Image-Guided Percutaneous Needle Biopsy of Colorectal Cancer Liver Metastases in Personalized Medicine: Evaluation of Biospecimen Quality for Genomics Analysis.

A Part of the Q-CROC-01 Project

C. Naim, A. Constantin, A. Gologan, B. Tetu, A. Aguilar, C. Hoffert, S. McNamara, G. Batist, E. Camlioglu

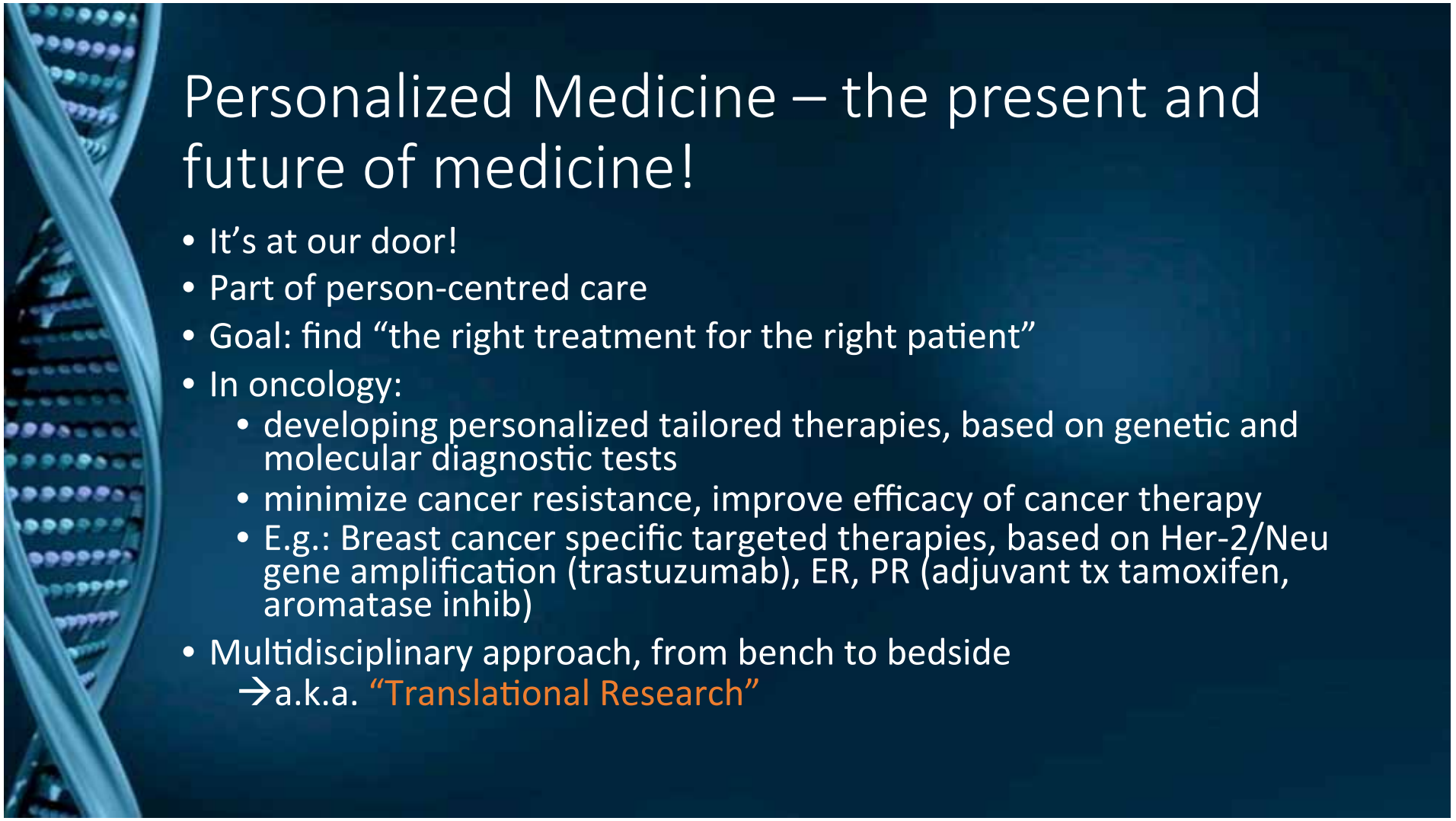
McGill University

Radiology Department, Jewish General Hospital

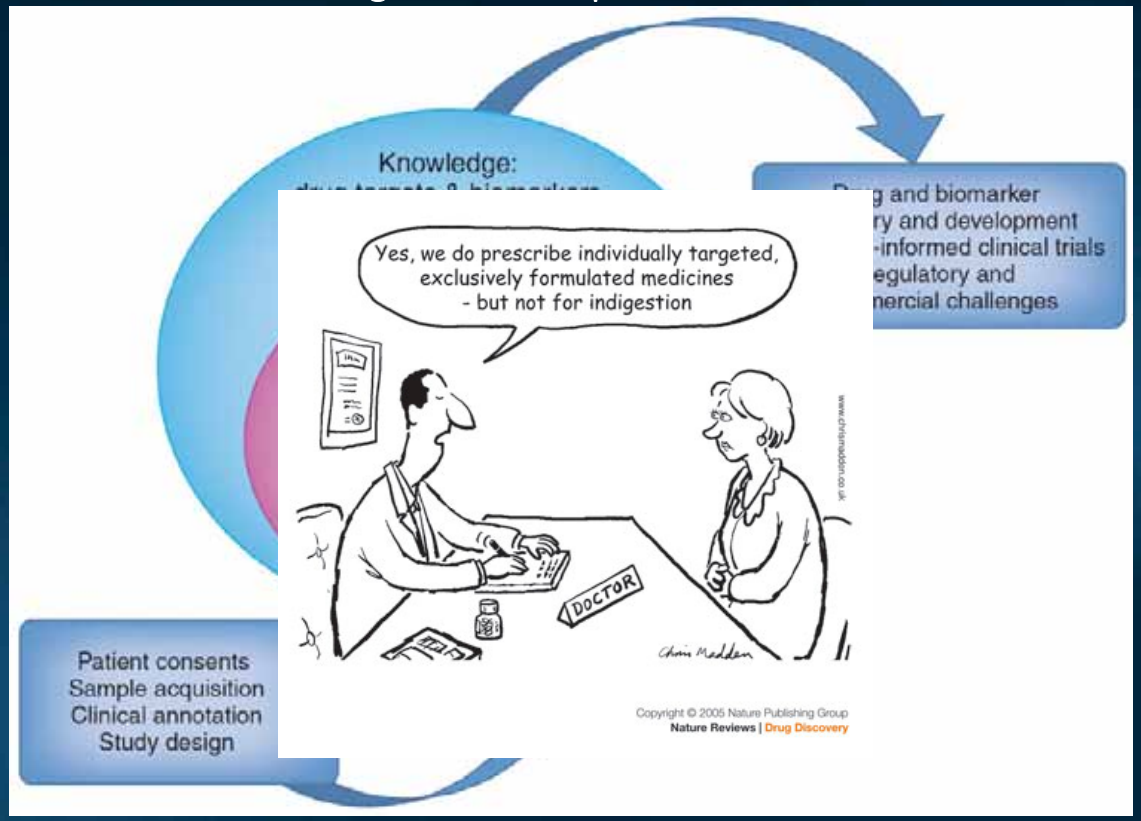
Hôpital général juif
Jewish General Hospital

McGill


No conflict of interest to declare


Personalized Medicine – the present and future of medicine!
• It's at our door!
• Part of person-centred care
• Goal: find "the right treatment for the right patient"
• In oncology:
• developing personalized tailored therapies, based on genetic and molecular diagnostic tests
• minimize cancer resistance, improve efficacy of cancer therapy
• E.g.: Breast cancer specific targeted therapies, based on Her-2/Neu gene amplification (trastuzumab), ER, PR (adjuvant tx tamoxifen, aromatase inhib)
• Multidisciplinary approach, from bench to bedside
→a.k.a. "Translational Research"

From cancer genomics to personalized medicine



Chin, L., et al. (2011). "Cancer genomics: from discovery science to personalized medicine." Nat Med **17**(3): 297-303.

https://kcryan.wordpress.com/2010/08/26/donna-dickenson-on-personalised-medicine/

