

Incorporating Anemia Submodule into Various Synthea Disease Module

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Anemia Prevalence for Disease Models in Synthea

Model	Anemia Prevalence for the Submodule (%)	Anemia Prevalence from Study (%)	Reference url	Comments
CHF	20	20-33	https://www.ncbi.nlm.nih.gov/pubmed/20630401	Generalized approximation
		15	https://www.ncbi.nlm.nih.gov/pubmed/12400591	193 patients (average age 54). 28 of 193 (15%patients with Anemia (hemoglobin<120 g/l)
		40.97	http://www.onlineijcs.com/detalhes/480/prevalence-of-anemia-in-patients-with-heart-failure	144 patients (mean age 67.8+-13.8)
Colorectal cancer	40 (Stage 1) 53 (stage 2) 66 (stage 3) 80 (stage 4)	40 to 80	https://www.sciencedirect.com/science/article/pii/S0002934303007708	"40% of patients with early-stage colon tumors and nearly 80% of patients with advanced disease had anemia"
		30.5 to 74.7	https://www.ncbi.nlm.nih.gov/pubmed/22469713	1189 patient. "The prevalence of anaemia diminished gradually and linearly as the location of the tumours was more distal towards the rectum. Anaemia was found in 74.7% (215/288) of the patients with cancer in the coecum or ascending colon, 57.1% (48/84) in the transverse colon, 40.0% (180/300) in the sigmoid and 30.5% (114/374) in the rectum" - Study came from a Norwegian Cancer Registry
Cystic Fibrosis	18.5 (< 11yrs) 4 (>= 11yrs && <=18yrs) 43 (> 18yrs)	18.5 (< 11yrs) 4 (>= 11yrs && <=18yrs) 43 (> 18yrs)	http://www.bloodjournal.org/content/108/11/1286?sso-checked=true	61 of 218 patients (ages 1m to 61). Prevalence varies significant depending on age.
COPD	21	7.5 to 33	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372868/	"The prevalence of anemia in patients with COPD varies from 7.5% to 33%"
Dialysis	53.4	53.4	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3879360/	"The prevalence of anemia increased with stage of CKD, from 8.4% at stage 1 to 53.4% at stage 5". Dialysis is needed at stage 5.
Female Reproduction		Data Unavailable		
Hypertension		Data Unavailable		
Injuries (some)		Data Unavailable		

Anemia Prevalence for Disease Models in Synthea – Cont'd

Model	Anemia Prevalence for the Submodule (%)	Anemia Prevalence from Study (%)	Reference url	Comments
Lung cancer	77	77	https://www.jto.org/article/S1556-0864(15)30388-9/fulltext	1462 of 1900 patients developed anemia at some point during the survey.
Lupus	50	50	https://www.lupus.org/resources/what-you-need-to-know-about-anemia https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1798007/	"The most common blood disorder is anemia, affecting about half of all people with active lupus." "Haematological abnormalities are common in systemic lupus erythematosus. Anaemia is found in about 50% of patients, with anaemia of chronic disease being the most common form. " - General statement from Greek authors. The prevalence number is not derived from study of Greek patient.
Metabolic Syndrome Disease Progression	8.4 (stage 1);12.1 (stage 2); 17.4 (stage 3);50.3 (stage 4); 53.4 (stage 5)	8.4% at stage 1 to 53.4% at stage 5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3879360/	The prevalence of anemia increased with stage of CKD, from 8.4% at stage 1 to 53.4% at stage 5.
Pregnancy	12.3	8.8 for general and 3.5 for severe	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0166635	Anemia across the board was 8.8% (general) and 3.5% for severe.
Primary Hypothyroidism (the more general case, not the specific Atropic). Waiting on permission to rename this model.	43	39 to 43	https://www.endocrine-abstracts.org/ea/0020/ea0020p140	"Anemia prevalence was 43% in the hypothyroid group, 39% in the subclinical hypothyroid group and 26% in the control group which was statistically significant (P=0.003 and P=0.021 respectively related to controls)."

