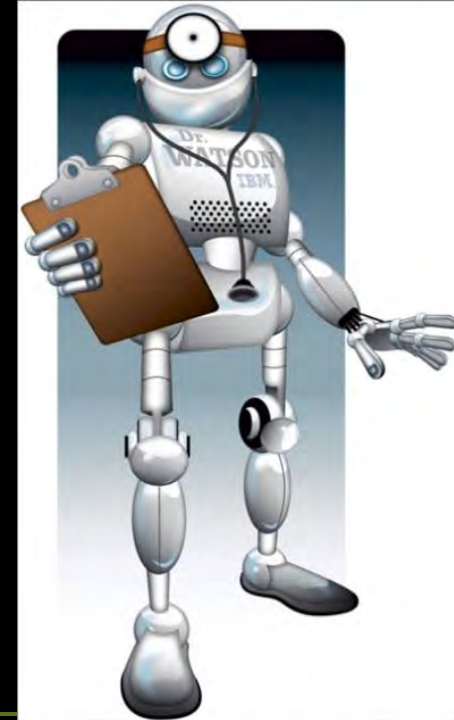
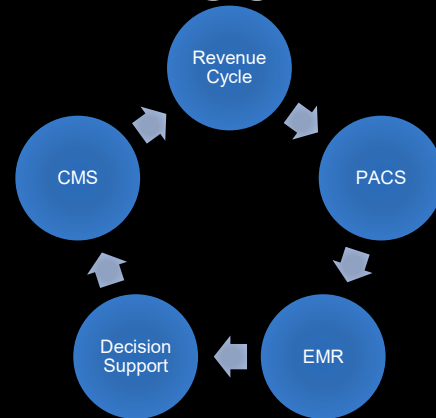


# WISH LIST FROM SOFTWARE VENDORS FOR CT LUNG CANCER SCREENING



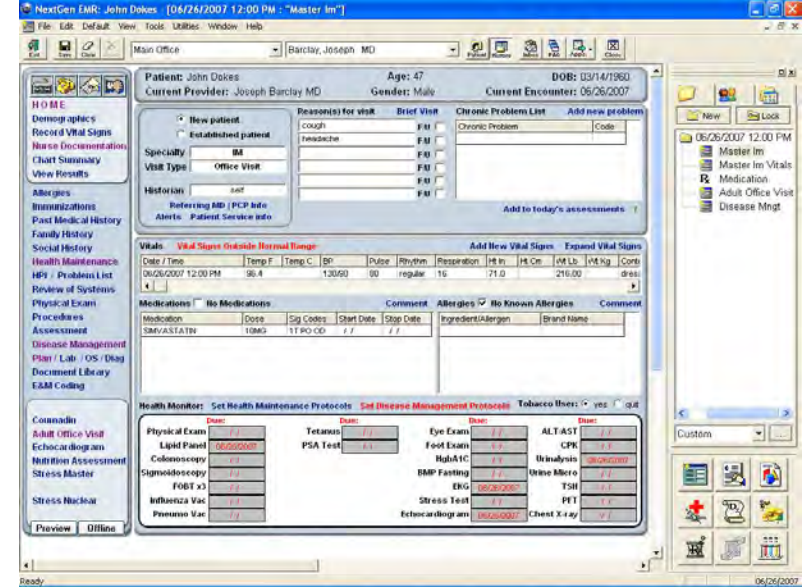
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Category	Category Descriptor	Category	Findings	Management	Probability of Malignancy	Estimated Population Parameters
Incomplete	-	0	either chest CT examination(s) being located for comparison or no all of lung cannot be evaluated	Additional lung cancer screening CT scans and/or comparison to prior chest CT examinations is needed	n/a	1%
Negative	No nodules and definitely benign nodules	1	no lung nodules nodules with specific calcifications: complete, central, popcorn, concentric rings and fat-containing nodules			
Benign Appearance or Behavior	Nodules with a very low likelihood of becoming a clinically active cancer due to size or lack of growth	2	solid nodules: new < 4 mm < 6 mm total diameter on baseline screening non-solid nodules (GGO): < 20 mm OR < 30 mm and unchanged or slowly growing	Continual annual screening with LDCT in 12 months	< 1%	90%
		3	solid nodules: 2.6 to < 8 mm at baseline OR new 4 mm to < 6 mm part solid nodules: 2.6 mm total diameter with solid component < 6 mm OR new < 6 mm total diameter non-solid nodules (GGO) > 20 mm on baseline CT or new solid nodules: 2.8 to < 15 mm at baseline OR growing < 8 mm OR new 6 to < 8 mm	6 month LDCT	> 1%	1%
Suspicious	Findings for which additional diagnostic testing and/or tissue sampling is recommended	4A	2.8 mm with solid component 2.8 mm to < 8 mm OR part solid nodules: 2.8 mm with solid component < 6 mm solid component	3 month LDCT; PET/CT may be used when there is a 2.8 mm solid component	> 15%	2%
		4B	solid nodules: new or growing, and 2.8 mm part solid nodules with: a solid component > 2.8 mm OR is new or growing > 2.8 mm solid component	chest CT with or without contrast, PET/CT and/or tissue sampling depending on the probability of malignancy and/or comorbidity. PET/CT may be used when there is a 2.8 mm solid component.	> 15%	2%
		4X	Category 3 or 4 nodules with additional features or imaging findings that increases the suspicion of malignancy			
Other	Clinically Significant or Potentially Clinically Significant Findings that are not coded	5	modifier - may add on to category 0-4 coding	As appropriate to the specific finding	n/a	10%
Prior Lung Cancer	Modifier for patients with a prior diagnosis of lung cancer who return to screening	C	modifier - may add on to category 0-4 coding	-	-	-

