Myeloid Neoplasms

2011 Reporting Requirements and CSv02.03.02 Standard Treatment Guidelines

FCDS 2011 Educational Webcast Series

November 2, 2011

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Presentation Outline

- Overview – Incidence/Mortality, Signs and Symptoms, Risk Factors
- WHO 2008 Classification of Myeloid Neoplasm – 6 Groups
- Characteristics of Major Classification Groups
- Characteristics of Specific Myeloid Neoplasm
- Standard Treatment Guidelines for Specific Conditions
- Hematopoietic Multiple Primary and Histology Coding Rules Refresher
- Collaborative Stage Data Collection System (CSv02.03.02)
- 2011 FCDS Required C.S. Site Specific Factors
- Text Documentation

Overview of the Myeloid Neoplasms

Incidence and Mortality

Signs and Symptoms

Risk Factors

Myeloid Neoplasm Characteristics

- 2011 estimates in the United States
  - 44,600 new leukemia cases – All types
    - 12,950 new AML cases
    - 5,150 new CML cases
    - 6,200 other leukemia Cases
  - 9,050 AML deaths and 270 CML deaths

- No published data for myeloproliferative disorders – new cases/deaths
- No published data for myelodysplastic syndrome – new cases /deaths

- 2011 estimates in the State of Florida
  - 2079 new leukemia cases – All types
    - 705 new AML cases
    - 244 new CML cases
    - 1131 other leukemia Cases
  - 634 AML deaths and 63 CML deaths

Source: American Cancer Society Cancer Facts and Figur
Florida Cancer Data System

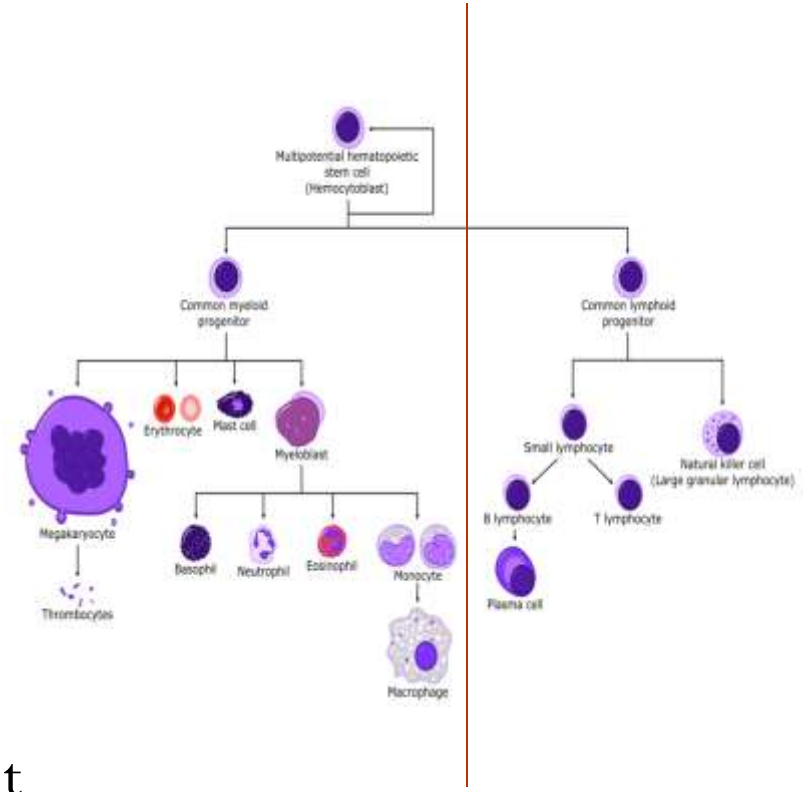
Risk Factors

- Exposure to ionizing radiation including medical radiation
- Exposure to cytotoxic chemotherapeutic agents
- Family history
- Cigarette smoking

- Benzene exposure – industrial chemicals, gasoline, cigarettes

Proliferation and Differentiation

- Regulation of proliferation
- Regulation of differentiation
- Both affect development along cell
- Turn on/Turn off
  - Growth factors
  - Genes (including mutations)
  - Proteins
- Ongogenesis – becoming malignant

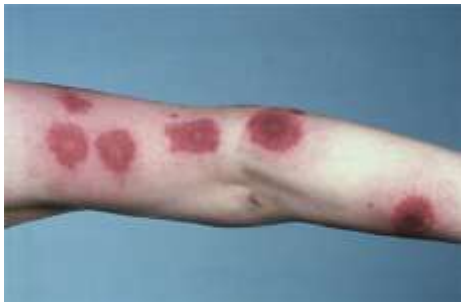


Hematopoietic stem cells give rise to two major progenitor cell lineages, myeloid and lymphoid progenitors
Regenerative Medicine, 2006. http://www.dentalarticles.com/images/hematopoiesis.png

Signs and Symptoms

- Fatigue
- Paleness
- Weight loss
- Repeated infections
- Fever
- Easy bruising
- Nosebleeds and other hemorrhage

http://www.allleukemia.com/leukemia-symptoms-in-adults.html



http://www.surgical-blog.com/symptoms-of-acute-myeloid-leukemia-

Signs and Symptoms

- AML usually has sudden onset of symptoms
- CML usually progresses slowly with 4-5 years lapsing prior to transformation to acute phase
- Other myeloid neoplasms have varying courses of disease
  - Some have more predictable disease progression
  - Others may remain in chronic phase for many years
  - A few rapidly advance to AML

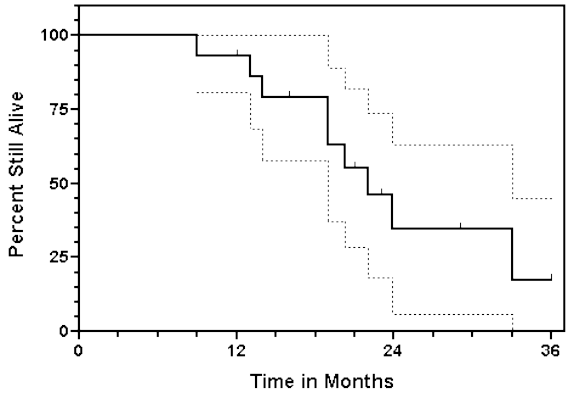
Work Up and Confirmation Testing

- CBC
- Peripheral Blood Smear
- Bone Marrow Aspirate
- Bone Marrow Biopsy

- Histology/Morphology
- Cytochemistry
- Flow Cytometry (Immunophenotype)
- Molecular Genetic Studies

Myeloid Neoplasm Disease Course

- Initial Diagnosis is based on abnormal CBC and symptoms
- Many are chronic and relatively asymptomatic
- Diagnosis of Inclusion and Exclusion
- Specific types tend to stay in chronic phase
- Some types predictably progress to acute (blastic) phase



Reclassification Myeloid Conditions

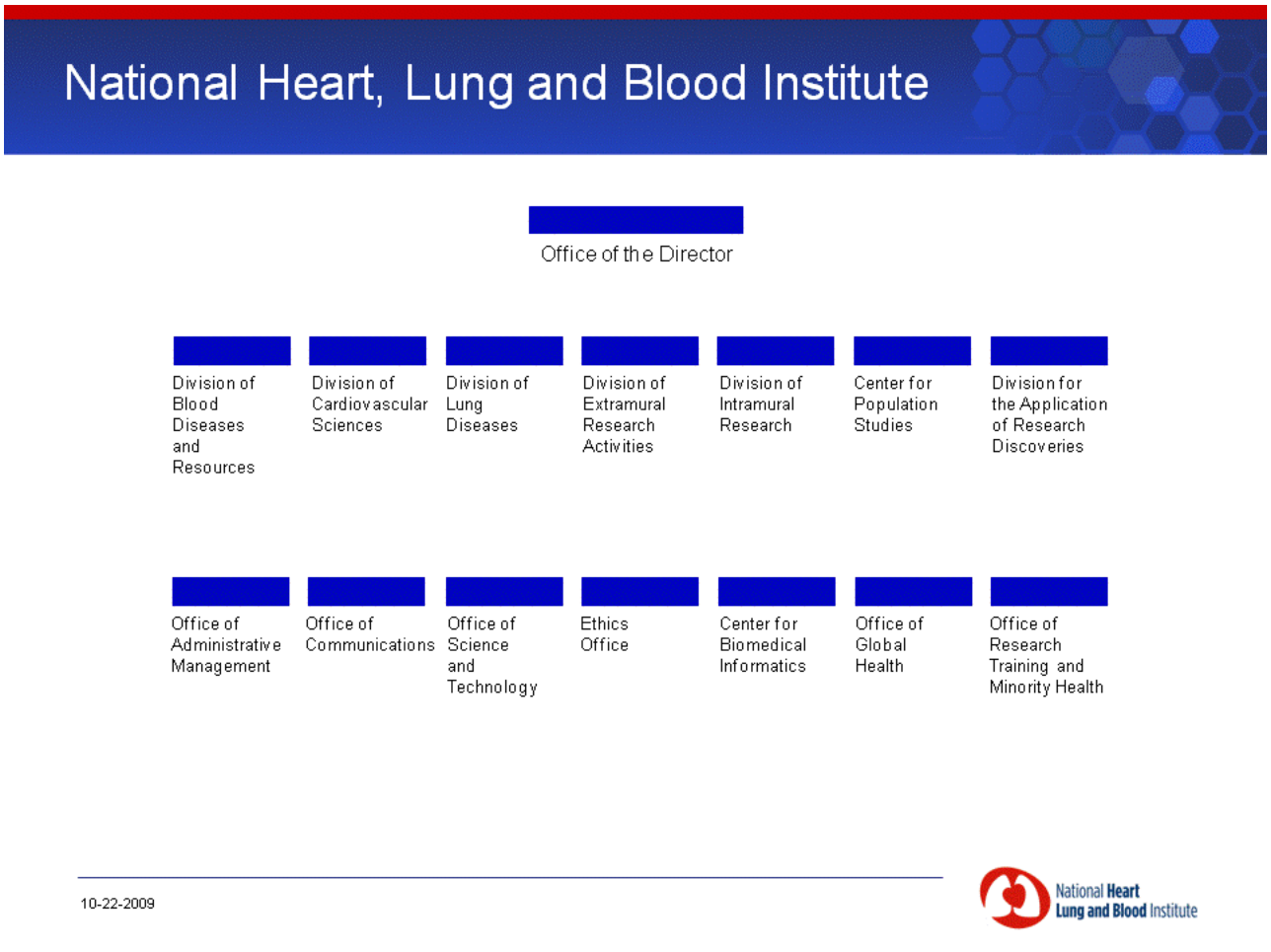
- Before 2000 myelodysplstic and myeloproliferave conditions were felt to be pre-leukemia blood-disorders – not malignaant
- Scientific evidence confirmed single cell line affected – met criteria
- ICD-O-3 "behavior" changed from /1 to /3
- WHO in 2008 reclassified again into six new categories
- Diagnosis and treatment occur outside hospital in office only
- Florida and ALL other states are underreporting these cases

Myeloid Neoplasm Research

- National Institutes of Health
- National Heart, Lung and Blood Institute
- National Cancer Institute
- Pharmaceutical company studies
- Device company funded studies
- Public/Private collaborations

Myeloid Neoplasm Research

Myeloid Neoplasm Research



Myeloid Neoplasm Research

- **NHLBI – Division of Blood Diseases and Resources**
- The Division of Blood Diseases and Resources (DBDR) is part of the National Heart, Lung, and Blood Institute (NHLBI), one of 27 institutes and centers at the National Institutes of Health (NIH). DBDR supports research on the causes, prevention, and treatment of **nonmalignant blood diseases, including anemias, sickle cell disease, and thalassemia**; **premalignant processes such as myelodysplasia and myeloproliferative disorders**; hemophilia and other abnormalities of hemostasis and thrombosis; and immune dysfunction. Funding encompasses a broad spectrum of research ranging from basic biology to medical management of blood diseases.
- **BLOOD DISEASES BRANCH**
- The Blood Diseases Branch supports research and training programs focusing on a wide variety of blood diseases that include sickle cell disease (SCD), thalassemia, **Fanconi anemia, Diamond-Blackfan anemia and other aplastic anemias** as well as outcomes-related research.
- **THROMBOSIS AND HEMOSTASIS BRANCH**
- This Branch supports research and training programs on basic research, clinical studies, and technology development in hemostasis, thrombosis, and endothelial cell biology. The main focus is on understanding the pathogenesis of both arterial and venous thrombosis in order to improve diagnosis, prevention, and treatment of thrombosis in heart attack, stroke, and peripheral vascular diseases. A major goal is to find additional platelet inhibitors, anticoagulants, and fibrinolytic agents that will improve specificity and reduce side effects when used in treating thrombotic and thromboembolic disorders. Specialized Centers of Clinically Oriented Research (SCCORS) support collaborative studies on hemostatic and thrombotic disorders.
- Finding effective treatments for bleeding disorders is another priority. The Branch supports research on hemophilia and von Willebrand Disease as well as immune disorders such as idiopathic thrombocytopenic purpura, thrombotic thrombocytopenic purpura, and systemic lupus erythematosus. **Emerging areas of interest are gene transfer, clinical proteomics, inflammation and thrombosis, stroke, coagulation activation, autoimmune disease, and thrombotic complications of obesity, diabetes, and cancer.**

Myeloid Neoplasm Research

- **NHLBI – Division of Blood Diseases and Resources**
- **TRANSFUSION MEDICINE AND CELLULAR THERAPEUTICS BRANCH**
- This Branch supports research and research training in transfusion medicine, **stem cell biology and disease, clinical cellular medicine**, and blood supply adequacy and safety. Research focus is on the use, safety, and availability of blood and blood components for transfusion and cellular therapies. Research areas include transmission of disease, non-infectious complications of transfusions, immunobiology, cell biology and disease, novel cell-based therapies, **hematopoietic stem cell transplantation**, and overall product availability. The Branch develops programs for basic and clinical research related to normal and abnormal cellular biology and pathology. It also collaborates with governmental, private sector, and international organizations to improve the safety and availability of the global supply of blood and blood components.
- **The Branch also supports two clinical research networks to promote efficient comparison of innovative treatment strategies. The Bone Marrow Transplant Clinical Trials Network (BMTCTN) supports trials for patients undergoing blood or marrow transplantation**. The Transfusion Medicine/Hemostasis Clinical Trials Network (TMHCTN) supports trials for patients with hemostatic disorders, such as idiopathic thrombocytopenia and thrombotic thrombocytopenic purpura. Specialized Centers of Clinically Oriented Research support collaborative studies on transfusion biology and medicine.

