




and treating preneoplastic lesions to prevent progression to malignancy. Well-known examples of such approaches include colonoscopy for colon cancer and Papanicolaou (Pap) smears for cervical cancer.

Cancer Stem Cells

The concept of cancer stem cells has gained traction in some malignancies. Observations of a hierarchy of cells within a malignancy, wherein some cells retain a proliferative self-renewing capacity and others do not, support this concept. These populations of cells may be responsible for treatment resistance.

 For a deeper discussion on this topic, please see Chapter 181, "Cancer Biology and Genetics," in Goldman-Cecil Medicine, 25th Edition.

SUGGESTED READINGS

- Cancer Genome Atlas Network: Comprehensive molecular characterization of human colon and rectal cancer, *Nature* 487:330–337, 2012.
- Hanahan D, Weinberg RA: Hallmarks of cancer: the next generation, *Cell* 144:646–674, 2011.
- Jordan CT, Guzman ML, Noble M: Cancer stem cells, *N Engl J Med* 355:1253–1261, 2006.
- Vander Heiden MG, Cantley LC, Thompson CB: Understanding the Warburg effect: the metabolic requirements of cell proliferation, *Science* 324:1029–1033, 2009.
- Vogelstein B, Kinzler KW: Cancer genes and the pathways they control, *Nat Med* 10:789–799, 2004.