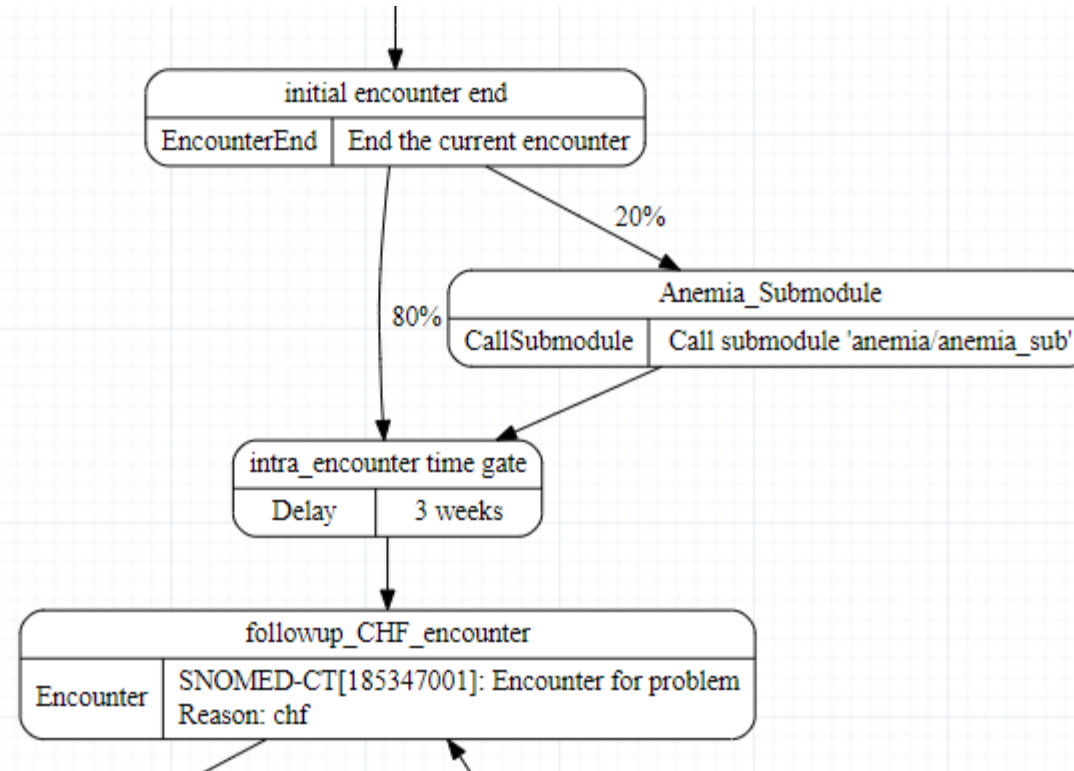
Changes to Anemia Submodule

- Moved Anemia Encounter to inside of the submodule. This prevents conflicts with encounters from within the calling module.
- Added attribute:pregnant since the probability distribution for “general” vs. “severe” anemia differs from a general anemia patient
- Created a clear separation between the initial anemia encounter and the transfusion encounter for patient with severe anemia.

