

3rd International Workshop on Interim PET in Lymphoma
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EANM FDG PET/CT accreditation program



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GUIDELINES

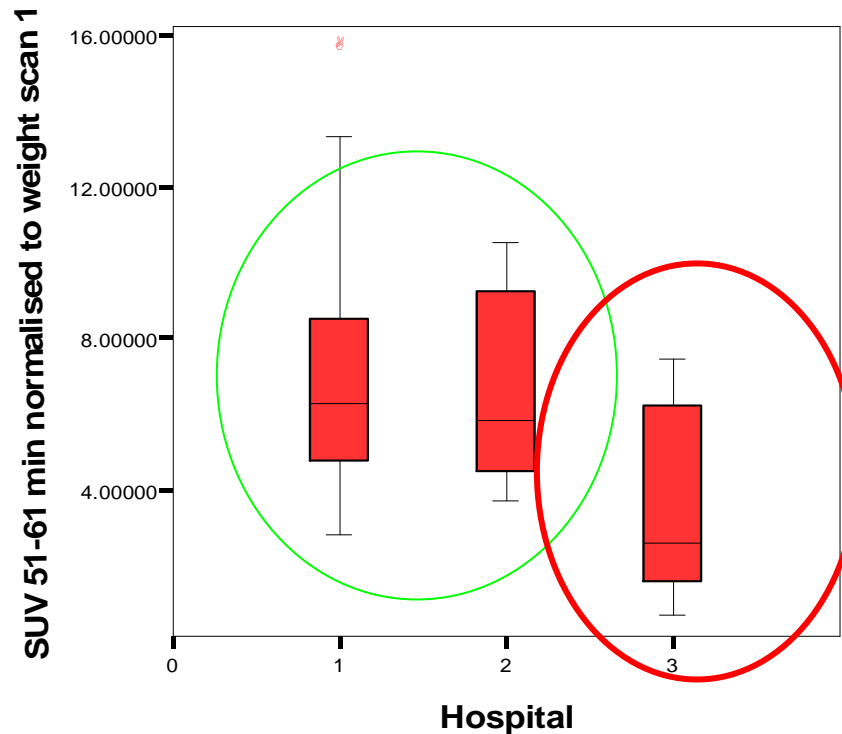
FDG PET and PET/CT: EANM procedure guidelines for tumour PET imaging: version 1.0

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The EANM guideline for FDG PET and PET/CT provides recommendations for:

- Minimizing physiological or biological effects by patient preparation guidelines
- Procedures to ensure accurate FDG administration
- Matching of PET study statistics ('image quality') by prescribing FDG dosage as function of patient weight, type of scanner, acquisition mode and scan duration
- Matching of image resolution by specifying image reconstruction settings and providing activity concentration recovery coefficients specifications
- Standardization of data analysis by prescribing region of interest strategies and SUV measures
- Multi-center QC/QA procedures for PET and PET/CT scanners

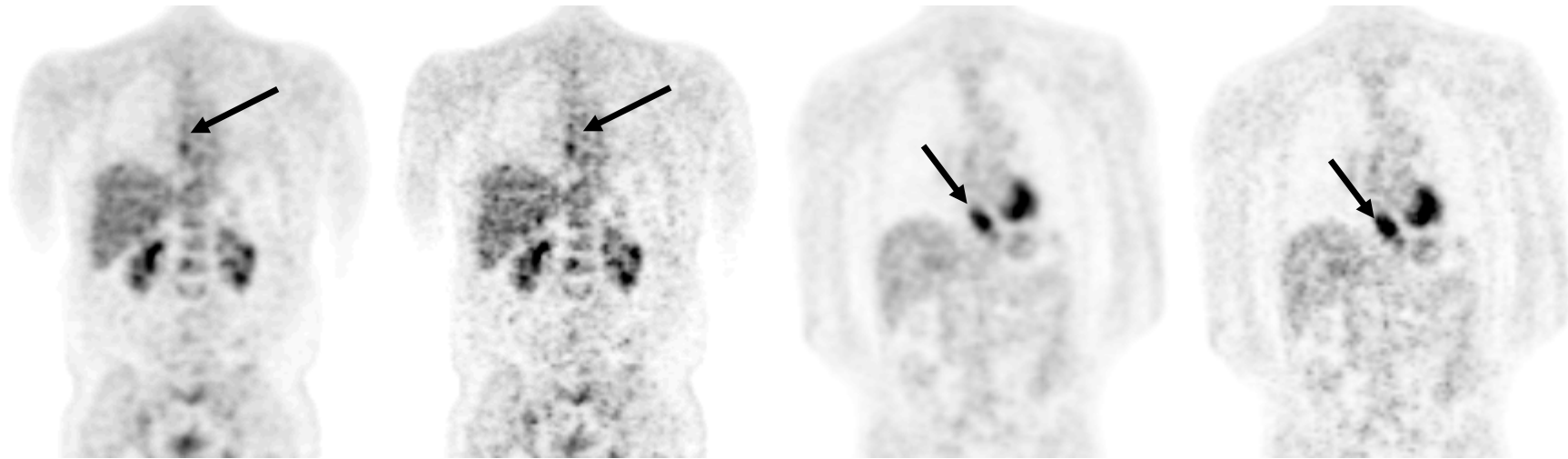
Why do we need a guideline for quantitative FDG PET/CT ?



