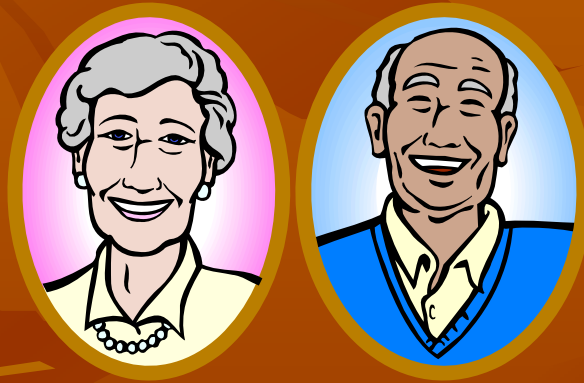
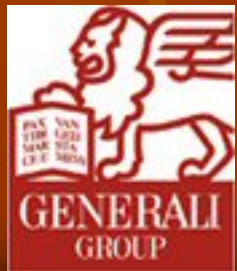


Laboratory Testing in the Elderly



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What is “Elderly”?

- ∞ No defining event such as puberty or menopause*
- ∞ Usually thought to be age over 65*
- ∞ “Age is just a number”
(well.....not always.....)*

Case for Thought

- ∞ 78 yr. old woman brought to M.D. by her daughter***
- ∞ C/O tiredness, dry skin, forgetfulness***
- ∞ M.D. found no striking physical findings—felt normal signs and symptoms for age***
- ∞ Routine blood profile –normal***

Pre-Analytical Variability

- ∞ ***Exaggerated in the elderly***
- ∞ ***Greater between-individual variability***
- ∞ ***Less homogeneous population at the older ages***

Physiologic Aging

- ∞ *Decreased level of activity leading to loss of muscle mass*
- ∞ *Less food intake*
- ∞ *Different posture than when younger*

Physiologic Aging

- ∞ Reduction of cardiac output***
- ∞ Reduction of renal blood flow***
- ∞ Decrease in vital lung capacity***
- ∞ Decreased immunity***

Variables

- ∞ ***Body Composition***
- ∞ ***Genetics***
- ∞ ***Gender***
- ∞ ***Geography***
- ∞ ***Temperature***

Variables

∞ ***Body Habitus***

∞ ***Diet***

∞ ***Malnutrition***

∞ ***Muscle Mass***

∞ ***Season***

Variables

- ∞ ***Blindness***
- ∞ ***Circadian Variation***
- ∞ ***Posture***

Body Composition

- ∞ Body mass increases until ~ age 60, then decreases @3kg/decade***
- ∞ Height decreases by 5-6 mm/5 yrs. in men***
- ∞ Height decreases by 7-8 mm/5 yrs. in women***

Age 90:

∞ 4' 11 1/2" tall

∞ 74 pounds

Body composition

- ∞ ***Decrease in absolute body water (wrinkles!) and elastin (more wrinkles!)***
- ∞ ***Decreased BMR***
- ∞ ***Decreased O₂ consumption***
- ∞ ***Decreased Ca, P, Na, K, cortisol, thyroid hormone, sex hormones***

Genetics

- ∞ ***Blacks—lower albumin, higher gamma globulin than white counterparts***
- ∞ ***Pima Indians—very high incidence of adult-onset diabetes***

Gender

- ∞ Differences lessen after menopause***
- ∞ Women—decreased estrogen, increased chol.***
- ∞ Men—testosterone 1/2 at age 80 what it was at 50***

Geography

- ∞ Hard water— higher cholesterol than soft water***
- ∞ Mining areas—increased trace elements***
- ∞ Urban—increased lead from water pipes and gasoline from traffic***

Temperature — Heat

- ∞ Increased blood volume by 5% after 30 mins.; 27% after several days***
- ∞ Resulting hemodilution reversed by increased sweating with dehydration, decreased plasma volume, glucose, hgb., electrolytes***

Temperature — Cold

- ∞ Decreased blood volume*
- ∞ Increased plasma proteins*
- ∞ Increased thyroid secretion*

Diet

- ∞ High Protein – increase in end-products of metabolism (urea, phosphate, uric acid)***
- ∞ High fat – increased plasma cholesterol, although only slightly altered by dietary cholesterol***

Diet

- ∞ High carbohydrate – increase in LDH , alk. Phos.***
- ∞ Vegetarian – decreased lipoprotein cholesterol, decreased triglycerides***

Malnutrition – causes

- ∞ Decreased sense of taste and smell → decreased appetite***
- ∞ Dental problems***
- ∞ Decreased visual and auditory acuity → less eating in public***

Malnutrition (Cont'd)

- ∞ Decreased activity → decreased caloric intake***
- ∞ Decreased acid secretion***
- ∞ Low income***

Blindness

- ∞ ***Diurnal variation of plasma cortisol is lost in some***
- ∞ ***Features of hypoadrenalism***
- ∞ ***Reduced plasma sodium and chloride***
- ∞ ***Impaired renal function***

