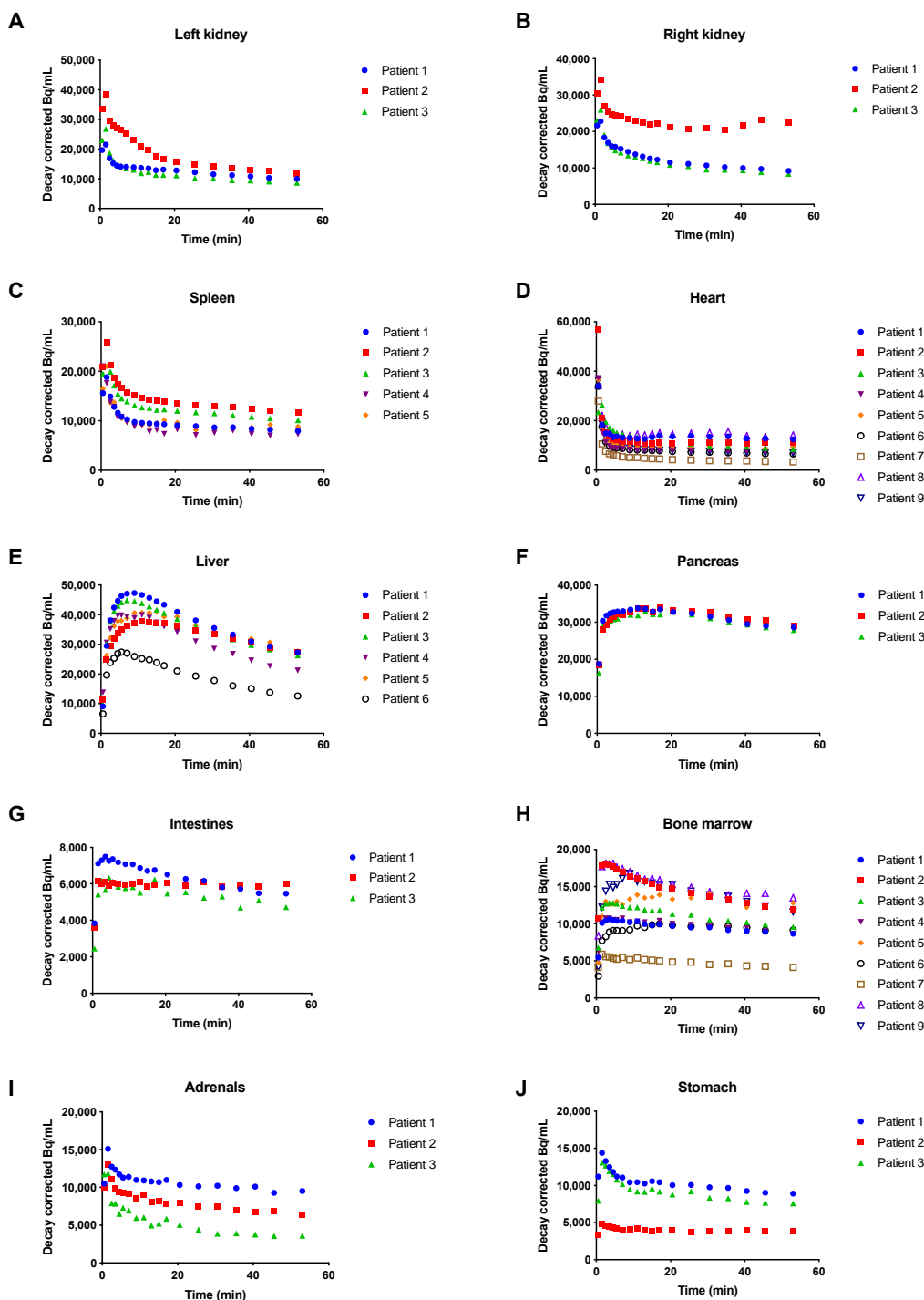**Supplemental Figure 1**: Whole-body biodistribution of ^{11}C-glutamine uptake in normal tissues. The standard uptake value (SUV), normalizing by body weight (bw), is plotted for 1-hour post-injection.

