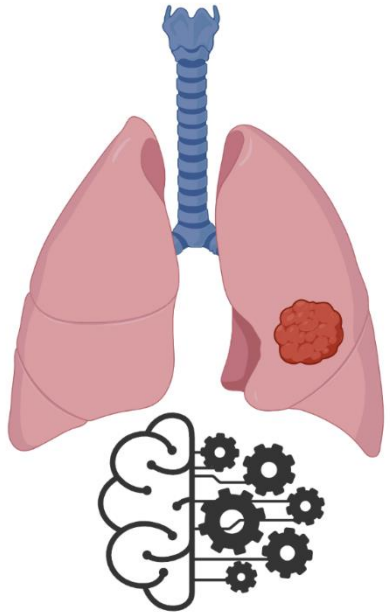
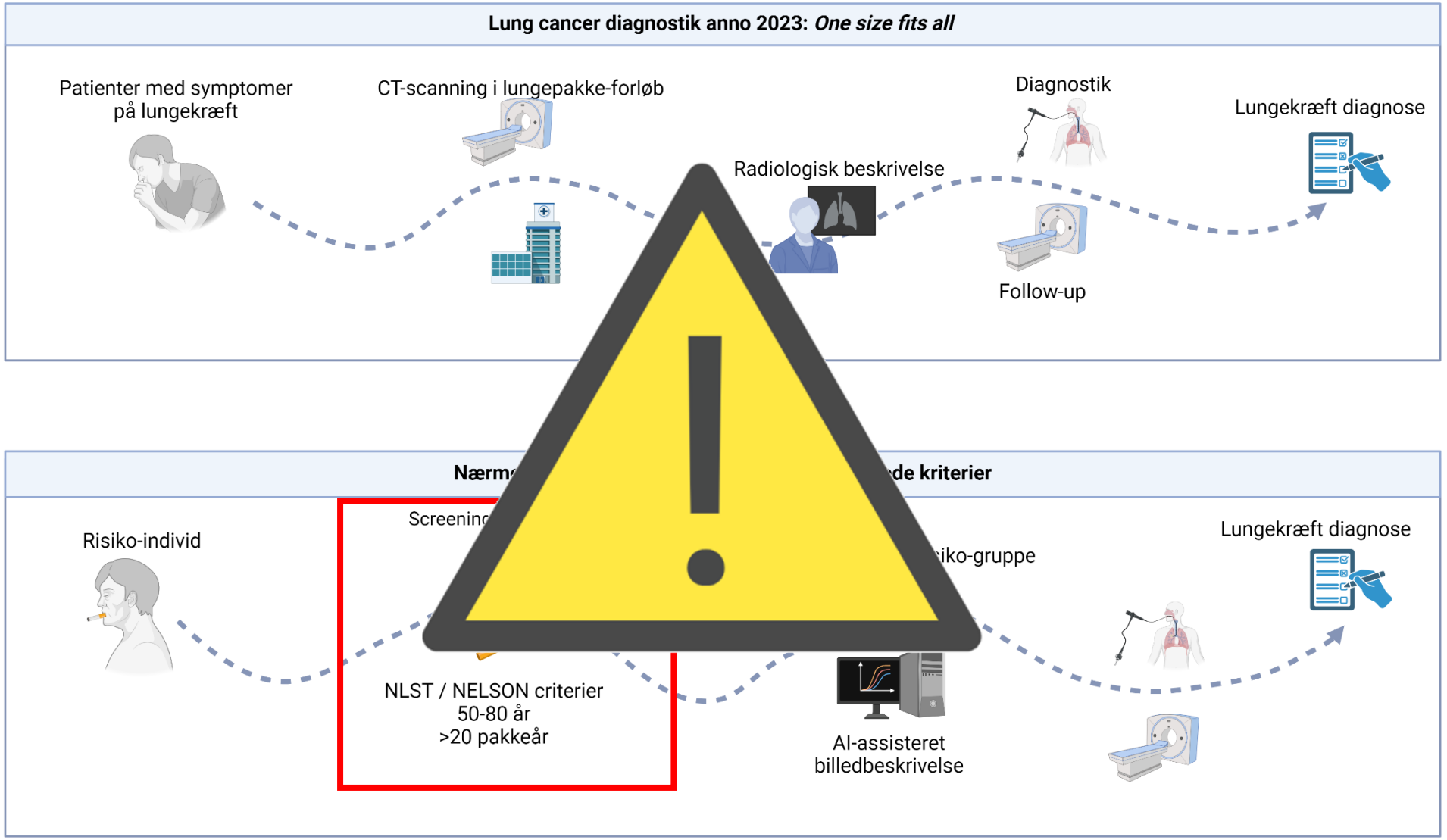
The clinical potential of artificial intelligence in early detection of lung cancer

