comprehensive plan of care. The comprehensive care plan for each resident includes measurable objectives and timetables to meet a resident's medical, nursing, and mental and psychosocial needs that are identified in the comprehensive assessment. |
| F309 | Quality of Care | Necessary care and services to attain and maintain the highest practicable physical, mental and psychosocial well-being in accordance with the assessment & care plan |
| F310 | Activities of Daily Living Eat §483.25(a)(iv) | The facility must ensure that a resident's abilities to do ADL's do not deteriorate unless it is unavoidable |
| F314 | Pressure Sores | To assure that the resident does not develop a pressure sore in the facility. If admitted with a pressure sore, the resident receives treatment to heal and prevent further pressure sores. |
| F321 | NG Tubes | NG feeding is used only after adequate assessment and resident's condition makes it necessary |
| F325 | Nutrition | Based on a resident's comprehensive assessment, the facility must ensure that a resident maintains acceptable parameters of nutritional status, such as body weight and protein levels, unless the resident's clinical condition demonstrates that this is not possible; and receives a therapeutic diet when there is a nutritional problem. |
| F327 | Hydration | Resident receives sufficient fluids based on individual needs to prevent dehydration |
| F328 | Special Needs Parenteral & enteral fluids §483.25(k)(2) | Resident receives care and treatment for parenteral and enteral fluids, colostomy, ileostomy, tracheostomy care |
| F360 | Dietary Services | Provide each resident with a nourishing, palatable, well-balanced diet that meets daily nutritional and special dietary needs of each resident |
| F361 | Staffing -qualified dietitian §483.35(a) | Ensure that a qualified dietitian is utilized in planning, managing and implementing dietary service activities in order to assure that residents receive adequate nutrition. |
| F362 | Sufficient Staff | Employ sufficient support personnel competent to carry out the functions of the dietary service. |
| F363 | Menus | Assure that meals served meet nutritional needs of residents in accordance with the RDA's, and that there is a prepared menu by which nutritionally adequate meals are planned and followed. |
| F364 | Food | To assure that the nutritive value of food is not compromised/destroyed because of prolonged food storage, light, air exposure, prolonged cooking and holding. Food should be palatable, attractive and at proper temperature |
| F365 | Food Form | Food prepared in form designed to meet residents' needs. |
| F366 | Substitutes | Substitutions are available |
| F367 | Therapeutic diets | Resident receives what is prescribed by the physician |
| F368 | Frequency of Meals / Snacks | Resident receives meals at times most accepted by the community and there are not extensive time lapses between meals. Resident receives adequate and frequent meals. |
| F369 | Assistive Devices | Provide resident with assistive devices to maintain or improve ability to eat independently. |

| F-TAG # | REGULATION | INTENT OF REGULATION |
|---|---|---|
| F370 | Food sources | Approved or considered satisfactory by federal, state or local authorities |
| F371 | Food Storage, Preparation & Distribution | Prevent spread of foodborne illnesses (FBI) and reduce practices that result in food contamination and compromised food safety. |
| F372 | Garbage | Assure that garbage and refuse are properly disposed. |
| F441<br>F442 | Infection Control AND Preventing Spread of Infection | Facility has an infection control program for investigating, controlling and preventing infections. This includes personal hygiene of staff (infections and wounds) and isolation procedure for trays. |
| F443 | Staff with Communicable Disease or Infected Skin Lesions | To prevent spread of infection. |
| F444 | Handwashing | Use appropriate handwashing techniques to prevent the spread of infection from one resident to another Written protocols for handwashing. |
| F456 | Equipment Maintenance | Maintain all essential mechanical, electrical and patient care equipment in safe operating condition. |
| F464 | Dining Room | Provide one or more rooms for dining that are well-lighted, ventilated, adequately furnished and have sufficient space |
| F469 | Pests | Maintain an effective pest control program so that the facility is free of pests and rodents. |
| F499 | Staff Qualifications | Staff must be licensed, certified or registered in accordance with applicable state laws. |
| F517 | Disaster | Facility must have written plans/procedures to meet all potential emergencies/disasters (fire, severe weather, missing residents, etc.); all staff must be trained on these procedures; facility must periodically review procedures with existing staff. |
| F520 | Quality Assessment & Assurance | Facility has an established QA Committee which identifies and addresses quality issues and implements corrective action as necessary. |

**SURVEY MANAGEMENT TIPS FOR THE RD:**

- Know the current Regulations and Rules: SOM, State Rules, State Food Code, MDS Manual) (Federal, State and Local).
- Periodically review a copy of the QI Report to identify residents that will be included in the sample selection.
- Follow ADA Standard of Practice (SOP/SOPP) and Evidence Based Best Practice Protocols.
- Incorporate the ADA Nutrition Care Process (NCP) of assessment, diagnosis, intervention and monitoring/evaluation in medical record documentation.
- Know previous survey information: CMS 2567 (Statement of Deficiencies), OSCAR Reports, Quality Measure Quality Indicator Reports, Plan of Correction (PoC)
- Request that the RD be notified of the arrival of surveyors as soon as possible.
- The RD should be introduced to the surveyors, particularly the one assigned to dietary and offer assistance as needed.
- Provide only the information requested or information that will support the facility.
- Check in with the dietary surveyor from time-to-time, offering assistance or clarification of procedures or to answer any questions.
- Be present when the surveyor is in the kitchen. Complete the Kitchen Tour (Sub Task 5B) with the dietary supervisor and the surveyor.
- Do not disagree with the surveyors, politely ask for their reason for the potential citation. Present the rebuttal in a calm manner by presenting facts and citing regulations.
- Attend the exit conference if the facility does not object, in order to offer further explanations, if necessary, and to record any problems noted by the surveyors.
- Correct problem areas as quickly as possible.

