Screening Tests

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**Testings during Pregnancy** – see 2700 p.

Principles

1. Finding disorder at *asymptomatic stage* – only if early diagnosis actually affects outcome (e.g. potentially curable cancer)
2. Relatively **noninvasive** tests
3. Disorder is **prevalent** in screened population
4. Management of false-positive screening test results (e.g. emotional distress, unnecessary biopsies)

Adults & General

cancers

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age (yrs) | < 1 | 1-10 | | 11-20 | | | 21-30 | 31-40 | 41-50 | | | 51-60 | | | 61-70 | | | | 70-80 | |
| **1. Breast self-exam** |  |  | |  | | | monthly | | | | | | | | | | | | | |
| **2. Breast clinical exam** |  |  | |  | | | q 3 yrs | | annually | | | | | | | | | | | |
| **3. Screening Mammograms** |  |  | |  | | |  |  | q 1-2 yr | | | annually\* | | | | | | | | |
| **4. Papanicolaou (Pap) smears** |  |  | |  | | q 1 → 3 yrs\*\* | | | | | | | | | | | |  |  | |
| **5. Gynecologic pelvic examination** |  |  | |  | | q 1-3 yrs | | | annually | | | | | | | | | | | |
| **6. PSA & rectal exam** | No longer recommended | | | | | | | |  | | | ~~annually~~ | | | | | | | |  |
| **7a. Serum lipids (total ch, HDL, tg)** |  |  | |  | | | q 5 yrs | | | | | q 2-3 yrs | | | | | | | | |
| **7b. Serum glucose** |  |  | |  | | | | | | | q 3 yrs | | | | | | | | | |
| **9. Colon cancer** |  |  | |  | | |  |  |  | | | q 1-10 yrs | | | | | | | |  |
| **10. TSH** |  |  | |  | | |  |  |  | | |  | | |  | q 3-5 yrs | | | | |
| **11. Glaucoma screening** | q 3-5 yrs | | | | | | | | more often | | | | | | | | | | | |
| **12. Lead screening** | once | repeat at 2 yrs | |  | | |  |  |  | | |  | | |  | | | |  | |
| **13. Hearing Loss screening** | child-cooperative tests begin at 3-4 yrs; then at 5, 10 and 12 yrs | | | | |  | |  |  | | |  | | |  | | | |  | |
| **14. Vision screening** |  | |  |  | | |  | | |  | | | |  | |
| **15. Dental Check-Up** |  |  | regularly from 3 yrs | | | | | | | | | | | | | | | | | |
| **16. Iron deficiency (Hct / Hb)** | once |  | | annually if menstruating | | |  |  |  | | |  | | |  | | | |  | |
| **17. HbS** |  |  | |  | | |  |  |  | | |  | | |  | | | |  | |
| **18. Tuberculin skin testing** |  |  | | | | | | | | | | | | | | | | | | |
| **19. Osteoporosis screening** |  |  | |  | | |  |  |  | | |  | | | | | | q 5 yrs | | |
| **20. Hip dislocation** |  |  | |  | | |  |  |  | | |  | | |  | | | |  | |
| **21. Scoliosis** |  |  | |  | | |  |  |  | | |  | | |  | | | |  | |
| **22. Abdominal aortic aneurysm** |  |  | |  | | |  |  |  | | |  | **once** | | | |  | |  | |
| **23. HIV** |  |  | |  | intervals on a case-by-case basis (high-risk groups → annually) | | | | | | | | | | | | | | | |
| **24. Rubella serology** |  |  | |  | | | | | |  | | | | |  | | | |  | |
| **25. Substance abuse** |  |  | | as often as possible | | | | | | | | | | | | | | | | |
| **26. BMI** |  | as often as possible (at least yearly) | | | | | | | | | | | | | | | | | | |
| **27. Autism** |  | once at age 18 months | |  | | |  |  |  | | |  | | |  | | | |  | |
| **28. Lung cancer** |  |  | |  | | |  |  |  | | |  | | ///55-77 yo smokers annually/// | | | | | | |
|  |  |  | |  | | |  |  |  | | |  | | |  | | | |  | |

tests only for women \*Lietuvoje 50-69 m. moterims kas 2 metai

tests only for men \*\*Lietuvoje 30-60 m. moterims kas 3 metai

tests for all (*//////////* - only selected population)

