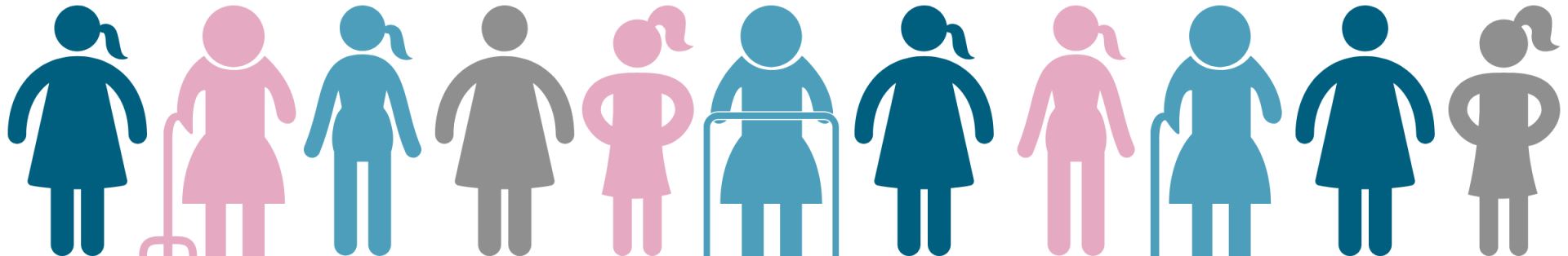
DBCG
17.01.2022

FDG-PET/CT in metastatic breast cancer

accuracy, clinical impact,
and response monitorng

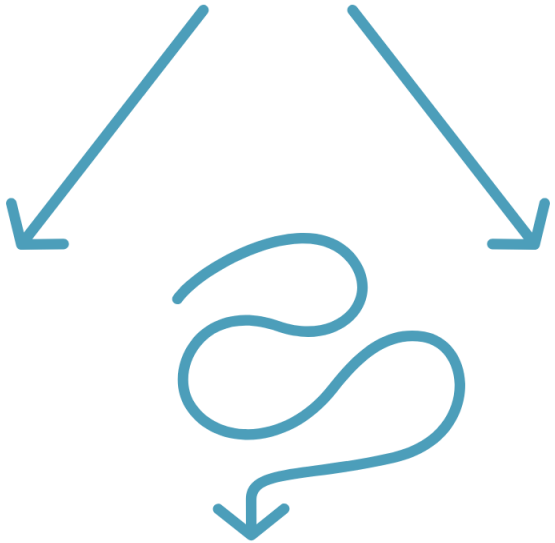
Marianne Vogsen



FDG-PET/CT

mere

præcis



supplerende staging af primær brystkræft

udredning for recidiv af brystkræft

response monitorering af metastastisk brystkræft

Ulaner GA et al, Am J Roentgenol, 2019
Cardoso F et al, ESMO early breast cancer guidelines, Ann Oncol, 2019

FDG-PET/CT

mere

præcis

GUIDELINES

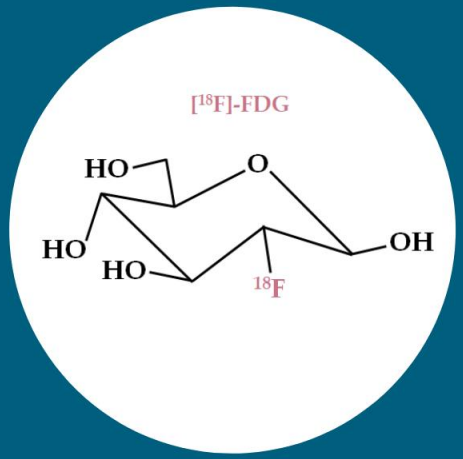
uden

klare anbefalinger

Ulaner GA et al, Am J Roentgenol, 2019
Cardoso F et al, ESMO early breast cancer guidelines, Ann Oncol, 2019

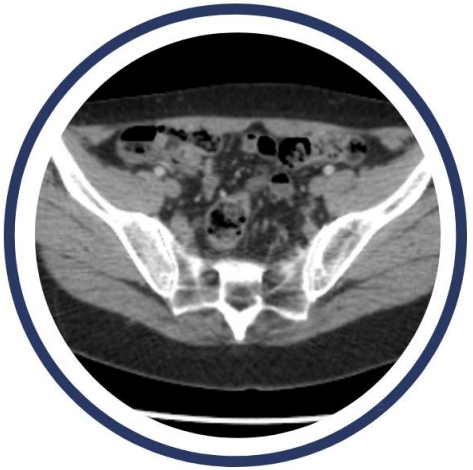
FDG-PET/CT

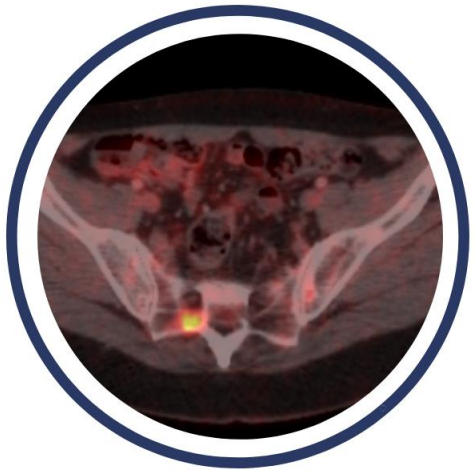
FDG akkumuleres i celler afhængig af glucose forbrug



FDG

hvordan virker det?





MESTAR

A UDREDNING
for metastaser

B RESPONSMONITORERING
af metastatisk brystkræft

patientinddragelse

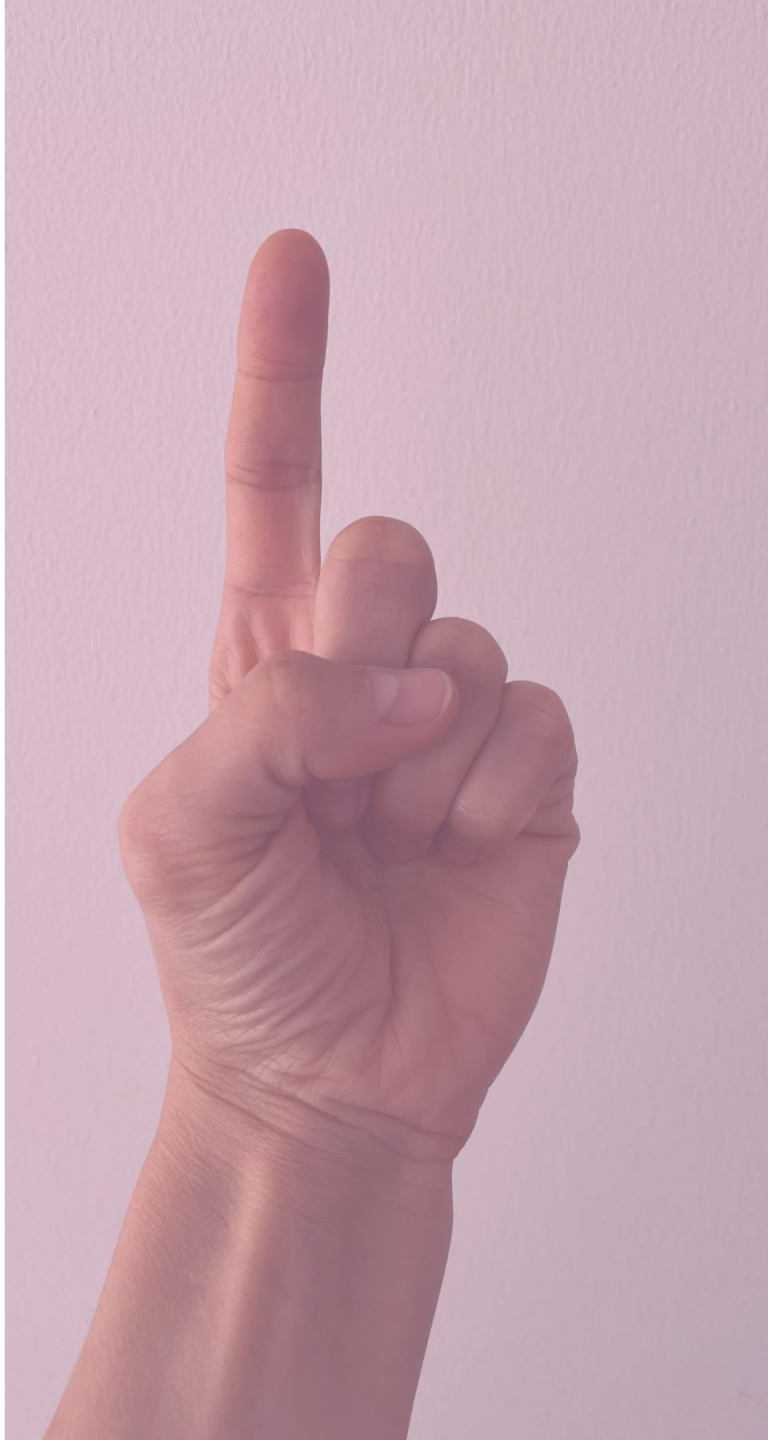
I FORSKNING

Vogsen *et al. Research Involvement and Engagement* (2020) 6:1
https://doi.org/10.1186/s40900-019-0174-y