**Remember:**

- If state regulations differ from federal, the stricter of the two prevails.
- A surveyor may cite any sanitation violation to the state food code – regardless of whether it is noted in the regulations.
- Interpretive guidelines are published as guidance to surveyors and are <u>NOT</u> law. Deficiencies can only be cited on actual regulations, which are identified by "tag" numbers.
- Regulations are subject to change and revision. Be certain that the most current regulations are available.

# APPENDIX

## How to Obtain Information on State & Federal Regulations

It is very important to be familiar with the state regulations for nursing facilities (assisted living, group homes, residential care, or other settings). Each state has its own set of regulations that may vary somewhat from the federal regulations. Generally speaking, the more stringent of the two regulations takes precedence.

1. Contact the state agency responsible for licensure, certification and regulations of long term care facilities.

2. Contact the state department of health for information of food service laws and rules, which may be separate from the licensure and certification regulations.

3. Contact the American Health Care Association (AHCA) *
   202-842-4444 or 1-800-321-0343
   http://www.ahca.org

4. Contact the American Association of Homes and Services for the Aged (AAHSA) *
   202-508-9478
   http://www.aahsa.org

5. Contact the state healthcare association and request information of how to obtain a copy of **The Long Term Care Survey** published by AHCA (SOM is included in this publication).

- See list of state affiliates in appendix

**Resources**


1. Centers for Medicare & Medicaid Services. State Operations Manual. Available at: https://www.cms.gov/Manuals/iom/itemdetail.asp?filterType=none&filterByDID=-99&sortByDID=1&sortOrder=ascending&itemID=CMS1201984&intNumPerPage=10 Accessed 5 August 2011.
2. Federal Register Vol 56 No 187, 1991. Part 483. Requirements for Long Term Care Facilities.
3. DHCC website: www.dhccdpg.org Members Only – For State and Federal survey links

## Web Sites

This list of Web sites is a starting point for reference. Internet resources are expanding and changing continually. These sites may have links to other pertinent sites. There are also numerous search engines available that will help find other resources (Google, AOL Search, AltaVista, Yahoo, Bing, etc.).

Please note that Web sites are constantly being updated, new information added and information deleted. At the time of publishing, the links below were all valid, working links. Most Web site include a search feature to aid in finding information.

*Disclaimer: Information provided does not suggest that products or services are endorsed or sponsored by the DHCC DPG or the ADA.*

**American Dietetic Association** www.eatright.org
**Dietetics in Health Care Communities (DHCC)** www.dhccdpg.org

**Associations and Organizations**

- A.S.P.E.N. American Society for Parenteral and Enteral Nutrition www.clinnutr.org
- AARP Health Guide www.aarp.org/health
- Alternative Medicine Foundation www.amfoundation.org
- Alzheimer's Association www.alz.org
- Alzheimer's Disease Education and Referral Center www.alzheimers.org
- American Association of Retired Persons (AARP) www.aarp.org
- American Dental Association www.ada.org
- American Diabetes Organization www.diabetes.org
- American Federation for Aging Research www.afar.org
- American Geriatric Society www.americangeriatrics.org
- American Health Care Association (AHCA) www.ahcancal.org
  State Affiliates of AHCA www.ahcancal.org/about_ahca/ahca_membership/Pages/StateAffiliates.aspx
- American Heart Association - Just Move www.justmove.org
- American Heart Association www.heart.org/HEARTORG
- American Parkinson Disease Association www.apdaparkinson.org
- American Senior Fitness Association. www.seniorfitness.net
- Arthritis Foundation www.arthritis.org
- Association for Gerontology in Higher Education: www.aghe.org
- Association for Healthcare Foodservice (AHF) www.healthcarefoodservice.org
- Association for Healthcare Foodservice (AHF): www.healthcarefoodservice.org
- Association of Mature American Citizens www.amac.us
- Dietary Manager's Association www.dmaonline.org
- Generation America www.generationamerica.org
- Healthy Aging www.hadpg.org
- Leadership Council of Aging Organizations www.lcao.org
- LeadingAge (formerly American Association of Homes and Services for the Aging) www.aahsa.org
  State Associations http://www.aahsa.org/StateSearch.aspx
- Meals on Wheels Association of America www.mowaa.org
- National Association for Home Care & Hospice www.nahc.org
- National Association of Area Agencies on Aging www.n4a.org
- National Association of Nutrition and Aging Services Programs: www.nanasp.org
- National Association of State United for Aging and Disabilities www.nasua.org
- National Council on Aging www.ncoa.org
- National Food Service Management Institute http://www.nfsmi.org
- National Kidney Foundation www.kidney.org
- National Parkinson Foundation www.parkinson.org
- National Pressure Ulcer Advisory Panel www.npuap.org
- National Restaurant Association www.restaurant.org
- NIH Osteoporosis and Related Bone Diseases-National Resource Center www.osteo.org
- Society for Food Service Management www.sfm-online.org
- SPRY Foundation - Setting Priorities for Retirement Years www.spry.org
- The Commonwealth Fund www.cmwf.org
- The Gerontological Society of America. www.geron.org