- Recent (2009) observation on site differences in SUV
- Site 1 & 2 closely followed NL standardized protocol
 - Site 3 did not – almost a factor of 2 lower SUV on average

Outcome of quantitative FDG-PET studies using standardized uptake values depend on many biological and technical factors

*Example of one of the many small factors: effects of different number of OSEM iterations, on SUV



SUVmax = 4.0

5.9

6.4

8.6

SUV 50%= 3.0

4.1

4.6

5.9

Impact of blood glucose level

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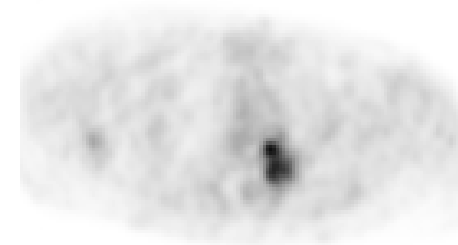
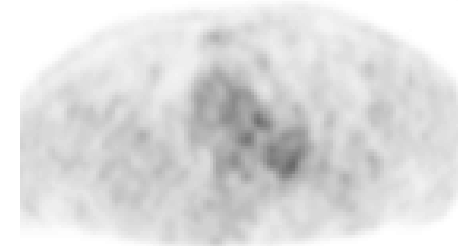
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Glu 200 mg%



