Statistics Appendix

Let Y denote the result of the PET/CT for a single LNM, i.e. $Y = 1$ indicates a true positive PET/CT, and $Y = 0$ a false negative PET/CT result. We can relate Y to a diameter of the TD in the LNM using a logistic growth curve model, i.e.

$$P\,(\,Y = 1|\,d) = logit^{-1}\,(\,\alpha + \beta d)$$

From such a model we can determine the threshold d_p to reach a detection probability of at least p as

$$d_p = (logit\,(p) - \,\alpha)/\beta$$

Under condition 1 we can fit the logistic growth curve model according to the maximum likelihood principle based on standard software for logistic regression. Under condition 2, we can also use the maximum likelihood principle. The contribution of a subregion with two LNMs to the likelihood is then based on the following modeling of the distribution of the number *N* of detected LNMs:

$$P(N = 0\,|d_1\,, d_2) = P(Y_1 = 0\,|d_1)\,P(\,Y_2 = 0\,|d_2)$$

$$P(N = 1|d_1\,, d_2) = P(Y_1 = 1|d_1)\,P(\,Y_2 = 0\mid d_2) + \,P(Y_1 = 0\,|d_1)\,P(\,Y_2 = 1\,|d_2)$$

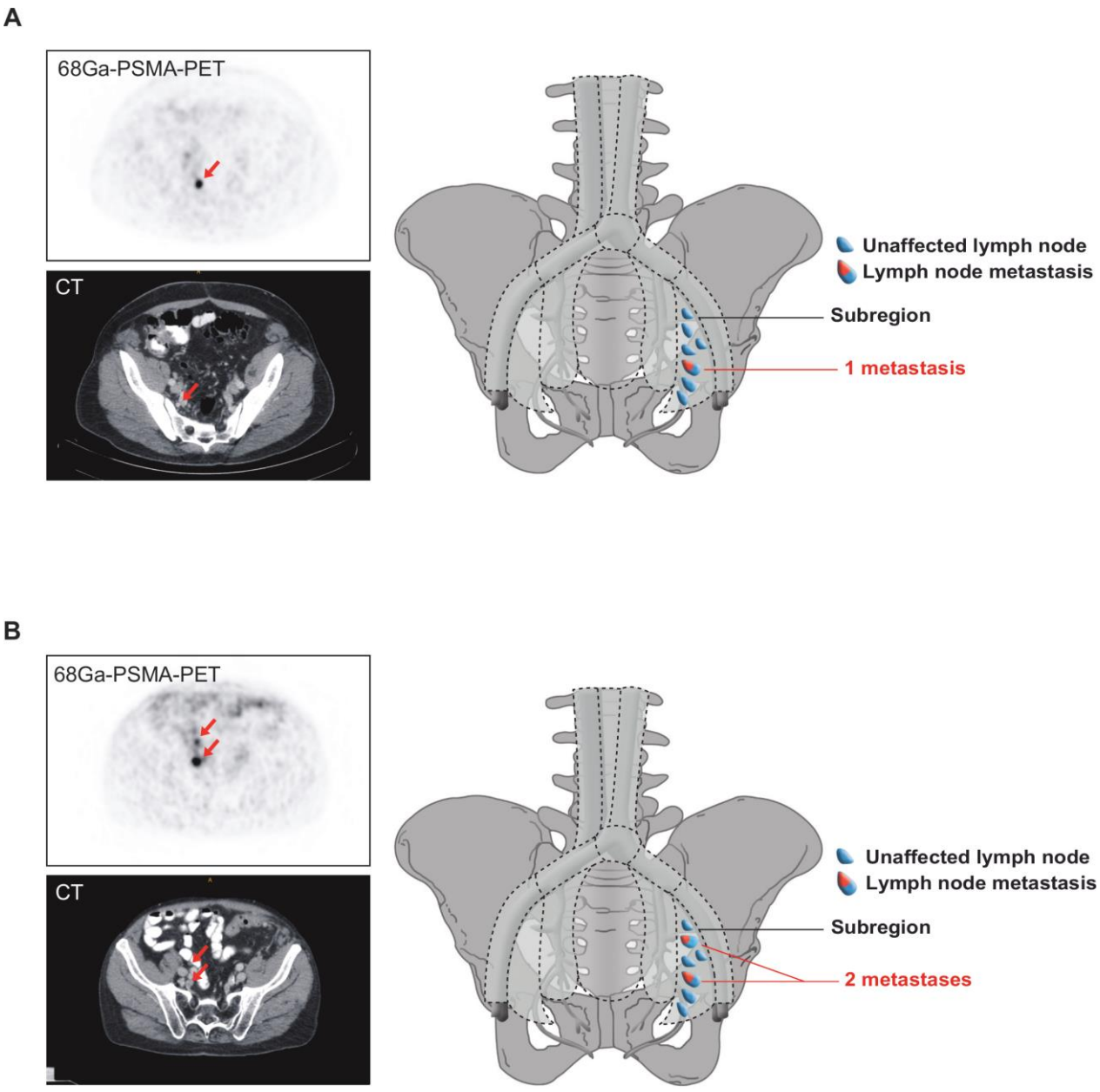
$$P(N = 2\,|d_1\,, d_2) = P(Y_1 = 1\,|d_1)\,P(\,Y_2 = 1\,|d_2)$$

This modeling reflects the assumption that the detection of one LNM is stochastically independent of the detection of the other LNM. We made use of Stata's ml command to obtain the corresponding maximum likelihood estimates.