**UNIVERSITY (.edu)**

- Center for Demography of Health & Aging www.ssc.wisc.edu/cdha/home.htm
- Colorado State University: Nutrition, Health & Food Safety Programs http://www.ext.colostate.edu/menu_nutrition.html
- FIU Long Term Care Institute Resource Materials
  www2.fiu.edu/~nutreldr/LTC_Institute/materials/LTC_Products.htm
  http://nutritionandaging.fiu.edu
- Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University www.hnrc.tufts.edu

- National Resource Center on Nutrition. Physical Activity and Aging at Florida International University
- Nutrition Navigator at Tufts http://navigator.tufts.edu
- University of Florida - Elder Nutrition and Food Safety http://enafs.ifas.ufl.edu

**Tools**

- DETERMINE Your Nutritional Health www.healthcare.uiowa.edu/igec/tools/nutrition/determineNutrition.pdf
- Nestlé MNA® Mini Nutritional Assessment http://www.mna-elderly.com/
- PUSH Tool www.npuap.org/PDF/push3.pdf

**Sources for Additional Information on Pressure Ulcer Prevention and Treatment**

- Agency for Health Care Research and Quality (AHRQ) www.ahrq.gov
  (clinical practice guidelines, research, quality measures)
- American Medical Directors Association (AMDA) www.amda.com
  (Pressure Ulcers in the Long-Term Care Setting Clinical Practice Guideline, 2008)
- Association for the Advancement of Wound Care (AAWC) www.aawconline.org
- Centers for Medicare & Medicaid Services (CMS) www.cms.gov/NursingHomeQualityInits
  (MDS 3.0 Training Materials)
- European Pressure Ulcer Advisory Panel (EPUAP) www.epuap.org
- Federal Guidance on Pressure Ulcers http://cms.gov/manuals/Downloads/som107ap_p_ltcf.pdf
  (State Operations Manual, Appendix PP)
- National Guidelines Clearinghouse www.guidelne.gov
- National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org
  (Staging System, International Guidelines for the Prevention and Treatment of Pressure Ulcers, diagrams of ulcer stages)
- National Quality Forum (NQF) www.qualityforum.org
  (National Voluntary Consensus Standards for Developing a Framework
  for Measuring Quality for Prevention and Management of Pressure Ulcers)
- Quality Improvement Organizations, Medicare Quality Improvement Community www.medqic.org
  Initiatives site (free on-line resource for quality improvement interventions, associated
  tools, toolkits, presentations, and links to other resources)
- World Union of Wound Healing Societies www.wuwhs.org
- Wound, Ostomy, and Continence Nurses Society (WOCN) www.wocn.org
  (Pressure Ulcer Assessment: Best Practice for Clinicians, 2009)

## COMMONLY USED MEDICAL ABBREVIATIONS

Beginning in January 2004, Joint Commission established a "Do Not Use" list of abbreviations. These are noted below in **BOLD** type. The preferred term is also noted. NOTE: Check facility policy on the use of abbreviations.

| | |
|---|---|
| ā | before |
| abd | abdomen |
| ABG | arterial blood gas |
| abs | absorption |
| ac | before meals |
| ACE | Angiotensin converting enzyme |
| ACVD | arteriosclerotic cardiovascular disease |
| ad lib | as desired |
| ADD | attention deficit disorder |
| ADHF | attention deficit hyperactivity disorder |
| ADL | activities of daily living |
| adm | admitted or admission |
| afib | atrial fibrillation |
| AIDS | Acquired immunodeficiency syndrome |
| AIR | acute inflammatory response |
| AKA | above knee amputation |
| Al | aluminum |
| Alb | albumin |
| ALP | alkaline phosphate |
| ALS | amyotrophic lateral sclerosis |
| AM | morning |
| AMA | against medical advice |
| amb | ambulatory |
| AMI | acute myocardial infarction |
| amt | amount |
| APAP | acetaminophen |
| approx | approximately |
| as tol | as tolerated |
| ASA | aspirin |
| ASAP | as soon as possible |
| ASBS | arteriosclerotic brain syndrome |
| ASHD | arteriosclerotic heart disease |
| ATP | adenisontriphosphate |
| **AS** | **left ear** |
| **AD** | **right ear** |
| **AU** | **both ears** |
| | **Write "left ear," "right ear," "both ears"** |
| BEE | basal energy expenditure |
| bid | twice daily |
| bil | bilateral |
| BKA | below knee amputation |
| BLE | bilateral lower extremity |
| bm | bowel movement |
| BMI | body mass index |
| BMR | basal metabolic rate |
| BP | blood pressure |
| BPH | benign prostatic hypertrophy |
| BRP | bathroom privileges |
| BUE | bilateral upper extremity |
| BUN | blood urea nitrogen |
| bx | biopsy |
| C | centigrade, Celsius |