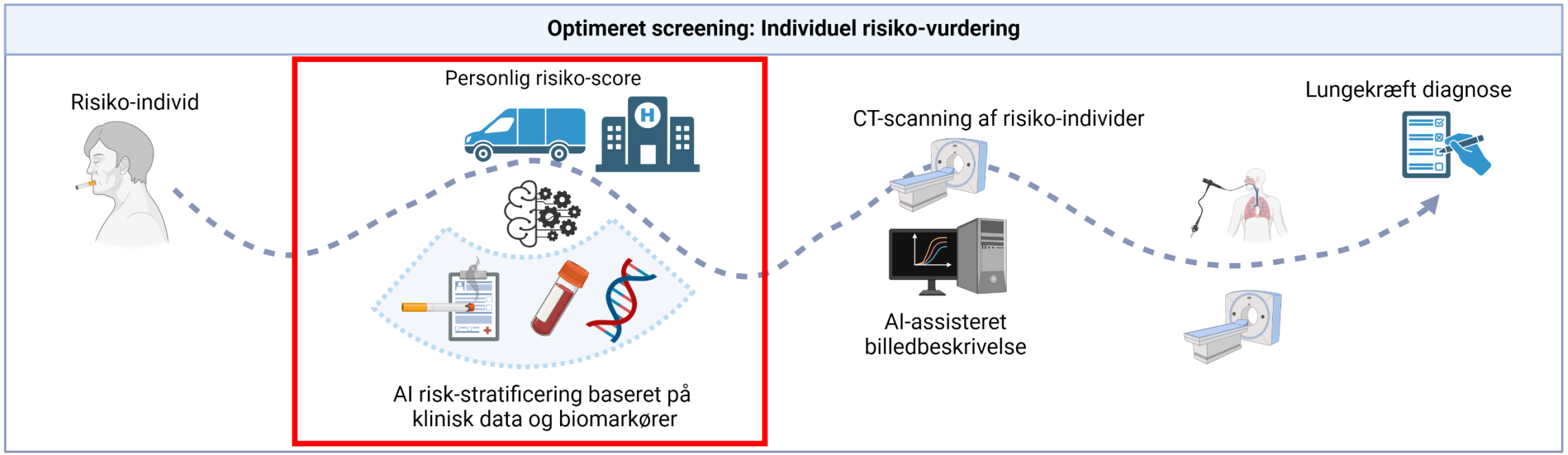


Margrethe Bang Henriksen

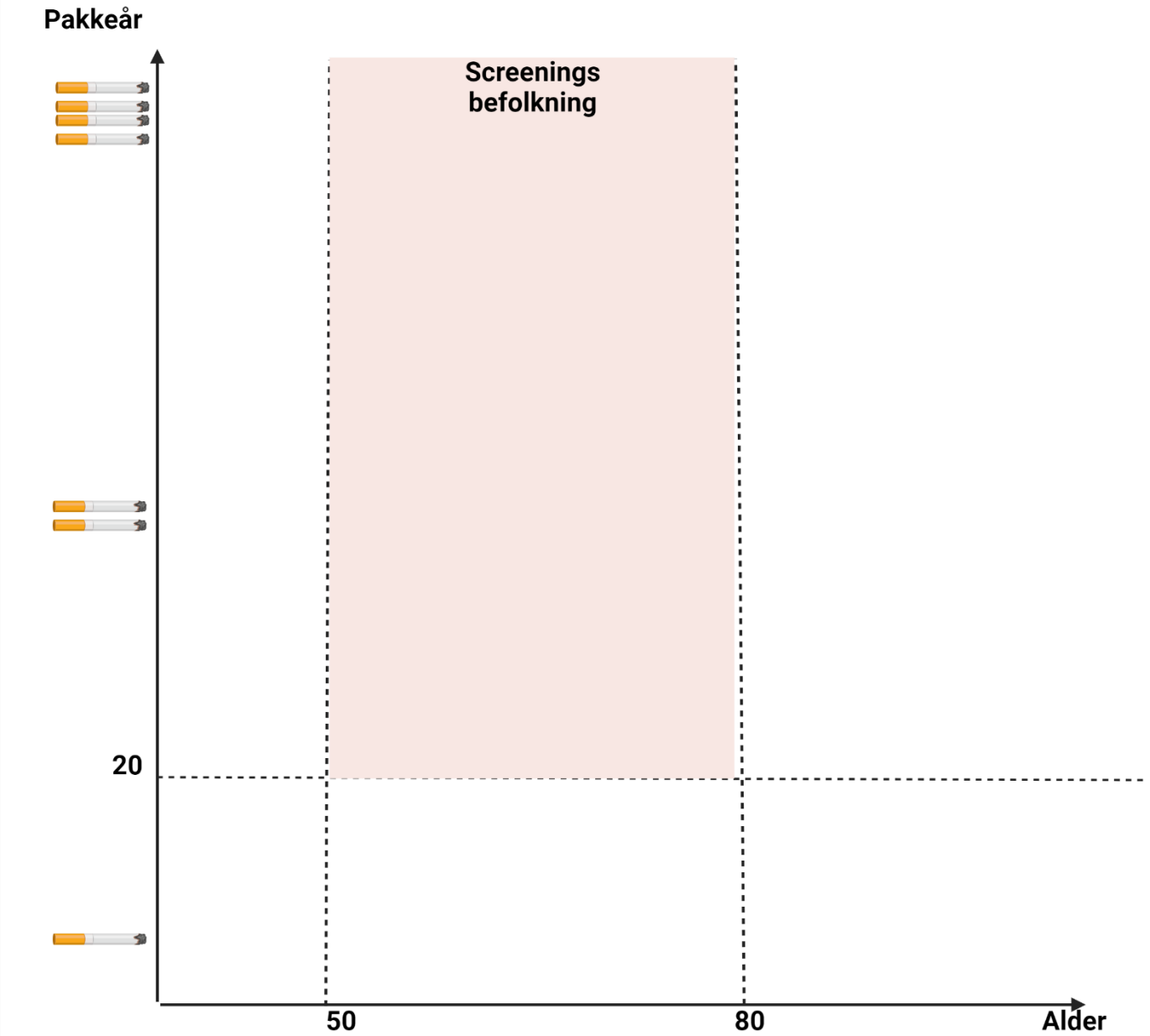
Ph.d. studerende 2020-2024

Onkologisk afdeling, Vejle Sygehus

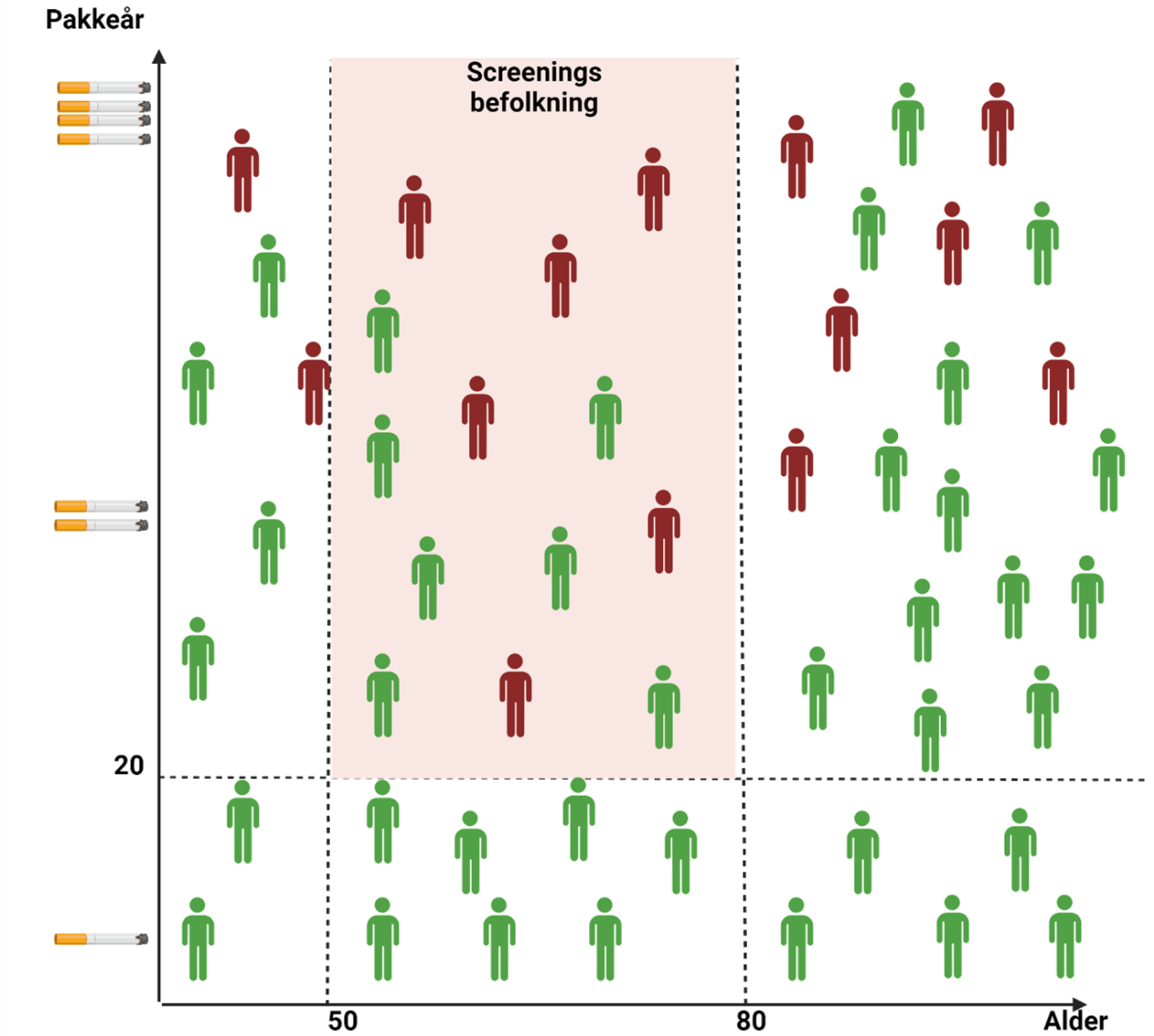

Lung cancer diagnostik anno 2023: *One size fits all*
Patienter med symptomer på lungekræft
CT-scanning i lungepakke-forløb
Radiologisk beskrivelse
Diagnostik
Lungekræft diagnose
Follow-up
Risiko-individ
NLST / NELSON criterier
50-80 år
>20 pakkeår
AI-assisteret billedbeskrivelse
Lungekræft diagnose