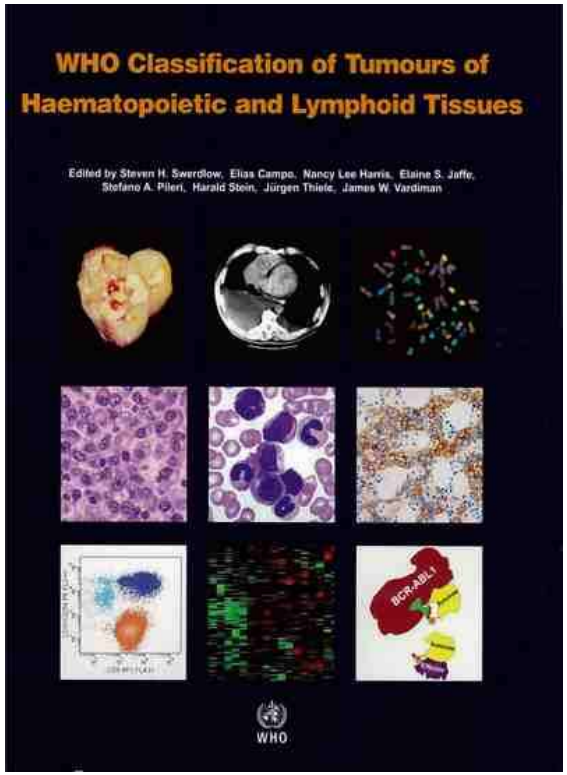
Myeloid Neoplasm Research

- WHO no longer classifies Myeloproliferative Disorders
- All are now Myeloproliferative Neoplasms
- Initial Reclassification 2000
- Updated Reclassification 2008
- New Registry Rules 2010

World Health Organization 2008 Classification of Myeloid Neoplasms

2008 - WHO Classification of Tumors

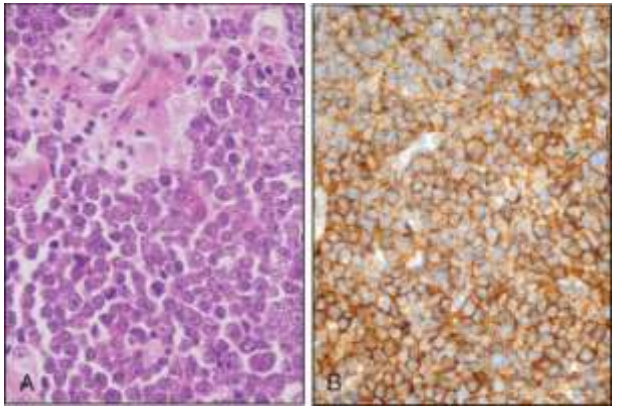
- 2008 – WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues, 4th edition, October 2008

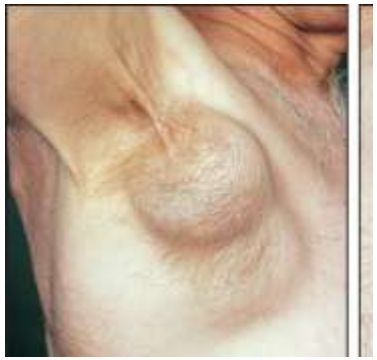


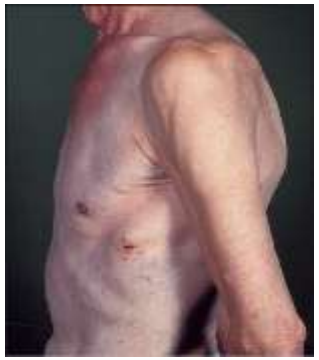
WHO Classification of Myeloid Neoplasms

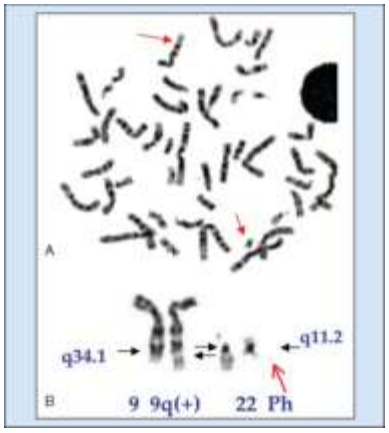
Incorporates:

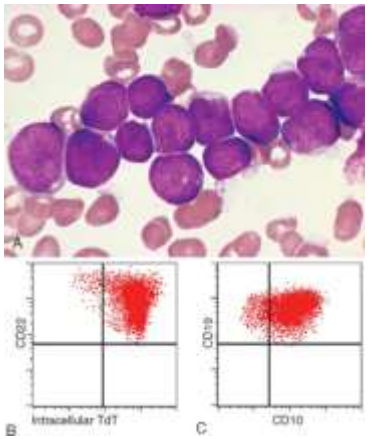
- Morphology
- Stage of differentiation
- Immunophenotype
- Genotypic features
- Clinical features









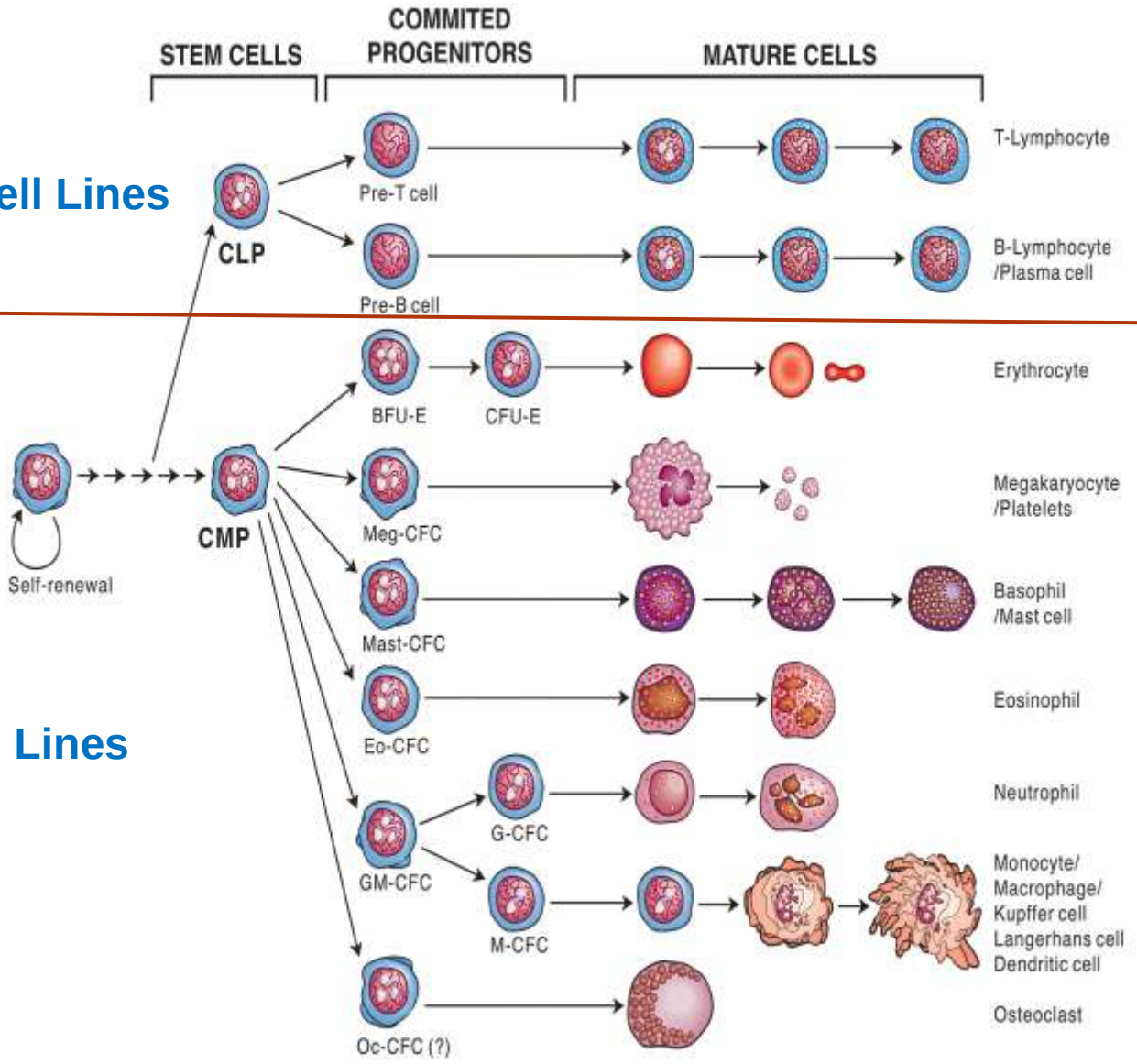


Myeloid – 6 Classification Groups

- Myeloproliferative Neoplasms
- Myeloid and Lymphoid Neoplasms with Eosinophilia and Abnormalities of PDGFRA, PDGFRB or FGFR1
- Myelodysplastic/Myeloproliferative Neoplasms
- Myelodysplastic Syndromes
- Acute Myeloid Leukemia and Related Precursor Neoplasms
- Acute Leukemias of Ambiguous Lineage

Lymphoid Cell Lines

Myeloid Cell Lines



Blood Lines – Donald Metcalf, AlphaMED Press, 2005

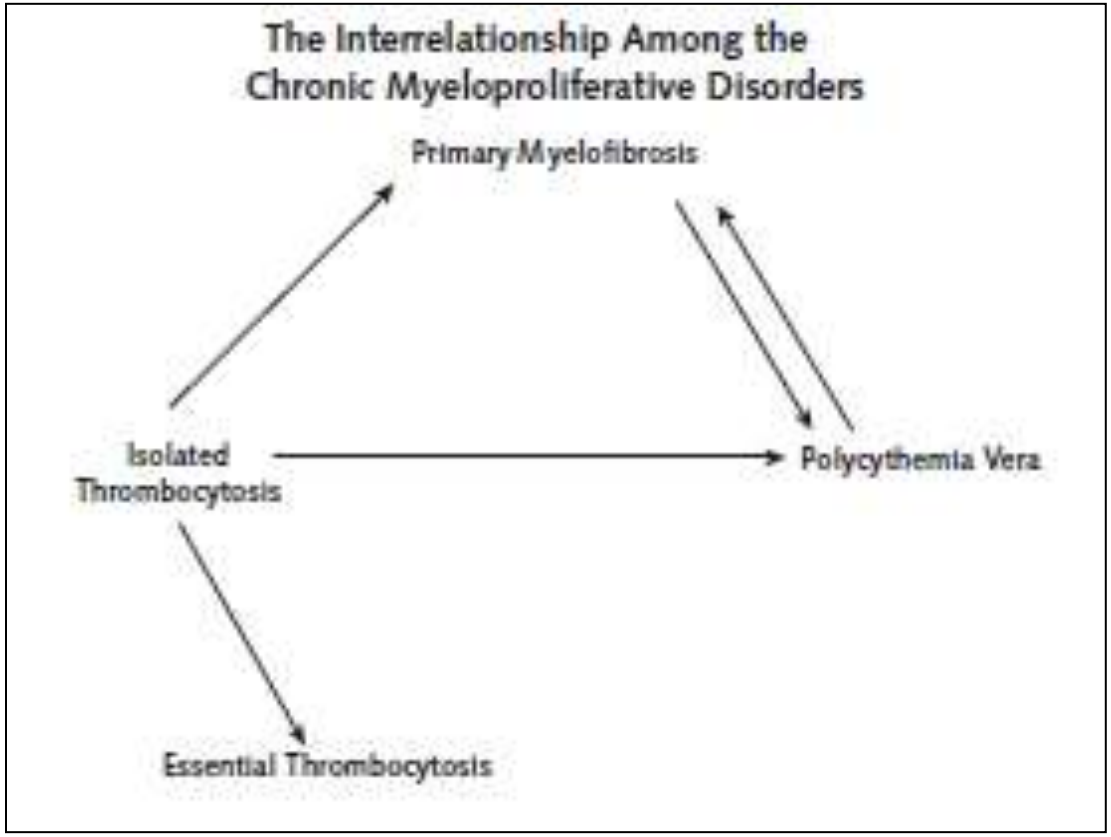
Figure 3.2 The eight major hematopoietic lineages generated by self-renewing multipotential stem cellsB

Myeloproliferative Neoplasms

Table B1: Myeloproliferative Neoplasms

WHO Preferred Term	ICD-O-3
Chronic eosinophilic leukemia, NOS (CEL)	**9964/3**
Chronic myelogenous leukemia (CML), BCR-ABL1+ (Ph+)	**9875/3**
Chronic neutrophilic leukemia (CNL)	9963/3
Cutaneous mastocytosis (SM)	**9740/1**
Essential thrombocythemia (ET)	**9962/3**
Mast cell leukemia ((SM)	9742/3
Mast cell sarcoma (SM)	9740/3
Myeloproliferative neoplasm, unclassifiable (MPN-U)	**9975/3**
Polycythemia vera (PV)	**9950/3**
Primary myelofibrosis (PMF)	**9961/3**
Systemic mastocytosis (SM)	**9741/3**