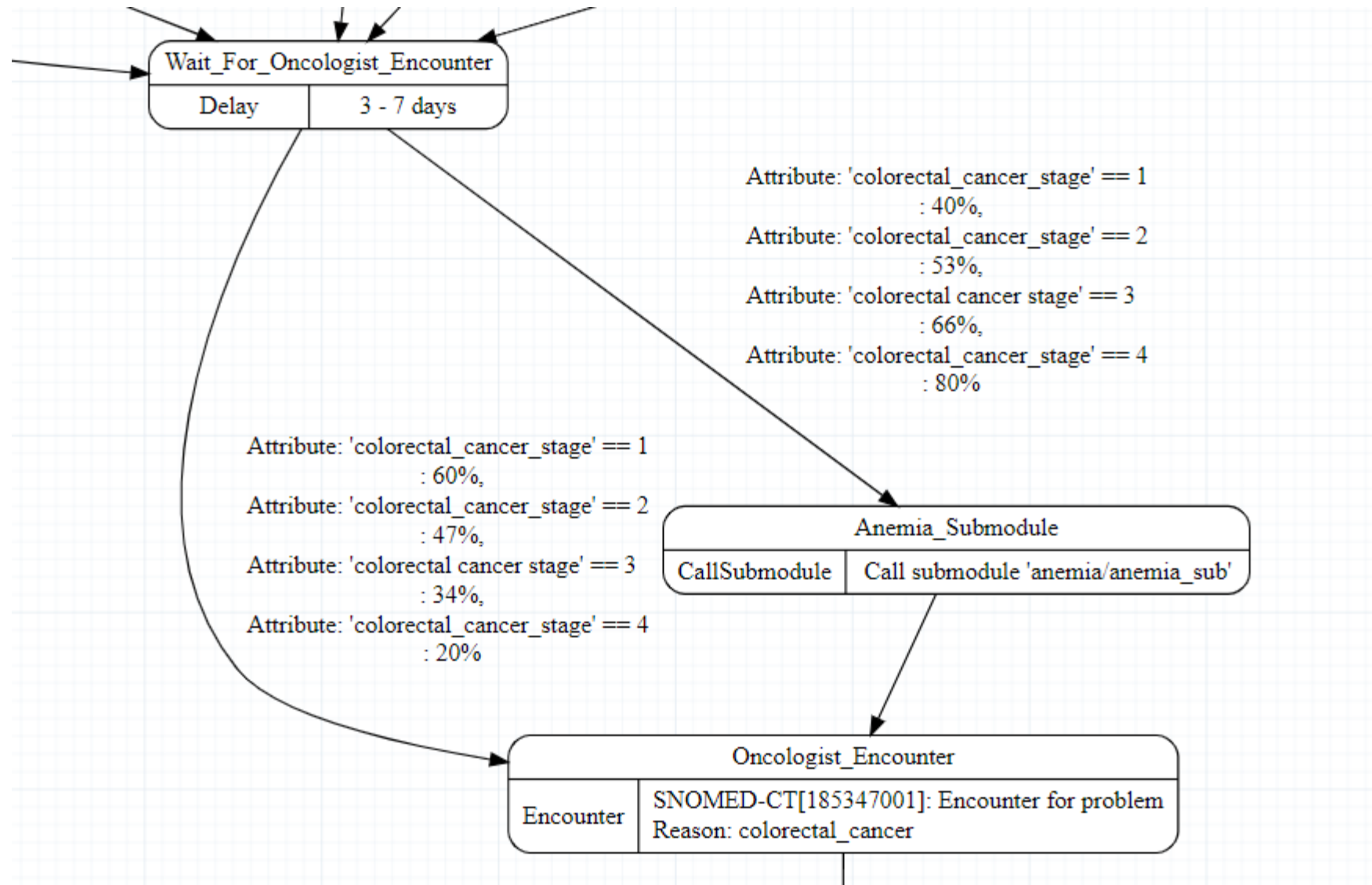
Method for Inserting Anemia Submodule

- Locate the end diagnosis encounter state and select the end encounter state (or use the state prior to the diagnosis encounter - see colorectal cancer).
- Add a new state. Name the new state as “Anemia_submodule”. Set the state type to “CallSubmodule” and Submodule parameter to “*anemia/anemia sub*”.