Research Involvement and Engagement

RESEARCH ARTICLE Open Access

Learning from patient involvement in a clinical study analyzing PET/CT in women with advanced breast cancer



PRIMÆR høj-risiko brystkræft

Breast Cancer Research and Treatment (2021) 185:145–153
https://doi.org/10.1007/s10549-020-05929-3

CLINICAL TRIAL

FDG-PET/CT in high-risk primary breast cancer—a prospective study of stage migration and clinical impact

Marianne Vogsen[1,2,3,4,5,11] · Jeanette Dupont Jensen[1] · Ivar Yannick Christensen[6] · Oke Gerke[2,3] · Anne Marie Bak Jylling[7] · Lisbet Brønsro Larsen[6] · Poul-Erik Braad[2,3] · Katrine Lydolph Søe[8] · Camilla Bille[9] · Marianne Ewertz[3] · Malene Grubbe Hildebrandt[2,3,5,10]

TIDLIGERE recidiv af brystkræft

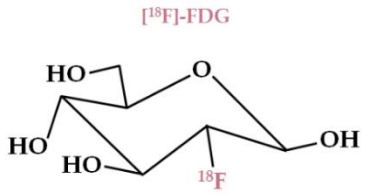
Vogsen *et al. EJNMMI Res* (2021) 11:93
https://doi.org/10.1186/s13550-021-00833-3

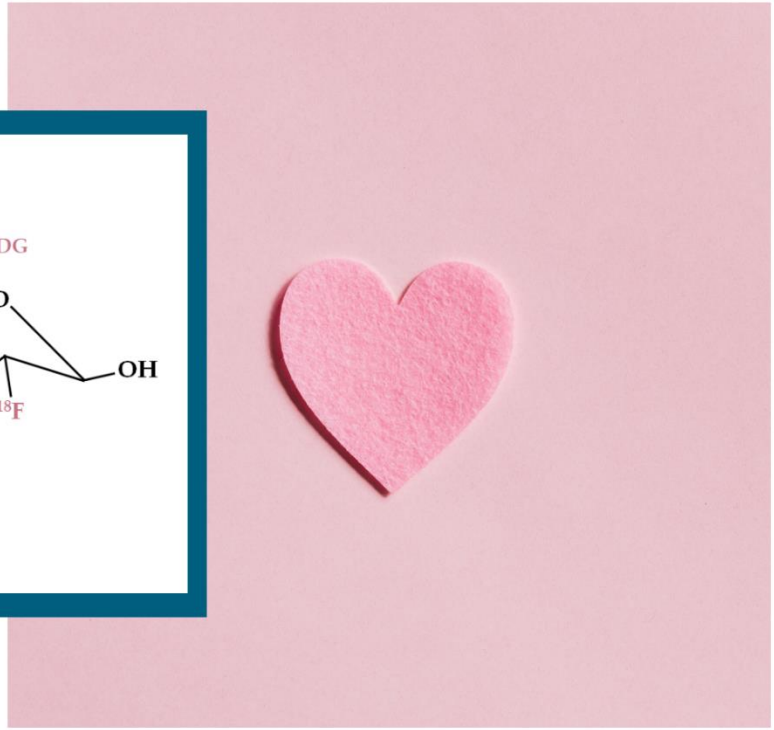
EJNMMI Research

ORIGINAL RESEARCH Open Access

Benefits and harms of implementing [^{18}F] FDG-PET/CT for diagnosing recurrent breast cancer: a prospective clinical study