US Preventive Services Task Force

American Cancer Society

National Cancer Institute

American College of Physicians

|  |  |  |
| --- | --- | --- |
| **Screening Test** | **When** | **Pastabos** |
| **1. Breast self-exam** | ***women > 20 yr.*** *– monthly* (bet kurią mėnesinių ciklo pirmos savaitės dieną, o postmenopauzėje – bet kurią, tačiau tą pačią mėnesio dieną) | Greičiausiai tai neduoda jokio survival benefit!!! USPSTF also recommends against teaching BSE |
| **2. Breast clinical exam** | ***women 20-39 yr.*** – *kas 3 metai*.  ***women ≥ 40 yr.*** – *annually* (kartu su mamografija). | |
| **3. Screening Mammograms**  N.B. skriningui netinka **echoscopy**, bet gali tikti **MRI** (esp. those > 30 yrs with ↑risk populations) | Mamogramas daryti pirmoje mėnesinių ciklo pusėje! (false-positives↓)  Baseline mammogram at 35-40 yrs.! Positive mammogram → FNAB   * 1. ***women > 50 yr*** – *annually* (or q 2 yrs - USPSTF)   2. ***women 40-50 yr*** – recommendations vary:      + 1. *annually* (American Cancer Society) – turbūt teisingiausia!        2. *every 1-2 yr* (National Cancer Institute)        3. *no periodic mammography* (American College of Physicians, USPSTF – consider mammography benefits for this age group to be uncertain)   Stop when life expectancy remains < 5 years (but > 75 yrs) | |
| **4. Papanicolaou (Pap) smears**  (exfoliative cytology) | ***annually*** (nepaisant HPV vakcinacijos) or *q 2 yrs* using liquid-based Pap tests  age > 30 yrs. – add **HPV test** for Pap material;  age > 30 yrs. – if 2-3 consecutive annual Pap smears negative + no HPV + no high-risk factors → ***every 3 years*** | Start at age 18 or at 0-3 yrs after onset of sexual activity (but no later than age 21 yrs). Finish at age 65-70 yrs.  High-risk factors:   1. age 25-60 2. low socioeconomic status 3. prison inmates, prostitutes 4. history of STDs (HPV types 16 & 18 are associated with cervical carcinoma) 5. young age at first intercourse 6. unmarried mothers 7. had induced abortions 8. history of cervical dysplasia |
| **5. Gynecologic pelvic examination** | ***every 1-3 yrs***. in 18-40, then ***annually*** | Encourage women at menopause to report any unexpected bleeding or spotting. |
| **6. PSA & digital rectal exam (DRE)** | ***annually*** – men 50-75 yrs.  (black men, men with prostate cancer in father/brother/son < 65 yrs – start from 40-45 yrs)  PSA is no longer recommended! | PSA is not recommended / stopped when life expectancy < 10 yrs. or age > 75 yrs. [see 1707a p. for requirements (to avoid false results) >>](file:///D:\Viktoro\Neuroscience\USMLE%202\Oncology%20(1701-1800)\1707a.%20Tumor%20Markers.doc)  USPSTF has insufficient evidence to recommend for or against routine screening for prostate cancer! |
| **7a. Serum lipids (total ch, HDL, tg)** | every 5 yr. (< 50 yr.)  every 2-3 yr. (> 50 yr.) | not routine for children; start at adolescence |
| **7b. Serum glucose**  or  **Hb A1C** | every 3 yr. (> 45 yr.) | High-risk individuals (early\* & more frequent screening) - overweight or obese (BMI ≥ 25 kg/m2) + at least 1 more risk factor:  \*start at age 10 yrs   1. diabetes-prone ethnic groups (Latin Americans, African Americans, Native Americans) 2. strong family history 3. metabolic syndrome or its individual components:    1. dyslipidemia    2. hypertension    3. central obesity    4. prediabetes (impaired glucose tolerance, impaired fasting glucose) 4. gestational diabetes 5. conditions associated with insulin resistance (acanthosis nigricans, polycystic ovary syndrome) |