- Select the end encounter state and set the Transition Type to “Distributed” or “Complex” depending on whether the statistics has other dependencies, i.e., stage of the disease. Set the “Weight” attribute in accordance with the prevalence statistics.

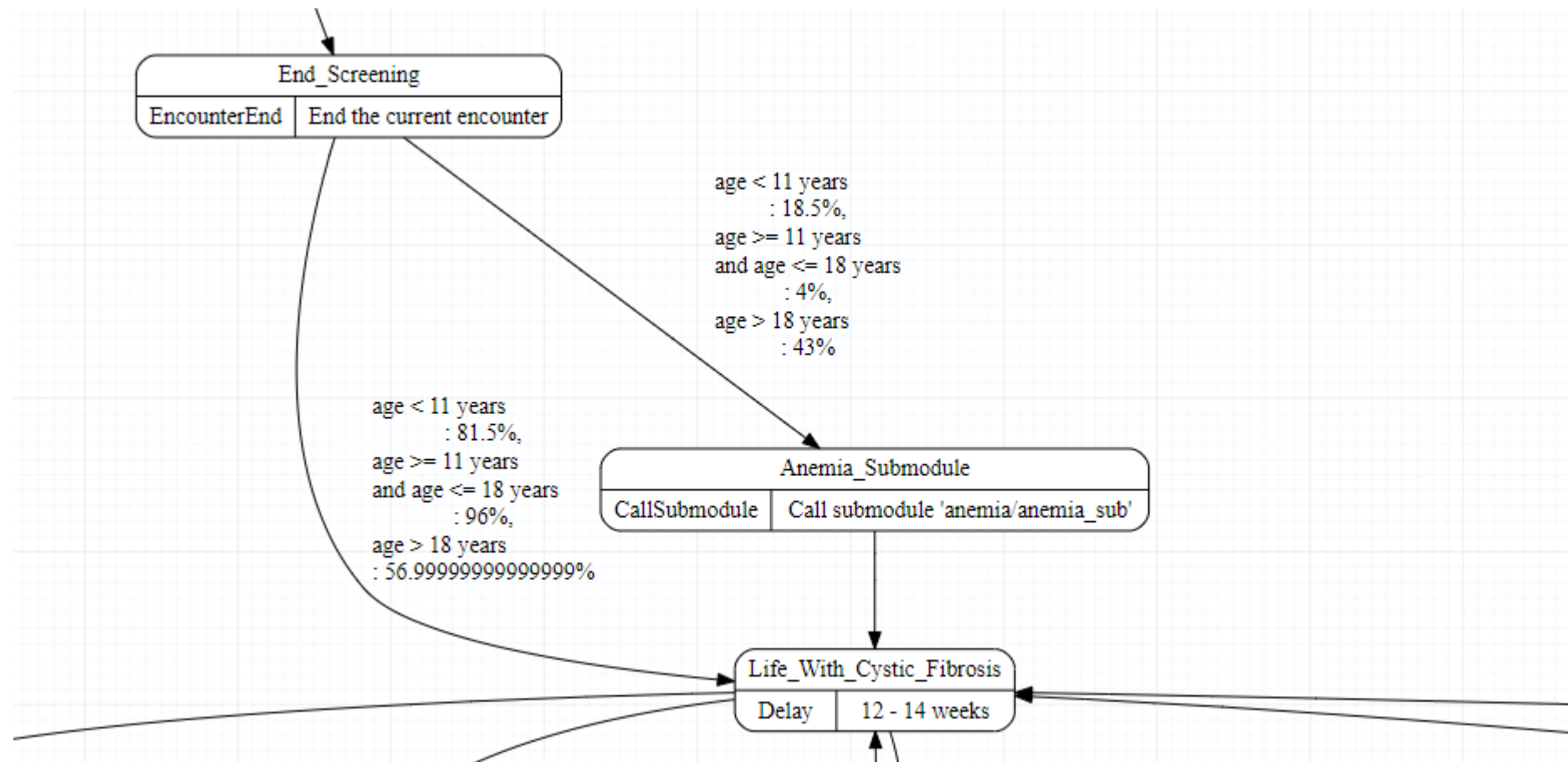
Congestive Heart Failure (CHF)



