this work was to study the impact of resolution on recovery coefficients (RCs) and propose a method to standardise PET spatial resolution for inter-centre comparison. **Materials and Methods:** A line source phantom and a NEMA-2012/IEC-2008 phantom with ^{68}Ga specific activity of 8 kBq/ml in spheres were prepared and acquired on a GE Discovery 690 PET/CT with EARL accreditation parameters (two 5-minutes steps overlapping on spheres). Images were reconstructed with the 3D OSEM algorithm (3 iterations, 18 subsets, TOF and resolution recovery correction) using different Gaussian post-filters with full width at half maximum (FWHM)=[0, 4.0, 6.8, 11.1, 13.6] mm. Resolution, caracterised by the FWHM, was determined on the line source phantom images for all filters. RCs were measured with Pmod 3.4 in spheres delineated on NEMA phantom PET images according to constructor volumes. Assuming that partial volume effect is proportional to sphere surface, RCs were plotted as a function of inverse sphere radius. The correlation of RC slope with PET resolution was also investigated, using a linear model. Flawless NEMA phantom PET images (without statistical noise) were simulated with Scilab 6.0.0 in order to mimic expiremental measurements and validate results. **Results:** With the line source phantom images, measured resolution for the five filters was FWHM=2.5, 4.7, 7.3, 11.4 and 13.8 mm. With the NEMA-2012/IEC-2008 phantom measurements, we demonstrated a linear relationship between RC and inverse sphere radius for each resolution (R^2≥0.99). RC line slopes were linearly correlated to image resolution (R^2=0.99). Trends were confirmed by Scilab simulation even if a systematic error was observed due to ideal simulation conditions. **Conclusion:** Linearisation of RC curves and quadratic sum of Gaussian FWHMs allowed direct determination of spatial resolution and of the needed post-reconstruction filter to reach comparable resolution for multi-centre studies, a first step towards ^{68}Ga PET/CT standardisation.

EP-0046

Standardizing image quality for ^{68}Ga-DOTA-TATE PET/CT.

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Aim: In recent years, the use of ^{68}Ga-DOTA conjugated PET tracers has become common practice. The 2017 European Association of Nuclear Medicine procedure guideline on PET/CT tumor imaging with ^{68}Ga-DOTA-conjungated peptides recommends a dose ranging between 100-200 MBq (at least 100 MBq), also depending on characteristics of the PET scanner and patient body weight. The relationship between patient weight or patient-dependent parameters and image quality is not known for ^{68}Ga-DOTA in contrast to ^{18}F-FDG where evidence exists for a quadratic dose regimen. The aim of this study is to propose a dose regimen based on a patient-dependent parameter that standardizes image quality and yields sufficient image quality for visual assessment. **Methods:** 21 patients scheduled for a diagnostic ^{68}Ga-DOTA-TATE PET/CT were prospectively included, patient weight ranged from 50-120 kg. According to local protocol a dose of 1.5 MBq ^{68}Ga-DOTA-TATE per kilogram body weight was administered. After 60 minutes scans were acquired on a Siemens Biograph mCT PET/CT in whole body listmode, 6 minutes/bed position (mbp). Listmode events were randomly sampled to obtain six reconstructions (1-6 mbp) for each patient. Image quality was assessed by the signal-to-noise ratio in a volume of interest within a homogeneous part of the liver (SNRvoi). SNR was normalized (SNRnorm) for variation in injected dose and mbp by dividing the SNRvoi with square root (dose x mbp (DTP)). The patient-dependent parameters body mass, length, body mass index, body mass per body length and lean body mass were correlated with SNRnorm. All images were visually graded (4-point scale) for image quality by three experienced nuclear medicine physicians. **Results:** A first analysis for quantitative (N=11) and visual (N=9) assessment. All patient-dependent parameters show a poor correlation (R^2<0.4) with the SNRnorm. Mean SNRvoi's of the 1-5 mbp scans are significantly ($p<0.05$) lower compared to the reference scan of 6 mbp. After normalization, no significant ($p>0.05$) difference in SNR between the mbp's was found. Comparing the mean visual score of the 2-5 mbp scans with the reference scan shows a significant lower score for the 2 and 3 mbp scans. Images with a SNRvoi of 5.8 were scored visually as sufficient. A DTP of 450 MBqxmin would lead to an average SNRvoi of 5.8. **Conclusions:** No relationship between patient-dependent parameters and image quality is found. A DTP of 450 MBqxmin is required for visually sufficient image quality.

EP-0047

Evaluation of Multi-Center PET/CT Quality Assurance: Multi-Paradigm Software Enables Automated PET Quality Control

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Context: PET quality assurance (QA) is becoming increasingly important as well as more complex, following the technological and radiopharmaceutical progress in PET imaging. Consequently, PET quality control (QC) has to handle an increasing heterogeneity of devices and diversity of clinical applications. However, actual PET QC focuses on equipment and good practice, while QC of individual datasets stays costly in terms of time and resources, and thus often lacks adequate diligence. **Aim:** Our aim is to promote automated PET QC of individual datasets and demonstrate its importance and feasibility as integral part of PET imaging. First objective was to develop a software prototype for automated PET QC on diverse data sets. Second objective was to demonstrate feasibility and benefits of such software. In particular, the automated QC should enable an in depth evaluation of data from a nationwide PET survey organized by the Swiss Society of Nuclear Medicine (SGNM-SSMN). **Materials and Methods:** The software implements a multi-paradigm approach based on an in-house software development tool. Among a range of modern design patterns, the software implements an embedded rule-based system to support decisions and reconfigurations of itself at runtime. A total of 453 datasets originating from 18 different PET/CT systems at 14