Supplemental Figure 2: Dynamic PET analysis of ^{11}C-glutamine uptake in normal tissues. The activity concentration (Bq/mL) decay-corrected to the time of injection is plotted over time for each organ. Shown are data for (**A**) Left kidney, (**B**) Right kidney, (**C**) Spleen, (**D**) Heart, (**E**) Liver, (**F**) Pancreas, (**G**) Intestines, (**H**) Bone marrow, (**I**) Adrenals, and (**J**) Stomach.
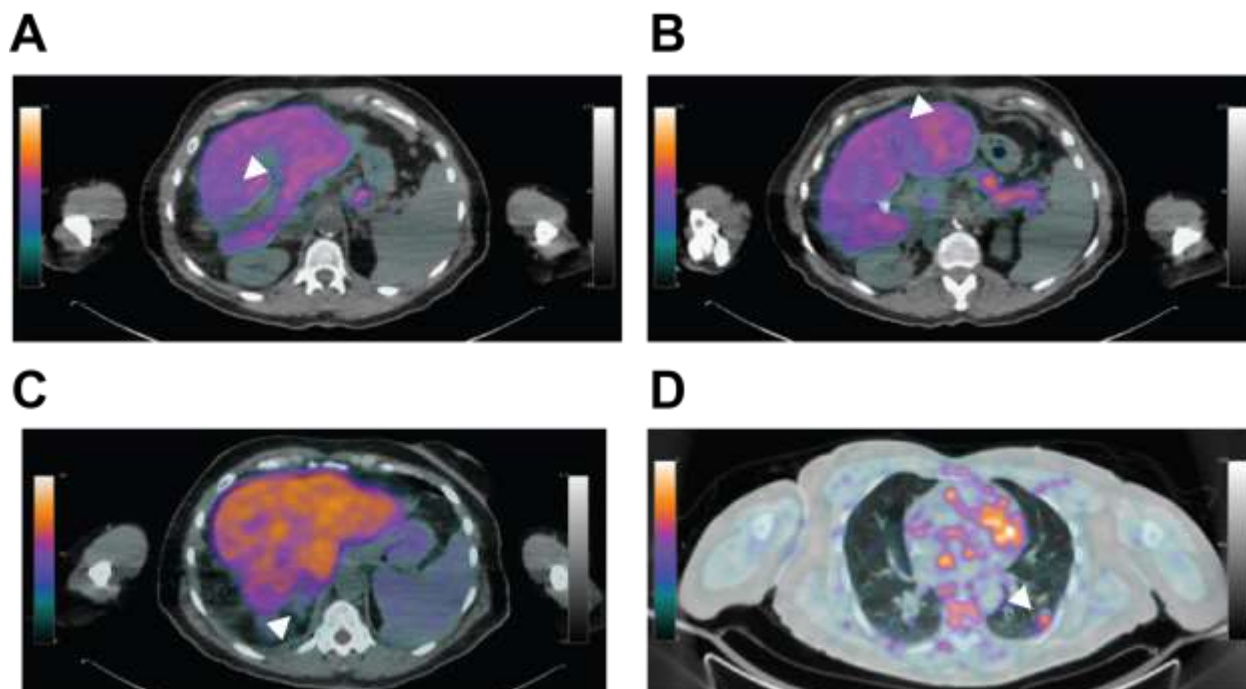
Supplemental Figure 3: ^{11}C-glutamine tumor imaging in a patient with metastatic colorectal cancer. Axial ^{11}C-glutamine PET/CT fusion images corresponding to two liver lesions (**A** and **B**), an adrenal mass (**C**), and a lung nodule (**D**). White arrowheads point to the lesions. The lesion-to-blood pool ratios from the whole-body scan were 5.40 (**A**), 5.11 (**B**), 3.50 (**C**), and 1.93 (**D**). The lesion-to-liver ratios from the whole-body scan were 1.19 and 1.13 for **A** and **B**, respectively.