| | |
|---|---|
| C&S | culture and sensitivity |
| c/o | complains of |
| Ca | calcium |
| CA | cancer |
| CABG | coronary artery bypass graft |
| CAD | coronary artery disease |
| cal | calorie |
| cap | capsule |
| CAPD | Continuous Ambulatory Peritoneal Dialysis |
| CAT or CT | computerized axial tomography |
| CBC | complete blood count |
| CBR | Complete bed rest |
| CBW | current body weight |
| CC | chief complaint |
| **cc** | **cubic centimeter** |
| | **Write "ml" for millileters** |
| CCPD | Continuous Cycler Peritoneal Dialysis |
| CCU | coronary/critical care unit |
| CHD | coronary heart disease |
| CHF | congestive heart failure |
| CHO | carbohydrate |
| Chol | cholesterol |
| Cl | chloride |
| CMP | complete metabolic profile |
| CNS | central nervous system |
| $CO_2$ | carbon dioxide |
| conc | concentrate |
| COPD | chronic obstructive pulmonary disease |
| CP | cerebral palsy |
| CPR | Cardiopulmonary resuscitation |
| cps | centipoise |
| CRF | Chronic renal failure |
| CTS | Carpal tunnel syndrome |
| Cu | copper |
| cu | Cubic |
| CVA | cerebrovascular accident (stroke) |
| CVD | cardiovascular disease |
| CVI | cerebrovascular insufficiency |
| | |
| D | day |
| d/t | due to |
| D/W | dextrose in water |
| DAT | diet as tolerated (also Dementia, Alzheimer's Type) |
| **d/c** | **discontinue** |
| | **For discharge – write "discharge"** |
| def | deficiency |
| DIC | disseminated intravascular coagulation |
| DJD | degenerative joint disease |
| DKA | diabetic ketoacidosis |
| dL | deciliter |
| DM | diabetes mellitus |
| DNR | do not resuscitate |
| DO | Doctor of Osteopathy |
| DOB | date of birth |
| DON | director of nursing |
| DPI | dietary protein intake |
| DVT | deep vein thrombosis |
| Dx | diagnosis |
| | |
| ec | enteric coated (eg – ec asa = enteric coated aspirin) |
| ECG (EKG) | electrocardiogram |
| eg | for example |
| EGCG | Epigallocatechin gallate |
| EPO | erythropoietin |
| EPS | extra pyramidal symptoms |
| ER | emergency room |
| ERT | estrogen replacement therapy |
| ESA | essential fatty acids |
| ESRD | end stage renal disease |
| et | and |
| ETOH | ethanol |
| exam | examination |
| | |
| F | Fahrenheit |
| F/C | Foley catheter |
| FBS | fasting blood sugar |
| Fe | iron |
| ff | force fluids |
| FH | family history |
| fld | fluid |
| Fol | folic acid or folate |
| Fr | French (catheter size) |
| func | function |
| FUO | fever of unknown origin |
| Fx | fracture |
| | |
| G6PD | glucose-6-phosphate dehydrogenase |
| GAS | generalized arteriosclerosis |
| GB | gallbladder |
| GBE | Gingko Biloba extract |
| GERD | gastroesophageal reflex disease |
| GFR | Glomerular filtration rate |
| GI | gastrointestinal |
| GLA | gamma linolenic acid |
| Glu | glucose |
| gm or g | gram |
| gtt | drops |
| GTT | glucose tolerance test |
| g-tube | gastrostomy tube |
| | |
| h or hr | hour(s) |
| H&P | history and physical |
| $H_2O$ | water |
| HBP | high blood pressure |
| HCl | Hydrochloric acid, hydrochloride |
| Hct | hematocrit |
| HCTZ | hydrochlorothiazide |
| HCVD | hypertensive cardiovascular disease |
| Hcy | homocysteine |
| HD | hemodialysis |
| HDL | high density lipoprotein |
| HEENT | head, eye, ears, nose, throat |
| Hgb | hemoglobin |
| HRT | hormone replacement therapy |
| **hs or HS** | **half-strength or hour of sleep** |
| | **Write "half-strength" or "at bedtime"** |
| HTN | hypertension |
| Hx | history |
| hyper- | above, excessive |
| hypo- | less than, below |
| | |
| I&O | intake and output |
| IBD | irritable bowel disease |
| IBW | ideal body weight |
| IDDM | insulin dependent diabetes mellitus |
| IM | intramuscular |
| Inj | injection |
| -itis | inflammation of |
| **IU** | **international units** |
| | **Write "international unit"** |
| IV | intravenous |
| | |
| jt | joint |