Q-CROC – a Multicentric Translational Study

- "Quebec Clinical Research Organization in Cancer"
- Patient stratification to different chemotherapeutic regimens based on their molecular genetic profile
  - Serial tumor biopsy before and after chemotherapy for genomics analysis
  - Who is resistant and why? Personalized response?
  - Tailoring chemotherapy for each person
- Radiology key role: serial tumor biopsies for genomics analysis, post-treatment imaging
- Different cancers studied (breast, NHL, colon)
- Q-CROC-01: colorectal cancer liver metastases

Rationale

- Liver biopsies for genomics profiling, not just histopathology!
- Current Technique: Standard Operating Procedure (SOP) for ultrasound-guided targeted liver biopsies, based on ACR recommendations
- Challenge: criteria for biospecimen adequacy are different for standard histopathology vs genomics analysis
  - Genomics analysis requires higher content of nucleic acids/tumor cells

Question: Is the current SOP going to yield a sample adequacy rate for genomics similar to or worse than that for histopathology analysis?

adequacy rate in the literature = 70-90% [5]

- First influential variable = tissue sampling by IR!

Objectives

- Determine adequacy rate of biospecimens for molecular profiling, using the current standard operating procedure for targeted liver biopsy
- Determine factors that influence biospecimen adequacy
- Compare our adequacy rate with that of the literature and that proposed by the ACR (75%)

Optimize biospecimen quality for molecular & genomics profiling

Materials and Methods

Inclusion Criteria:

-confirmed CRC with at least one liver metastatsis

-confirmed liver metastasis

-patient not initially resectable

-scheduled for first line chemotx

-adequate coag profile

-life expectancy >=12 weeks

Exclusion Criteria:

-resectable liver met

-prior therapy for metastatic cancer

-non-diagnostic specimen path

-contraindication to chemotx

-brain mets

-pregnant or breastfeeding

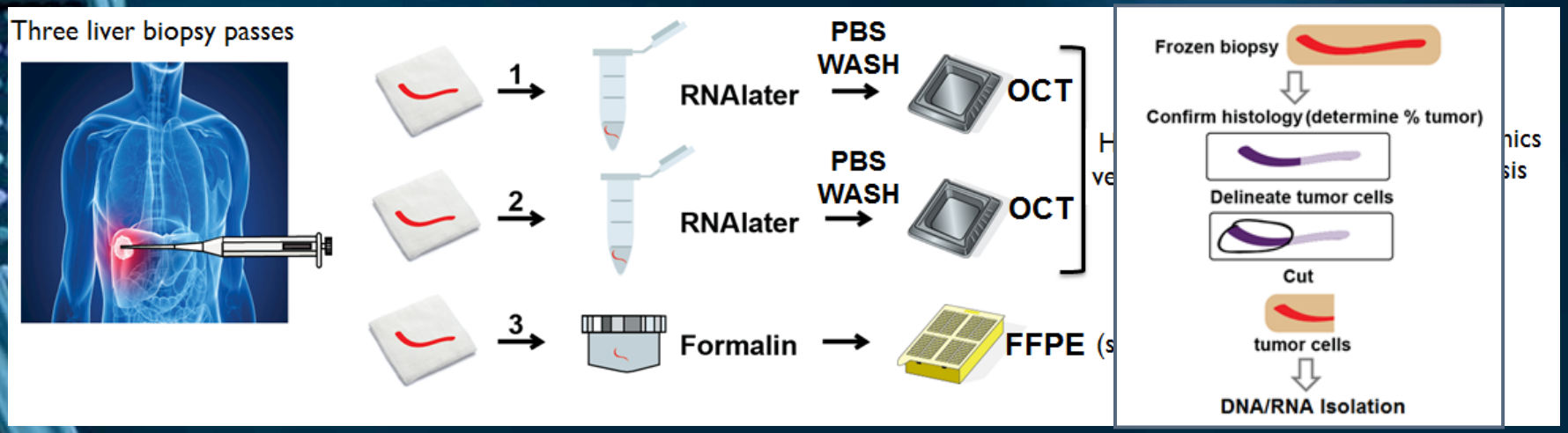
-HIV +ve

Materials and Methods

- Baseline CT scan and liver metastasis biopsy (by US) pre-chemotx
- Chemotherapy
- Response evaluation at 8 weeks, then q12weeks with CT
- Re-biopsy liver metastasis if there is recurrence

Liver Biopsy Technique

- 3 needle passes (3 core biopsy samples)
- Evaluation of tissue sample contents: %tumor material (>=50% required), tumour cellularity (>=60% required), necrosis, and stroma