Optimeret screening: Individuel risiko-vurdering
Risiko-individ
Personlig risiko-score
AI risk-stratificering baseret på klinisk data og biomarkører
CT-scanning af risiko-individer
AI-assisteret billedbeskrivelse
Lungekræft diagnose

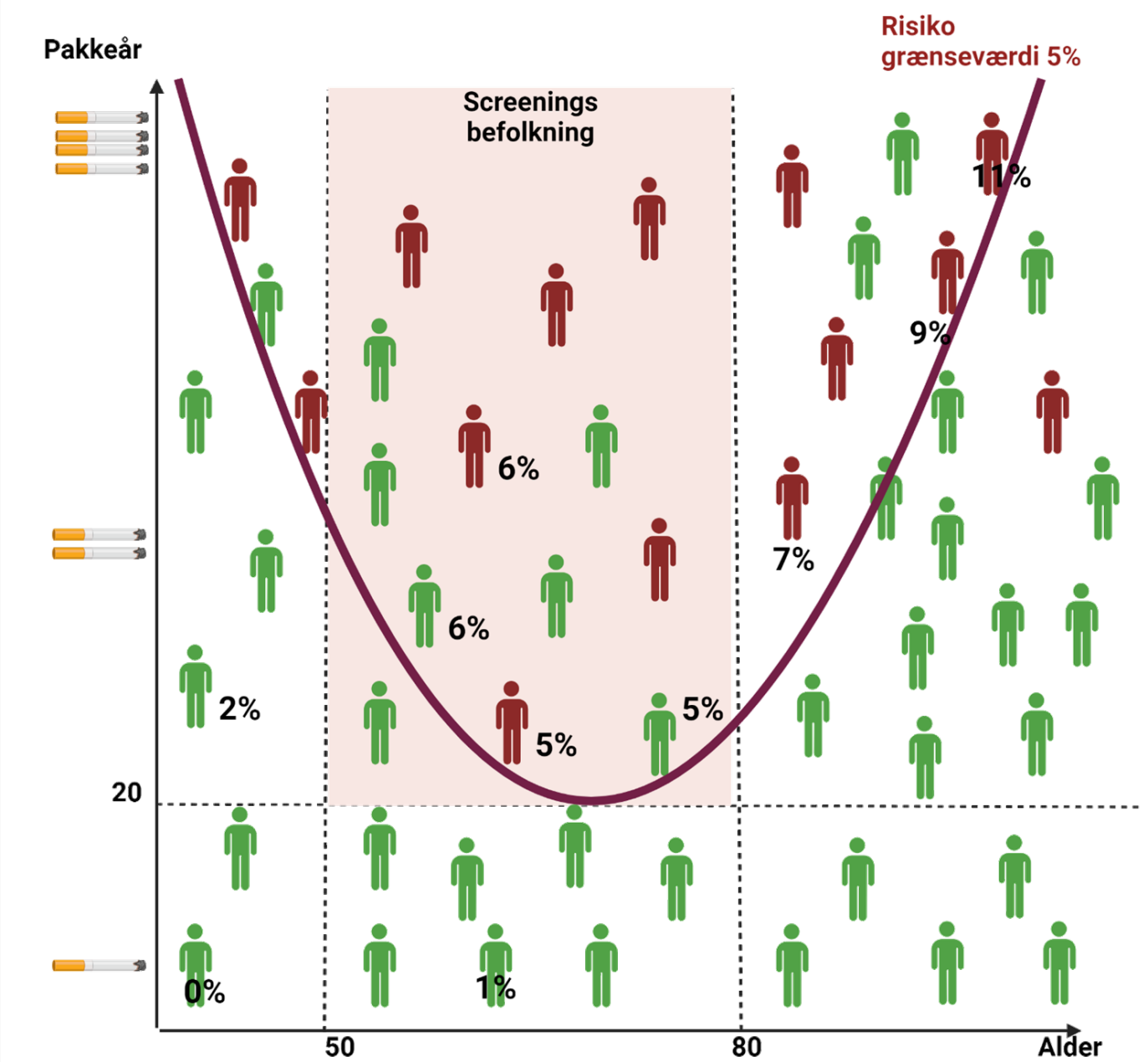
Fikserede kriterier / Personlig risikoscore



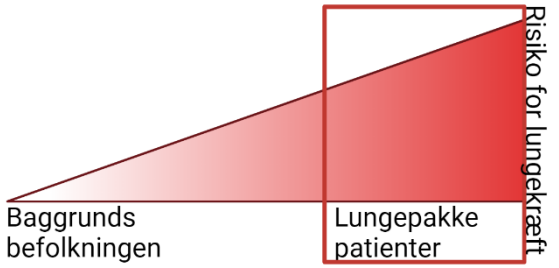
Fikserede kriterier / Personlig risikoscore



Fikserede kriterier / Personlig risikoscore



Kan vi udvikle en algoritme til prædiktion af lungekræft hos lungepakke-patienter baseret på klinisk og blodprøvedata?