# Patient Identification for Screening

- Search EMR for eligible patients
  - CMS Benefit eligibility criteria
  - Age 50-77 years
  - Asymptomatic with no signs or symptoms of lung cancer
  - Tobacco smoking history of at least 20 pack-years
  - Current smoker or one who has quit smoking within the last 15 years
- Consider retrospective AI application to previous CT studies
- Pull relevant patient information into ACR registry
  - DOB, actual pack year smoking history, whether signs/symptoms of lung cancer, NPI of ordering physician
- Use databases such as PLCO and NLST to identify patients with highest a priori risk to make screening more cost effective and higher yield
  - Pacific islanders with 6 fold greater risk of lung cancer than Hispanic patients
  - Other risk factors



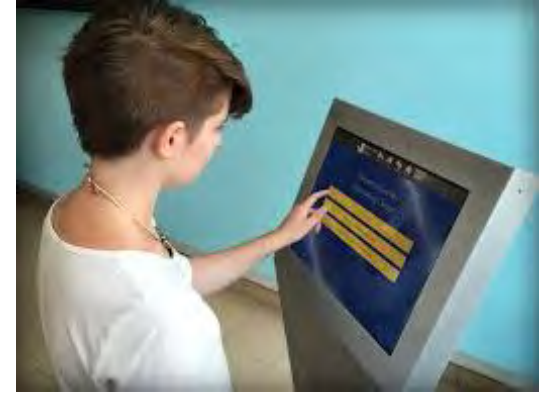
# EMR/HIS Ordering Template for Initial and Subsequent Annual LDCT lung cancer Screenings and Documentation in Beneficiary Medical Records

- Date of birth
- Actual pack – year smoking history (number)
- Current smoking status
  - For former smokers number of years since quitting
- Statement that beneficiary is without signs/symptoms of lung cancer
- National Provider Identifier of the ordering practitioner

# CT Image Acquisition

- Optimize texture by using Deep Learning reconstruction rather than IR
- Consider reconstruction at higher matrix sizes, at least for clinical decision support

# Access to Software



- Need to have flexibility to access AI software both locally and in the cloud

# Integration

- Needs to be integrated with PACS or reporting workflow process
- Server onsite or in cloud should take all relevant CT studies and automatically do pre-processing as part of routine workflow

# Functionality



- Software can take CT and find lung nodules but only small part of the total screening process
- Would like to get reason or level of certainty and benign vs. malignant
- Software should be interactive to allow agreement or lack of agreement
- Software should be based on similar patient population for identification of lung nodules which might depend on prevalence of disease, e.g. VA different from UMMS or Southwest
  - Continuous learning e.g. Berkman Sahiner FDA lecture

# Functionality

- Second and third opinions have been shown to increase accuracy
  - Should have support for ensembles of AI programs that might do the same thing or might do complementary things
- Track change over time and identify progressive but very slow change and identify rapid change even if nodules are small
- Automatic software to follow up to determine whether recommendations have been followed by clinicians for additional studies and procedures and communication with patients or primary care providers
- Automatic ACR registry reporting



# Conclusion

- IT is becoming increasingly critical to the success of today's practice of radiology and is especially critical as we move to implement the complex process that is associated with Lung Cancer Screening
- Clinical decision support tools are evolving from the current state of the art to next generation and beyond systems that will allow us to take care of patients
- This will allow us to maximize the likelihood that our CT screening studies will save lives and reduce morbidity associated with lung cancer