Circadian Variation

- ∞ ***Similar to young adults***
- ∞ ***Peak cortisol concentration:
6:00 – 8:00 AM (earlier than
in younger persons)***
- ∞ ***Growth hormone rise during
sleep is often blunted***

Posture —Supine to Upright

- ∞ Decrease in blood volume by 600 - 700 ml.***
- ∞ Increase in plasma proteins by 10% because small molecules pass through the capillary press***
- ∞ Increase in elements bound to protein (cholesterol, triglycerides)***

Lab Values in Underwriting: Liver Enzymes

- ∞ Increase in alkaline phosphatase by 20% between the third and eighth decade***
- ∞ Sometimes marked increase in GGT***
- ∞ LDH-slight increase with age***

Creatinine

- ∞ ***Unchanged until age 90, then slight increase because of decreased renal blood flow***
- ∞ ***Creatinine clearance decreases by 10 mL/min/1.73 m² per decade. Serum creatinine may not change noticeably due to decreasing muscle mass***
- ∞ ***Creatinine clearance may decline by as much as 50% between the third and ninth decades of life***

Proteins

- ∞ Increased urine protein***
- ∞ Slight decrease in serum total protein and pre-albumin***
- ∞ Albumin-slight decrease normally, but significantly decreased with malnutrition***

Lipids

- ∞ *Cholesterol—Increased in women age 60-90*
- ∞ *HDL—Increased age 60-90, but decreased in very old (by as much as 30%)*
- ∞ *Triglycerides—Increased in 60-90, then decreased in the very old, possibly from decreased absorption*

Other Lab Values

- ∞ ***Gastrin levels increase because of hypochlorhydria***
- ∞ ***Mg decreases by 15%***
- ∞ ***PSA levels increase***
- ∞ ***PaO₂ decreases by 25% between the 3rd and 8th decade***
- ∞ ***Sed rate up to 40 may be normal***

Nutrients

- ∞ ***Folate — decreased 60-90***
- ∞ ***Vitamin B¹² — decreased 60-90 but increased in population in nursing homes***

CBC

- ∞ ***Hgb. and Hct. – sometimes slightly decreased because of increased plasma volume with aging (secondary to less time spent in upright position?)***
- ∞ ***WBC – Usually some decrease; if elevated, check for CLL***

Danger Signs in Underwriting

∞ ***Cholesterol < 175mg / dL***

∞ ***Albumin < 3.6 g / dL***

∞ ***Combo of above is especially significant***

∞ ***? Elevated hs - CRP***

Hypothyroidism

- ∞ ***TSH not a part of routine insurance lab testing***
- ∞ ***Seniors are most likely to have undiagnosed thyroid disease***
- ∞ ***Reason: some of the symptoms are common in seniors (feeling cold when it's hot out, depression, dry skin, fatigue, forgetfulness, insomnia)***

Case for Thought

- ∞ *78 yr. old woman brought to M.D. by her daughter*
- ∞ *C/O tiredness, dry skin, forgetfulness*
- ∞ *M.D. found no striking physical findings—felt normal signs and symptoms for age*
- ∞ *Routine blood profile –normal*

∞ Several years of undiagnosed thyroid failure can increase the risk for elevated cholesterol levels and heart disease for seniors

Anemia in the Elderly

- ∞ ***Affects 13% of older Americans***
- ∞ ***Doubles the risk of serious physical declines****
- ∞ ***Not yet anemic, but just above the lower cut off – 1.5 times more likely to develop physical declines than those with values well within normal limits***

****American Journal of Medicine, August 1, 2003; Funded by the National Institute on Aging and through support from Ortho Biotech products, L.P.***

The Study:

- ∞ 1,146 people, ages 71 and older***
- ∞ Followed more than 4 years***
- ∞ Assessed ability to perform:***
 - Timed 8-ft. walk***
 - Standing balance***
 - Ability to rise from a chair***

The Study:

- ∞ Each activity scored on a 5-point scale: 0 = inability to do the test; 4 = top performance; points added together to create 0 to 12 overall score***
- ∞ Scores correlated with blood samples***

Anemia – Definition - WHO

- ∞ Women – Hgb < 12 gm / dL***
- ∞ Men – Hgb < 13 gm / dL***
- ∞ Borderline anemia: 12 -13 gm / dL in women and 13 -14 gm/dL in men***

The Study: End of 4 Years

- ∞ 2 / 3 of the participants had at least modest declines in physical performance scores***
- ∞ 30% had substantial decreases***

Conclusions

- ∞ No anemia: Avg. 1.4 points decline on the 12-point scale***
- ∞ Borderline anemia: Avg. 1.8 points decline***
- ∞ Anemia: Avg. of 2.3 points decline***

Conclusions

- ∞ *Of all the categories, women with anemia showed the greatest physical decline, followed by women with borderline anemia*
- ∞ *Excluding people with ailments associated with anemia (cancer, renal disease, infections) did not change the findings*

Underwriting — Lab values to watch

- ∞ Routine blood profile***
- ∞ Include albumin on older ages if not on all ages***
- ∞ CBC with differential if no recent one in APS***
- ∞ Watch for signs/symptoms of hypothyroidism in APS since not a routine insurance lab test***