- Lungekræft
- Alder, køn
- Blodprøver
- **Rygestatus**
- Komorbiditet
- Medicin
- Almen praksis, besøg og CRP
- Symptomer
- Ekspositioner, disp.

Publikation

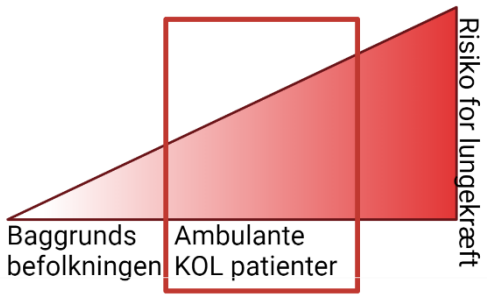
Accepteret — **Machine learning**

Accepteret — **Maastricht collaboration Bayesian Networks**

Review — **Maastricht collaboration Udvidet Bayesian Networks**

1 2

Skal vi screene ambulante KOL patienter?

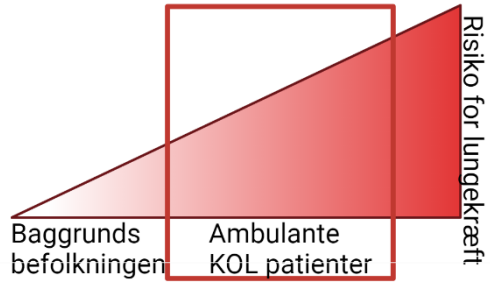


Publikation

- Lungekræft prævalens
- Stadie
- KOL grad

3

Hvilken model er bedst? Hvordan afprøver vi det?



- Afprøvning af andre algoritmer
- Prospektivt studie

4

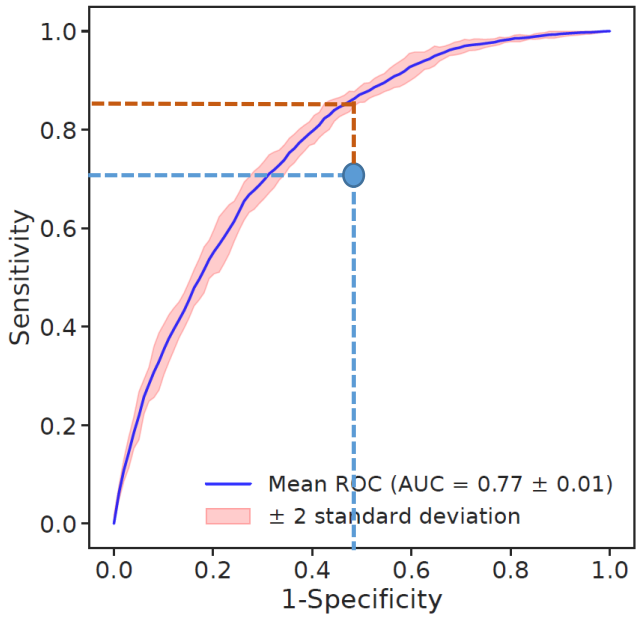
Kan vi udvikle en algoritme til prædiktion af rygestatus baseret på fritekst fra journaler?