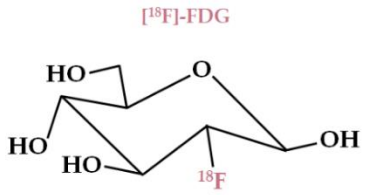
FDG PET CT

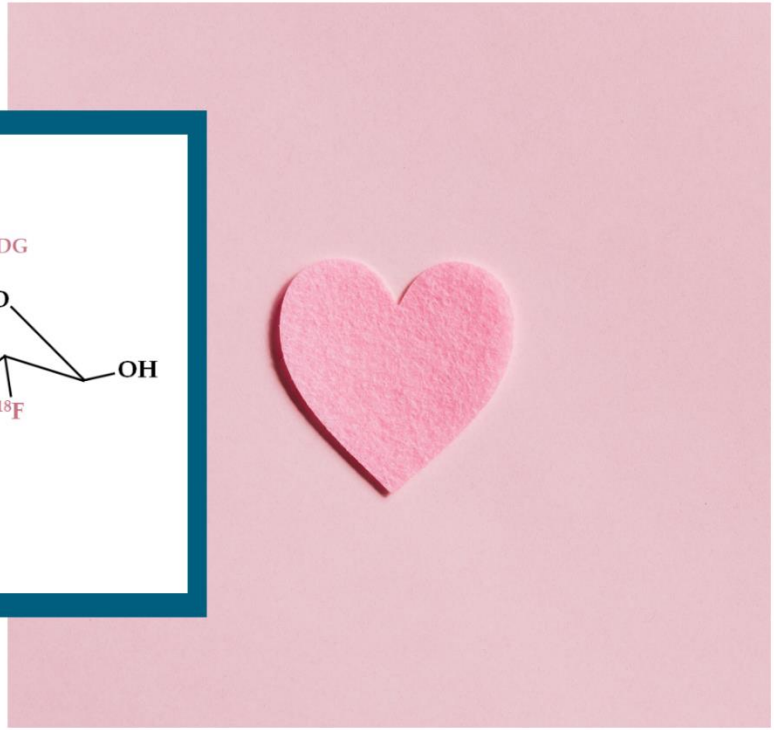




N = 383

FDG PET CT

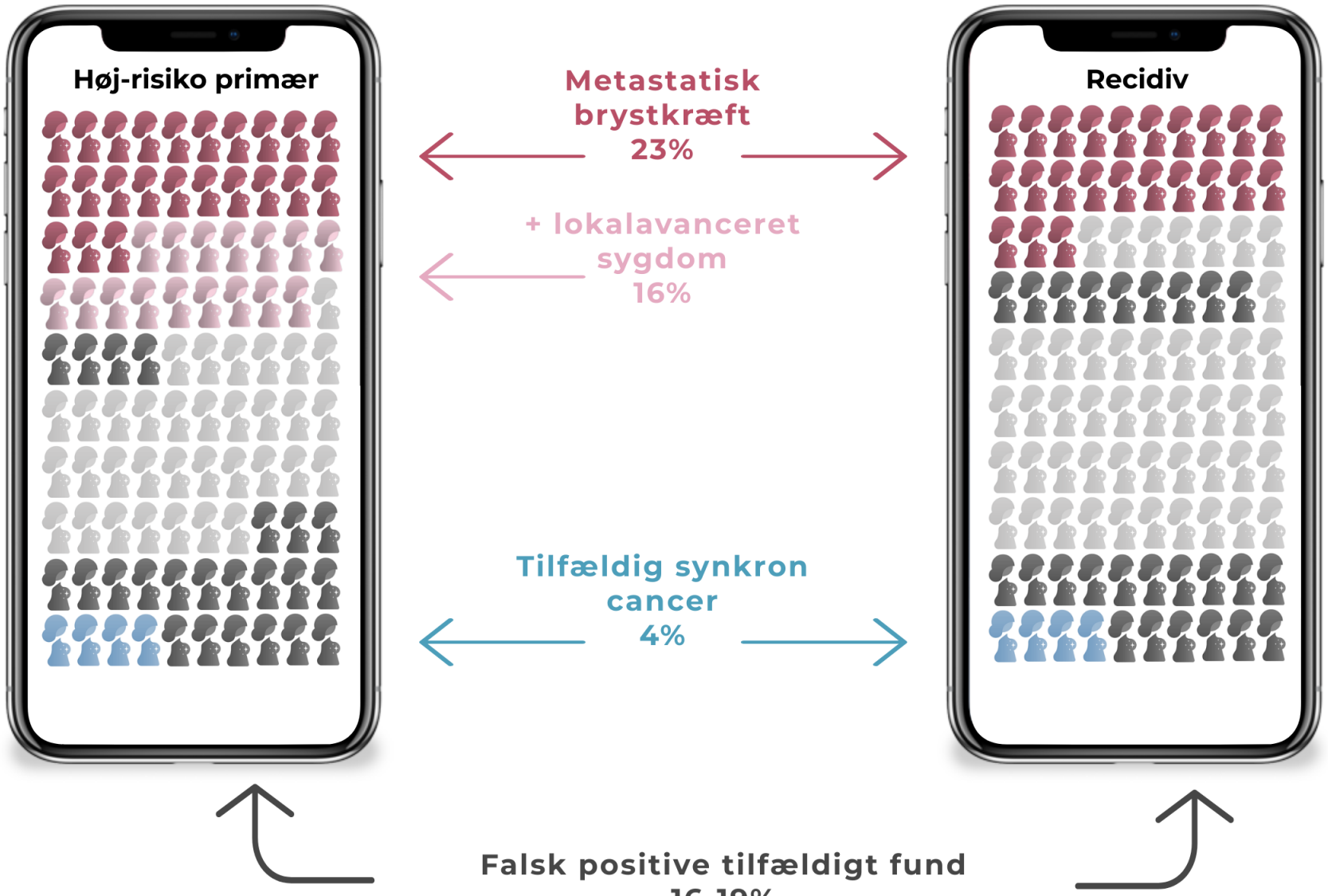




sensitivitet
1.00

specificitet
0.88-0.95

AUC-ROC
0.98-0.99


Høj-risiko primær
Metastatisk brystkræft 23%
+ lokalavanceret sygdom 16%
Tilfældig synkron cancer 4%
Recidiv
Falsk positive tilfældigt fund 16-19%

FDG-PET/CT

VISER

- høj nøjagtighed
- vigtige behandlingsmæssige konsekvenser
- ny viden om tilfældige fund

Breast Cancer Research and Treatment (2021) 185:145–153
https://doi.org/10.1007/s10549-020-05929-3

CLINICAL TRIAL

FDG-PET/CT in high-risk primary breast cancer—a prospective study of stage migration and clinical impact

Marianne Vogsen[1,2,3,4,5,11] · Jeanette Dupont Jensen[1] · Ivar Yannick Christensen[6] · Oke Gerke[2,3] · Anne Marie Bak Jylling[7] · Lisbet Brønsro Larsen[8] · Poul-Erik Braad[2,3] · Katrine Lydolph Søe[8] · Camilla Bille[9] · Marianne Ewertz[3] · Malene Grubbe Hildebrandt[2,3,5,10]

Received: 2 July 2020 / Accepted: 4 September 2020 / Published online: 12 September 2020

Abstract

Purpose To investigate the clinical impact of FDG-PET/CT for staging and treatment planning in high-risk primary breast cancer.

Methods Women with high-risk primary breast cancer were enrolled between September 2017 and August 2019 at Odense University Hospital, Denmark. Conventional mammography with/without MRI was performed before staging by FDG-PET/CT. We studied the accuracy of FDG-PET/CT for the detection of distant metastases, the effect on the change of treatment, and the prevalence of incidental findings. Biopsy and follow-up were used as a reference standard for the accuracy analysis.

Results Of 103 women, 24 (23%) were diagnosed with distant metastases by FDG-PET/CT. Among these, breast surgery was omitted in 18 and could have been spared in six. Another sixteen (16%) patients were upstaged to more advanced loco-regional disease, leading to more extensive radiotherapy. Sensitivity and specificity for diagnosing distant metastases were 1.00 (95% confidence interval: 0.86–1.00) and 0.95 (0.88–0.99), respectively. Twenty-nine incidental findings were detected in 24 women (23%), leading to further examinations in 22 and diagnosis of eight (8/22, 36%) synchronous diseases: cancer ($n=4$), thyroiditis ($n=2$), aorta aneurysm ($n=1$), and meningioma ($n=1$).

Conclusions FDG-PET/CT had a substantial impact on staging and change of treatment in women with high-risk primary breast cancer, and further examination of incidental findings was considered clinically relevant. Our findings suggest that PET/CT should be considered for primary staging in high-risk primary breast cancer to improve treatment plan

cancer · FDG-PET/CT · Stage migration · Clinical impact · Incidental findings

Dep

Vogsen *et al. EJNMMI Res* (2021) 11:93
https://doi.org/10.1186/s13550-021-00833-3

ORIGINAL RESEARCH Open Access

Benefits and harms of implementing [^{18}F] FDG-PET/CT for diagnosing recurrent breast cancer: a prospective clinical study

Marianne Vogsen[1,2,3,4,5*], Jeanette Dupont Jensen[1], Oke Gerke[2,3], Anne Marie Bak Jylling[3,6], Jon Thor Asmussen[7], Ivar Yannick Christensen[7], Poul-Erik Braad[2,3], Peter Thye-Rønn[3,8], Katrine Lydolph Søe[9], Marianne Ewertz[3] and Malene Grubbe Hildebrandt[2,3,5,10]

Abstract

Background: [^{18}F]-fluorodeoxyglucose-positron emission tomography/computed tomography ([^{18}F]FDG-PET/CT) has been implemented sporadically in hospital settings as the standard of care examination for recurrent breast cancer. We aimed to explore the clinical impact of implementing [^{18}F]FDG-PET/CT for patients with clinically suspected recurrent breast cancer and validate the diagnostic accuracy.

Methods: Women with suspected distant recurrent breast cancer were prospectively enrolled in the study between September 2017 and August 2019. [^{18}F]FDG-PET/CT was performed, and the appearance of incidental benign and malignant findings was registered. Additional examinations, complications, and the final diagnosis were registered to reflect the clinical consequence of such findings. The diagnostic accuracy of [^{18}F]FDG-PET/CT as a stand-alone examination was analyzed. Biopsy and follow-up were used as a reference standard.

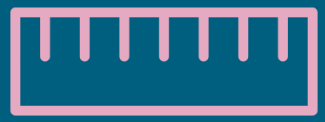
Results: [^{18}F]FDG-PET/CT reported breast cancer metastases in 72 of 225 women (32.0%), and metastases were verified by biopsy in 52 (52/225, 23.1%). Prior probability and posterior probability of a positive test for suspected metastatic cancer and incidental malignancies were 27%/85% and 4%/20%, respectively. Suspected malignant incidental findings were reported in 46 patients (46/225, 20.4%), leading to further examinations and final detection of nine cancers (9/225, 4.0%). These cancers originated from the lung, thyroid, skin, pancreas, peritoneum, malignant melanoma, and one was hematological cancer. False-positive incidental findings 37/225 patients (16.4%), mainly in the colon ($n=12$) and thyroid gland, benign disease were suggested by [^{18}F]FDG-PET/CT, and further examinations requiring treatment. Sensitivity, specificity, and (0.82–0.92), and 0.98 (95% CI 0.97–0.99), re

MESTAR

B

RESPONSMONITORERING
af metastatisk brystkræft

CE-CT
RECIST 1.1



sum lesion
diameter

FDG-PET/CT
PERCIST

SULpeak

PERCIST

FEASIBILITY

diagnostics

MDPI

Article

FDG-PET/CT for Response Monitoring in Metastatic Breast Cancer: The Feasibility and Benefits of Applying PERCIST

Marianne Vogsen [1,2,3,4,5,*], Jakob Lykke Bülow [1,3], Lasse Ljungstrøm [1,3], Hjalte Rasmus Oltmann [1,3], Tural Asgharzadeh Alamdari [1,3], Mohammad Naghavi-Behzad [1,3,5], Poul-Erik Braad [1,3], Oke Gerke [1,3] and Malene Grubbe Hildebrandt [1,3,5,6]