| | |
|---|---|
| j tube | jejunostomy tube |
| K | potassium |
| kCal | kilocalorie |
| kg | kilogram |
| L | liter |
| lab | laboratory |
| lat | lateral |
| lb | pound |
| LCT | Long chain triglycerides |
| LD | liver disease |
| LDL | low density lipoprotein |
| LFT | Liver function tests |
| LH | Luteinizing hormone |
| liq | liquid |
| LLE | left lower extremity |
| LLL | left lower lobe |
| LLQ | left lower quadrant |
| LOS | Length of Stay |
| lt or L | left |
| LT | long term |
| LUE | left upper extremity |
| LUQ | left upper quadrant |
| MAOI | monoamine oxidase inhibitor |
| mcg | micrograms |
| MCH | mean corpuscular hemoglobin |
| MCHC | mean corpuscular hemoglobin concentration |
| MCT | medium chain triglyceride |
| MCV | mean corpuscular volume |
| MD | medical doctor, muscular dystrophy |
| MDS | Minimum Data Set |
| meds | medication |
| meq or mEq | milliequivalent (23 mg Na = 1mEq) |
| Mg | magnesium |
| mg | milligram |
| MI | myocardial infarction (heart attack) |
| min | minute(s) |
| mL | milliliter |
| MMA | methylmalonic acid |
| Mn | manganese |
| MNT | medical nutrition therapy |
| mo | month |
| mod | moderate |
| MOM | milk of magnesia |
| mOsm | milliosmole |
| MRI | magnetic resonance imaging |
| MS | multiple sclerosis |
| **MS** | **morphine sulfate or magnesium sulfate**<br>**Write "morphine sulfate" or "magnesium sulfate"** |
| MSDS | Material Safety Data Sheets |
| MVI | multi-vitamin |
| N & V | nausea and vomiting |
| N | nitrogen |
| n/c | no complaint |
| N/V | nausea/vomiting |
| Na | sodium |
| NaCl | sodium chloride |
| neg | negative |
| ng | nanogram |
| NG | nasogastric |
| NGT | nasogastric tube |
| Nia | niacin |
| NIDDM | non-insulin-dependent diabetes mellitus |
| NIH | National Institute of Health |
| NKA | no known allergies |
| NKFA | no known food allergies |
| nl | normal |
| noc | night |
| NPO | nothing by mouth |
| NSAI | nonsteroidal anti-inflammatory |
| NSAID | nonsteroid anti-inflammatory drug |
| NSS | normal saline solution |
| NWB | non-weight bearing |
| $O_2$ | oxygen |
| OA | osteoarthritis |
| OBS | organic brain syndrome |
| OCD | obsessive-compulsive disorder |
| od | once a day |
| OD | overdose |
| **OD** | **right eye** |
| OOB | out of bed (also out of building) |
| ORIF | open reduction internal fixation |
| **OS** | **left eye** |
| OSHA | Occupational Safety & Health Administration |
| Osm | osmolarity |
| OT | occupational therapy |
| OTC | over the counter, non-prescription |
| **OU** | **both eyes** |
| oz | ounce |
| P | phosphorus |
| PAB | prealbumin |
| pc | after meals |
| PCM | protein calorie malnutrition |
| PCR | protein catabolic rate |
| PD | peritoneal dialysis |
| PEG | percutaneous endoscopic gastrostomy |
| PEJ | percutaneous endoscopic jejunostomy |
| PEM | protein-energy malnutrition |
| Perrla | Pupils equal, round, react to light and accommodation |
| PGE | Prostaglandin |
| PKU | phenylketonuria |
| PM | afternoon |
| po | by mouth (per os) |
| postop | postoperative, meaning after surgery |
| ppm | parts per million |
| PPN | peripheral parenteral nutrition |
| preop | preoperative, meaning before surgery |
| prep | preparation |
| prn | as necessary |
| Pro | protein |
| PT | physical therapy |
| pt | pint |
| Pt | prothrombin time (also seen Pro time used) |
| PUD | peptic ulcer disease |
| PVI, PVD | peripheral vascular insufficiency or disease |
| PWB | partial weight bearing |
| pwd | powder |
| Pyr | pyridoxine (vit $B_6$) |
| q | every |
| q(x)h | every (x) hours (x = number of hours) |
| **qd** | **every day**<br>**Write "daily"** |
| qh | every hour |
| qhs | every night at bed |
| qid | 4 times daily |
| **qod** | **every other day**<br>**Write "every other day"** |
| qt | quarts |