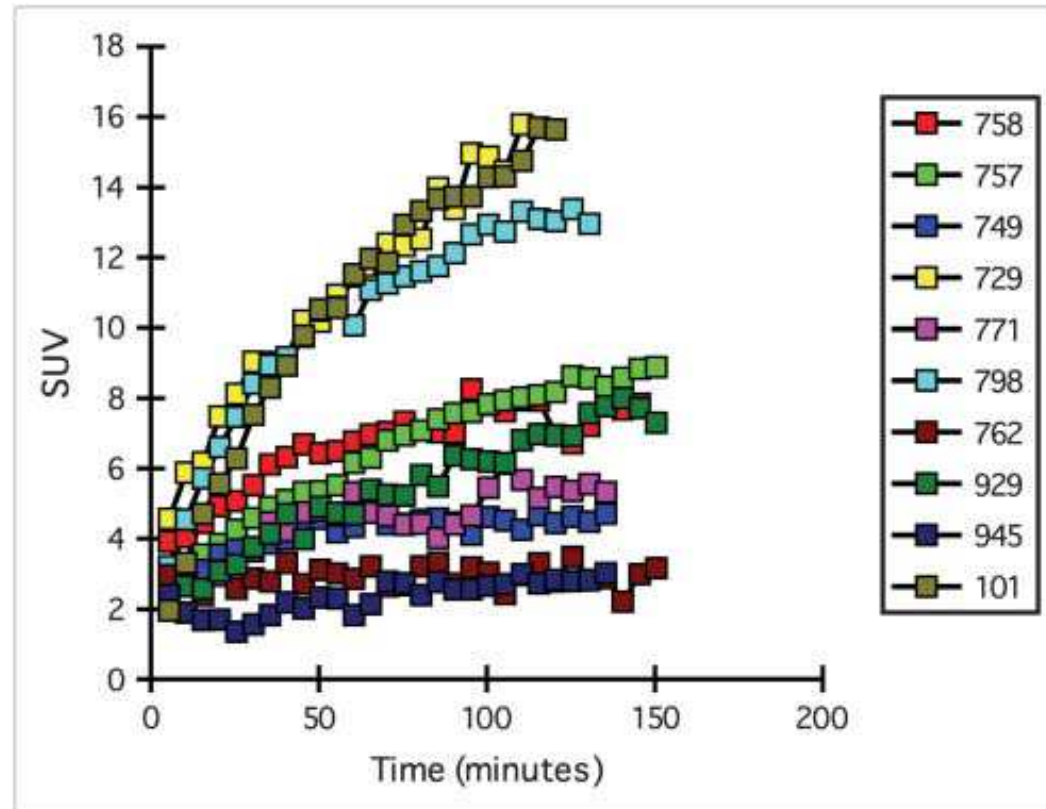
Glu 79 mg%



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Factors affecting SUV

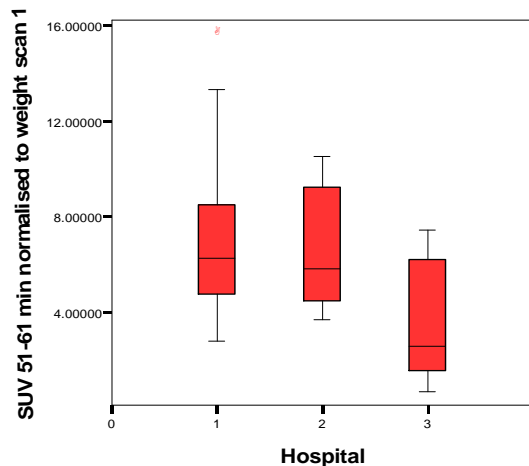
biological factors – uptake period



Lowe VJ *et al.* Optimum scanning protocol for FDG-PET evaluation of pulmonary malignancy. J Nucl Med. 1995, image taken from Shankar *et al.* JNM 2006

Scanner validation programs

- Usually performed as part of imaging site accreditation to check (minimal) PET/CT system performance
- Accreditation organisations have different scanner validation procedures
- There is not a unique phantom adopted by all groups



Need for harmonisation of *resolution-dependent quantitation*, rather than minimal performance standards

Types of standards / recommendations

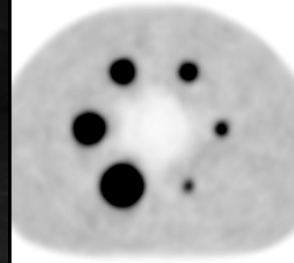
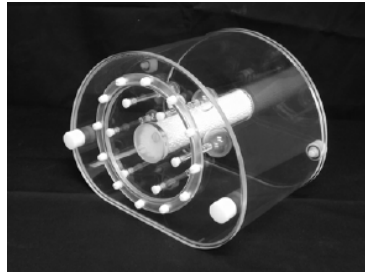
- Minimal performance standards:
 - “Focus” on accuracy
 - Lower threshold

- Harmonising performance standards
 - “Focus” on reducing inter-institute, -scanner, -patient variability – ‘precision’
 - Lower and upper limits