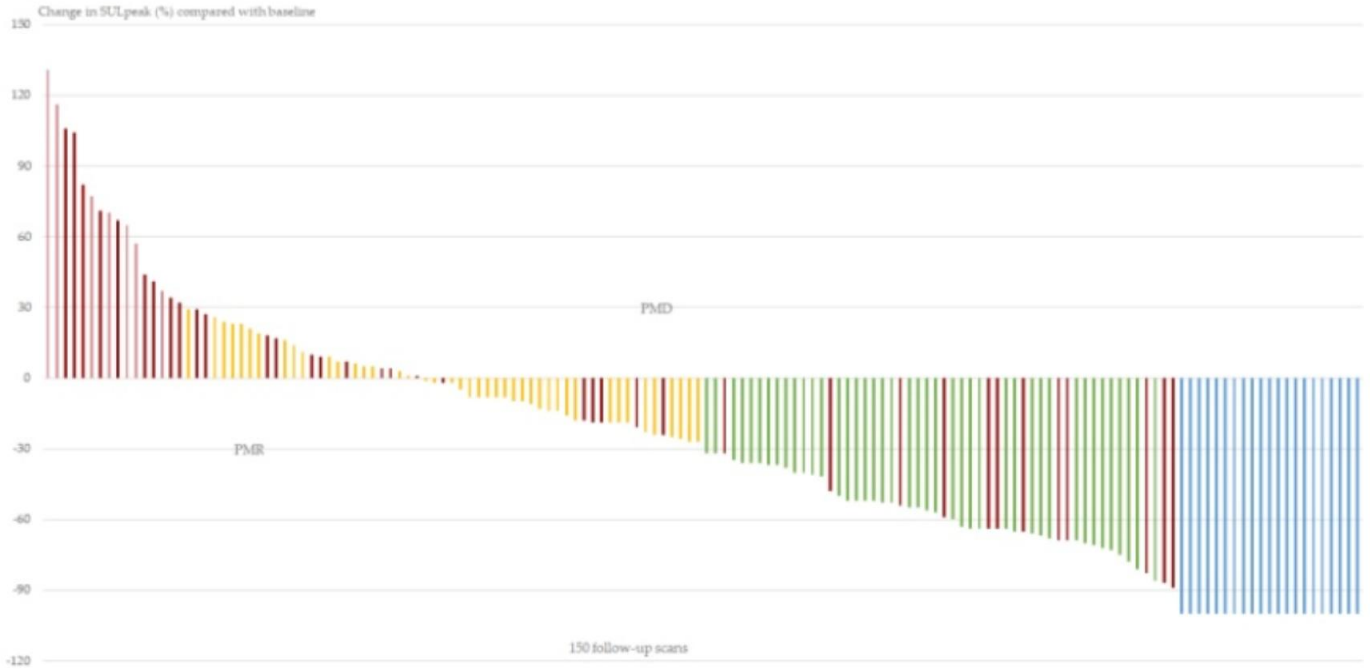


Figure 2. A waterfall plot with the percentage change in SULpeak in 150 follow-up scans compared with the baseline standardized uptake values normalized by lean body mass (SULpeak). In 37 cases new lesions were visualized by the dark-red color. In 12 cases, new lesions were visualized despite the favorable partial metabolic response category. Complete metabolic response indicated by blue bars was assessed visually. Response categories: PMD (**light-red**): PMD: progressive metabolic disease, SMD (**yellow**): stable metabolic disease, PMR (**green**): partial metabolic response, CMR (**blue**): complete metabolic response.

Vogsen M et al, Diagnostics, 2021

MBC

response monitorering

Response monitoring in metastatic breast cancer – a prospective study comparing FDG-PET/CT with conventional CT

Marianne Vogsen[1,2,3,4,5], Frederik Harbo[6], Nick M. Jakobsen[2], Henriette J. Nissen[2], Sara E. Dahlsgaard-Wallenius[2], Oke Gerke[2,3], Jeanette D. Jensen[1], Jon T. Asmussen[6], Anne Marie B. Jylling[3,7], Poul-Erik Braad[2], Werner Vach[8], Marianne Ewertz[3], Malene G. Hildebrandt[2,3,5,9]

[1]Department of Oncology, Odense University Hospital, Odense, Denmark

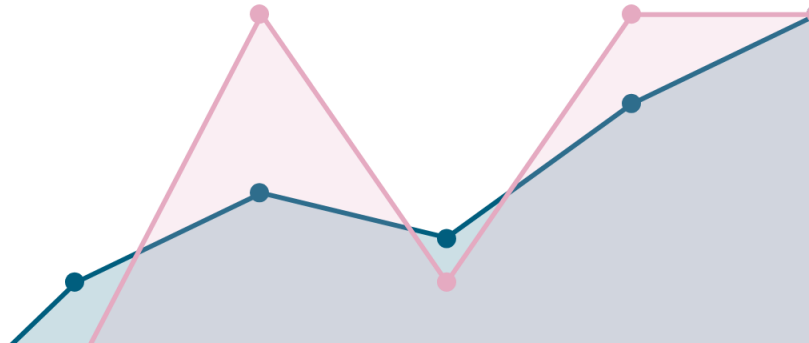
[2]Department of Nuclear Medicine, Odense University Hospital, Odense, Denmark