| **9. Colon cancer** – one of following tests: | all 50-75 yrs.  (testing 75-85 yrs patients – only if medical history and risk factors warrant it) | * if with **IBD** – start screening when ≥ 8 yrs duration. * if first-degree relative was diagnosed with **colon cancer** – start screening 10 yrs prior to age when first-degree relative was diagnosed with colon cancer (but no later than age 40 yrs). * family history of **familial adenomatous polyposis** → **genetic screen**; if positive → frequent colonoscopy starting at 10 yrs of age |
| **a) traditional (optical)** **colonoscopy** – preferred test in U.S.A. | ***q 10 yrs***. | **virtual (CT colonography)** is not approved by USPSTF;  all identified polyps should be removed entirely!  American Cancer Society allows alternative - **double-contrast barium enema** ***q 5 yrs*** |
| **b) flexible sigmoidoscopy + occult stool blood** | ***q 5 yrs.***  ***q 3 yrs.*** |  |
| **c) rectal exam + occult stool blood** | ***annually*** | **Cologuard® - stool DNA test** can be added – increases sensitivity from 74% to 92% |
| **10. TSH** | ***every 3-5 yr***. (all > 65 yr.) | thyroid dysfunction is prevalent in elderly + difficult to detect clinically |
| **11. Glaucoma** | at least ***every 3-5 years*** in asymptomatic individuals;  ***more often*** in high risk groups:   1. African Americans 2. individuals > 40 yrs | 1. **Intraocular pressure (IOP) measurements** 2. Optic nerve status (**funduscopy** + **visual fields**) |
| **19. Osteoporosis** | all ≥ 50 yrs – asses **risk factors**  women ≥ 65 and men ≥ 70 yrs → **DEXA** ***q 5 yrs.*** | Individualized assessment for **risk factors**:   1. Age > 70 yrs 2. BMI < 20-25 kg/m2 3. Weight loss > 10% 4. Physical inactivity / sedentary lifestyle 5. Previous osteoporotic fractures 6. Prolonged / ongoing use of certain drugs (e.g. corticosteroids) 7. Low-calcium diet 8. Androgen deprivation therapy (in men) 9. Spinal cord injury (in men) 10. Any type of fracture at age > 50 yrs   Increased risk + candidate for drug therapy → **DEXA** at earlier age |
| **22. Abdominal aortic aneurysm** | ***one-time*** for ***men 65-75 yrs*** who have ever smoked (i.e. ≥ 100 cigarettes in person’s lifetime) | **ultrasound** |
| **23. HIV** | all > 13 yrs, all pregnant  ***repeat screening intervals on case-by-case basis*** | Higher risk patients (should be retested more frequently, e.g. annually):   1. Shared injection drug needles 2. Blood transfusion 1978-1985. 3. Sexual practices - unprotected sex with multiple partners; having STD; engaging in unprotected sex with anyone who falls into any of those risk categories. |
| **24. Rubella serology** | women ≥ 11 yrs | If negative → vaccination |
| **26. BMI** | all children (even those who appear fit) and adults, ***at least yearly*** | Including **counselling** about obesity prevention (most important in recent guidelines);  for *obese children* → blood lipids, family Hx of cardiovascular disease & obesity |
| **27. Autism** | all children ***once at age 18 months*** |  |
| **28. Lung cancer** | 55-77 yrs who are current smokers or who quit in the last 15 years, and who have a history of at least 30 “pack years.” ***annually*** | Low-dose **CT** (Medicare covers) |
| **Chest X-ray, sputum cytology** |  | Only for high risk groups (screening for lung cancer) |
| **AFP (α-fetoprotein) + liver ultrasound** | ***annually*** (those with non-alcoholic cirrhosis) | Screening for hepatocellular carcinoma |
| **All cancers** | all ***≥ 20 yrs***, on occasion of periodic health examination | Examination: thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin  Health counseling: tobacco use, sun exposure, diet and nutrition, risk factors, sexual practices, and environmental and occupational exposures. |