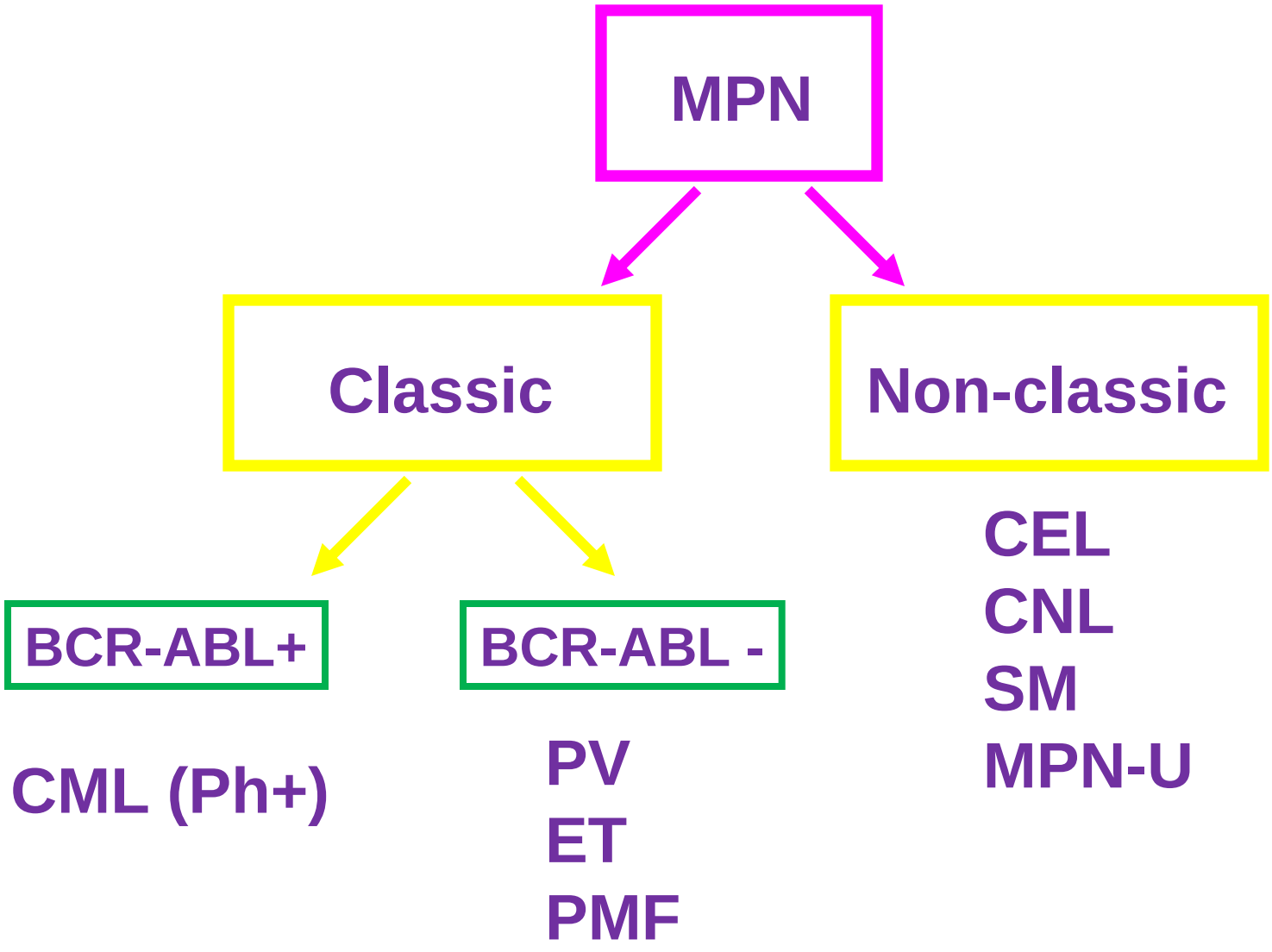
Interrelationship of MPNs



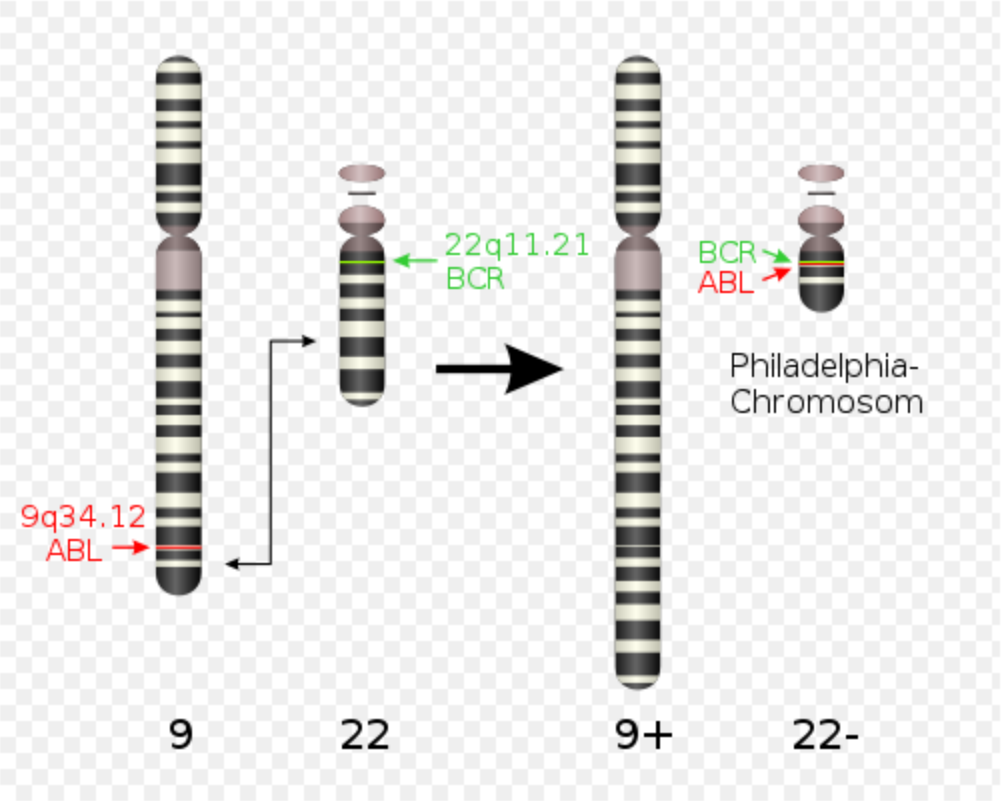
Acute Leukemia (~10%)

Spivak, J. Ann Intern Med; 152:300

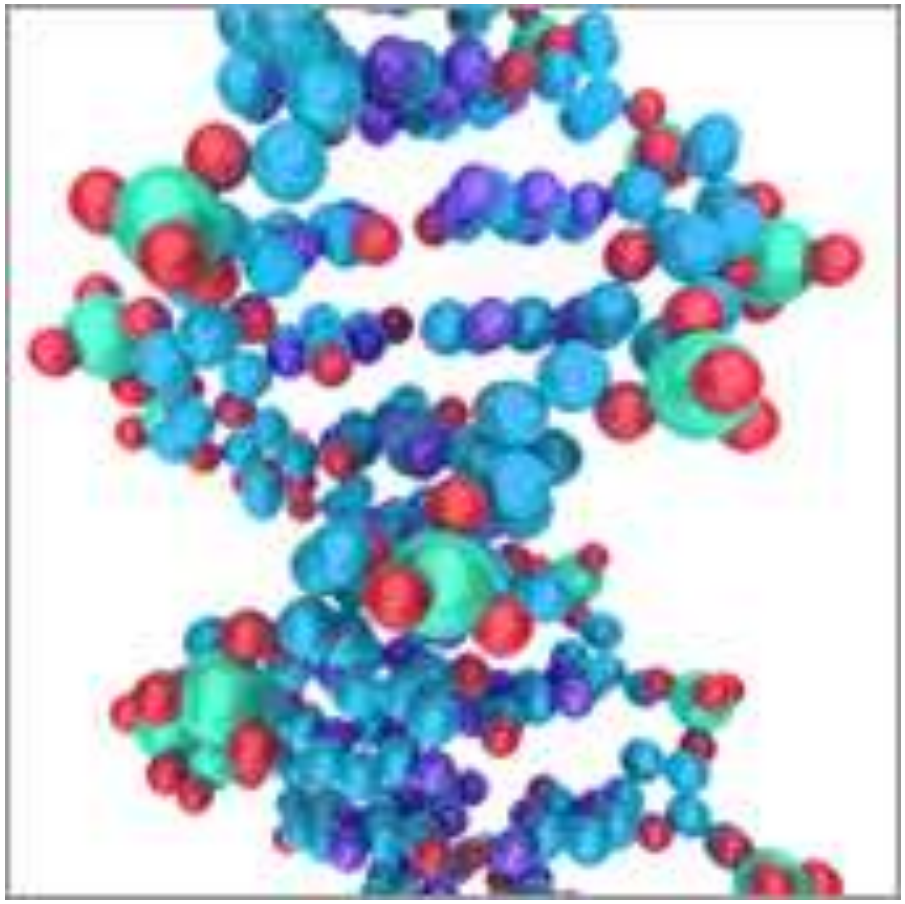
Framework for MPNs



Philadelphia Chromosome



BCR ABL Fusion Gene



Molecular Defects in MPNs

Table. The Chronic Myeloproliferative Disorders

Disease	Molecular Defect*
Chronic myelogenous leukemia	*BCR-ABL*
Chronic eosinophilic leukemia and the hypereosinophilic syndrome	*FIP1L1-PDGFRA*
Chronic neutrophilic leukemia	*BCR-ABL* p230
Chronic myelomonocytic leukemia	*TEL-PDGFRB*
Systemic mastocytosis	*KIT* D816V
Polycythemia vera	*JAK2* V617F (~92% positive) *JAK2* exon 12 mutations (3% positive)
Essential thrombocytosis	*JAK2* V617F (~50% positive) *MPL* W515L/K (~3% positive) *MPL* K39N
Primary myelofibrosis	*JAK2* V617F (~50% positive) *MPL* W515L/K (~14% positive)

Spivak, J. Ann Intern Med, 2010; 152:300

CML as Our Primary Example

Chronic Myelogenous Leukemia

Chronic Myelogenous Leukemia, BCR ABL+

Chronic Myeloid Leukamia

Chronic Myelogenous Leukemia

- Today known as Chronic Myelogenous Leukemia BCR-ABL1 +
- Previously known as Chronic Granulocytic Leukemia
- Diagnostic work up should include bone marrow aspirate cytogenetics, fluorescent in situ hybridization (FISH) and quantitative polymerase chain reaction (QPCR).
- Most patients with CML are found to be Philadelphia chromosome positive (Ph^+) or BCR-ABL positive.
- BCR-ABL is a chromosomal abnormality that can be detected by QPCR.

Chronic Myelogenous Leukemia

Initial Indicators:

- The white blood cell count can range from ~25,000/L to >300,000/L.
- Mild anemia is common.
- Thrombocytosis is present in ~30 to 50% of patients, and the platelet count can exceed 1,000,000/L.

Peripheral Blood Smear:

- The blood smear in CML is very characteristic.
- There is a marked granulocytosis including all stages of granulocytic maturation, from blasts to segmented neutrophils.
- There is a predominance of more mature forms, from myelocytes to segmented neutrophils.
- Myeloblasts are typically only 1 to 2% of WBCs and are always <10% in the chronic phase.
- ***Basophils*** *are* ***always*** *increased in number and usually in the percentage of WBC.*

Chronic Myelogenous Leukemia

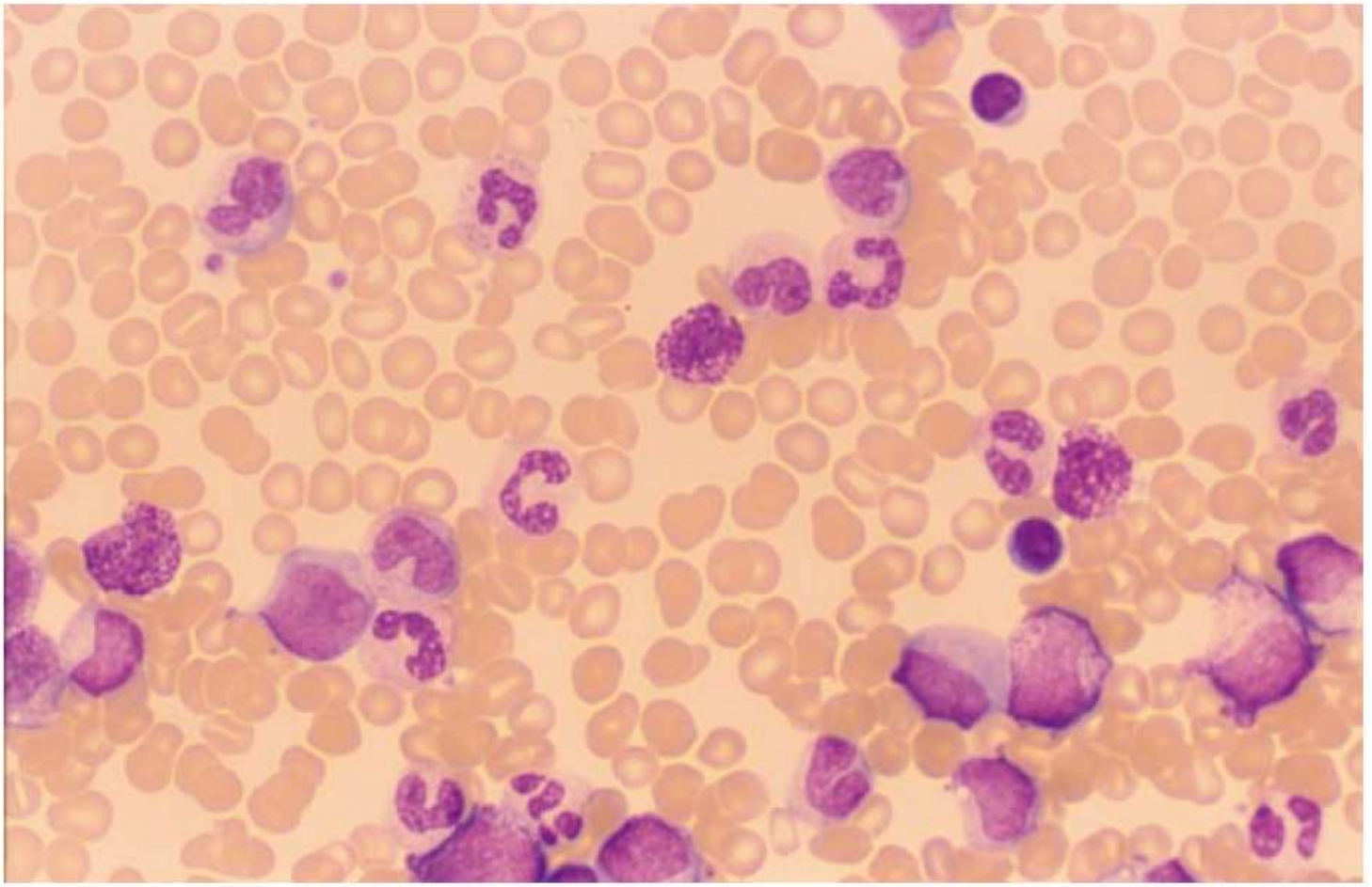


Figure 14–1 Chronic myelogenous leukemia blood smear. All stages of granulocyte maturation are present, with a predominance of mature forms; several basophils are present.