Swiss sites was available for QC. According to a detailed study protocol, each site was requested to provide a range of various image reconstructions from multiple acquisitions of two differing phantoms. The software was applied in a single run to all datasets, producing an individual quality report for each dataset and a database making all results available for further evaluation. **Results**: The automated QC correctly classified the diverse datasets according to acquisition protocol, reconstruction protocol and type of phantom used. Corresponding protocol adherence verification and quantitative evaluations were performed. The system rejected 7% of the data sets because of serious violations of protocol. Another 57% of the datasets were categorized as of restricted use, because of a variety of minor violations of protocol or a mismatch between quantitative specifications and actual data. Only 36% of the data sets fully passed QC. The resulting database proved to be essential for further evaluations as published elsewhere. **Conclusion**: The results indisputably prove the need, the feasibility and the benefits of automated PET QC. More intelligent software is a prerequisite for rigorous PET QC of individual datasets, especially given the increasing diversity of PET imaging applications.

EP-0048

PET/CT scanner qualification in onco-haematological Clinical Trial: comparison between nationwide experience

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Purpose/Introduction: The aim of this work was to compare the Clinical Trial Qualification (CTQ) adopted by the Italian Foundation on Lymphoma (FIL), the Grupo Espanol de Linfomas/Transplante Autologo de Medula Osea (GELTAMO) and the International Extranodal Lymphoma Study Group (IELSG). **Subjects & Methods:** Local personnel acquired Uniformity (UQP) and Image Quality (IQ) NEMA/IEC phantoms filled with 18F. The images were uploaded to a central server and analysed within Cuneo CoreLab. Background activity concentration (the average of activity concentration in a large homogenous ROI) in UQP (BACUQP) and in IQ (BACIQ) and sphere to background ratio (SBR) in the IQ phantom were compared to expected values. Recovery coefficient (RC) were calculated in the IQ phantom. Inter-scanner variability (ISV) of BACUQP, BACIQ and SBR was estimated as the 95% confidence level of difference between measured and expected values. Criteria for fulfilling the CTQ are a ISV less than 10% in BACUQP and RC coefficient within EANM limits. **Results:** 68/89 (76%) Italian PET/CT scanners fulfilled the CTQ. For qualified scanners the CTQ was reached at the first round in 35% of the cases, while in 31%, 16% and 18%, two, three or more than three iterations, were required, respectively. The ISV were 21.1%, 62.0% and 61.7% for BACUQP, BACIQ and SBR respectively. 25/26 (96%) Spanish PET/CT scanners fulfilled the CTQ. For qualified scanners the CTQ was reached at the first round in 24% of the cases, while in 40%, 16% and 20%, two, three or more than three iterations, were required, respectively. The ISV were 20.8%, 36.4% and 57.5% for BACUQP, BACIQ and SBR respectively. 22/29 (76%) worldwide PET/CT scanners fulfilled the CTQ. For qualified scanners the CTQ was reached at the first round in 59% of the cases, while in 27%, 0% and 14%, two, three or more than three iterations, were required, respectively. The ISV were 21.9%, 38.2% and 43.9% for BACUQP, BACIQ and SBR respectively. **Discussion/Conclusion:** The CTQ is a robust and reproducible procedure to verify inter-scanner calibration but has several limitations. Indeed, the BACIQ is at least two or three times larger than BACUQP demonstrating that the uniformity phantom, used to achieve CTQ, is more accurately prepared by local sites. SBR demonstrated a great variability (ISV from about 43.9% to 61.7%) because it accounts both for variability in phantom preparation and in reconstruction algorithm tuning.

EP-0049

Quantitative PET: Count Number Adaptations of Organ and Site specific Acquisition Protocols are a Key Determinant of comparable PET/CT Measurements

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Aim: The ever-growing diversity and complexity of PET/CT systems make it increasingly difficult to define common acquisition protocols for quantifiable and comparable PET measurements in clinical routine and, above all, in multicenter clinical trials. We aimed to analyze the dependency of quantitative PET on technical variability, in order to improve acquisition and reconstruction protocols. The results formed the base for selected clinical acquisitions protocols, tailored to particular PET/CT systems. **Materials and Methods:** Image noise was examined in 422 PET/CT datasets from 18 PETCT systems participating in a Swiss multicenter phantom study. 215 of these measurements contained also hot spheres for recovery curve (RC) analysis. The study protocol combined different acquisition durations and low- and high-resolution image reconstructions with filtered back projection (FBP), ordered subset expectation maximization (OSEM), and vendor specific point spread function (PSF) based reconstruction. Data was analyzed with regard to exposure, defined as the product of background activity concentration and acquisition time. This produced results comparable in relation to the number of available decays per volume, independently from the actual activity concentration. Quality assurance (QA) limits for RCs were taken from guidelines issued by the Federal Office of Public Health in Switzerland. Additionally, RC shapes were quantitatively analyzed. **Results**: Passing the given QA limits depended highly on adequate exposure by keeping image noise levels low. Also, the minimal exposures required to fulfill the given QA limits differed between PET/CT systems, acquisition protocols and reconstruction algorithms. Despite higher image noise levels, quantifiability of FBP data was affected less by low count numbers than OSEM or PSF data. Insufficient count numbers led to faulty and incomparable image quantification,