periodic visits

Recommended frequency

**Infancy**:by 1 month (2-4 days for infants discharged < 48 hours after delivery), 2, 4, 6, 9, 12, 15, 18, 24 months.

**Preschool**:at 3, 4, and 5 years.

**School age**:at 6, 8, 10, 11, and 12 years.

**Adolescent**:yearly (beginning at 13 years).

**Adults up to 40 yrs** – every 5 yrs

**Adults 40-65 yrs** – every 2-3 yrs

**Adults > 65 yrs** – annually

Examinations

- complete physical examination!

Seven areas need more frequent examination:

1. BP
2. Hearing
3. Vision (incl. tonometry)
4. Teeth & gingivae
5. Breasts
6. Pelvic exam (incl. Pap)
7. Rectum (incl. occult blood)

Neonatal screening

1. **Visual** **loss** – all newborns (subjective tests).
2. **Hearing loss** – all newborns (subjective tests - responses to sounds made through headphones; watch attempts to localize sound)

High-risk\* neonates before age of 3 months: (otoacoustic emissions →) auditory brainstem response (ABR) done by audiologist; latest date to screen – 8 months of age

\*High-risk neonates:

* 1. birth weight < 1500 g
  2. Apgar score ≤ 7 at 5 min
  3. serum bilirubin > 22 mg/dL (> 376 μmol/L) in neonate whose birth weight is > 2000 g, or > 17 mg/dL (> 290 μmol/L) in neonate < 2000 g
  4. perinatal hypoxia
  5. neonatal sepsis / meningitis
  6. craniofacial abnormalities
  7. seizures or apneic spells
  8. congenital infections (rubella, syphilis, herpes simplex, CMV, toxoplasmosis)
  9. maternal exposure to aminoglycosides
  10. history of early hearing loss in parent or close relative

1. Metabolic screening: (recommendations vary by state)

**Hypothyroidism** – all states, all newborns (cord blood at birth or heel blood at discharge): TSH or T4; many states require rescreening at 2 weeks of age.

**Phenylketonuria** (!!!) and hyperphenylalaninemias – all states, all newborns (heel blood); many states require rescreening at 2 weeks of age.

N.B. cases may be missed if screening is done too soon after delivery (before adequate protein input); if infant is screened before 24 hours of age, rescreening must be done before 3rd week of life!

In many states, all newborns -tyrosinemia, biotinidase deficiency, homocystinuria, maple syrup urine disease, galactosemia, isovaleric acidemia, congenital adrenal hyperplasia, sickle cell disease, cystic fibrosis, medium-chain acyl-CoA dehydrogenase deficiency (MCADD)

NeoGram Amino Acids and Acylcarnitines Tandem Mass Spectrometry Kit – tests levels of amino acids and free carnitine and acylcarnitines in newborn blood.

1. **Hemolytic disease of newborn** – newborn of mother with type O or Rh-negative blood or when minor blood antigens are present: blood typing.
2. **Hyperbilirubinemia** – all newborns: transcutaneous or serum measurements.
3. **Peri- / intra-ventricular hemor­rhage** – all infants < 30 weeks gestational age: cranial ultrasonography at 7-14 days postnatal life and at 36-40 weeks postmenstrual age.
4. **Hip dislocation** – all (!!!) or only those with risk factors (female sex, breech position in utero, twin gestation, family history): hip ultrasonography at 4-6 wk.
5. **HIV**:
   * 1. all
     2. only if mother HIV positive or engaging in HIV high-risk behaviors.
6. Toxicology screening - if maternal history of drug use, unexplained placental abruption, unexplained premature labor, infant exhibits drug withdrawal.