detektion af første progression

tid til
første progression

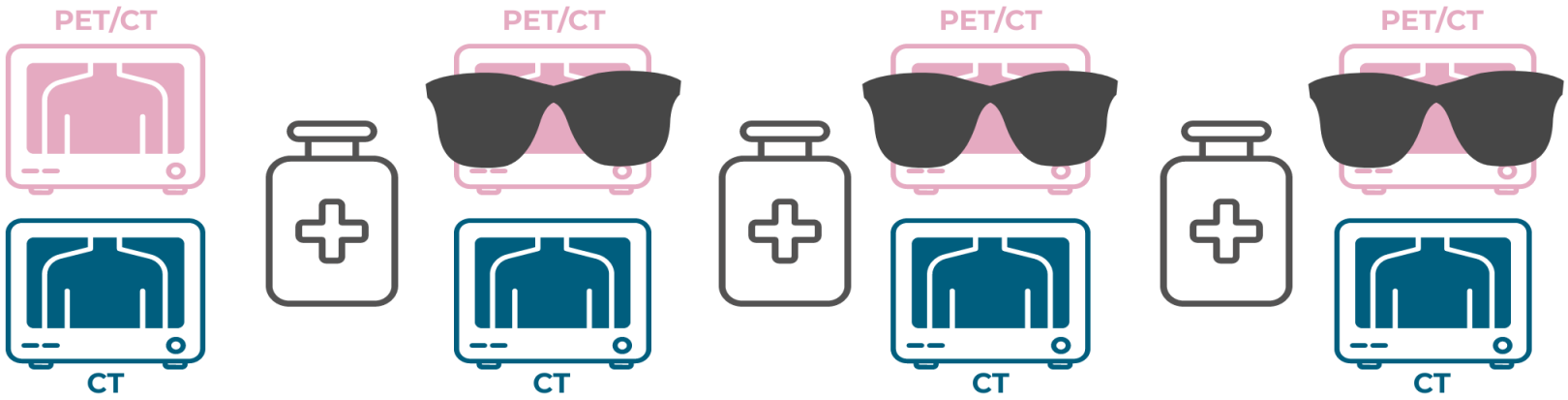
respons
kategorier

målbar sygdom



vurdering af scanninger

RESPONS EVALUERING



Baseline

9.-12. uge

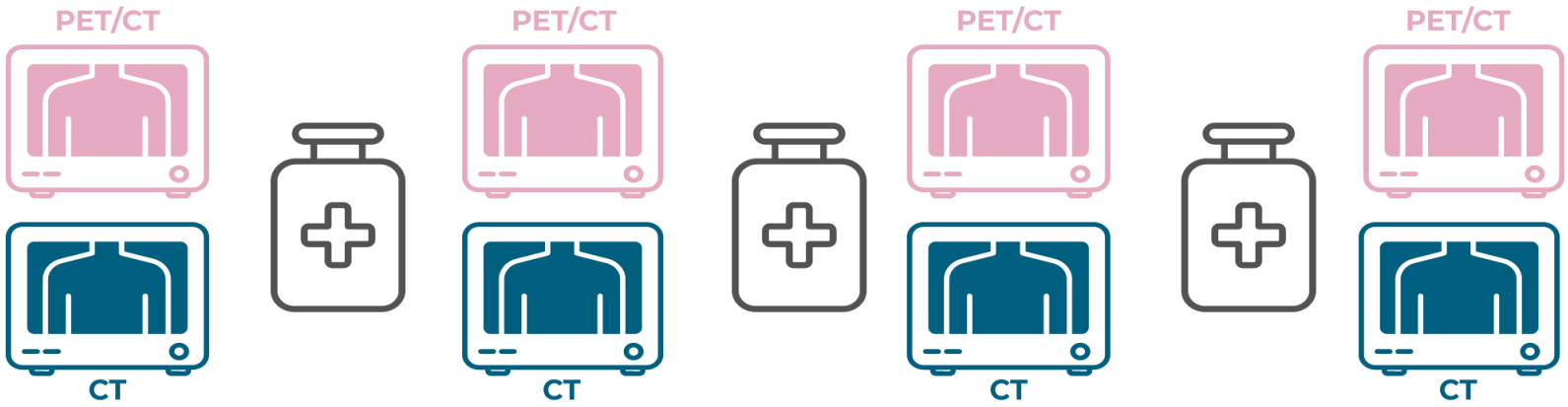
9.-12. uge

9.-12. uge

Patienterne var deres egen kontrol

vurdering af scanninger

END-OF-STUDY



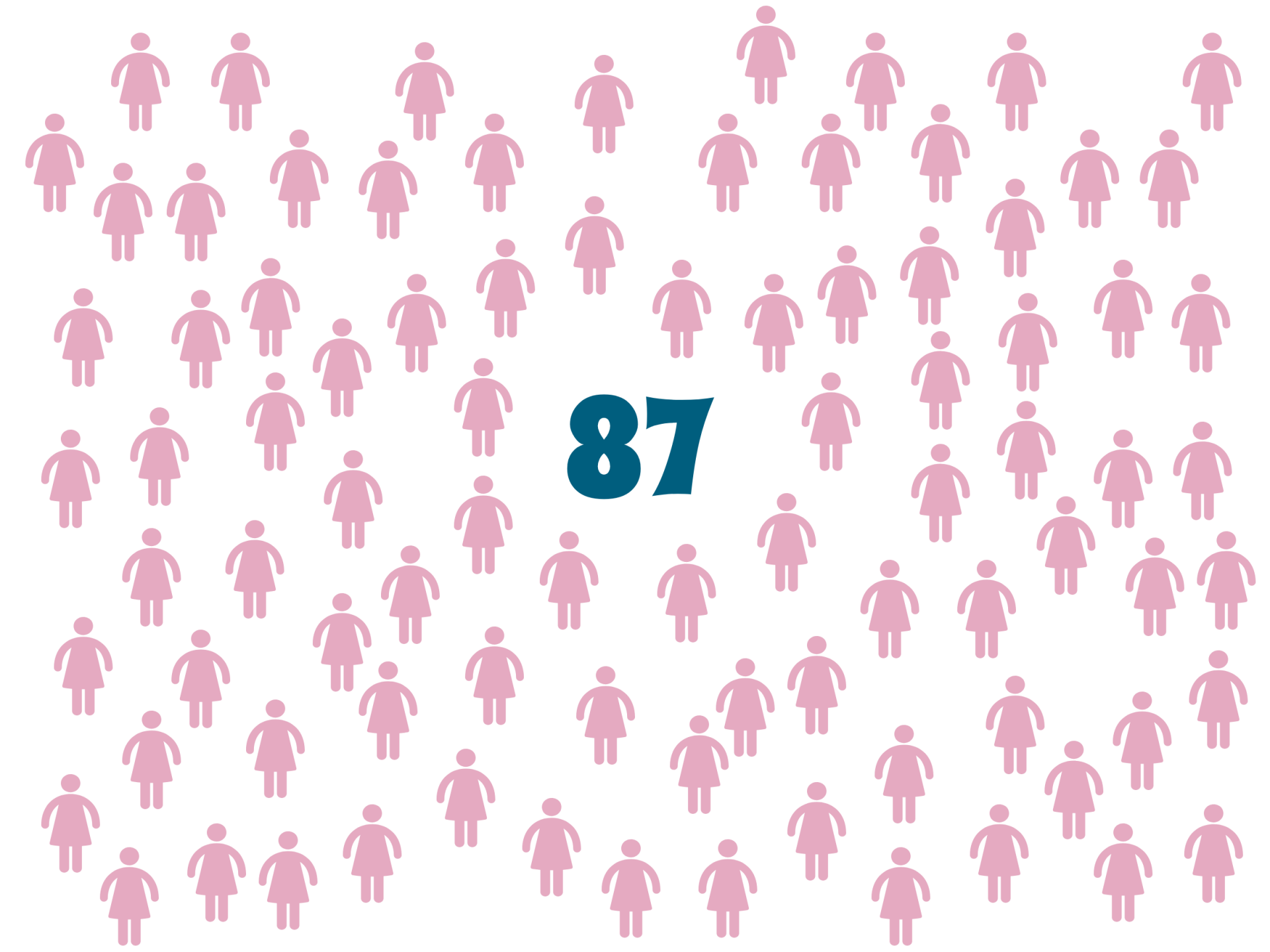
Baseline

9.-12. uge

9.-12. uge

9.-12. uge

Patienterne var deres egen kontrol

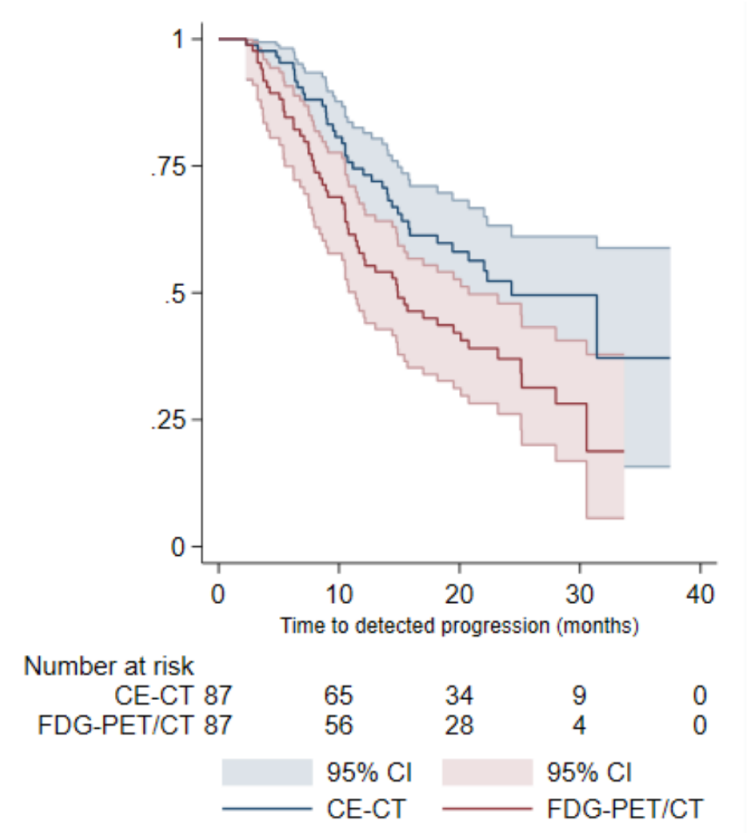

87

detektion af progression

Fordeling af progression		***N*** (%)	***N*** (%)
Progression set først på FDG-PET/CT	Progression på begge modaliteter, set først FDG-PET/CT	26 (29.9)	43 (49.4)
	Progression kun på FDG-PET/CT	17 (19.5)	
Progression set først på CE-CT	Progression på begge modaliteter, set først på CE/CT	0 (0.00)	1 (1.15)
	Progression on CE/CT only	1 (1.15)	
Progression på modaliteter samtidig		11 (12.6)	
Ikke progression på nogen af modaliteterne		32 (36.8)	

tid til første progression

MÅNEDER, MEDIAN (95% CI)



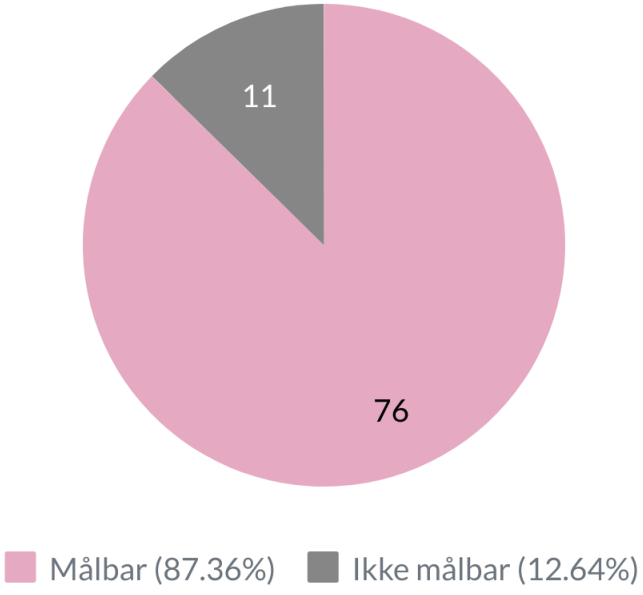
FDG-PET/CT
14.9 (11.4-20.8)

CE-CT
24.3 (15.9 -inf)