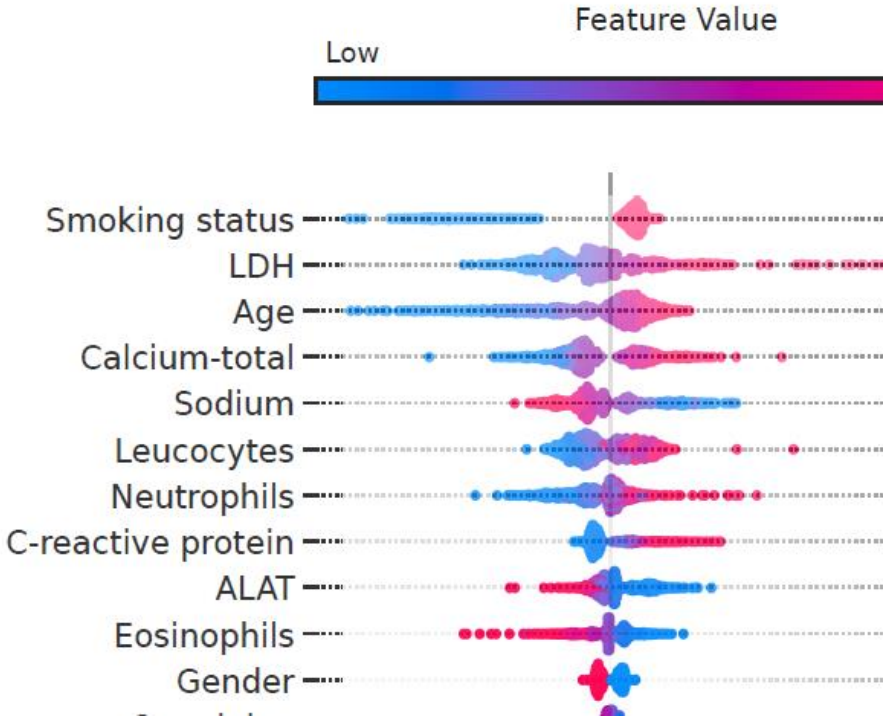
Publikation

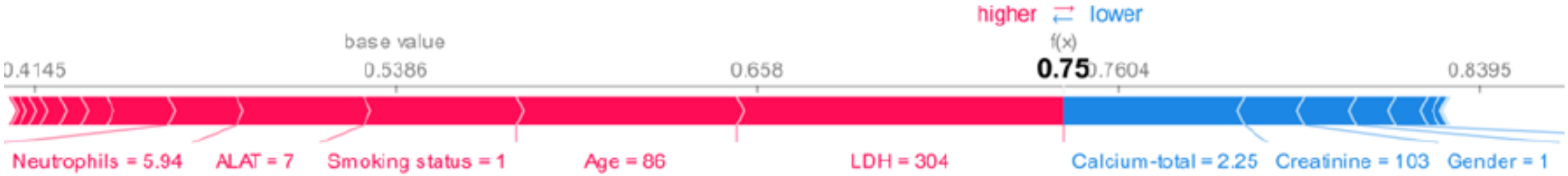
Sprogmodel til klassificering: Tidligere, nuværende eller aldrig rygere

→ **Version 2.0: Prædiktion af pakkeår fra fritekst**

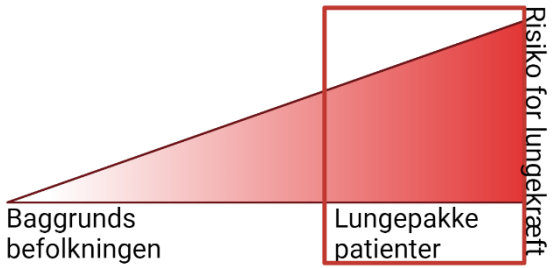
Machine learning model: Blodprøve- og rygedata