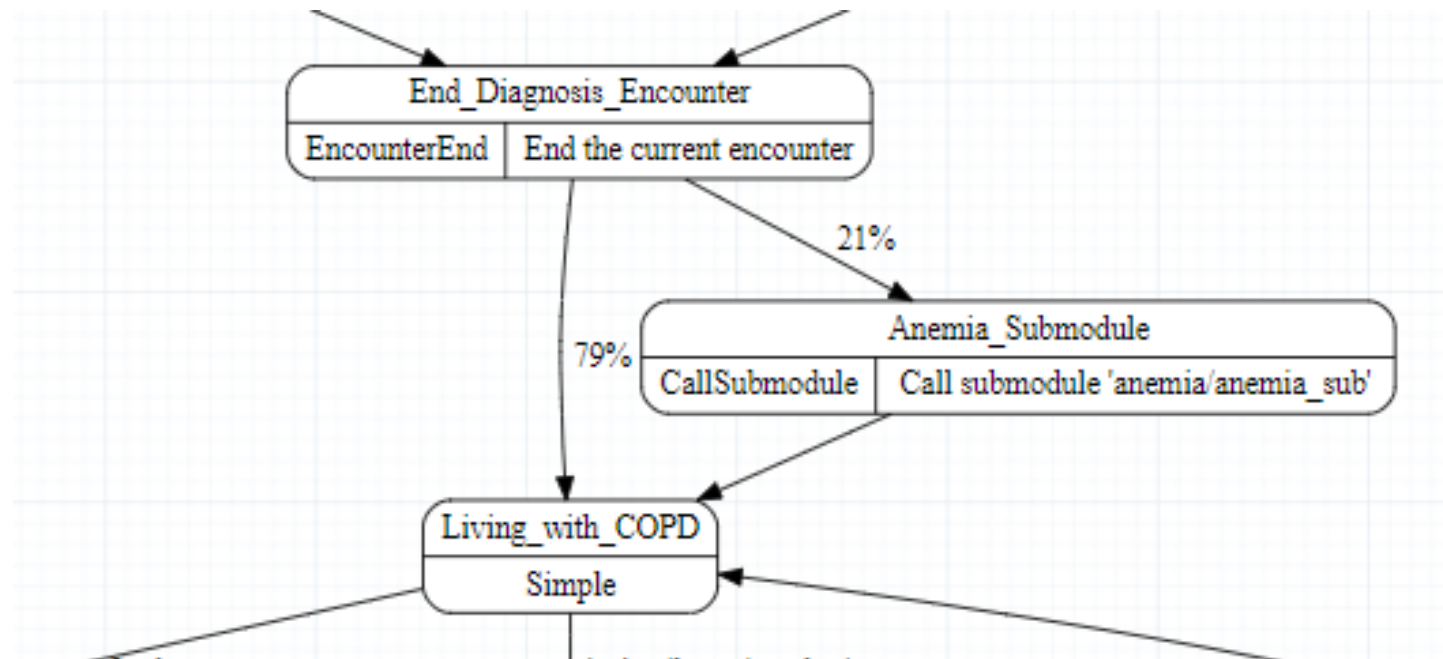
Colorectal Cancer



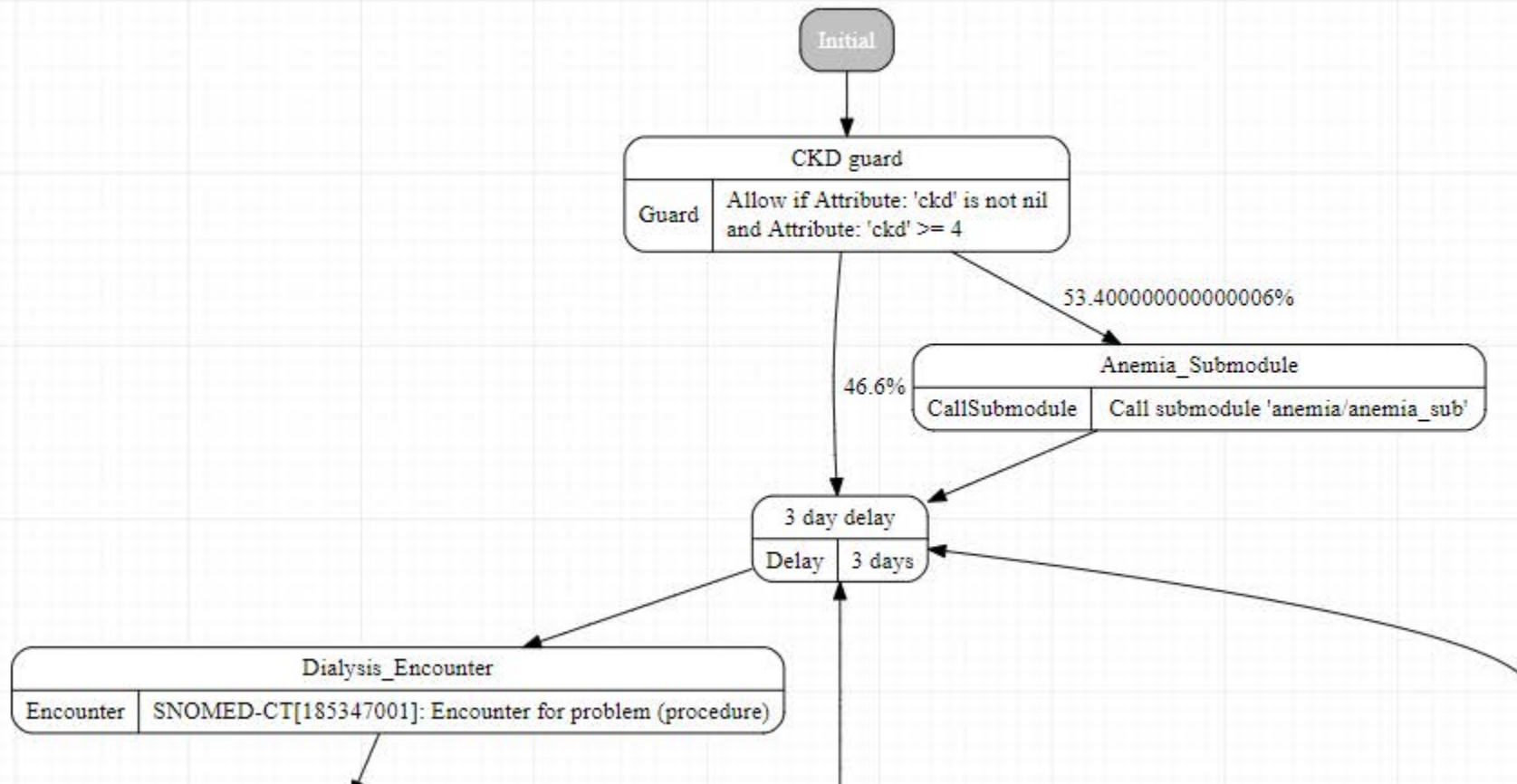