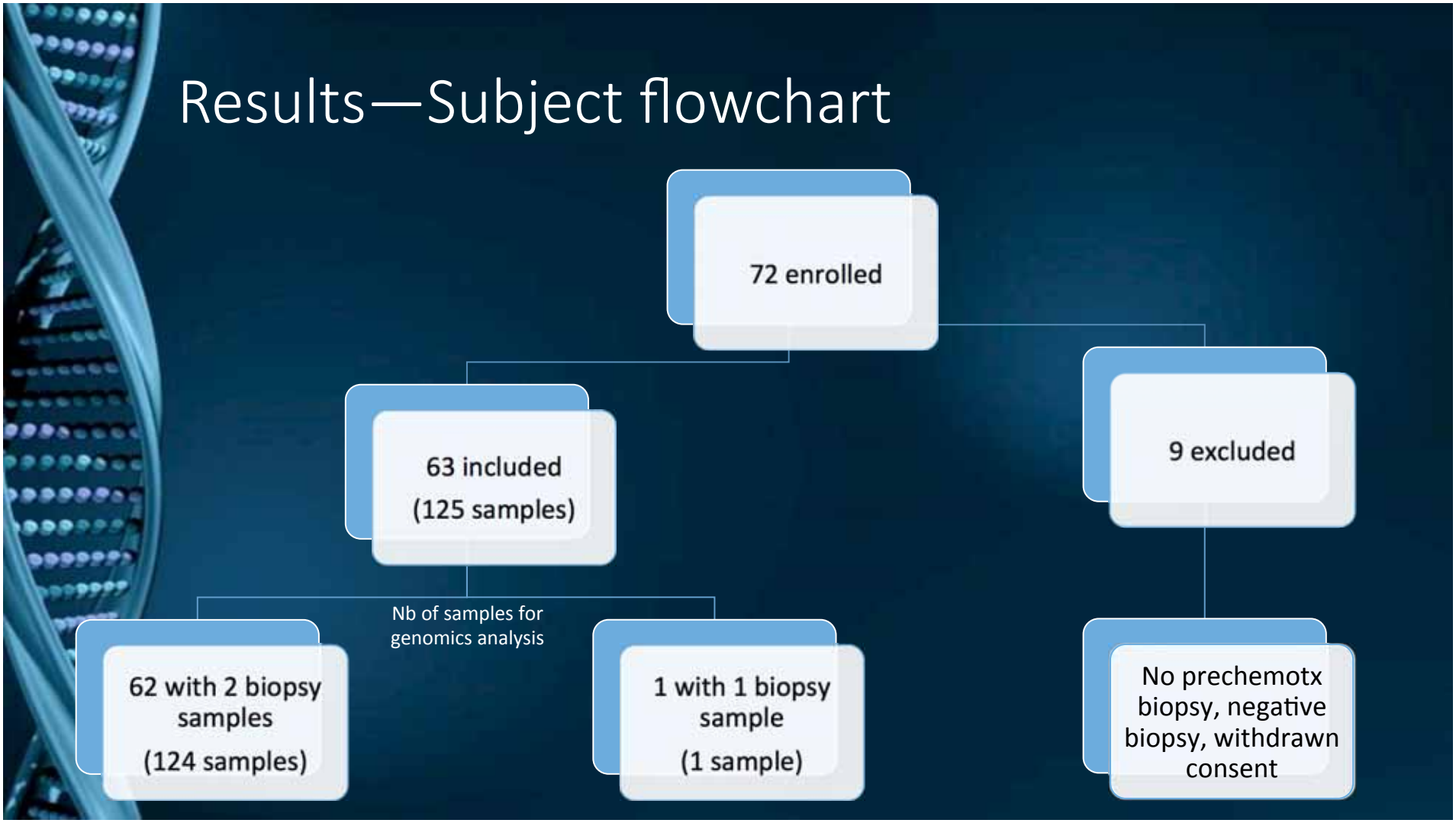
Liver Biopsy – Standard Operating Procedure

- US-guided by IR
- Conscious sedation
- Sterile draping, local anesthetic
- Free-hand technique
- BioPince™ end-cutting core biopsy device (16- or 18-gauge), Tru-Cut core biopsy device (18-g), or Temno device (18-g)
- Samples put in respective vials, kept at 4^{o}C and shipped immediately to Central Pathology Lab
- Patients kept for observation x 4-6 hours