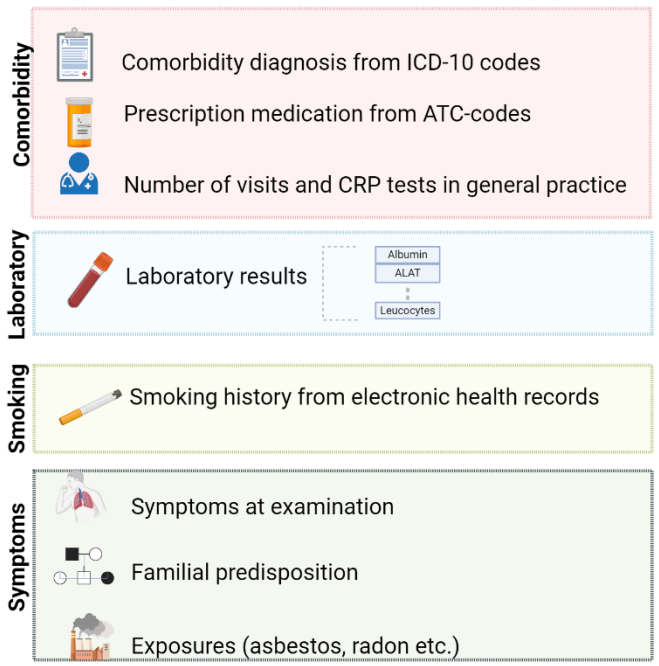


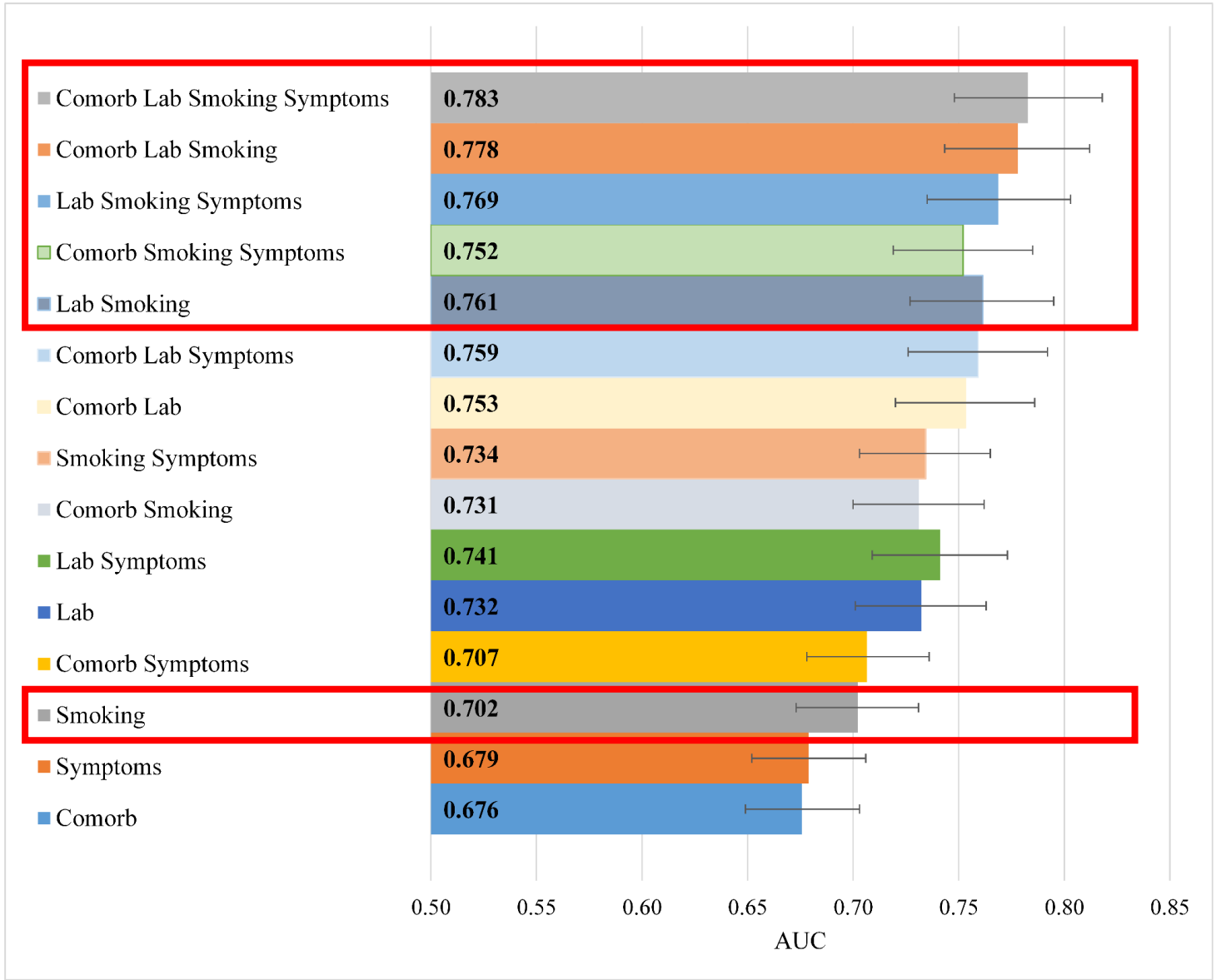


Bayesian Networks: Udvidet model

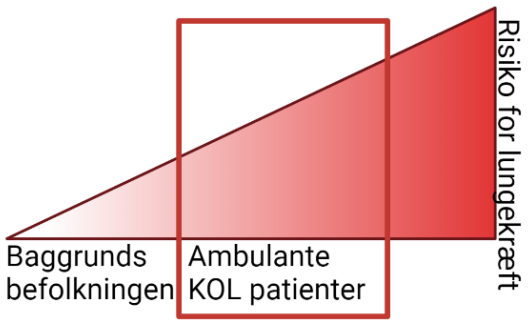


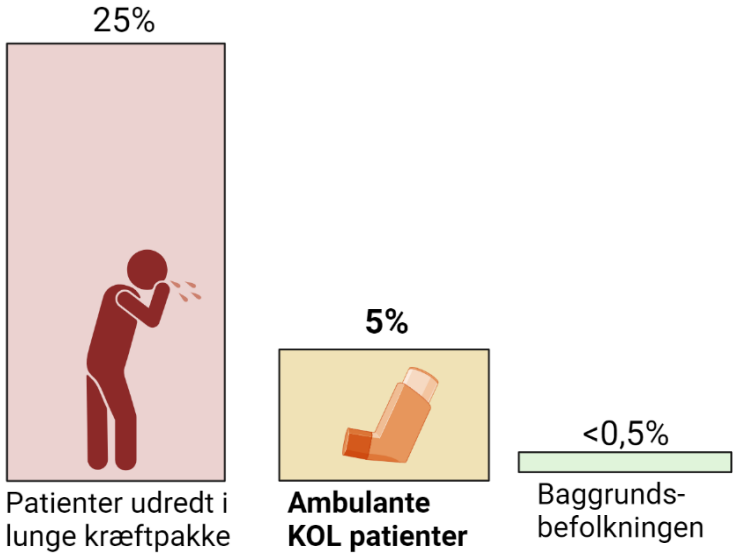
- 5.583 patienter (33% lungekræft)