Infant-Preschooler Screening

1. **Growth parameters/development/behavior**: at each visit, every 2–6 months (for first 3 years), → annually.
2. **Visual acuity**: see D1eye p.

**infants** – noncooperative subjective methods; perform ophthalmoscopy at 2-6 months.

**age ≥ 3 yrs** – cooperative objective methods (at 3, 4, 5, 6, 8, 10, 12, 15, 18 years – i.e. almost annually).

1. **Hearing loss** – can be screened objectively (screening audiometry) at age 3-4 years; then at 5, 6, 8, 10, 12, 15, 18 years (i.e. almost annually). see D1ear p.

Seek parental input about hearing at every visit during early childhood!

Examine middle ear (pneumatic otoscopy ± tympanometry) in all young children!

1. **Lead screening** (at age 9 months ÷ 1 year; repeat at 24 months) – question regularly:
   * 1. does your child live in or regularly visit house or child care facility ***built before 1950***? (according to Merck – ***before 1980***)
     2. does your child live in or regularly visit house or child care facility ***built before 1978 that is recently been renovated / remodeled*** (within last 6 months)?
     3. does child have ***sibling / playmate*** who has / did have lead poisoning?
        + if answers to any of three above questions are either "Yes" or "Not Sure" → blood lead level (norma < 10 μg/dL or 0.1 mg/L).
2. **Iron deficiency** (Hct or Hb):
   1. at age 9-12 mo for *term* infants
   2. at age 5-6 mo for *premature* infants
      * + repeat in menstruating adolescents.
3. **Sickle cell** testing (HbS) at 6-9 mo (if not done in newborn period) - all black and Hispanic patients.
4. Regular **dental** check-ups begin from 3 yrs.
5. **Blood pressure** - annually (starting at 3 yrs).
6. Universal **cholesterol** screening is not advocated; screening is directed at children > 2 yrs. with *high risk for early atherosclerosis* based upon *family history* (e.g. parent or grandparent with premature [< 55 years] atherosclerotic heart disease, vascular disease, stroke, sudden death from heart disease; parent with hypercholesterolemia).
7. **Hip dislocation** – all infants (regardless of newborn testing results).
8. **TBC** - risk assessment at each well-child check;
   * + - current recommendations do not support routine tuberculin skin testing for children without risk factors who reside in low-prevalence regions; for others tuberculin skin testing (PPD) begins at 12 mo. further see 237 p.

Screening at School Entry

* + - * regular **dental** check-ups.
      * screening for **anemia**.
      * routine urinalysis.
      * full-scale audiometry(vs. screening audiometry at other ages).
      * BP annually.

School age

* + - * **hearing loss** – screening audiometry at 8, 10, 12 (± 15, 18 years). see D1ear p.
      * **iron deficiency** (Hct or Hb) - annually in *menstruating adolescents*.
      * at each adolescent visit:

1. **Sleep** and **nutrition** counseling
2. **Injury** and **violence** prevention
3. **High-risk behaviors / STD screening**;

*at 16 yrs* - routine urinalysis;

*sexually active adolescents* annually - urinary dipstick analysisfor **leukocytes** ± urinary testing for **Chlamydia**.

* + - * BP annually.
      * **scoliosis** – clinical examination.

Nationalities and Specific Genetic Disorders

- genetic screening is recommended for following:

|  |  |  |  |
| --- | --- | --- | --- |
| **Ethnicity** | **Disease** | **Screening** | **Confirmation** |
| Northern European Caucasian | **cystic fibrosis** | direct DNA analysis? | |
| Ashkenazi Jews, French Canadians | **Tay-Sachs disease** | serum [hexosaminidase A]↓ |  |
| African descent | **sickle cell disease** | sickling test, solubility test | Hb electrophoresis |
| Mediterranean descent | **α-thalassemia** | RBC indices? | Hb electrophoresis? |
| Southeast Asians | **β-thalassemia** | RBC indices? | Hb electrophoresis? |

[Viktor’s Notes℠ for the Neurosurgery Resident](http://www.neurosurgeryresident.net/)

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