Chronic Myelogenous Leukemia

Table 14–1

Characteristics of Chronic Myelogenous Leukemia (Chronic Phase)

Blood:
- Granulocytosis
- Full range of granulocyte precursors
- Predominance of myelocytes and segmented neutrophils
- Myeloblasts typically ~1–2%; always <10%
- Basophilia
- Thrombocytosis common

Bone Marrow:
- Hypercellular
- Granulocytic hyperplasia (increased M:E ratio)
- Increased megakaryocytes, particularly small megakaryocytes
- Mild fibrosis in one-third of patients

Splenomegaly

Decreased LAP score

Philadelphia chromosome [t(9;22)] and/or *bcr/abl* rearrangement

Elevated serum cobalamin (vitamin B_{12}) and uric acid

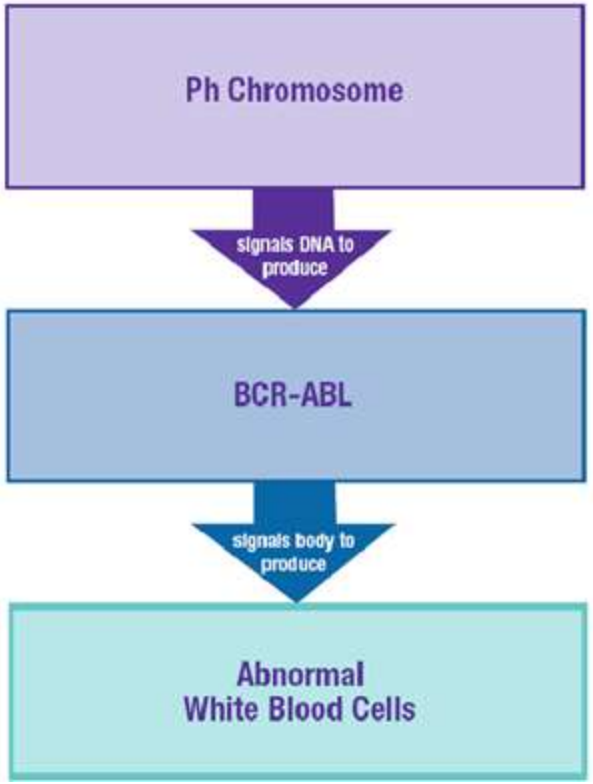
M:E = myeloid to erythroid; LAP = leukocyte alkaline phosphatase.

Source: National Cancer Institute - PDQ Hematology

Chronic Myelogenous Leukemia

- Directly associated with translocation of specific area of the Philadelphia chromosome (Ph) resulting in juxtaposition of abl (Abelson leukemia virus) gene on chromosome 9 fusing with the bcr (breakpoint cluster region) on chromosome 22 [aka: t(9;22)]

- This is referred to as the *bcr/abl* fusion gene] found in nearly 100% of all CML patients

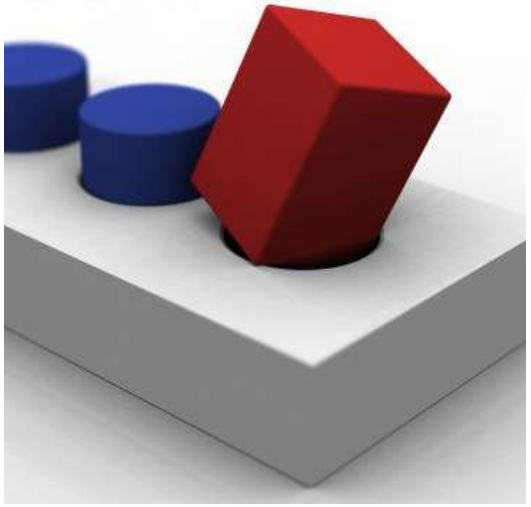


Chronic Myelogenous Leukemia

- Philadelphia chromosome [t(9;22)(q34;q11)] present in ~85 to 95% of cases standard cytogenetic analysis (QPCR)
- Variant cytogenetic abnormality present in ~5 to 10% of cases.
- Occasionally, no Philadelphia chromosome or other detectable abnormality is noted by RT PCR, but a t(9;22) is detected by fluorescence in situ hybridization (FISH)
- Other bcr/abl rearrangement is detected by molecular test

Chronic Myelogenous Leukemia

If there is no Philadelphia chromosome or variant by standard cytogenetics (standard cytogenic analysis or RT PCR), and no evidence of a bcr/abl rearrangement is identified by FISH or other molecular tests, then the diagnosis is not CML!



Chronic Myelogenous Leukemia Treatment Recommendations

- Treatment by Phase
- Chronic Phase: 3 month, 6 month, 12 month F/U
- Accelerated and Blast Phase

Treatment by Phase

- Based on the percent of blasts in the peripheral blood, patients are diagnosed as:
  - **Chronic Phase (<10% blasts)**
  - **Accelerated phase (10-19% blasts)**
  - **Blast phase (>20% blasts)**

- Some patients progress directly from chronic phase to blast crisis, without an intermediate accelerated phase.

- Some patients never progress to more advanced phase.

Chronic Phase CML: Recommendations

- **Ph^+ chronic phase CML is typically treated with a tyrosine kinase inhibitor (TKI).**
- **TKIs include imatinib, nilotinib or dasatinib.**
- All TKIs are given orally so there will be no "administration" documentation rather the patient will be given prescriptions
- Other treatment options include clinical trial or Hematopoietic Stem Cell Transplant [HSCT].

Tyrosine Kinase Inhibitor (TKI).

- Imatinib (Gleevec®) 400 mg po daily (with a meal and large glass of water)
- Nilotinib (Tasigna®) 300 mg po twice daily (no food 2 hours before or 1 hour after dose)
- Dasatinib (Sprycel®) 100mg po daily (with or without a meal)
- Patients are typically asked during follow up appointments if they are taking meds as prescribed or to bring back their pill bottles so the pills can be counted to determine compliance.

Chronic Phase CML –Follow-up

- Patients are evaluated for a cytogenetic response
- Treatment is based on response
  - Complete Response – no Ph^+ positive metaphases
  - Partial Response – 1 %-35% Ph^+ positive metaphases
  - Major Response – 0 %-35% Ph^+ positive metaphases
    - Complete + Partial
  - Minor - > 35% Ph^+ positive metaphases

Chronic Phase CML – 3 Month F/U

- Patients achieving a complete hematologic response are continued on their current medication at the same dose.

- Patients who fail to achieve a complete hematologic response are evaluated for compliance, drug-drug interaction and possibly mutational status but generally are switched to an alternate TKI as second line treatment.

- Other treatment options include evaluation and discussion of HSCT and clinical trial.

Chronic Phase CML – 6 Month F/U

- Patients achieving a complete hematologic response are continued on their current medication at the same dose.

- Patients who fail to achieve a complete hematologic response are evaluated for compliance, drug-drug interaction and possibly mutational status but generally are switched to an alternate TKI as second line treatment.

- Other treatment options include evaluation and discussion of HSCT and clinical trial.

Chronic Phase CML – 12 Month F/U

- Patients are again evaluated for a cytogenetic response
- Treatment is based on response
  - Complete – continue same med, same dose
  - Partial - continue same med at same dose. If taking imatinib, increase daily dose to 800mg po as tolerated.
  - Minor or no - evaluated for compliance, drug-drug interaction and possibly mutational status but generally are switched to an alternate TKI as second line treatment.
  - Other treatment options include evaluation and discussion of HSCT depending on response to secondary therapy or clinical trial.

CML Tx in Accelerated or Blast Phase

- About **85%** of patients are **diagnosed in the chronic phase**
- The **accelerated phase** of CML is characterized by **10% - 19% blasts in the WBC of peripheral blood** (WHO)
  - Note: There are alternative ways to define the accelerated phase proposed by Sokal et al., the International Bone Marrow Transplant Registry, and MD Anderson.
- The **blast phase**, also referred to as blast crisis, is most often defined as **>20% blasts WBC of peripheral blood**

Treatment for Accelerated or Blast Phase

- NCCN recommendations for patients who present with de novo accelerated or blast phase CML include
  - Treatment with combination chemotherapy and TKI or a clinical trial.
  - For patients with a CML of the lymphoid lineage, ALL –type induction chemotherapy should be used in combination with a TKI. (Listing/description of ALL regimens to be provided as a handout.)
  - For patients with a CML of the myeloid lineage, AML-type induction chemotherapy should be used in combination with a TKI . (Listing/description of AML regimens to be provided as a handout.)

FDA Approved CML Anti-Neoplastic Agents

Clafen (Cyclophoasphamide)
Cyclophoasphamide
Cytarabine
Cytosar-U (Cytarabine)
Cytoxan (Cyclophoasphamide)
Dasatinib
Gleevec (Imatinib Mesylate)
Imatinib Mesylate
Neosar (Cyclophosphamide)
Nilotinib
Sprycel (Dasatinib)
Tarabine PFS (Cytarabine)
Tasigna (Nilotinib)

CML Treatment Support Care Drugs

- **Growth Factors**
  - **filgrastim (Neupogen®)**
  - **pegfilgrastim (Neulasta ®)**
- Diuretics (aldactone, hydrochlorothiazide [HCTZ]), steroids (prednisone 20mg/day x 3 for effusions)
- Topical steroids (hydrocortisone cream)
- Antidiarrheal agents (loperamide [Imodium®])
- Analgesics (acetaminophen, ibuprofen)

Primary Myelofibrosis

Table 5. Criteria for primary myelofibrosis (PMF)

Diagnosis requires meeting all 3 major criteria and 2 minor criteria

Major criteria

1. Presence of megakaryocyte proliferation and atypia,* usually accompanied by either reticulin or collagen fibrosis,
   or,
   in the absence of significant reticulin fibrosis, the megakaryocyte changes must be accompanied by an increased bone marrow cellularity characterized by granulocytic proliferation and often decreased erythropoiesis (ie, prefibrotic cellular-phase disease)
2. Not meeting WHO criteria for polycythemia vera,† *BCR-ABL1*–positive chronic myelogenous leukemia,‡ myelodysplastic syndrome,§ or other myeloid disorders
3. Demonstration of *JAK2* V617F or other clonal marker (eg, *MPL*W515K/L),
   or,
   in the absence of the above clonal markers, no evidence that bone marrow fibrosis is secondary to infection, autoimmune disorder or other chronic inflammatory condition, hairy cell leukemia or other lymphoid neoplasm, metastatic malignancy, or toxic (chronic) myelopathies‖

Minor criteria

1. Leukoerythroblastosis¶
2. Increase in serum lactate dehydrogenase level¶
3. Anemia¶
4. Palpable splenomegaly¶

Vardiman JW et al. Blood, 2009; 114:937

Polycythemia Vera

Table 3. Criteria for polycythemia vera (PV)

Diagnosis requires the presence of both major criteria and one minor criterion or the presence of the first major criterion together with two minor criteria:

Major criteria

1. Hemoglobin > 18.5 g/dL in men, 16.5 g/dL in women or other evidence of increased red cell volume*
2. Presence of *JAK2* V617F or other functionally similar mutation such as *JAK2* exon 12 mutation

Minor criteria

1. Bone marrow biopsy showing hypercellularity for age with trilineage growth (panmyelosis) with prominent erythroid, granulocytic, and megakaryocytic proliferation
2. Serum erythropoietin level below the reference range for normal
3. Endogenous erythroid colony formation in vitro

Vardiman JW et al. Blood, 2009; 114:937

Essential Thrombocythemia

Table 4. Criteria for essential thrombocythemia (ET)

Diagnosis requires meeting all 4 criteria

1. Sustained platelet count $\geq$ 450 $\times$ 10^9/L*
2. Bone marrow biopsy specimen showing proliferation mainly of the megakaryocytic lineage with increased numbers of enlarged, mature megakaryocytes. No significant increase or left-shift of neutrophil granulopoiesis or erythropoiesis.
3. Not meeting WHO criteria for polycythemia vera,† primary myelofibrosis,‡ *BCR-ABL1*–positive CML,§ or myelodysplastic syndrome,‖ or other myeloid neoplasm.
4. Demonstration of *JAK2* V617F or other clonal marker, or in the absence of *JAK2* V617F, no evidence of reactive thrombocytosis¶.

Vardiman JW et al. Blood, 2009; 114:937

FDA Approved - Myeloproliferative Anti-Neoplastic Agents

ADE
Adriamycin PFS (Doxorubicin Hydrochloride)
Adriamycin RDF (Doxorubicin Hydrochloride)
Arsenic Trioxide
Cerubidine (Daunorubicin Hydrochloride)
Clafen (Cyclophosphamide)
Cyclophosphamide
Cytarabine
Cytosar-U (Cytarabine)
Cytoxan (Cyclophosphamide)
Daunorubicin Hydrochloride
Doxorubicin Hydrochloride
Neosar (Cyclophosphamide)
Rubidomycin (Daunorubicin Hydrochloride)
Tarabine PFS (Cytarabine)
Trisenox (Arsenic Trioxide)
Vincasar PFS (Vincristine Sulfate)
Vincristine Sulfate

Myeloid and Lymphoid Neoplasms with Esosinophilia and Abnormalities of PDGFRA, PDGFRB or FGFR1

Table B2: Myeloid and Lymphoid Neoplasms with Eosinophilia and Abnormalities of PDGFRA, PDGFRB or FGFR1