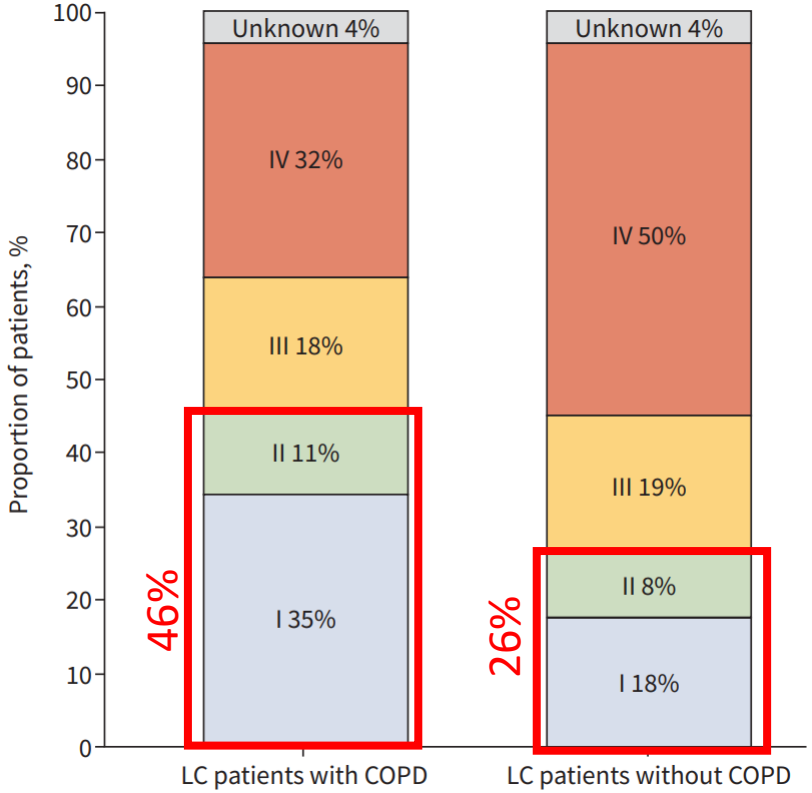


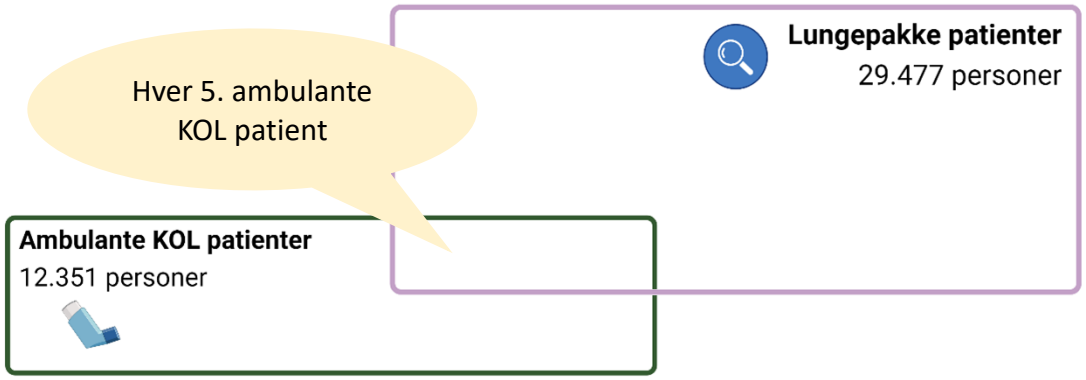


Skal vi screene ambulante KOL-patienter?





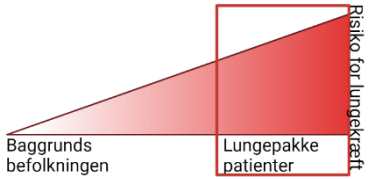




Afprøvning af andre algoritmer / prospektive studier

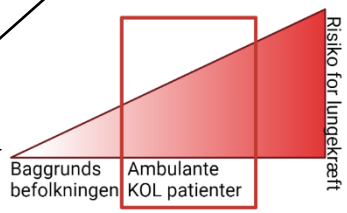
Roche samarbejde
Retrospektiv validering af *LungFlag*-algoritme

- Demografi
- Rygestatus
- Blodprøvesvar
- Comorbiditet



50-80 årige

5271 lungekræft / 13,329 kontroller
Alle med rygedata: AUC 69%
Ever smokers AUC 63%



50-80 årige

240 lungekræft / 10,901 kontroller
Alle med rygedata: AUC 61%
Ever smokers AUC 60%

- Lille forskel i rygehistorik
- Lille sample size
- Mange bias…

Prospektiv afprøvning af *Lungflag* på ambulante KOL-patienter & medicinske patienter
(CE ultimo 2024)

Tak for støtten og opmærksomheden!

Hovedpointer:

- Et potentielt værktøj: Moderat AI-model baseret på laboratoriedata og rygeoplysninger (**1,2)**
- Laboratoriedata og rygeoplysninger indeholdt mest information **(3,4)**
- KOL-ambulatoriepatienter er relevante at overveje i screeningsøjemed **(5)**
- Præcis model til påvisning af rygeadfærd (AUC 98%) baseret på fritekst **(6)**

1) A collection of multiregistry data on patients at high risk of lung cancer-a Danish retrospective cohort study of nearly 40,000 patients, Transl. Lung Cancer R. 2023 Dec;12(12):2392-2411.
2) Pulmonologist-Level lung cancer detection based on standard blood test results and smoking status using an explainable machine learning approach, in press, Scientific Reports
3) Lung cancer detection using Bayesian networks: A retrospective development and validation study on a Danish population of high-risk individuals, in press, Cancer Medicine
4) A Bayesian Network approach to lung cancer screening: Accessing data quantity, quality and the combination of variables from Danish electronic health records, Under peer review, Cancers.
5) Lung Cancer among outpatients with Chronic Obstructive Pulmonary Disease - A seven-year cohort Study, ERJ Open Research. 2024; 10: 64–2024.
6) Identification of patients' smoking status using an explainable AI approach: a Danish electronic health records case study, BMC Med Res Methodology. 2024, 114 (2024).