Cystic Fibrosis



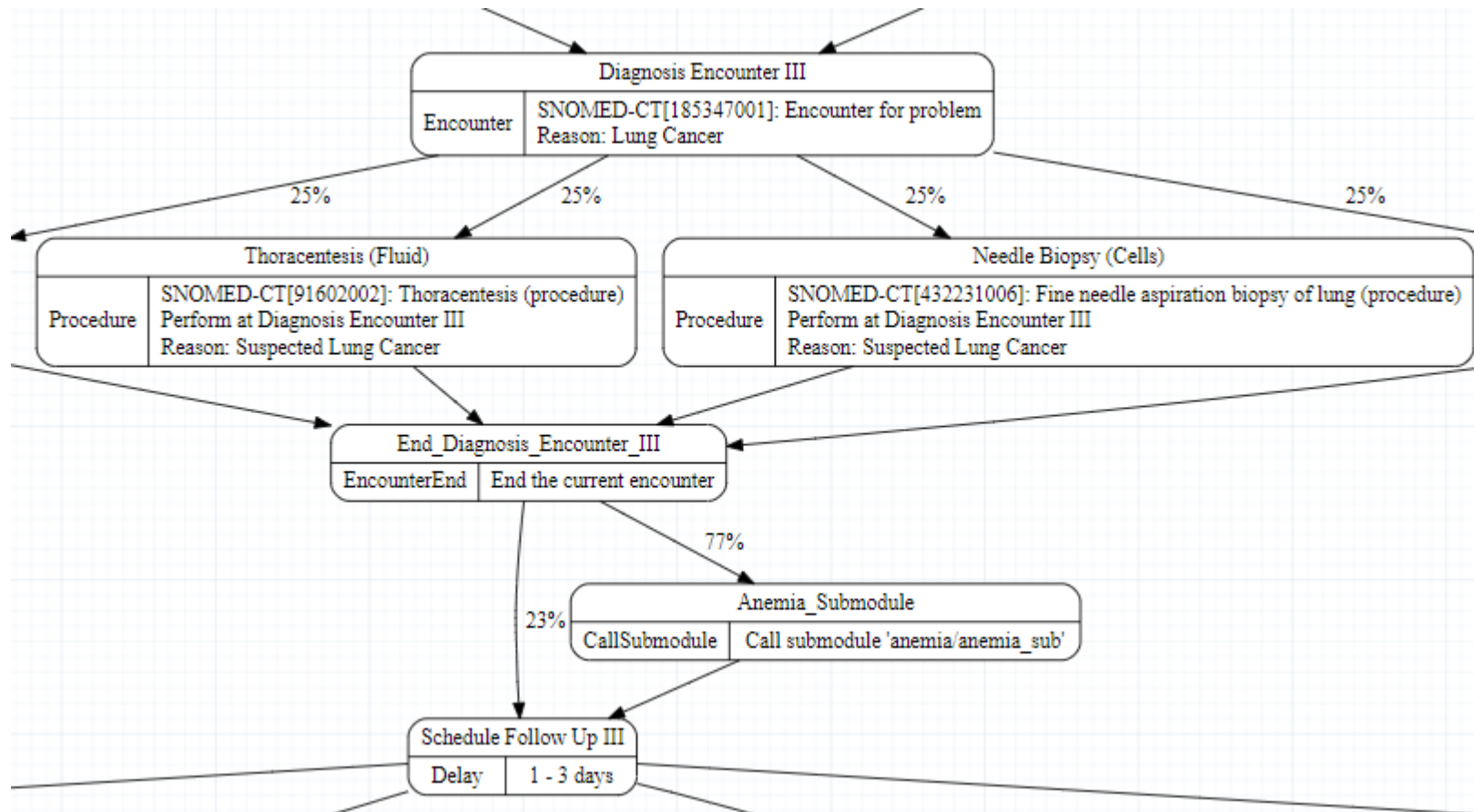
COPD



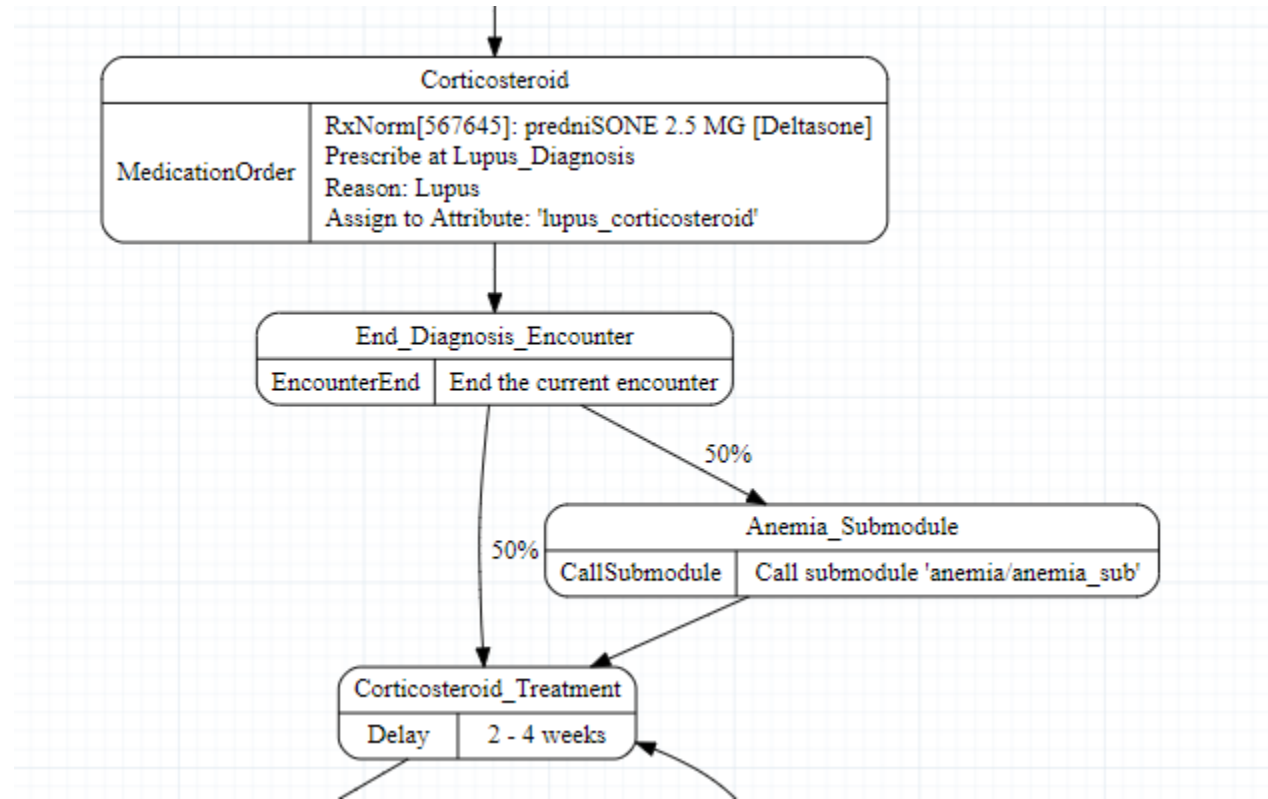