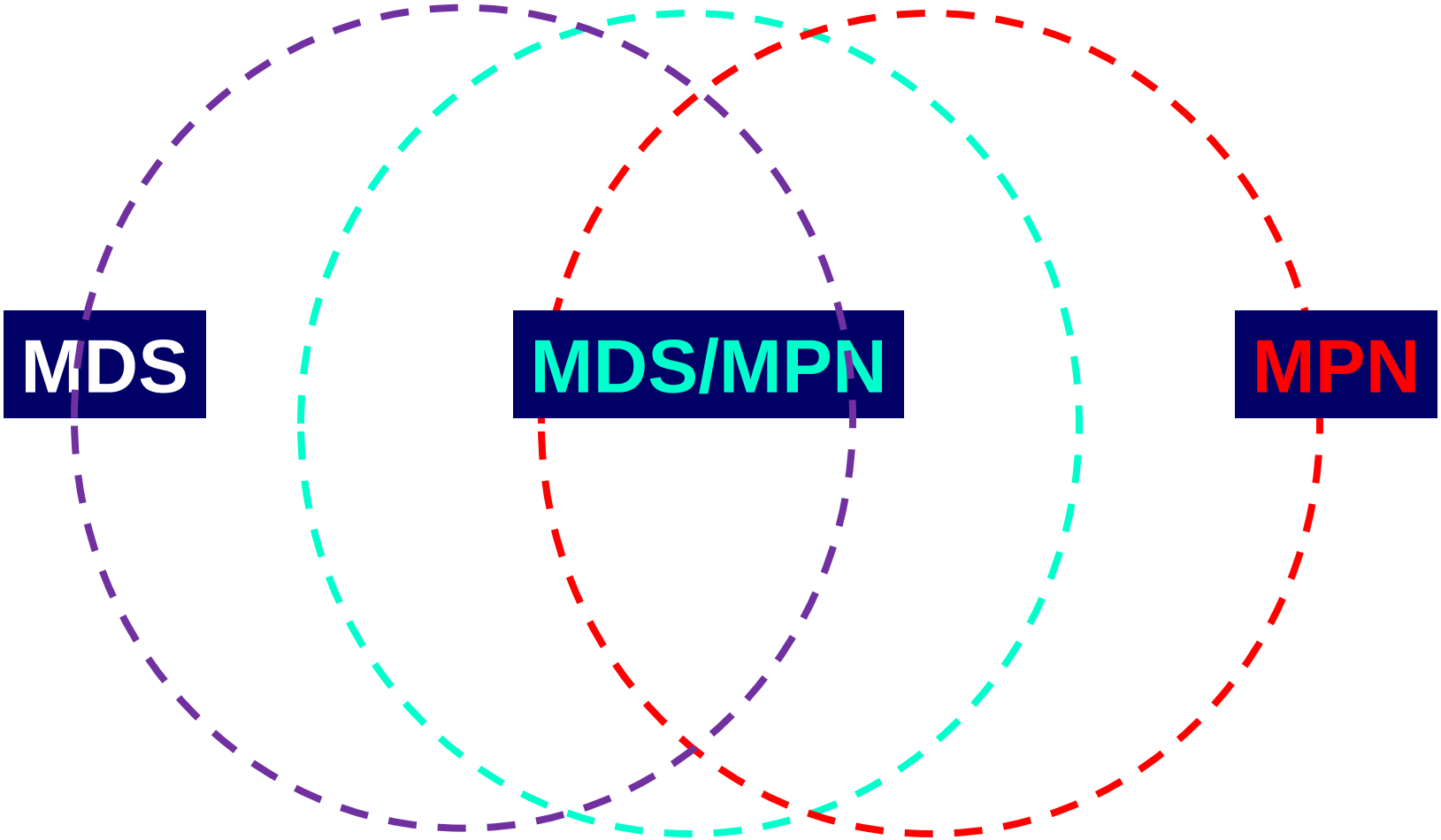
WHO Preferred Term	ICD-O-3
Myeloid and lymphoid neoplasm with **FGFR1** abnormalities	9967/3
Myeloid and lymphoid neoplasm with **PDGFRA** rearrangement	9965/3
Myeloid neoplasm with **PDGFRB** rearrangement	9966/3

Myelodysplastic /Myeloproliferative Neoplasm

Table B3: Myelodysplastic / Myeloproliferative Neoplasms

WHO Preferred Term	ICD-O-3
Atypical chronic myeloid leukemia, BCR-ABL1 negative	9876/3
Chronic myelomonocytic leukemia	9945/3
Juvenile myelomonocytic leukemia	9946/3
Myelodysplastic/myeloproliferative neoplasm, unclassifiable	9975/3
Refractory anemia with ring sideroblasts	9982/3

Chronic Myeloid Neoplasms



Myelodysplastic Syndromes

Table B4: Myelodysplastic Syndromes

WHO Preferred Term	ICD-O-3
Myelodysplastic syndrome associated with isolated de1(5q)	9986/3
Myelodysplastic syndrome, unclassifiable	9989/3
Refractory anemia	9980/3
Refractory anemia with excess blasts	9983/3
Refractory anemia with ring sideroblasts	9982/3
Refractory cytopenia of childhood	9985/3
Refractory neutropenia	9991/3
Refractory thrombocytopenia	9992/3

Myelodysplastic Syndromes Treatment (PDQ®)

Updated: 04/13/2011

Myelodysplastic Syndromes: Comparison of the FAB and WHO Classifications

FAB (1982)	WHO (1997)
Myelodysplastic Syndromes	
Refractory anemia.	Refractory anemia.
	Refractory cytopenia with multilineage dysplasia.
Refractory anemia with ringed sideroblasts.	Refractory anemia with ringed sideroblasts.
Refractory anemia with excess blasts.	Refractory anemia with excess blasts.
	Myelodysplastic syndrome, unclassifiable.
	Myelodysplastic syndrome associated with del(5q).
	Reclassified from MDS to:
Refractory anemia with excess blasts in transformation.	**Acute Myeloid Leukemia** identified as AML with multilineage dysplasia following a myelodysplastic syndrome.
Chronic myelomonocytic leukemia.	**Myelodysplastic and Myeloproliferative Diseases**

AML = Acute Myeloid Leukemia; FAB = French-American-British classification scheme; MDS = Myelodysplastic Syndromes; WHO = World Health Organization.

MDS – 2 Classification Systems

- **De novo myelodysplastic syndrome**
  - Most MDS cases occur de novo with no known cause.
- **Secondary myelodysplastic syndrome**
  - MDS may be increased by exposure to a variety of agents including
    - Tobacco smoke.
    - Ionizing radiation.
    - Organic chemicals (e.g., benzene, toluene, xylene, and chloramphenicol).
    - Heavy metals.
    - Herbicides.
    - Pesticides.
    - Fertilizers.
    - Stone and cereal dusts.
    - Exhaust gases.
    - Nitro-organic explosives.
    - Petroleum and diesel derivatives.
    - Alkylating agents.
    - Marrow-damaging agents used in cancer chemotherapy.
- Patients with documented exposure to such agents are referred to as having secondary MDS or treatment-related MDS and constitute as many as 30% of all patients with MDS. Secondary MDS typically has a poorer prognosis than does de novo MDS.

Myelodysplastic Syndrome Treatments

- De Novo and Secondary Myelodysplastic Syndromes
  - Supportive care with transfusion therapy
  - High-dose chemotherapy with stem cell transplant using stem cells from a donor.
  - Supportive care with growth factor therapy.
  - Chemotherapy with azacitidine, decitabine, or other anticancer drugs.
  - Supportive care with drug therapy.
  - A clinical trial of a new anticancer drug.
  - A clinical trial of low-dose chemotherapy with stem cell transplant using stem cells from a donor.
  - A clinical trial of a combination of treatments.
  - A clinical trial of growth factor therapy.

Myelodysplastic Syndrome Treatments

- Previously Treated Myelodysplastic Syndromes
  - High-dose chemotherapy with stem cell transplant using stem cells from a donor.
  - Chemotherapy with azacitidine or decitabine.
  - Supportive care with transfusion therapy, growth factor therapy, and/or drug therapy.
  - A clinical trial of low-dose chemotherapy with stem cell transplant using stem cells from a donor.
  - A clinical trial of new drug therapy.
  - A clinical trial of a combination of treatments.
  - A clinical trial of growth factor therapy.

FDA Approved – Myelodysplastic Anti-Neoplastic Agents

ADE
Adriamycin PFS (Doxorubicin Hydrochloride)
Adriamycin RDF (Doxorubicin Hydrochloride)
Arsenic Trioxide
Cerubidine (Daunorubicin Hydrochloride)
Clafen (Cyclophosphamide)
Cyclophosphamide
Cytarabine
Cytosar-U (Cytarabine)
Cytoxan (Cyclophosphamide)
Daunorubicin Hydrochloride
Doxorubicin Hydrochloride
Neosar (Cyclophosphamide)
Rubidomycin (Daunorubicin Hydrochloride)
Tarabine PFS (Cytarabine)
Trisenox (Arsenic Trioxide)
Vincasar PFS (Vincristine Sulfate)
Vincristine Sulfate

Acute Myeloid Leukemia (AML) and Related Precursor Neoplasms

Table B5: Acute Myeloid Leukemia (AML) and Related Precursor Neoplasms

WHO Preferred Term	ICD-O-3
Acute myeloid leukemias with recurrent genetic abnormalities	
Acute myeloid leukemia (megakaryoblastic) with t(1;22)(p13;q13); RBM15-MKL1	**9911/3**
Acute myeloid leukemia with inv(16)(p13.1q22) or t(16;16)(p13.1;q22); CBFB-MYH11	**9871/3**
Acute myeloid leukemia with inv(3)(q21;q26.2) or t(3;3)(q21;q26.2); RPN1-EVI1	**9869/3**
Acute myeloid leukemia with t(8;21)t(q22;q22); RUNX1-RUNX1T1	**9896/3**
Acute myeloid leukemia with t(9;11)(p22;q23); MLLT3-MLL	**9897/3**
Acute promyelocytic leukemia (AML with t(15;17)(q22;q12), PML/RARA	**9866/3**
Acute myeloid leukemia with myelodyspliasia-related changes	9895/3
Therapy-related myeloid neoplasm	**9920/3**

Table B5 continued

WHO Preferred Term	ICD-O-3
Acute myeloid leukemia, NOS	**9861/3**
Acute myeloid leukemia with minimal differentiation	9872/3
Acute myeloid leukemia without maturation	9873/3
Acute myeloid leukemia with maturation	9874/3
Acute myelomonocytic leukemia	9867/3
Acute erythroid leukemia	**9840/3**
Acute megakaryoblastic leukemia	9910/3
Acute basophilic leukemia	9870/3
Acute panmyelosis with myelofibrosis	9931/3
Myeloid sarcoma	**9930/3**
Myeloid proliferations related to Down syndrome	*No Code*
Transient abnormal myelopoiesis	**9898/1**
Myeloid leukemia associated with Down syndrome	**9898/3**
Blastic plasmacytoid dendritic cell neoplasm	9727/3

AML Treatment

- Successful treatment of acute myeloid leukemia (AML) requires the control of bone marrow and systemic disease.

- The cornerstone of this strategy includes systemically administered combination chemotherapy.

- Treatment is divided into two phases:
  - remission induction (to attain remission)
  - postremission (to maintain remission).

FDA Approved
AML Anti-Neoplastic Agents

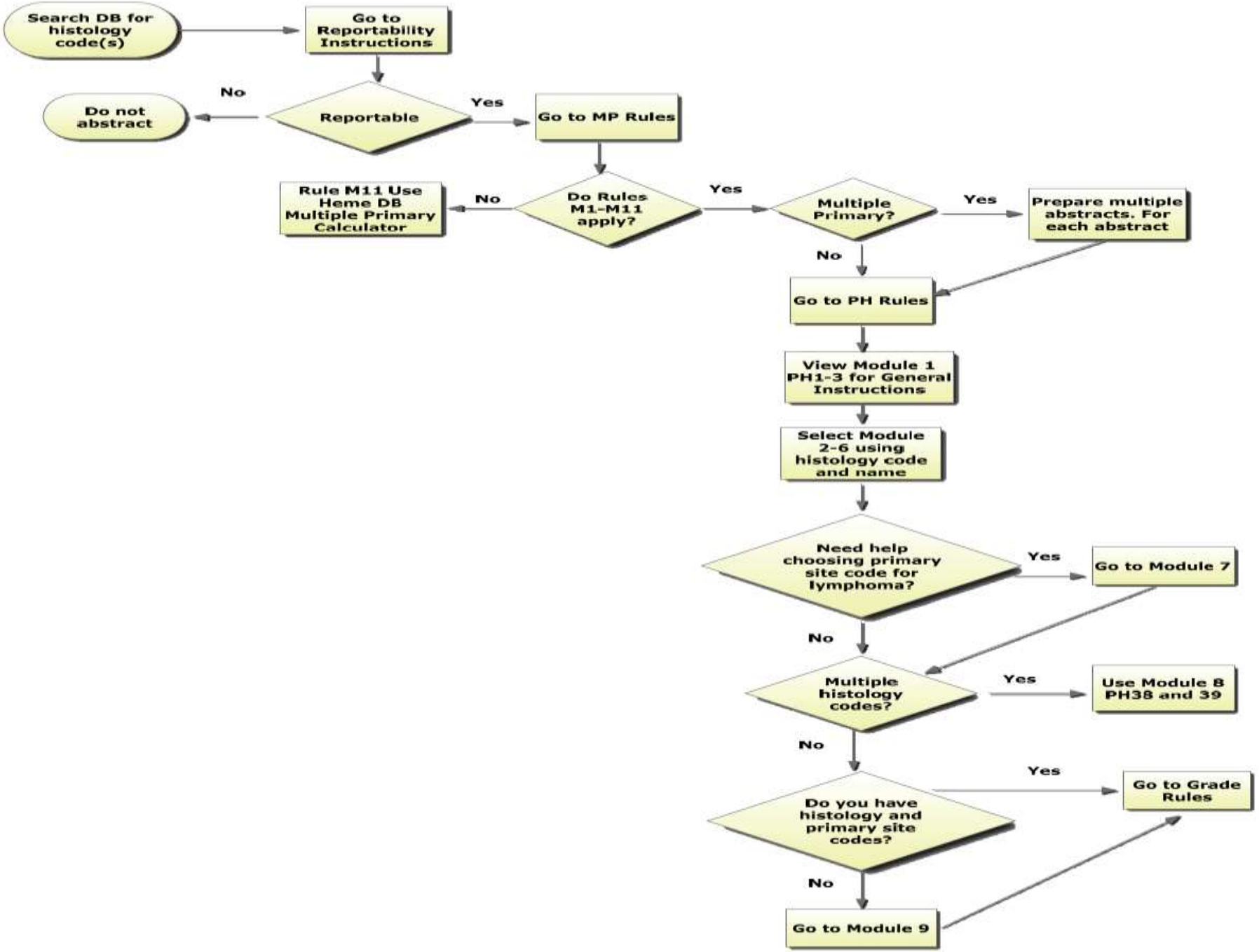
ADE	Cytoxan (Cyclophosphamide)
Adriamycin PFS (Doxorubicin Hydrochloride)	Daunorubicin Hydrochloride
Adriamycin RDF (Doxorubicin Hydrochloride)	Doxorubicin Hydrochloride
Arsenic Trioxide	Neosar (Cyclophosphamide)
Cerubidine (Daunorubicin Hydrochloride)	Rubidomycin (Daunorubicin Hydrochloride)
Clafen (Cyclophosphamide)	Tarabine PFS (Cytarabine)
Cyclophosphamide	Trisenox (Arsenic Trioxide)
Cytarabine	Vincasar PFS (Vincristine Sulfate)
Cytosar-U (Cytarabine)	Vincristine Sulfate