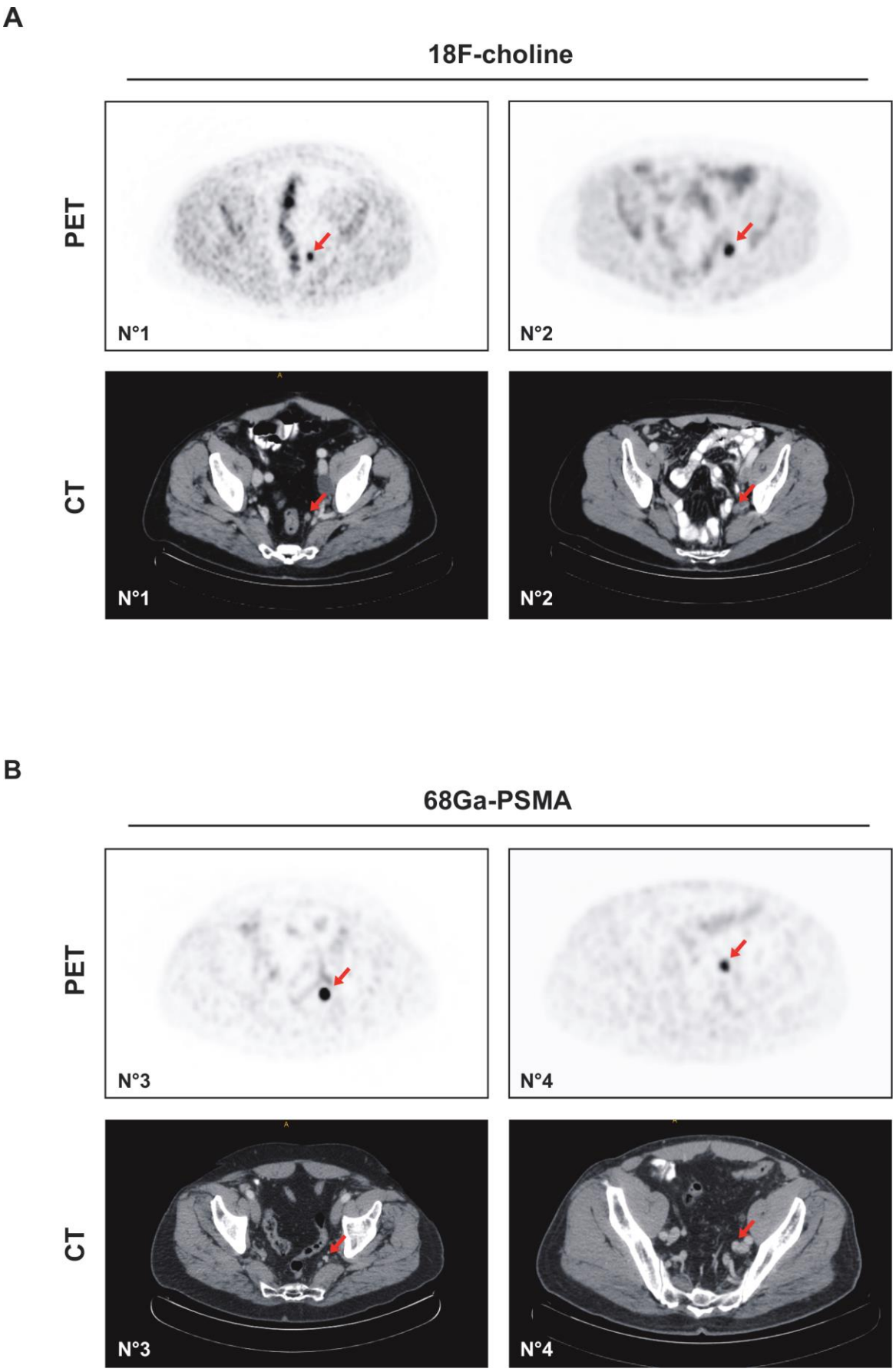
Supplemental Table 1 Size, area and volume from tumour deposits in histologically confirmed true positive or false negative lymph node metastases on 18F-choline-PET/CT and 68Ga-PSMA-PET/CT

Condition 1				
	18F-choline-PET/CT (n=73LNM)		68Ga-PSMA-PET/CT (n=73 LNM)	
TUMOR DEPOSITS in LNM	True positive LNM* (n=52)	False negative LNM (n=21)	True positive LNM (n=55)	False negative LNM (n=18)
Longitudinal diameter Mean ±SD, median (mm)	10.8 ±6.7, 9.5	3.6 ±2.8, 2.5	10.4 ±6.9, 8.0	2.9 ±1.6, 2.5
Short diameter Mean ±SD, median (mm)	7.1 ±3.7, 6.8	2.1 ±1.9, 1.5	7.0 ±5.4, 5.5	1.9 ±1.5, 1.0
Area Mean ±SD, median (mm^2)	76.2 ±87.0, 48.3	9.2 ±15.5, 2.9	84.2 ±142.5, 38.9	5.7 ±6.6, 2.4
Volume Mean ±SD, median (ml)	0.5 ±0.9, 0.2	0.03 ±0.09, 0.0	0.9 ±2.4, 0.2	0.01 ±0.02, 0.0

* LNM = Lymph node metastases



Supplemental Figure 1. (A) PET and corresponding CT with one LNM in a subregion fulfilling **condition 1**: subregion (dashed lines) with one solitary PET-positive and histologically verified LNM. **(B)** PET and corresponding CT with two LNMs in a subregion fulfilling **condition 2**: subregion with two PET-positive and histologically verified LNMs.


A
18F-choline
PET
CT
N°1
N°2
N°1
N°2
B
68Ga-PSMA
PET
CT
N°3
N°4
N°3
N°4

Supplemental Figure 2. (A) Representative 18F-choline-PET and **(B)** 68Ga-PSMA-PET meeting condition 1 with corresponding CTs from representative patient N°1-4 showing single lymph node metastasis (red arrows) in one subregion.