Multi-center QC and calibration

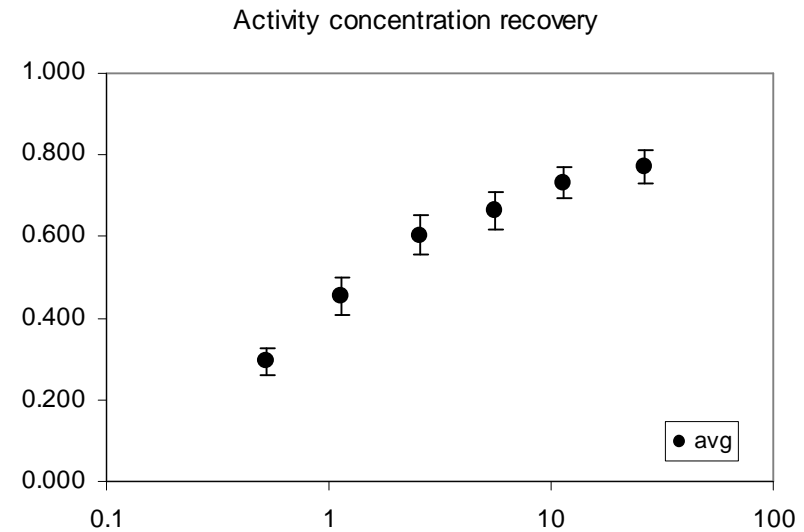
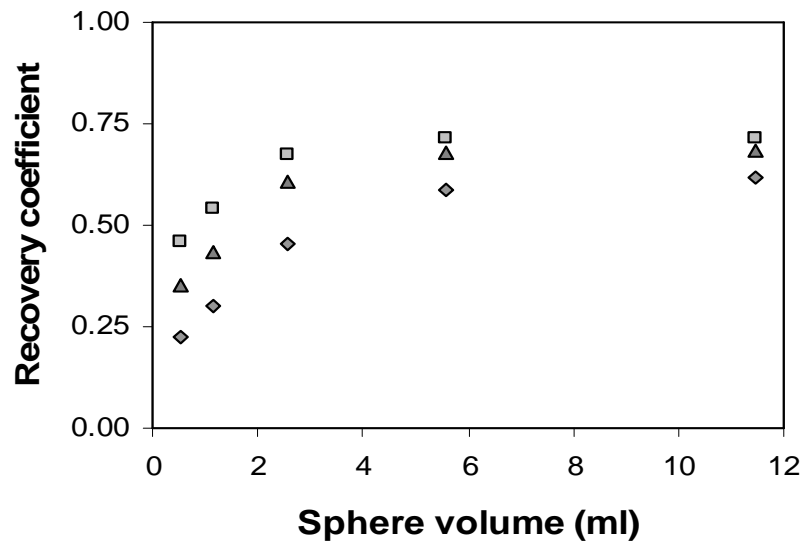
- Daily QC conform standard procedure of system / manufacturer
- Calibration QC using (cylindrical) phantom (15-30 cm diameter)
- “Adjusted” NEMA NU 2-2001 Image Quality procedure/measurement to measure recovery coefficients as function of sphere size (= ‘effective image resolution’)
- CT-QC cf recommendations of ESR/national law
- Misc. QC (e.g. for scales, alignment etc)

Absolute activity concentration recoveries – NEMA NU 2 2001 IQ Phantom



w/o

with standardisation



Right figure: Average (± 1 SD) activity concentration recovery coefficients as function of sphere size observed with image quality quality control measurements at 8 different scanners

European accreditation program EARL, EANM, EORTC

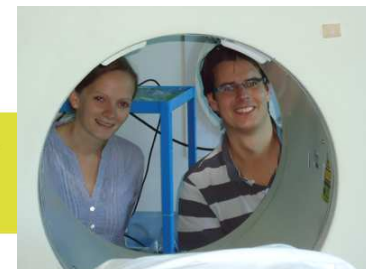


Based on the QC experiments as described in the EANM guideline published in EJMNM 2010