2010 Hematopoietic and Lymphoid Multiple Primary Rules and Histology Coding Rules

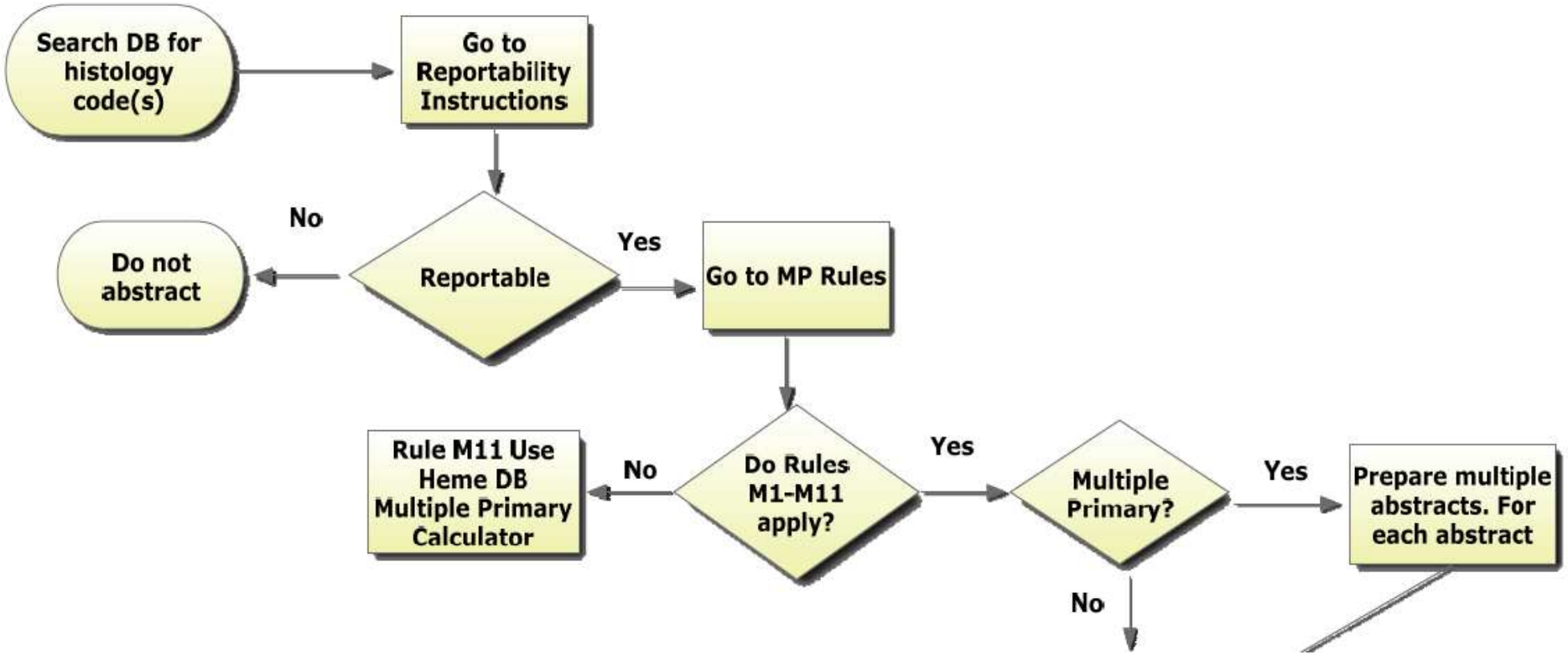
How to Use and Follow the Rules

Rule Basics

1. Is the condition reportable?
2. How many cases do I abstract?
3. How do I code the primary site?
4. How do I code the histology?
5. How do I code the grade?


Search DB for histology code(s)
Go to Reportability Instructions
Reportable
No
Do not abstract
Yes
Go to MP Rules
Do Rules M1-M11 apply?
No
Rule M11 Use Heme DB Multiple Primary Calculator
Yes
Multiple Primary?
Yes
Prepare multiple abstracts. For each abstract
No
Go to PH Rules
View Module 1 PH1-3 for General Instructions
Select Module 2-6 using histology code and name
Need help choosing primary site code for lymphoma?
Yes
Go to Module 7
No
Multiple histology codes?
Yes
Use Module 8 PH38 and 39
No
Do you have histology and primary site codes?
Yes
Go to Grade Rules
No
Go to Module 9

Case Reportability and MP Rules

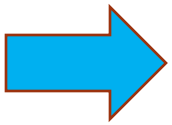


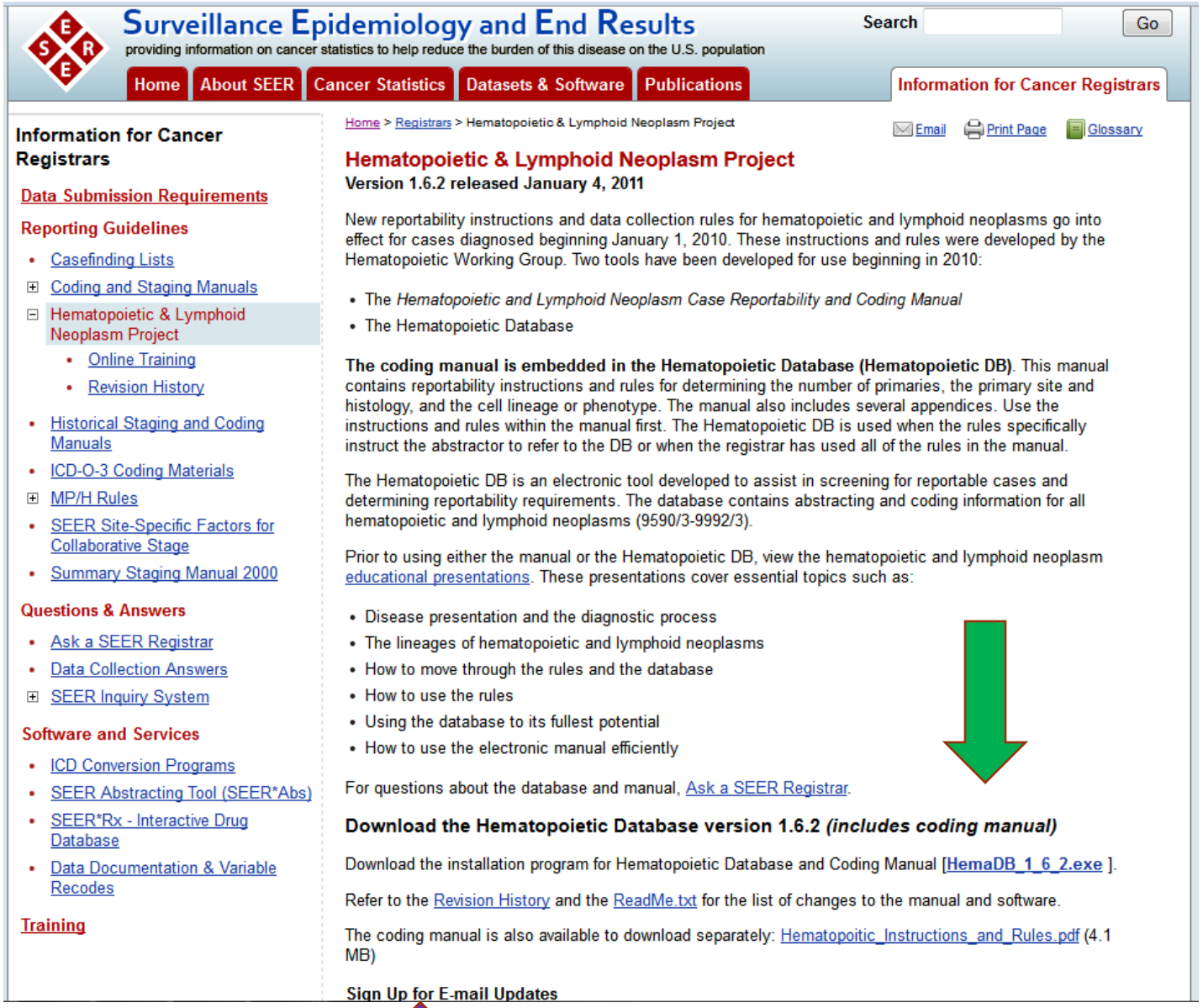
Case Reportability Instructions

- 10 Case Reportability Instructions
- Follow the instructions
- Not hierarchical
- Not “rules”
- Text

Multiple Primary – M Rules

- 3 formats
  - Text
  - Matrix
  - Flowchart
- Use Multiple Primary Rules and Database
  - First Apply the Rules
  - If necessary – Apply Multiple Primary Calculator
- DO NOT GO DIRECTLY to the Database




Surveillance Epidemiology and End Results
providing information on cancer statistics to help reduce the burden of this disease on the U.S. population
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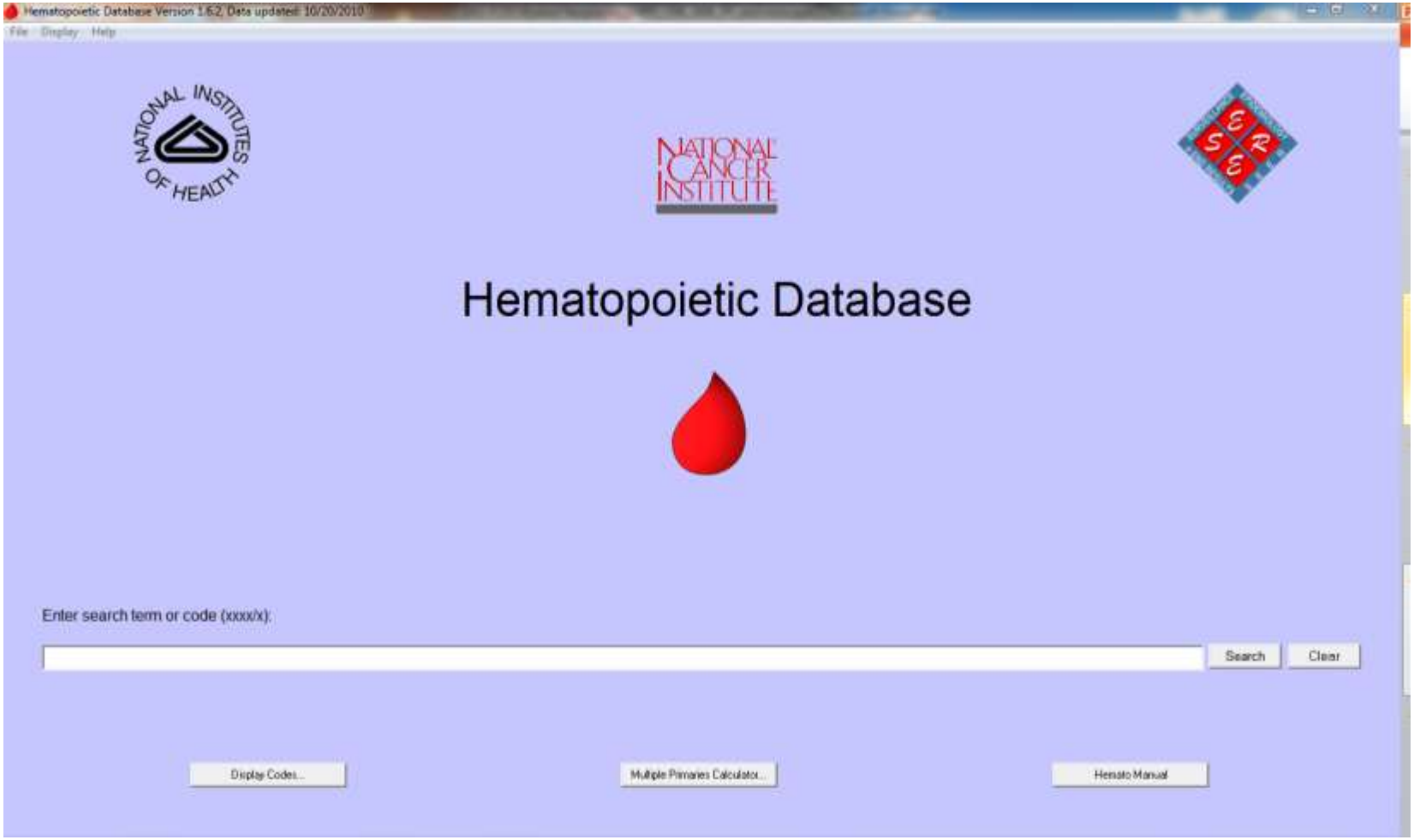
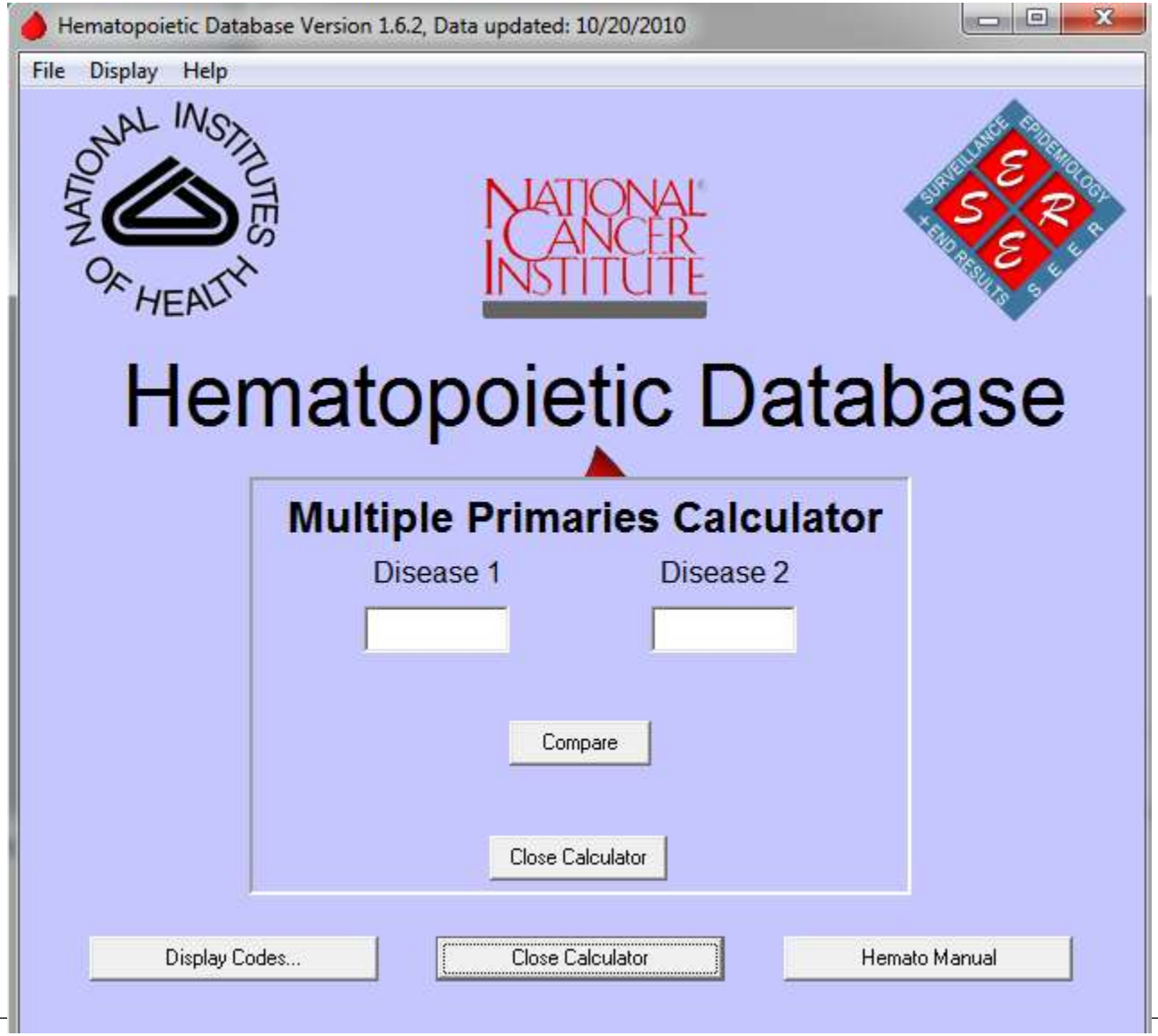
Data Submission Requirements
Reporting Guidelines
Casefinding Lists
Coding and Staging Manuals
Hematopoietic & Lymphoid Neoplasm Project
Online Training
Revision History
Historical Staging and Coding Manuals
ICD-O-3 Coding Materials
MP/H Rules
SEER Site-Specific Factors for Collaborative Stage
Summary Staging Manual 2000
Questions & Answers
Ask a SEER Registrar
Data Collection Answers
SEER Inquiry System
Software and Services
ICD Conversion Programs
SEER Abstracting Tool (SEER*Abs)
SEER*Rx - Interactive Drug Database
Data Documentation & Variable Recodes
Training
Home > Registrars > Hematopoietic & Lymphoid Neoplasm Project
Email
Print Page
Glossary
Hematopoietic & Lymphoid Neoplasm Project
Version 1.6.2 released January 4, 2011
New reportability instructions and data collection rules for hematopoietic and lymphoid neoplasms go into effect for cases diagnosed beginning January 1, 2010. These instructions and rules were developed by the Hematopoietic Working Group. Two tools have been developed for use beginning in 2010:
The Hematopoietic and Lymphoid Neoplasm Case Reportability and Coding Manual
The Hematopoietic Database
The coding manual is embedded in the Hematopoietic Database (Hematopoietic DB). This manual contains reportability instructions and rules for determining the number of primaries, the primary site and histology, and the cell lineage or phenotype. The manual also includes several appendices. Use the instructions and rules within the manual first. The Hematopoietic DB is used when the rules specifically instruct the abstractor to refer to the DB or when the registrar has used all of the rules in the manual.
The Hematopoietic DB is an electronic tool developed to assist in screening for reportable cases and determining reportability requirements. The database contains abstracting and coding information for all hematopoietic and lymphoid neoplasms (9590/3-9992/3).
Prior to using either the manual or the Hematopoietic DB, view the hematopoietic and lymphoid neoplasm educational presentations. These presentations cover essential topics such as:
Disease presentation and the diagnostic process
The lineages of hematopoietic and lymphoid neoplasms
How to move through the rules and the database
How to use the rules
Using the database to its fullest potential
How to use the electronic manual efficiently
For questions about the database and manual, Ask a SEER Registrar.
Download the Hematopoietic Database version 1.6.2 (includes coding manual)
Download the installation program for Hematopoietic Database and Coding Manual [HemaDB_1_6_2.exe].
Refer to the Revision History and the ReadMe.txt for the list of changes to the manual and software.
The coding manual is also available to download separately: Hematopoitic_Instructions_and_Rules.pdf (4.1 MB)
Sign Up for E-mail Updates