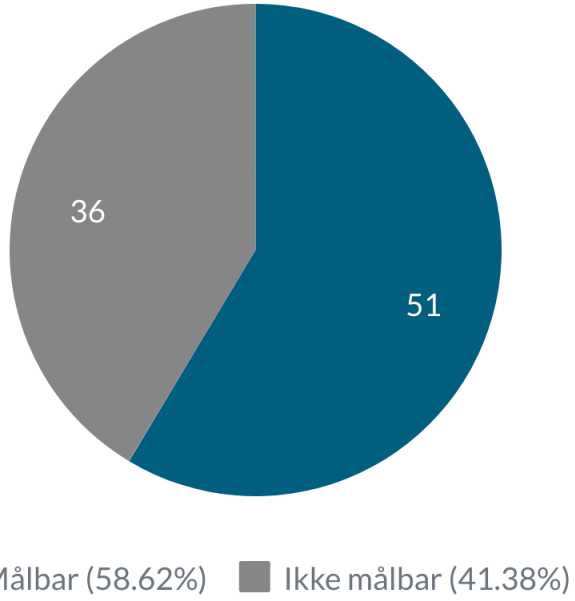
FDG-PET/CT til **CE-CT**
6.0 (4.3-6.4)

målbar sygdom

FDG-PET/CT
PERCIST



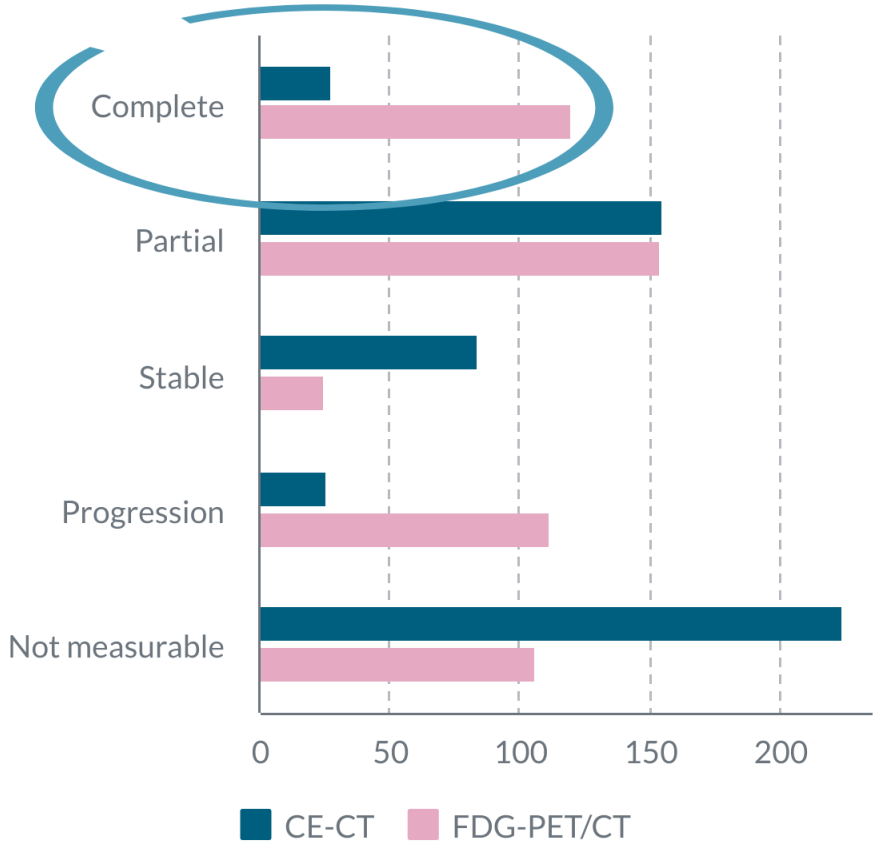
CE-CT
RECIST 1.1



responskategorier

CE-CT

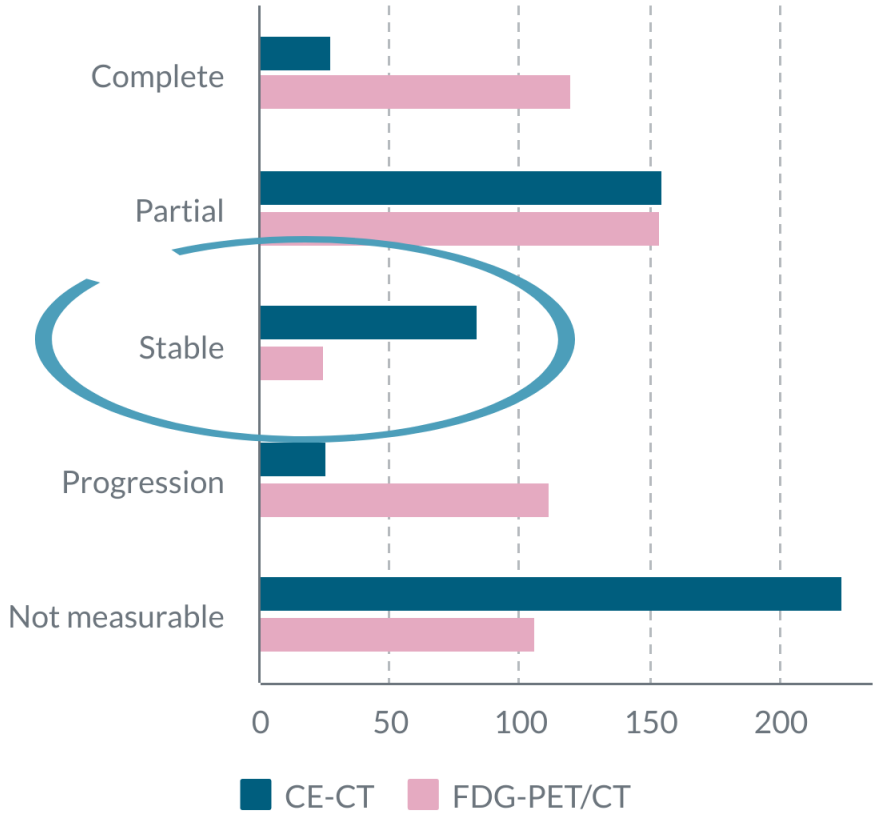
FDG PET/CT



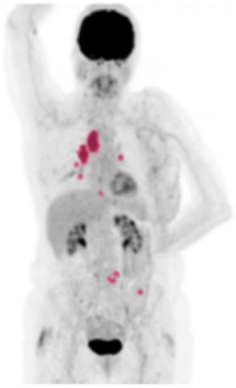
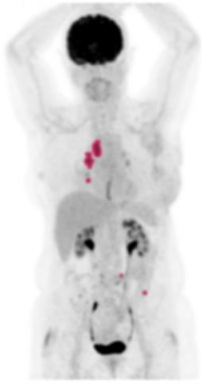
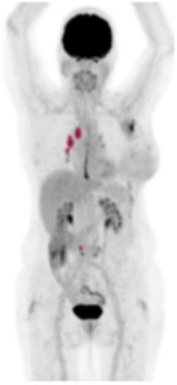
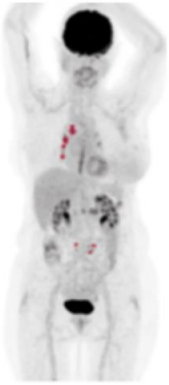
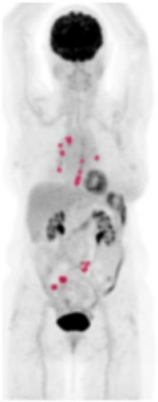
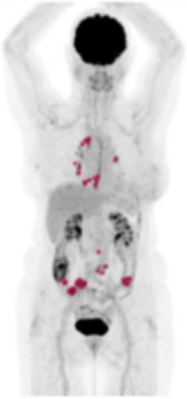
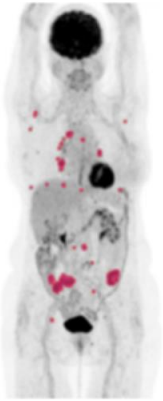
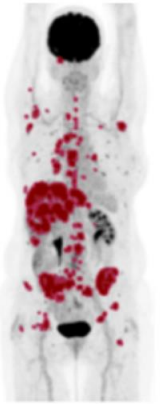
responskategorier