| | |
|---|---|
| R/T | related to |
| RA | rheumatoid arthritis |
| RAPs | Resident Assessment Protocols |
| RBC | red blood cell |
| RBP | retinal binding protein |
| RDA | recommended dietary allowances |
| RDI | recommended dietary intake |
| re | regarding |
| REE | resting energy expenditure |
| RLE | right lower extremity |
| RLL | right lower lobe |
| RLQ | right lower quadrant |
| RML | right middle lobe |
| ROM | range of motion |
| RQ | respiratory quotient |
| RRT | renal replacement therapy |
| RUE | right upper extremity |
| RUL | right upper lobe |
| RUQ | right upper quadrant |
| Rx | treatment, therapy, prescription |
| | |
| s | without |
| S/P | status post |
| S+Sx | signs and symptoms (also S&S) |
| SC | subcutaneous |
| SIADH | syndrome of inappropriate antidiuretic hormone |
| SLE | Systemic lupus erythematosus |
| SNS | sympathetic nervous system |
| SOB | shortness of breath |
| soln | solution |
| SOS | if necessary |
| sp gr | Specific gravity |
| spec | specimen |
| SR | sustain release form |
| SS | soap suds |
| SSRI | selective serotonin reuptake inhibitor |
| stat | immediately or at once |
| Susp | suspension |
| | |
| T Pro | total protein (also TP) |
| T | tablespoon |
| tab | tablet caplet |
| TB | Tuberculosis |
| temp | temperature |
| TF | tube feeding |
| TG | triglycerides |
| Thi | thiamin |
| TIA | transient ischemic attacks (small strokes) |
| TIBC | total iron binding capacity |
| tid | three times daily |
| TLC | total lymphocyte count |
| TO | telephone order |
| TPN | total parenteral nutrition |
| TPR | temperature, pulse, respiration |
| tr | trace |
| TSH | Thyroid-stimulating Hormone |
| tsp | teaspoon |
| | |
| **U** | **Unit**<br>**Write "unit"** |
| **ų g** | **microgram**<br>**Write "mcg"** |
| UA | urinalysis |
| UBW | usual body weight |
| UE | upper extremities |
| UQ | upper quadrant |
| URI | upper respiratory infection |
| UTI | urinary tract infection |
| | |
| via | by way of |
| Vit | vitamin |
| VLDL | very low density lipoprotein |
| VO | verbal order |
| VS | vital signs |
| | |
| w/c | wheelchair |
| w/n | well-nourished |
| w/o | without |
| WBAT | weight bearing as tolerated |
| WBC | white blood count |
| wk | week |
| WNL | within normal limits (levels) |
| wt | weight |
| | |
| x | times |
| | |
| yo | year old |
| yr or y | year |
| | |
| Zn | zinc |

**Zeros**

**Trailing Do not use**
**Write X**

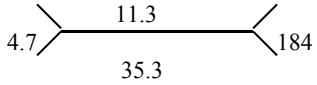
**Leading Write 0.X**

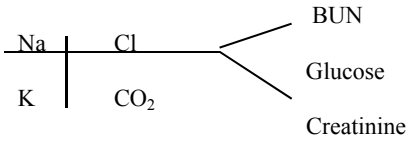
## Commonly Used Symbols

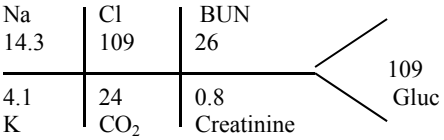
| | | | |
|---|---|---|---|
| - | negative, minus, deficiency | º | degree |
| + | positive | = | equal |
| > | greater than | ≠ | not equal |
| < | less than | # | number, pound |
| ↓ | decrease | ♂ | male |
| ↘ | decreasing | ♀ | female |
| ↑ | increase | 1º | primary |
| ↗ | increasing | 2º | secondary |

## Shortcut Lab Value Diagrams


Example:



**CONVERTING Kg To Pounds**

| lb | kg | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.5 | 21 | 9.5 | 41 | 18.5 | 61 | 27.5 | 81 | 36.5 | 101 | 46.0 | 121 | 55.0 | 141 | 64.0 | 161 | 73.0 |
| 2 | 1.0 | 22 | 10.0 | 42 | 19.0 | 62 | 28.0 | 82 | 37.0 | 102 | 46.5 | 122 | 55.5 | 142 | 64.5 | 162 | 73.5 |
| 3 | 1.5 | 23 | 10.5 | 43 | 19.5 | 63 | 28.5 | 83 | 37.5 | 103 | 46.5 | 123 | 56.0 | 143 | 65.0 | 163 | 74.0 |
| 4 | 2.0 | 24 | 111.0 | 44 | 20.0 | 64 | 29.0 | 84 | 38.0 | 104 | 47.0 | 124 | 56.5 | 144 | 65.5 | 164 | 74.5 |
| 5 | 2.5 | 25 | 11.5 | 45 | 20.5 | 65 | 29.5 | 85 | 38.5 | 105 | 47.5 | 125 | 56.5 | 145 | 66.0 | 165 | 75.0 |
| 6 | 2.5 | 26 | 12.0 | 46 | 21.0 | 66 | 30.0 | 86 | 39.0 | 106 | 48.0 | 126 | 57.0 | 146 | 66.0 | 166 | 75.5 |
| 7 | 3.0 | 27 | 12.5 | 47 | 21.5 | 67 | 30.5 | 87 | 39.5 | 107 | 48.5 | 127 | 57.5 | 147 | 66.5 | 167 | 76.0 |
| 8 | 3.5 | 28 | 12.5 | 48 | 22.0 | 68 | 31.0 | 88 | 40.0 | 108 | 49.0 | 128 | 58.0 | 148 | 67.0 | 168 | 76.0 |
| 9 | 4.0 | 29 | 13.0 | 49 | 22.0 | 69 | 31.5 | 89 | 40.5 | 109 | 49.5 | 129 | 58.5 | 149 | 67.5 | 169 | 76.5 |
| 10 | 4.5 | 30 | 13.5 | 50 | 22.5 | 70 | 32.0 | 90 | 41.0 | 110 | 50.0 | 130 | 59.0 | 150 | 68.0 | 170 | 77.0 |
| | | | | | | | | | | | | | | | | | |
| 11 | 5.0 | 31 | 14.0 | 51 | 23.0 | 71 | 32.5 | 91 | 41.5 | 111 | 50.5 | 131 | 59.5 | 151 | 68.5 | 171 | 77.5 |
| 12 | 5.5 | 32 | 14.5 | 52 | 23.5 | 72 | 32.5 | 92 | 41.5 | 112 | 51.0 | 132 | 60.0 | 152 | 69.0 | 172 | 78.0 |
| 13 | 6.0 | 33 | 15.0 | 53 | 24.0 | 73 | 33.0 | 93 | 42.0 | 113 | 51.5 | 133 | 60.5 | 153 | 69.5 | 173 | 78.5 |
| 14 | 6.5 | 34 | 15.5 | 54 | 24.5 | 74 | 33.5 | 94 | 42.5 | 114 | 51.5 | 134 | 61.0 | 154 | 70.0 | 174 | 79.0 |
| 15 | 7.0 | 35 | 16.0 | 55 | 25.0 | 75 | 34.0 | 95 | 43.0 | 115 | 52.0 | 135 | 61.5 | 155 | 70.5 | 175 | 79.5 |
| 16 | 7.5 | 36 | 16.5 | 56 | 25.5 | 76 | 34.5 | 96 | 43.5 | 116 | 52.5 | 136 | 61.5 | 156 | 71.0 | 176 | 80.0 |
| 17 | 7.5 | 37 | 17.0 | 57 | 26.0 | 77 | 35.0 | 97 | 44.0 | 117 | 53.0 | 137 | 62.0 | 157 | 71.0 | 177 | 80.5 |
| 18 | 8.0 | 38 | 17.0 | 58 | 26.5 | 78 | 35.5 | 98 | 44.5 | 118 | 53.5 | 138 | 62.5 | 158 | 71.5 | 178 | 80.5 |
| 19 | 8.5 | 39 | 17.5 | 59 | 27.0 | 79 | 36.0 | 99 | 45.0 | 119 | 54.0 | 139 | 63.0 | 159 | 72.0 | 179 | 81.0 |
| 20 | 9.0 | 40 | 18.0 | 60 | 27.0 | 80 | 36.5 | 100 | 45.5 | 120 | 54.5 | 140 | 63.5 | 160 | 72.5 | 180 | 81.5 |
| | | | | | | | | | | | | | | | | | |
| 181 | 82.5 | 201 | 91.0 | 221 | 100.5 | 241 | 109.5 | 261 | 118.5 | 281 | 127.5 | 301 | 136.5 | 321 | 145.5 | 341 | 154.5 |
| 182 | 82.5 | 202 | 91.5 | 222 | 100.5 | 242 | 110.0 | 262 | 119.0 | 282 | 128.0 | 302 | 137.0 | 322 | 146.0 | 342 | 155.0 |
| 183 | 83.0 | 203 | 92.0 | 223 | 101.0 | 243 | 110.0 | 263 | 119.5 | 283 | 128.5 | 303 | 137.5 | 323 | 146.5 | 343 | 155.5 |
| 184 | 83.5 | 204 | 92.5 | 224 | 101.5 | 244 | 110.5 | 264 | 120.0 | 284 | 129.0 | 304 | 138.0 | 324 | 147.0 | 344 | 156.0 |
| 185 | 84.0 | 205 | 93.0 | 225 | 102.0 | 245 | 111.0 | 265 | 120.0 | 285 | 129.5 | 305 | 138.5 | 325 | 147.5 | 345 | 156.5 |
| 186 | 84.5 | 206 | 93.5 | 226 | 102.5 | 246 | 111.5 | 266 | 120.5 | 286 | 130.0 | 306 | 139.0 | 326 | 148.0 | 346 | 157.0 |
| 187 | 85.0 | 207 | 94.0 | 227 | 103.0 | 247 | 112.0 | 267 | 121.0 | 287 | 130.0 | 307 | 139.5 | 327 | 148.5 | 347 | 157.5 |
| 188 | 85.0 | 208 | 94.5 | 228 | 103.5 | 248 | 112.5 | 268 | 121.5 | 288 | 130.5 | 308 | 139.5 | 328 | 149.0 | 348 | 158.0 |
| 189 | 85.5 | 209 | 95.0 | 229 | 104.0 | 249 | 113.0 | 269 | 122.0 | 289 | 131.0 | 309 | 140.0 | 329 | 149.5 | 349 | 158.5 |
| 190 | 86.0 | 210 | 95.5 | 230 | 104.5 | 250 | 113.5 | 270 | 122.5 | 290 | 131.5 | 310 | 140.5 | 330 | 149.5 | 350 | 159.0 |
| | | | | | | | | | | | | | | | | | |
| 191 | 86.5 | 211 | 95.5 | 231 | 105.0 | 251 | 114.0 | 271 | 123.0 | 291 | 132.0 | 311 | 141.0 | 331 | 150.0 | 351 | 159.5 |
| 192 | 87.0 | 212 | 96.0 | 232 | 105.5 | 252 | 114.5 | 272 | 123.5 | 292 | 132.5 | 312 | 141.5 | 332 | 150.5 | 352 | 160.0 |
| 193 | 87.5 | 213 | 96.5 | 233 | 105.5 | 253 | 115.0 | 273 | 124.0 | 293 | 133.0 | 313 | 142.0 | 333 | 151.0 | 353 | 160.5 |
| 194 | 88.0 | 214 | 97.0 | 234 | 106.0 | 254 | 115.0 | 274 | 124.5 | 294 | 133.5 | 314 | 142.5 | 334 | 151.5 | 354 | 161.0 |
| 195 | 88.5 | 215 | 97.5 | 235 | 106.5 | 255 | 115.5 | 275 | 125.0 | 295 | 134.0 | 315 | 143.0 | 335 | 152.0 | 355 | 161.5 |
| 196 | 89.0 | 216 | 98.0 | 236 | 107.0 | 256 | 116.0 | 276 | 125.0 | 296 | 134.5 | 316 | 143.5 | 336 | 152.5 | 356 | 162.0 |
| 197 | 89.5 | 217 | 98.5 | 237 | 107.5 | 257 | 116.5 | 277 | 125.5 | 297 | 134.5 | 317 | 144.0 | 337 | 153.0 | 357 | 162.5 |
| 198 | 90.0 | 218 | 99.0 | 238 | 108.0 | 258 | 117.0 | 278 | 126.0 | 298 | 135.0 | 318 | 144.5 | 338 | 153.5 | 358 | 63.0 |
| 199 | 90.5 | 219 | 99.5 | 239 | 108.5 | 259 | 117.5 | 279 | 126.5 | 299 | 135.5 | 319 | 144.5 | 339 | 154.0 | 359 | 163.5 |
| 200 | 90.5 | 220 | 100.0 | 240 | 109.0 | 260 | 118.0 | 280 | 127.0 | 300 | 136.0 | 320 | 145.0 | 340 | 154.5 | 360 | 164.0 |