Dialysis



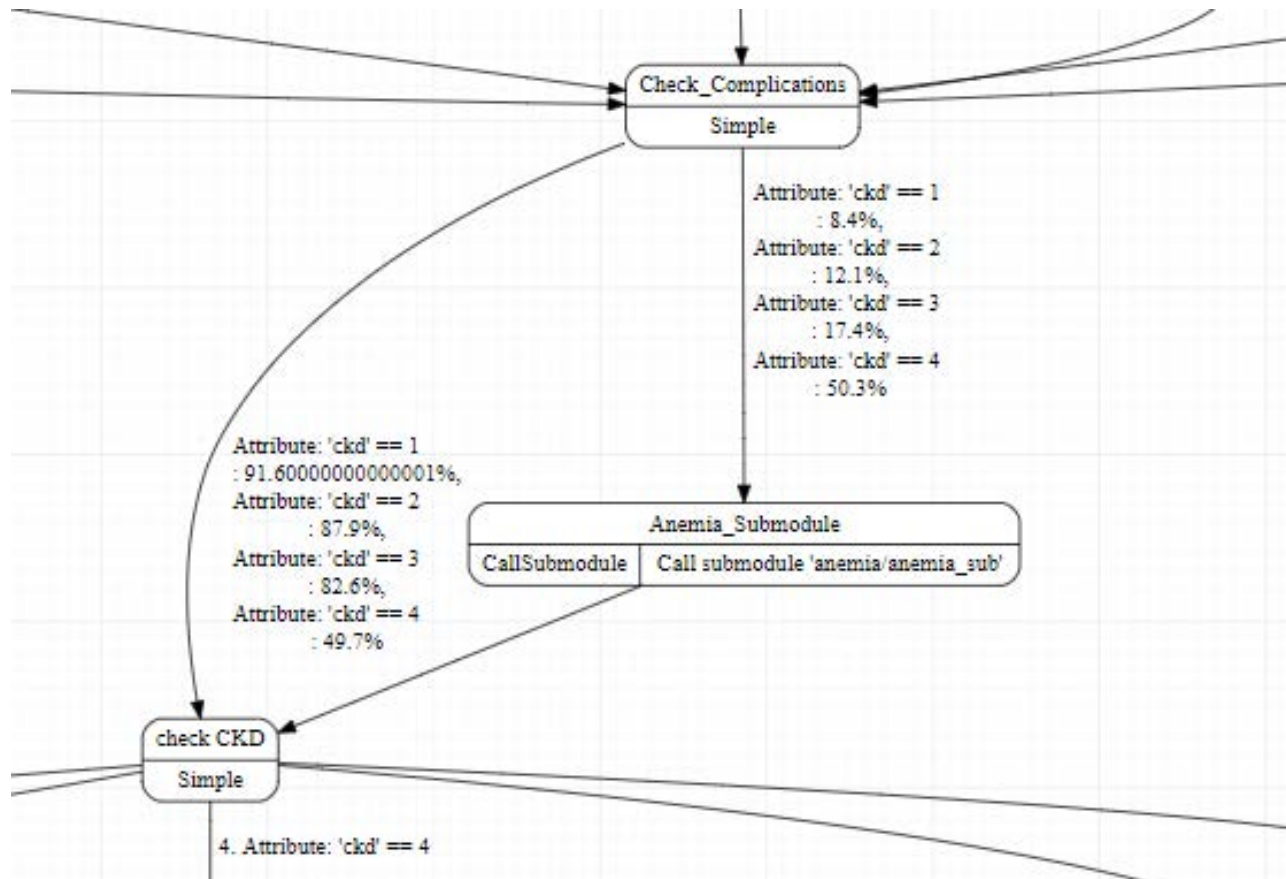
Lung Cancer



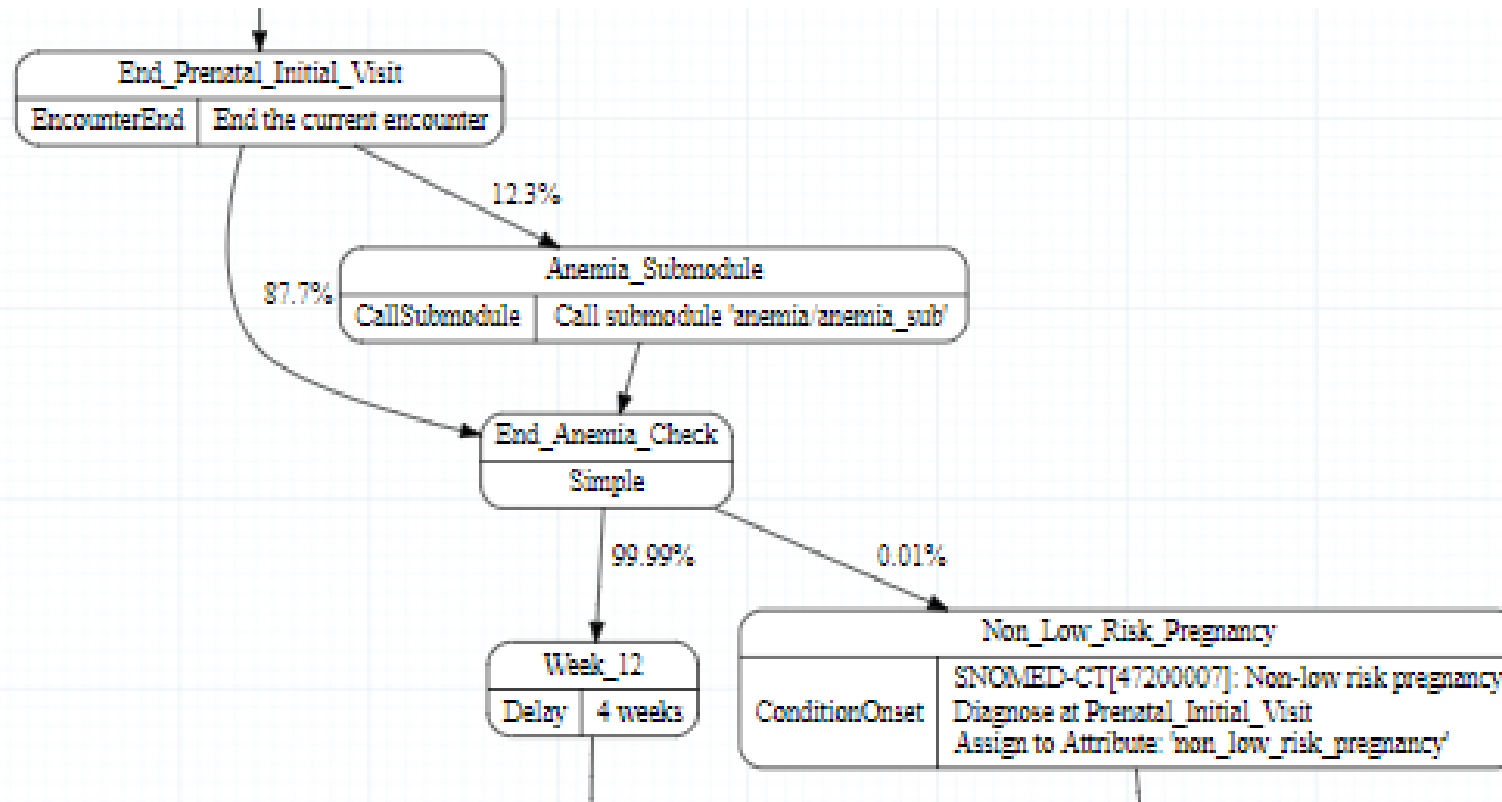
Lupus



Metabolic Syndrome Standards of Care



Pregnancy



Primary atrophic hypothyroidism