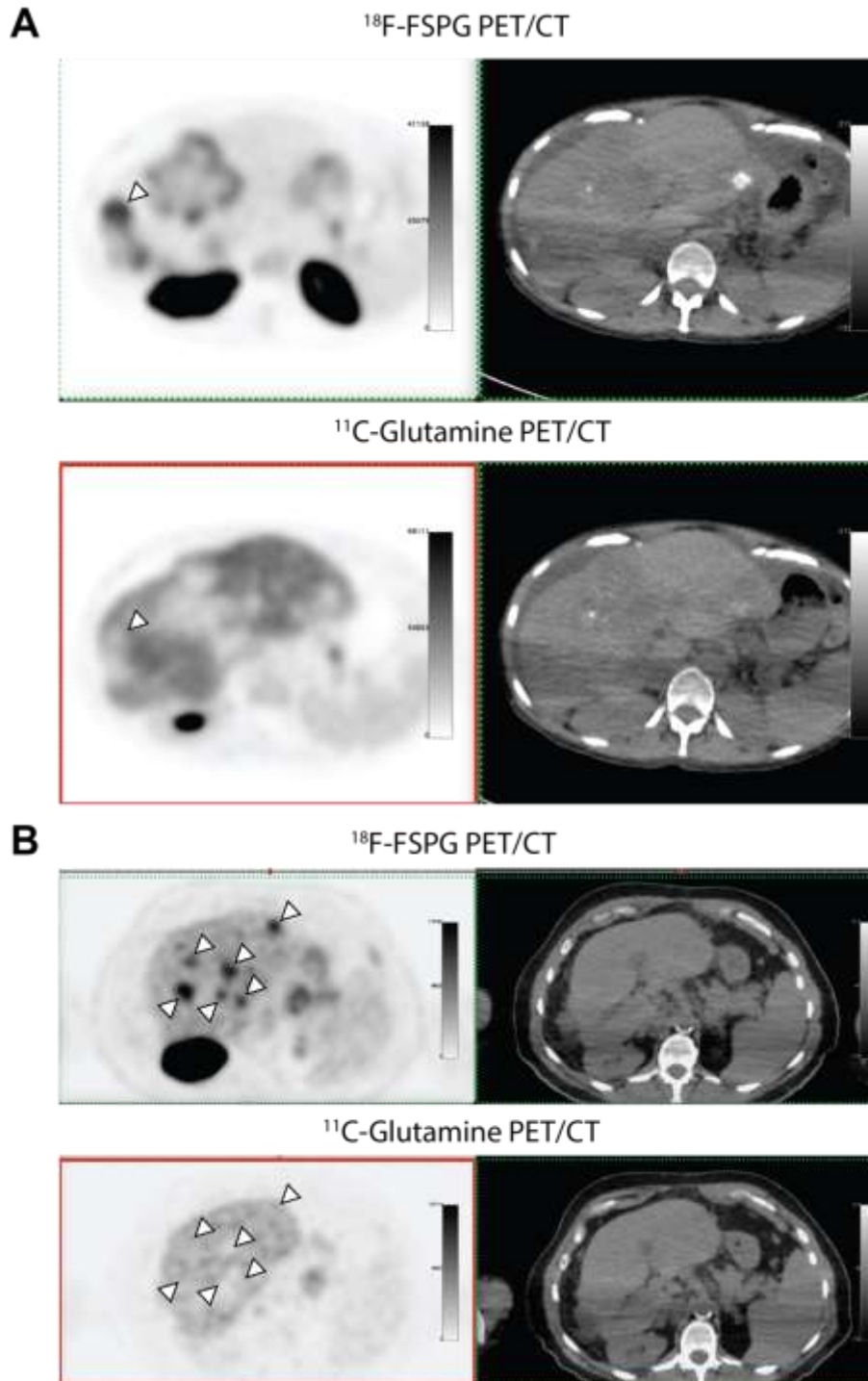
Supplemental Figure 4: ^{11}C-glutamine negative tumors in patients with metastatic colorectal cancer. ^{18}F-FSPG is an investigational PET radiotracer being evaluated for tumor imaging (*50,51*). Axial ^{18}F-FSPG PET images with corresponding CTs (upper images) show (**A**) a right lateral liver lesion and (**B**) multiple hepatic metastases. The corresponding locations on axial ^{11}C-glutamine PET images (lower images) demonstrate a lack of tumor uptake. White arrowheads point to the lesions.