## Conversion Formulas for pounds and kilograms

1 pound = 0.45359 kilograms
1 kilogram = 2.2 pounds

## Conversion Formulas for inches and centimeters

1 centimeter = 0.3937 inches
1 inch = 2.54 cm

| Inches | CM | Inches | CM | Inches | CM |
|---|---|---|---|---|---|
| 56 | 142 | 63 | 160 | 70 | 177.5 |
| 57 | 144.5 | 64 | 162.5 | 71 | 180 |
| 58 | 117 | 65 | 165 | 72 | 183 |
| 59 | 150 | 66 | 167.5 | 73 | 185.5 |
| 60 | 152.5 | 67 | 170 | 74 | 188 |
| 61 | 155 | 68 | 172.5 | 75 | 190.5 |
| 62 | 157.5 | 69 | 175 | | |

**Equivalent Fahrenheit and Centigrade Degrees**

| Fahrenheit | Centigrade | Fahrenheit | Centigrade |
|---|---|---|---|
| 0 | - 17.8 | 80 | 26.7 |
| 10 | -12.2 | 85 | 29.4 |
| 15 | -9.4 | 90 | 32.2 |
| 20 | -6.7 | 95 | 35 |
| 32 | 0 | 100 | 37.8 |
| 35 | 1.7 | 110 | 43.3 |
| 40 | 4.4 | 120 | 48.9 |
| 45 | 7.2 | 150 | 65.6 |
| 50 | 10.0 | 200 | 93.3 |
| 55 | 12.8 | 212 | 100 |
| 60 | 15.6 | 250 | 121.1 |
| 65 | 18.3 | 300 | 148.9 |
| 70 | 21.1 | 350 | 176.7 |
| 75 | 23.9 | 400 | 204.4 |
| | | 450 | 232.2 |
| | | 500 | 260.0 |

Celsius to Fahrenheit = (º C x 9/5) + 32 = º F

Fahrenheit to Celsius = (º F – 32) x 5/9 = º C

**Conversion Factors for Various Minerals**

**Sodium ($Na^+$)**
Molecular weight = 23
1 mEq $Na^+$ = 23 mg
1 g $Na^+$ = 43 mEq (1000 mg/23 mg per mEq)
1 g NaCl = 0.4 g $Na^+$ ($Na^+$ = 40% of weight of NaCl)
1 g $Na^+$ = 2.5 g NaCl

**Potassium ($K^+$)**
Molecular weight = 39
1 mEq $K^+$ = 39 mg

**Calcium ($Ca^{++}$)**
Molecular weight = 40
1 mEq $CA^{++}$ = 20 mg (40/2)
For example, 15 mEq $Ca^{++}$ in TPN = 300 mg

**Magnesium ($Mg^{**}$)**
Molecular weight = 31
1 mEq $Mg^{**}$ = 12 mg (24/2)
**Phosphorus (P, phos)**
Molecular weight = 31
1 mmol P = 31 mg