CE-CT

FDG PET/CT



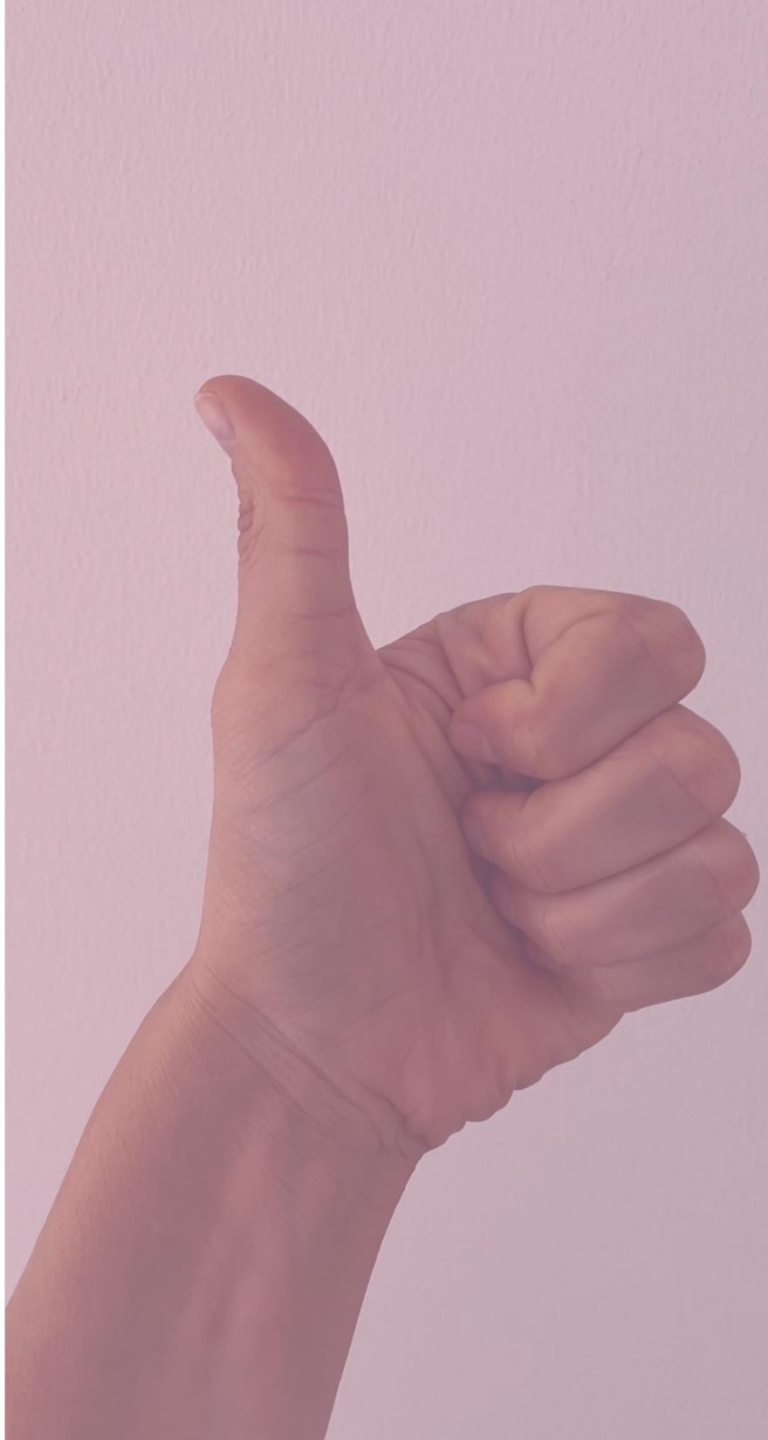
visualisering

mar 2018	maj 2018	aug 2018	nov 2018	mar 2019	jun 2019	sep 2019	jan 2020
							
baseline	CE-CT SD FDG-PET/CT PMR	CE-CT PR FDG-PET/CT PMR	CE-CT PR FDG-PET/CT PMR	CE-CT PR FDG-PET/CT **PMD**	CE-CT PR FDG-PET/CT **PMD**	CE-CT PR FDG-PET/CT **PMD**	CE-CT **PD** FDG-PET/CT **PMD**

FDG-PET/CT

VISER

- progression før CT
- mere målbar sygdom
- højere responsrater



MEN

er tidligere bedre?

MBC

overlevelse

British Journal of Cancer

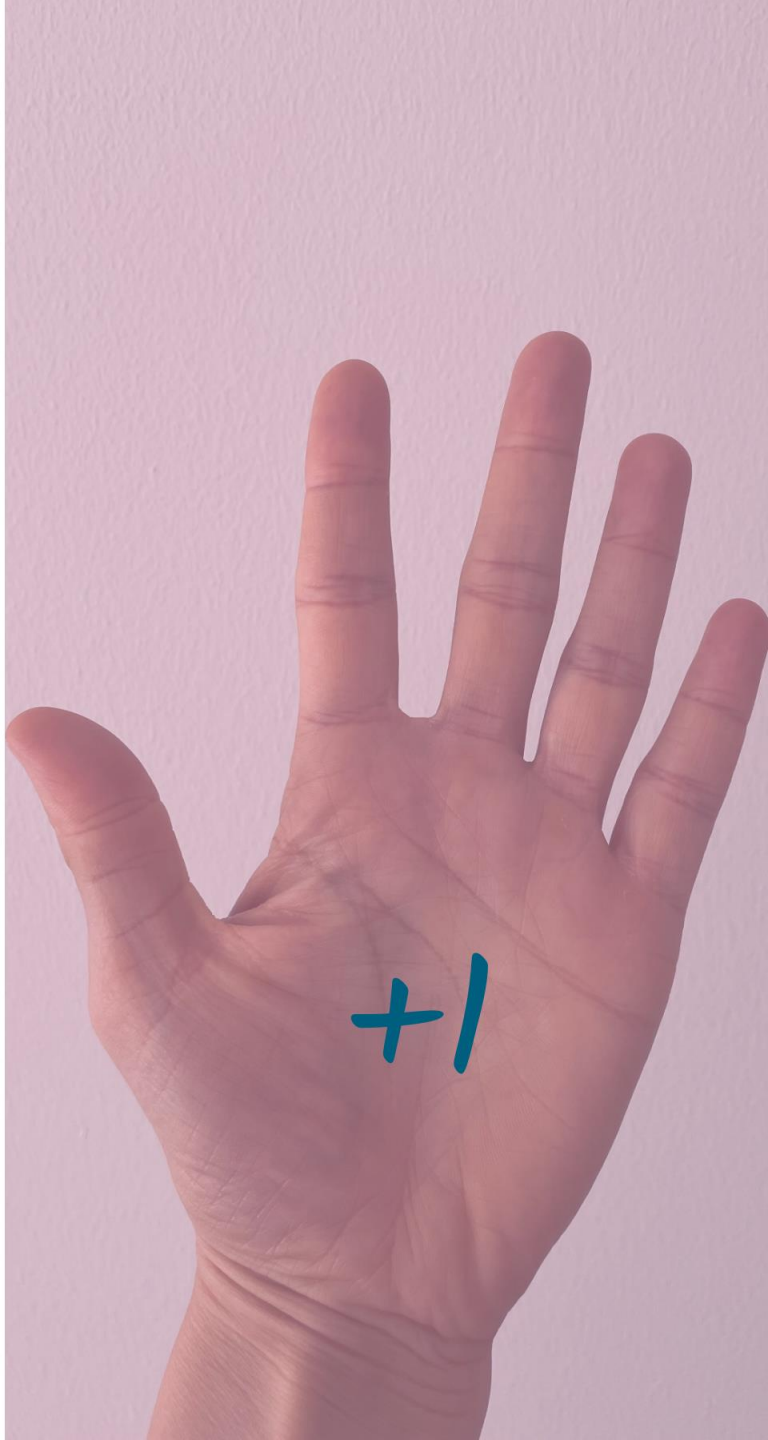
www.nature.com/bjc

ARTICLE

Clinical Studies

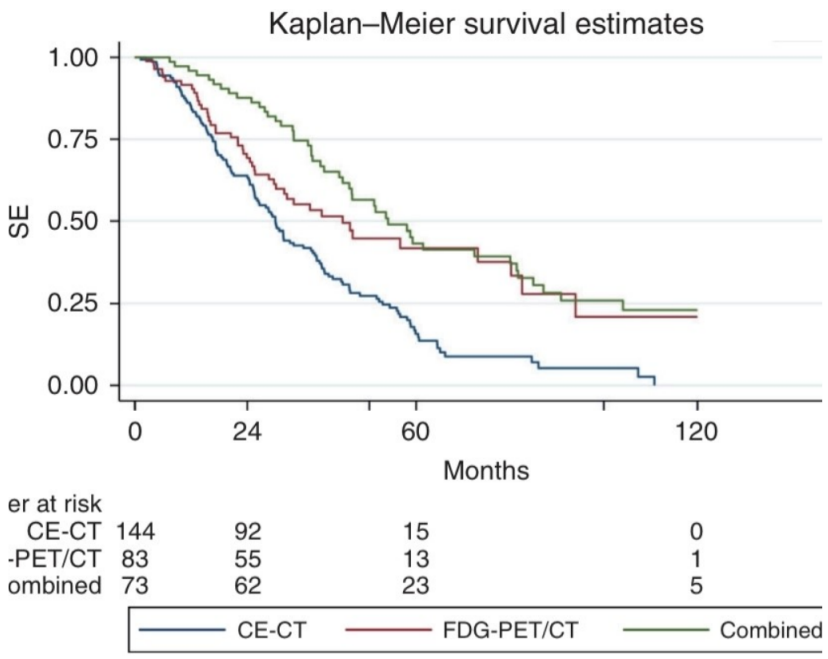
Response monitoring in metastatic breast cancer: a comparison of survival times between FDG-PET/CT and CE-CT

Mohammad Naghavi-Behzad[1,2,3,4], Marianne Vogsen[1,2,3,4,5], Rasmus Mølgård Vester[1], Maiken Madsen Bjerregaard Olsen[1], Hjalte Oltmann[1], Poul-Erik Braad[1,2], Jon Thor Asmussen[6], Oke Gerke[1,2], Werner Vach[7], Kristian Kidholm[8], Annette Raskov Kodahl[1,5], Wolfgang Weber[9,10] and Malene Grubbe Hildebrandt[1,2,3,4,8]



overlevelse

MÅNEDER, MEDIAN (95% CI)