NCI SEER Hematopoietic Database



NCI SEER Hematopoietic Database



NCI SEER Hematopoietic Database

2010 Hematopoietic and Lymphoid Neoplasm
Case Reportability and Coding Manual
Effective with Cases Diagnosed 1/1/2010 and after

Editors: Carol Hahn Johnson, BS, CTR, NCI SEER
Margaret (Peggy) Adamo, AAS, RHIT, CTR, NCI SEER
Steven Peace, BS, CTR, Westat
Antoinette Percy-Laurry, MSPH

Suggested citation: Johnson CH, Adamo M, Peace S, Percy-Laurry A (eds.), 2010 Hematopoietic and Lymphoid Neoplasm Case Reportability and Coding Manual. National Cancer Institute, Bethesda, MD 20892-8316

Appendix F
Master Code Lists

Table F1: WHO/ICD-O-3 Master List of Histology Codes – Alphabetic List

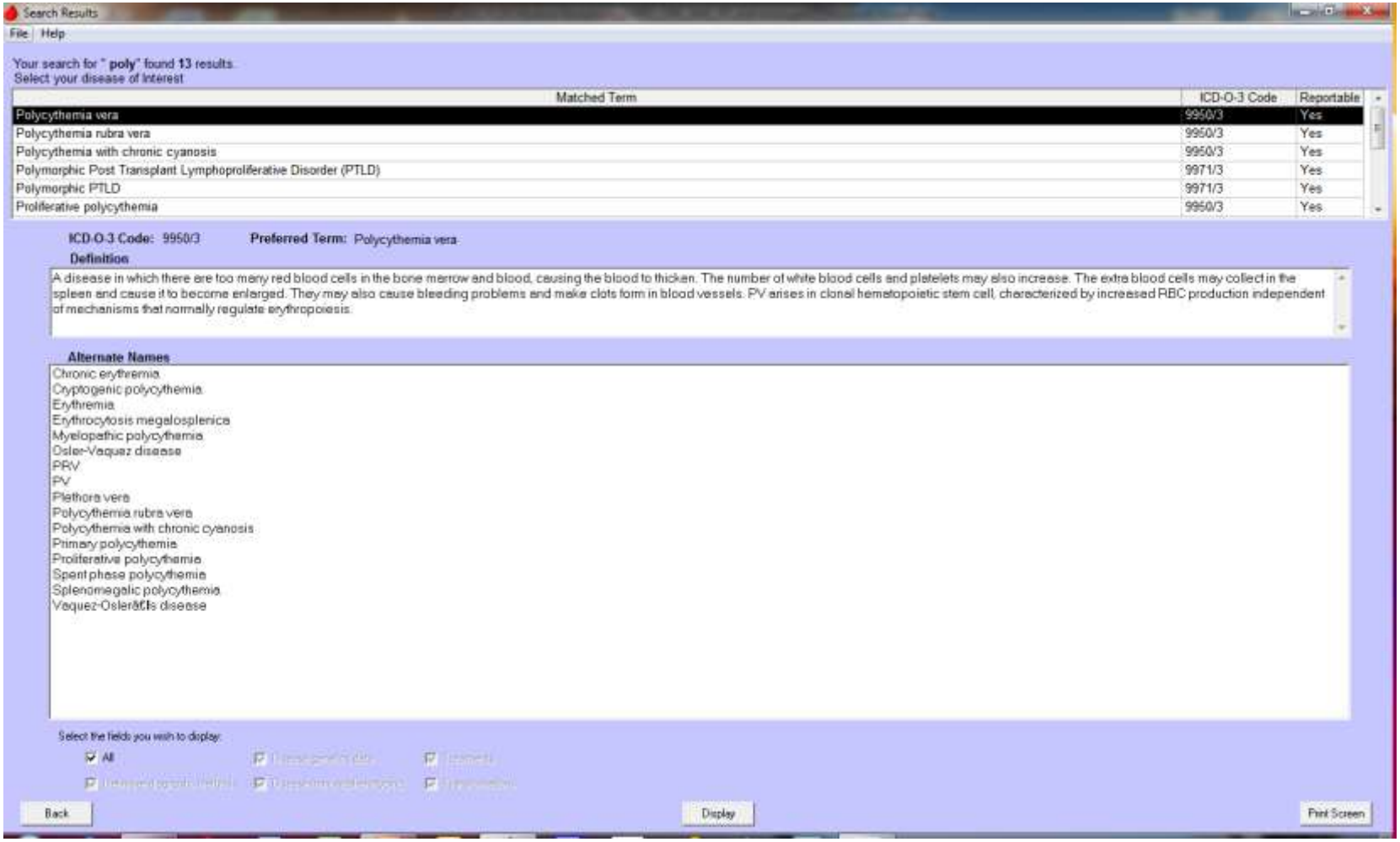
2010 WHO Only: New histology terms and codes published in the *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues*, 4th Edition. These codes are not in ICD-O-3 or the ICD-O-3 errata.

ICD-O-3 Only: The histology term and code are published only in ICD-O-3

WHO and ICD-O-3: The histology term is the WHO preferred term for that neoplasm; the WHO and ICD-O-3 preferred histology terms may not be the same, but the codes for this neoplasm are published in both WHO and in ICD-O-3.

Histologic Term	2010 WHO Only	ICD-O-3 Only	WHO and ICD-O-3
Acute basophilic leukemia			9870/3
Acute biphenotypic leukemia		9805/3	
Acute erythroid leukemia			9840/3
Acute megakaryoblastic leukemia			9910/3
Acute monoblastic and monocytic leukemia			9891/3
Acute myeloid leukemia (megakaryoblastic) with t(1;22)(p13;q13);RBM15-MKL1	9911/3		
Acute myeloid leukemia with inv(16)(p13.1q22) or t(16;16)(p13.1;q22), CBFB/MYH11			9871/3
Acute myeloid leukemia with inv(3)(q21;q26.2) or t(3;3)(q21;q26;2); RPN1-EVI1	9869/3		
Acute myeloid leukemia with maturation			9874/3
Acute myeloid leukemia with minimal differentiation			9872/3
Acute myeloid leukemia with mutated CEBPA			9861/3
Acute myeloid leukemia with mutated NPM1			9861/3
Acute myeloid leukemia with myelodysplasia-related changes			9895/3
Acute myeloid leukemia with t(6;9)(p23;q34); DEK-NUP214	9865/3		
Acute myeloid leukemia with t(8;21)(q22;q22); RUNX1-RUNX1T1			9896/3
Acute myeloid leukemia with t(9;11)(p22;q23); MLLT3-MLL			9897/3
Acute myeloid leukemia without maturation			9873/3
Acute myeloid leukemia, NOS			9861/3
Acute myelomonocytic leukemia			9867/3
Acute panmyelosis with myelofibrosis			9931/3
Acute promyelocytic leukemia (AML with t(15;17)(q22;q12), PML/RARA			9866/3
Acute undifferentiated leukemia			9801/3
Adult T-cell leukemia/lymphoma			9827/3
Aggressive NK-cell leukemia			9948/3
ALK positive large B-cell lymphoma	9737/3		
Alpha heavy chain disease			9762/3
Anaplastic large cell lymphoma, ALK negative			9702/3
Anaplastic large cell lymphoma, ALK positive			9714/3

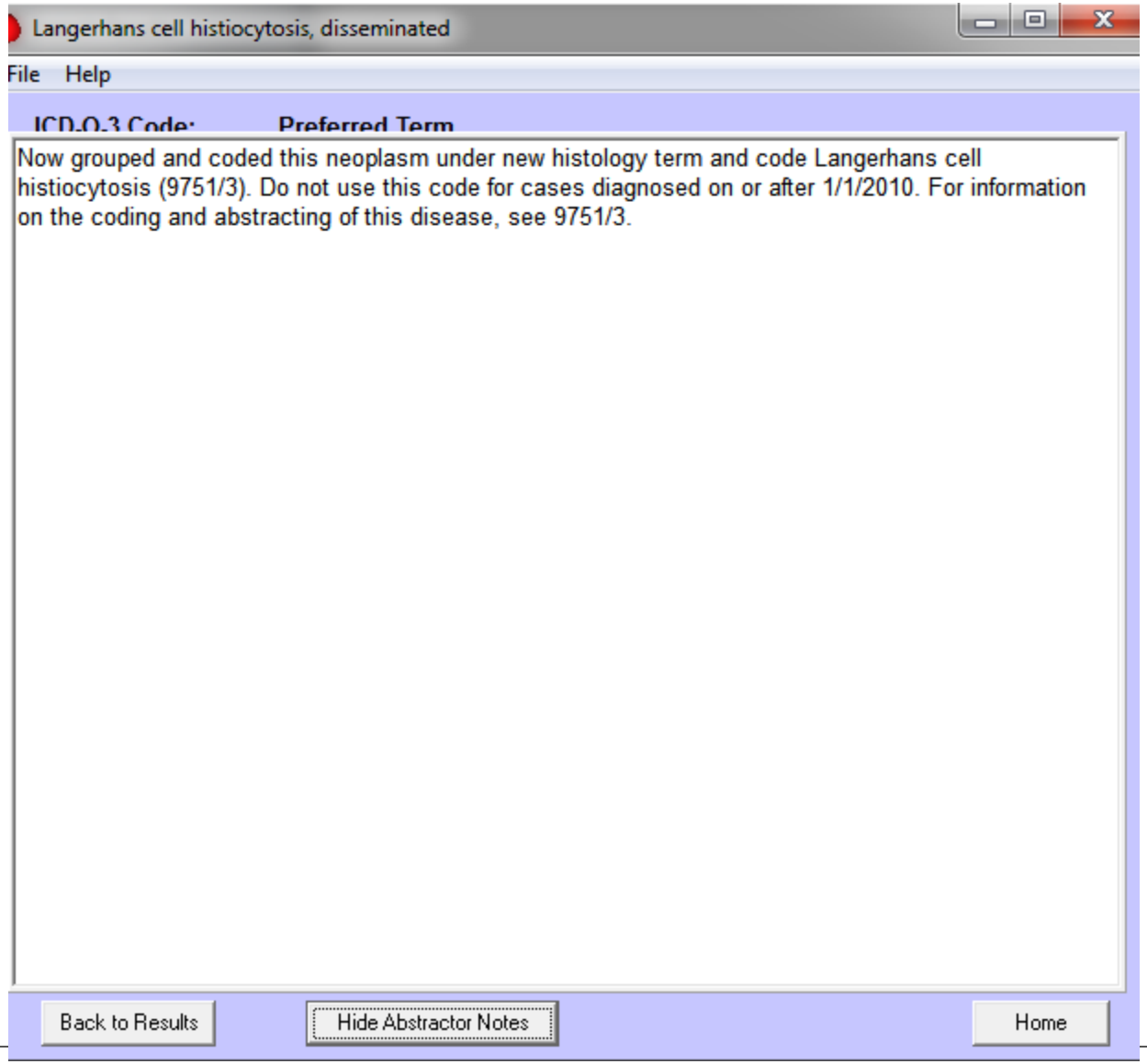
NCI SEER Hematopoietic Database



NCI SEER Hematopoietic Database

NCI SEER Hematopoietic Database

NCI SEER Hematopoietic Database



HemeRetic

HemeRetic

Hematopoietic, Reticuloendothelial, Immunoproliferative, and Myeloproliferative Neoplasms