Statistical Analyses

- Outcome variables:
  - biospecimen adequacy for genomics analysis
  - % tumour cellularity and % tumour content
- Comparison btwn 1st and 2nd tissue samples: paired t-test and Chi-square test
- Comparison btwn types of needles (TruCut, Biopince, Temno): One-way ANOVA and Chi-square test

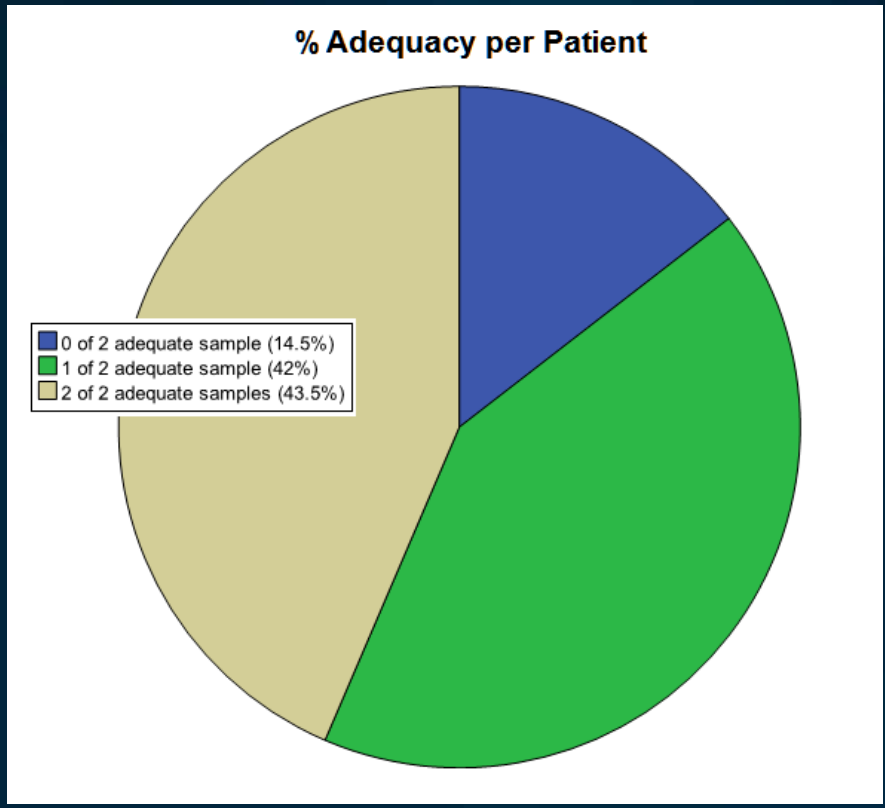
Results—Subject flowchart



Results

- Among 62 patients, overall biospecimen adequacy rate 85.5%

- Among 125 biospecimens, adequacy rate was 65%



Results

- Biospecimen adequacy for genomics analysis:
  - No significant difference btwn 1st and 2nd tissue samples (p=0.852)
  - No significant difference btwn needle types (p=0.239)
- % Tumor material and % Tumor cellularity:
  - No significant difference btwn 1st and 2nd tissue samples (p=0.542; p=0.065)
  - No significant difference btwn needle types (p=0.252; p=0.393)

Discussion

- Biospecimen adequacy rate for standard pathology:
  - In the literature: 70 to 90%
  - Recommended by the ACR: >=75%
- Our adequacy rate for genomics analysis:
  - Per patient: 85.5%
  - Per needle pass: 65%
- Good results compared to recommendations
- Results confirm need for at least 2 needle passes to reach recommended adequacy rate

Conclusion

- Standard Operating Procedure for US-guided targeted liver biopsy is satisfactory in tissue sampling for genomics analysis
  - Good adequacy rate compared to literature and recommendations
- The order of sampling (1st versus 2nd needle pass) and the type of biopsy needle does not influence the adequacy rate nor tumor cell content.
- At least 2 needle passes are required per patient to obtain a satisfactory adequacy rate.

Future Directions

- More patients are being recruited; final analyses will ensue
- Comparison with the 3rd tissue sample in progress
- Comparison of location of targeted metastatic liver lesion
- Factor-in the experience of the operator


Thank you