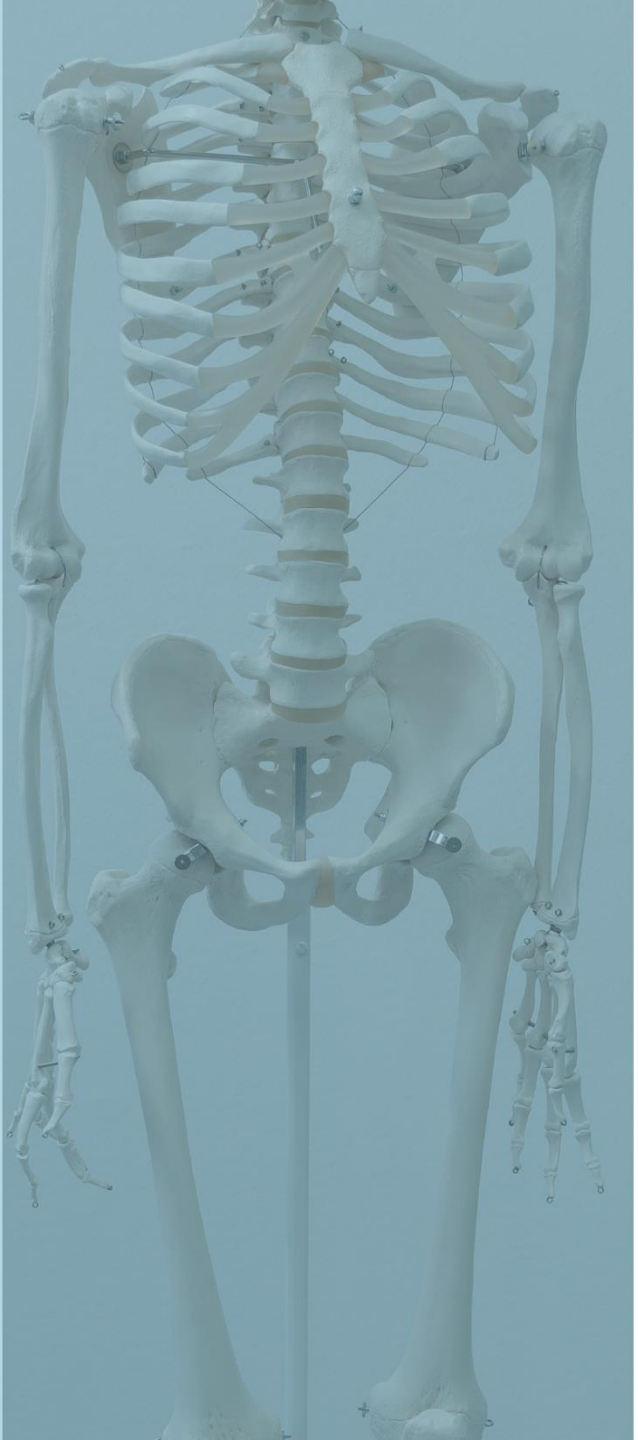
FDG-PET/CT
44.3 (29.7-80.2)

CE-CT
30.0 (25.4-36.0)

Hazard ratio
0.44 (95% CI 0.29-0.68)
P= 0.001

Bedre bedømmelse

- behandlingseffekt
- progression



målbar sygdom

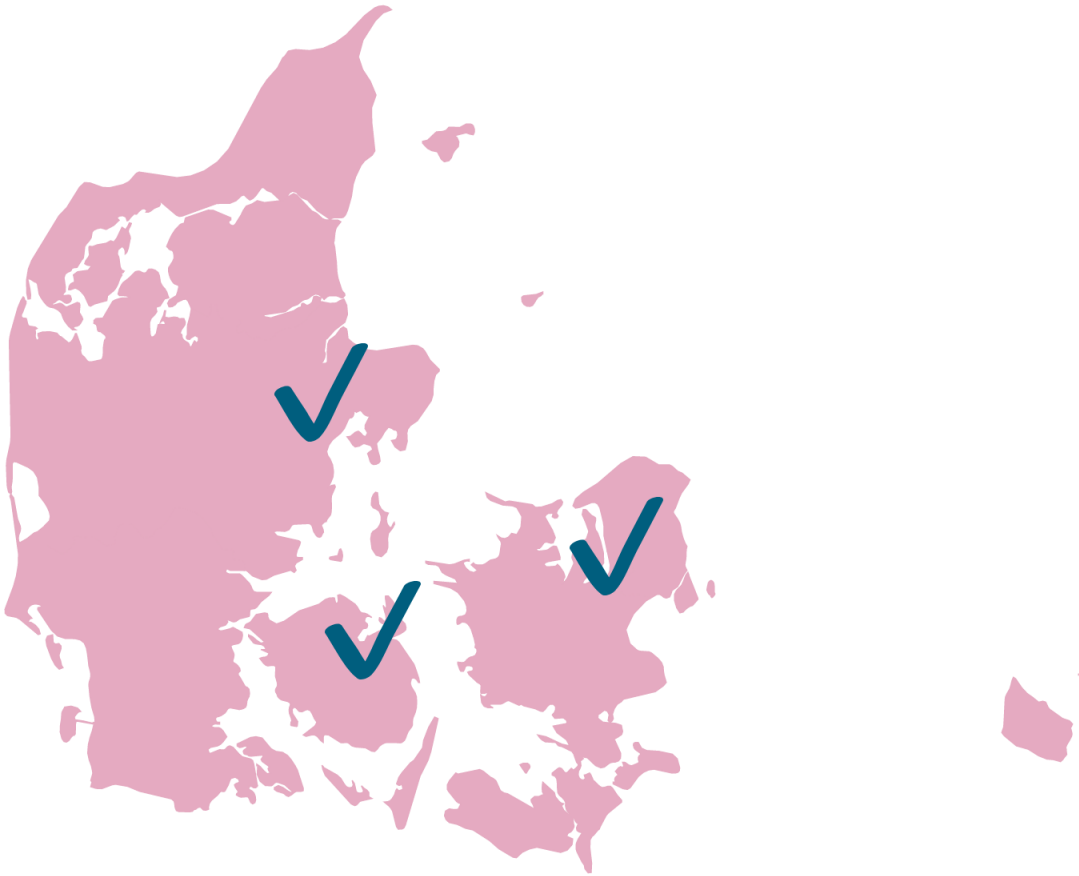
30%

med et objektivt mål
for respons

bone-only sygdom

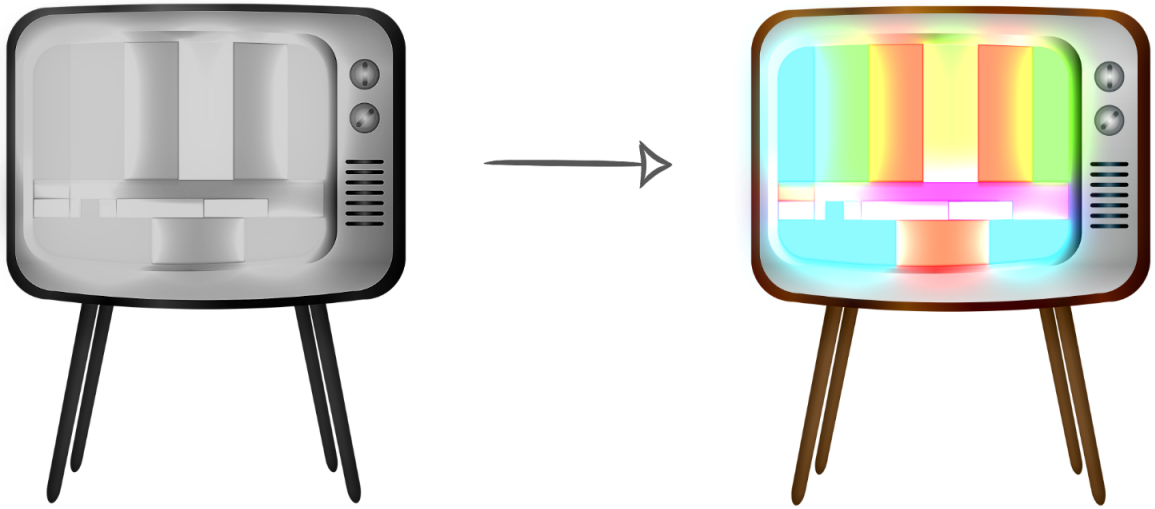
multicenter RCT

RESPONSE EVALUERING AF METASTATISK BRYSTKRÆFT
CT versus FDG-PET/CT



valget

RESPONSE EVALUERING AF METASTATISK BRYSTKRÆFT



spørgsmål