Manuals, SOPs, online questionnaire completed in August 2010

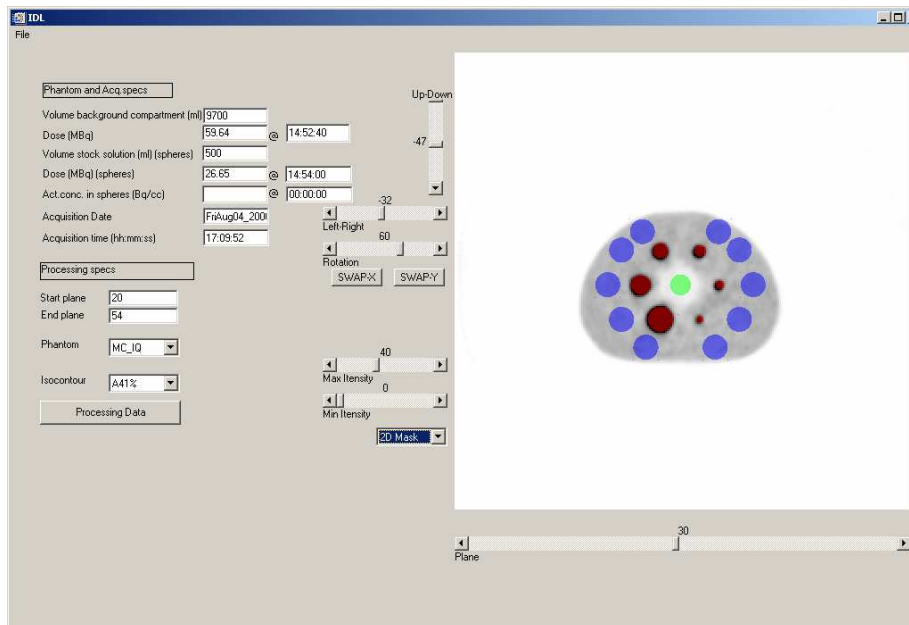
Training of EARL coordinator (S. Ettinger) September 2010

Pilot program (in collaboration with EORTC) began in October 2010 with 11 sites (12 PET/CT systems)



European accreditation program EARL - EANM, EORTC

Standardised software tools for analysis and interpretation of QC experiments were developed:



Calibration QC:

- Automatic VOI placement
- Verification of calibration
- Verification of inter-&intra-plane uniformity

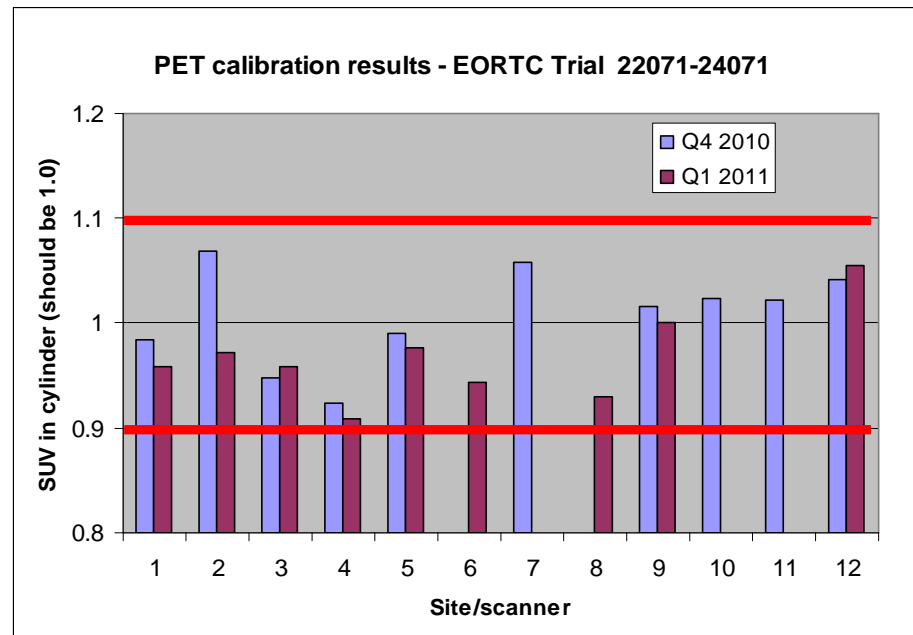
IQ QC

- Recovery coefficients (volume & act.conc.)
- Cold spot recovery using central insert (scatter)
- Verification of calibration using back ground VOI

Now: next phase of program is ongoing

Accreditation within trial EORTC_22071-24071: basic calibration

- 11 sites (12 PET/CT systems)



- 2 sites needed re-calibration and/or adjustment of reconstruction settings

Accreditation: in progress

- In July 2011: 7 sites joined
- In October 2011: 12 sites are joining
- In January 2012: 7 sites / 9 scanners are joining
- Q1 2012: 37 sites with 40 scanners expected
- Program is now open for all interested sites
 - Yearly certification with quarterly QC reports

EANM: next steps

FDG PET and PET/CT: EANM Procedure Guidelines for
Tumour PET Imaging **Version 2.0**

Mutual recognition of different accreditation programs

Standardization of response criteria

Standardization of reporting