- M-9733, 9740-9742, 9750-9758, 9760-9762, 9764-9769, 9800-9801, 9805-9809, 9811-9818, 9820, 9823 [C420, C421, or C424 ONLY], 9826, 9827 [C420, C421, or C424 ONLY], 9831-9837, 9840, 9860-9861, 9863, 9865-9867, 9869-9876, 9891, 9895-9898, 9910, 9920, 9930-9931, 9940, 9945-9946, 9948, 9950, 9960-9967, 9970, 9971, 9975, 9980, 9982-9987, 9989, 9991-9992. See site exceptions below.
- Schema includes only preferred terms from ICD-O-3.
- Plasmacytomas (9731 and 9734) and Multiple Myeloma (9732), except for cases with primary site C441, C690 and C695-C696, have been moved to the MyelomaPlasmaCellDisorder schema in V0203
-
- 9733 Plasma cell leukemia [except C441, C690, C695-C696]
-
- 9740 Mast cell sarcoma
- 9741 Malignant mastocytosis
- 9742 Mast cell leukemia
- 9750 Malignant histiocytosis
- 9752 Langerhans cell histiocytosis, unifocal* (see new reportable code 9751/3)
- 9753 Langerhans cell histiocytosis, multifocal* (see new reportable code 9751/3)
- 9754 Langerhans cell histiocytosis disseminated
- 9755 Histiocytic sarcoma
- 9756 Langerhans cell sarcoma
- 9757 Interdigitating dendritic cell sarcoma
- 9758 Follicular dendritic cell sarcoma
- 9760 Immunoproliferative disease, NOS
- 9761 Waldenstrom macroglobulinemia
- 9762 Heavy chain disease, NOS
- 9764 Immunoproliferative small intestinal disease
- 9765 Monoclonal gammopathy of undetermined significance*
- 9766 Angiocentric immunoproliferative lesion*
- 9767 Angioimmunoblastic lymphadenopathy*
- 9768 T-gamma lymphoproliferative disease*
- 9769 Immunoglobulin deposition disease*
- 9800 Leukemia, NOS
- 9801 Acute leukemia, NOS
- 9805 Acute biphenotypic leukemia
- 9820 Lymphoid leukemia, NOS [except C441, C690, C695-C696]
- 9823 B-cell chronic lymphocytic leukemia/small lymphocytic lymphoma [C420, C421, or C424 ONLY]
- 9826 Burkitt cell leukemia leukemia [except C441, C690, C695-C696]
- 9827 Adult T-cell leukemia/lymphoma (HTLV-1 positive)[C420, C421, or C424 ONLY]
- 9832 Prolymphocytic leukemia, NOS [except C441, C690, C695-C696]
- 9833 Prolymphocytic leukemia, B-cell type [except C441, C690, C695-C696]
- 9834 Prolymphocytic leukemia, T-cell type [except C441, C690, C695-C696]
- 9835 Precursor cell lymphoblastic leukemia, NOS [except C441, C690, C695-C696]
- 9836 Precursor B-cell lymphoblastic leukemia [except C441, C690, C695-C696]
- 9837 Precursor T-cell lymphoblastic leukemia [see 9837 below, new definition]
- 9840 Acute myeloid leukemia, M6 type
- 9860 Myeloid leukemia, NOS
- 9861 Acute myeloid leukemia, NOS
- 9863 Chronic myeloid leukemia
- 9866 Acute promyelocytic leukemia
- 9867 Acute myelomonocytic leukemia
- 9870 Acute basophilic leukemia
- 9871 Acute myeloid leukemia with abnormal marrow, eosinophils
- 9872 Acute myeloid leukemia, minimal differentiation
- 9873 Acute myeloid leukemia without maturation
- 9874 Acute myeloid leukemia with maturation
- 9875 Chronic myelogenous leukemia, BCR/ABL positive
- 9876 Atypical chronic myeloid leukemia BCR/ABL negative
- 9891 Acute monocytic leukemia
- 9895 Acute myeloid leukemia with multilineage dysplasia
- 9896 Acute myeloid leukemia, t(8;21)(q22;q22)
- 9897 Acute myeloid leukemia, 11q23 abnormalities
- 9910 Acute megakaryoblastic leukemia
- 9920 Therapy-related acute myeloid leukemia, NOS
- 9930 Myeloid sarcoma
- 9931 Acute panmyelosis with myelofibrosis
- 9940 Hairy cell leukemia
- 9945 Chronic myelomonocytic leukemia, NOS
- 9946 Juvenile myelomonocytic leukemia
- 9948 Aggressive NK-cell leukemia

- 9982 Refractory anemia with sideroblasts
- 9983 Refractory anemia with excess blasts
- 9984 Refractory anemia with excess blasts in transformation
- 9985 Refractory cytopenia with multilineage dysplasia
- 9986 Myelodysplastic syndrome with 5q deletion (5q-) syndrome
- 9987 Therapy-related myelodysplastic syndrome, NOS
- 9989 Myelodysplastic syndrome, NOS
- The following ICD-O codes were added to the reportable list for Hematopoietic diseases. These are from the "WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues, 3rd edition" publication, which was released in 2008. These new codes have been incorporated into the new Hematopoietic and Lymphoid Neoplasm MP/H rules. Use these only for cases diagnosed on January 1, 2010 and forward.
- 9751 Langerhans cell histiocytosis, NOS
- 9806 Mixed phenotype acute leukemia with t(9;22(q34;q11.2); BCR-ABL1
- 9807 Mixed phenotype acute leukemia with t(v;11q23); MLL, rearranged
- 9808 Mixed phenotype acute leukemia, B/myeloid, NOS
- 9809 Mixed phenotype acute leukemia, T/myeloid, NOS
- 9811 B lymphoblastic leukemia/lymphoma, NOS [C420, C421, or C424 ONLY]
- 9812 B lymphoblastic leukemia/lymphoma with t(9;22))q34;q11.2); BCR-ABL1 [C420, C421, or C424 ONLY]
- 9813 B lymphoblastic leukemia/lymphoma with t(v;11q23); MLL rearranged [C420, C421, or C424 ONLY]
- 9814 B lymphoblastic leukemia/lymphoma with t(12;21)(p13;q22); TEL-AML1 (ETV6-RUNX1) [C420, C421, or C424 ONLY]
- 9815 B lymphoblastic/lymphoma with hyperdiploidy[C420, C421, or C424 ONLY]
- 9816 B lymphoblastic/lymphoma with hypodiploidy (hypodiploid ALL) [C420, C421, or C424 ONLY]
- 9817 B lymphoblastic/lymphoma with t(5;14)(q31;q32); IL3-IGH [C420, C421, or C424 ONLY]
- 9818 B lymphoblastic/lymphoma with t(1;19)(q23;p13.3); E2A PBX1 (TCF3 PBX1) [C420, C421, or C424 ONLY]
- 9831 T-cell large granular lymphocytic leukemia [except C441, C690, C695-C696]
- 9837 T lymphoblastic leukemia/lymphoma [C420, C421, or C424 ONLY]
- 9865 Acute myeloid leukemia with t(6;9)([23;q34) DEK-NUP214
- 9869 Acute myeloid leukemia with inv(3)(q21q26.2) or t(3;3)(q21;q26.2); RPN1EVI1
- 9898 Myeloid leukemia associated with Down Syndrome
- 9911 Acute myeloid leukemia (megakaryoblastic) with t(1;22)(p13;q13); RBM15-MKL1
- 9965 Myeloid and lymphoid neoplasms with PDGFRB rearrangement
- 9966 Myeloid neoplasm with PDGFRB arrangement
- 9967 Myeloid and lymphoid neoplasm with FGFR1 abnormalities
- 9971 Polymorphic PTLD
- 9975 Myeloproliferative neoplasm, unclassifiable
- 9991 Refractory neutropenia
- 9992 Refractory thrombocytopenia
- *Usually considered of uncertain/borderline behavior
- Note: AJCC does not define TNM staging for this site.

CS Tumor Size = **988**
CS Extension
CS Tumor Size/Ext Eval = **9**
CS Lymph Nodes
CS Lymph Nodes Eval = **9**
Regional Nodes Positive = **99**
Regional Nodes Examined = **99**
CS Mets at DX
CS Mets Eval = **9**
CS Site-Specific Factor 1
JAK2 (also known as Janus Kinase 2 and JAK2 Exon 12)
CS Site-Specific Factor 2 = **988**
CS Site-Specific Factor 3 = **988**
CS Site-Specific Factor 4 = **988**
CS Site-Specific Factor 5 = **988**
CS Site-Specific Factor 6 = **988**

CS Site-Specific Factor 7 = **988**
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CS Site-Specific Factor 14 = **988**
CS Site-Specific Factor 15 = **988**
CS Site-Specific Factor 16 = **988**
CS Site-Specific Factor 17 = **988**
CS Site-Specific Factor 18 = **988**
CS Site-Specific Factor 19 = **988**
CS Site-Specific Factor 20 = **988**
CS Site-Specific Factor 21 = **988**
CS Site-Specific Factor 22 = **988**
CS Site-Specific Factor 23 = **988**
CS Site-Specific Factor 24 = **988**
CS Site-Specific Factor 25 = **988**
Histology Inclusion Table AJCC 7th ed. = **NA**
Histology Exclusion Table AJCC 6th ed. = **NA**
AJCC TNM 7 Stage = **NA**
AJCC TNM 6 Stage = **NA**
Summary Stage

Revision Info List of Schemas

HemeRetic

CS Extension

- Note: Plasmacytomas (9731 and 9734) and Multiple Myeloma (9732) have been moved to the MyelomaPlasmaCellDisorder schema effective with CS version 2: 0203

Code	Description	TNM 7 Map	TNM 6 Map	SS77 Map	SS2000 Map
100	Localized disease: (Single/solitary/unifocal/isolated): May be coded for: Mast cell sarcoma (9740) Malignant histiocytosis (9750) Langerhans cell histiocytosis (9751) Histiocytic sarcoma (9755) Langerhans cell sarcoma (9756) Dendritic cell sarcoma (9757, 9758) Myeloid sarcoma (9930)	NA	NA	L	L
800	Systemic disease (All histologies including those in 100)	NA	NA	D	D
999	Unknown; extension not stated Primary tumor cannot be assessed Not documented in patient record	NA	NA	D	D

FCDS Required
Site-Specific Factors

FCDS-Required ONLY SSFs for FCDS and CER
FCDS Staff will Collect the CER Items

Schema Name	FCDS Required	CER Required	CoC Additional Required
HemeRetic	SSF1	Non-Standard	SSF1
CML	Non-Standard	BCR-ABL	no

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CS Site-Specific Factor 1
JAK2 (also known as Janus Kinase 2 and JAK2 Exon 12)

- Note 1: Janus Kinase 2 (JAK2, JAK 2)is a gene mutation that increases susceptibility to several myeloproliferative neoplasms (MPNs). Testing for the JAK2 mutation is done on whole blood. Nearly all people with polycythemia vera and about half of those with essential thrombocythemia and primary myelofibrosis have the mutation.
- Note 2: JAK2 is used primarily for the following histologies: Polycythemia Vera, Essential Thrombocytopenia, and Primary Myelofibrosis. Its usage continues to increase and may be used for other histologies in the future. Record JAK2 for any hematopoietic/reticuloendothelial disease even if it is not one of these three specific histologies.
- Note 3: If JAK2 test result is positive, NOS, use code 850.

Code	Description
000	JAK-2 result stated as negative
010	JAK2 positive for mutation V617F in exon 14
020	JAK2 positive for mutation of exon 12
800	JAK2 positive for other specified mutation
810	JAK2 positive for more than one mutation
850	JAK2 positive NOS; specific mutation(s) not stated
888	OBSOLETE DATA CONVERTED V0200 See code 988 Not applicable for this site
988	Not applicable: Information not collected for this case (May include cases converted from code 888 used in CSv1 for "Not applicable" or when the item was not collected. If this item is required to derive T, N, M, or any stage, use of code 988 may result in an error.)
997	Test ordered, results not in chart
998	Test not done (test not ordered and not performed)
999	Unknown or no information Not documented in patient record

REMINDER

2010 Text Documentation Requirements
2011 FCDS DAM / Appendix K, Oct 2011

Text documentation should always include the following components:

- ✓ Date(s) – include date(s) references – so the reviewer can determine event chronology
- ✓ Location – include facility/physician/other location where the event occurred (test/study/treatment/other)
- ✓ Description – include description of the event (test/study/treatment/other) – include positive/negative results
- ✓ Details – include as much detail as possible – document treatment plan even if treatment is not given as planned

References & More Information

- **WHO Classification of Tumors of Hematopoietic and Lymphoid Tissues , 4th edition**, S. Swerdlow, E. Campo, N. Lee Harris, E. Jaffe, S. Pileri, H. Stein, J. Thiele, J. Vardiman, IAR C, Lyon, France, 2008
- **2010 Hematopoietic and Lymphoid Neoplasm Case Reportability and Coding Manual**, C. Hahn Johnson, M. Adamo, S. Peace, NCI SEER, 2009
- **Classificaiton, Characteristics, and Behavior of Myeloid Neoplasms,** G.M. Dores, NCI, 2010
- **North Carolina Central Cancer Registry CER Mini-Guidebook, 2011**
- **Louisiana Tumor Registry Presentation (CML Treatment Guidelines), 2011;** Colleen Lemoine, APRN, MN, AOCN, RN-BC
- **Advances in Understanding and Management of Myeloproliferative Neoplasms,** Alessandro M. Vannucchi, Paola Guglielmelli and Ayalew Tefferi**,** *CA Cancer J Clin 2009;59;171-191; Apr 15, 2009*
- **NCCN Treatment Guidelines for CML, 2011**
- **The Chronic Myeloproliferative Disorders and the Myelodysplastic/ Myeloproliferative Disorders, Chapter 14**
- **The Myelodysplastic Syndromes, Chapter 15**