Improving non-targeted native renal biopsy specimen adequacy

A province-wide, multicenter and interdepartmental quality initiative

James P. Nugent[1], Mei Lin Bissonnette[2], Brian T. Gibney[1], Alison C. Harris[1]

[1]Vancouver General Hospital, Department of Radiology

[2]St. Paul's Hospital, Department of Pathology & Laboratory Medicine

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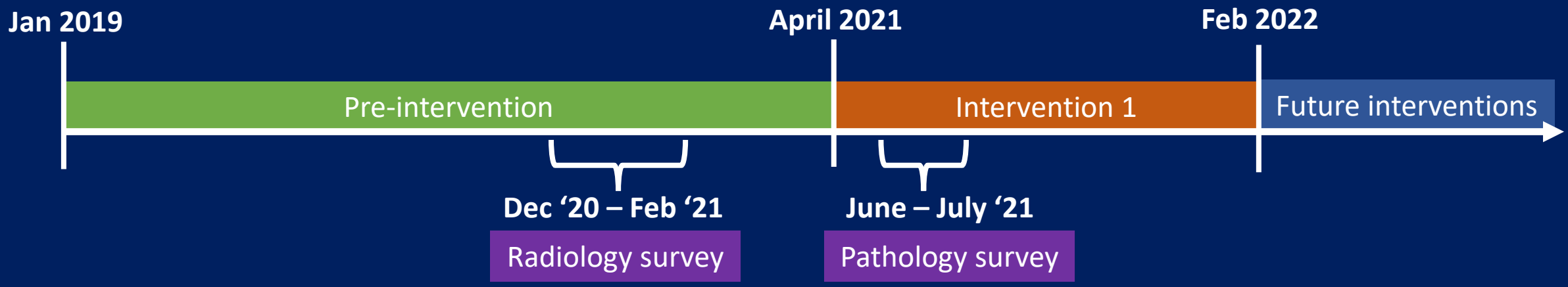
Background

- The provincial imaging committee received feedback from pathology that there was high variance in renal biopsy adequacy across BC
- Our goals are to:
  - Understand current practices in radiology & pathology
  - Characterize specimen adequacy rates
  - Implement QI interventions to improve rates



Addressing biopsy adequacy

Two major aspects to renal specimens prior to pathologist review:

1. Collection of tissue
2. Assessment and allocation of tissue
    - Tissue assessment provided to radiology
        - Qualitative/quantitative evaluation of cortex (glomeruli) in sample to determine how many core biopsies to collect
    - Allocation of collected tissue into fixatives for light, immunofluorescence, electron microscopy before it is sent to a central lab for analysis

Adequacy: definitions & targets

Definitions were determined by expert panel following a literature review[1,2]

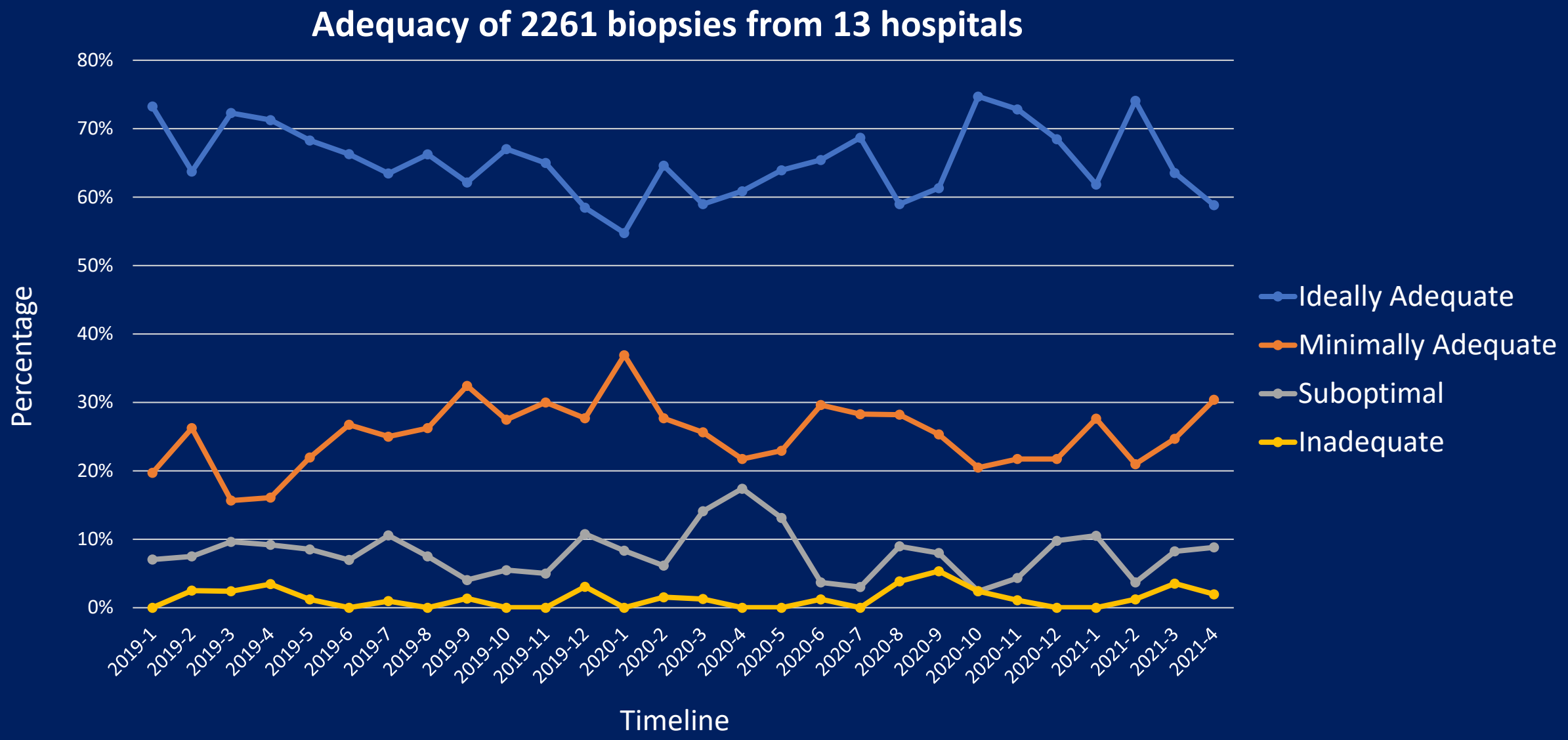
Category	Definition
Inadequate	< 15 glomeruli collected total, no diagnosis can be rendered
Suboptimal	< 15 glomeruli collected total, diagnosis can be rendered
Minimally adequate	15-24 glomeruli collected total
Ideally adequate	≥ 25 glomeruli collected total, allowing classification and prognostic determination

Targets

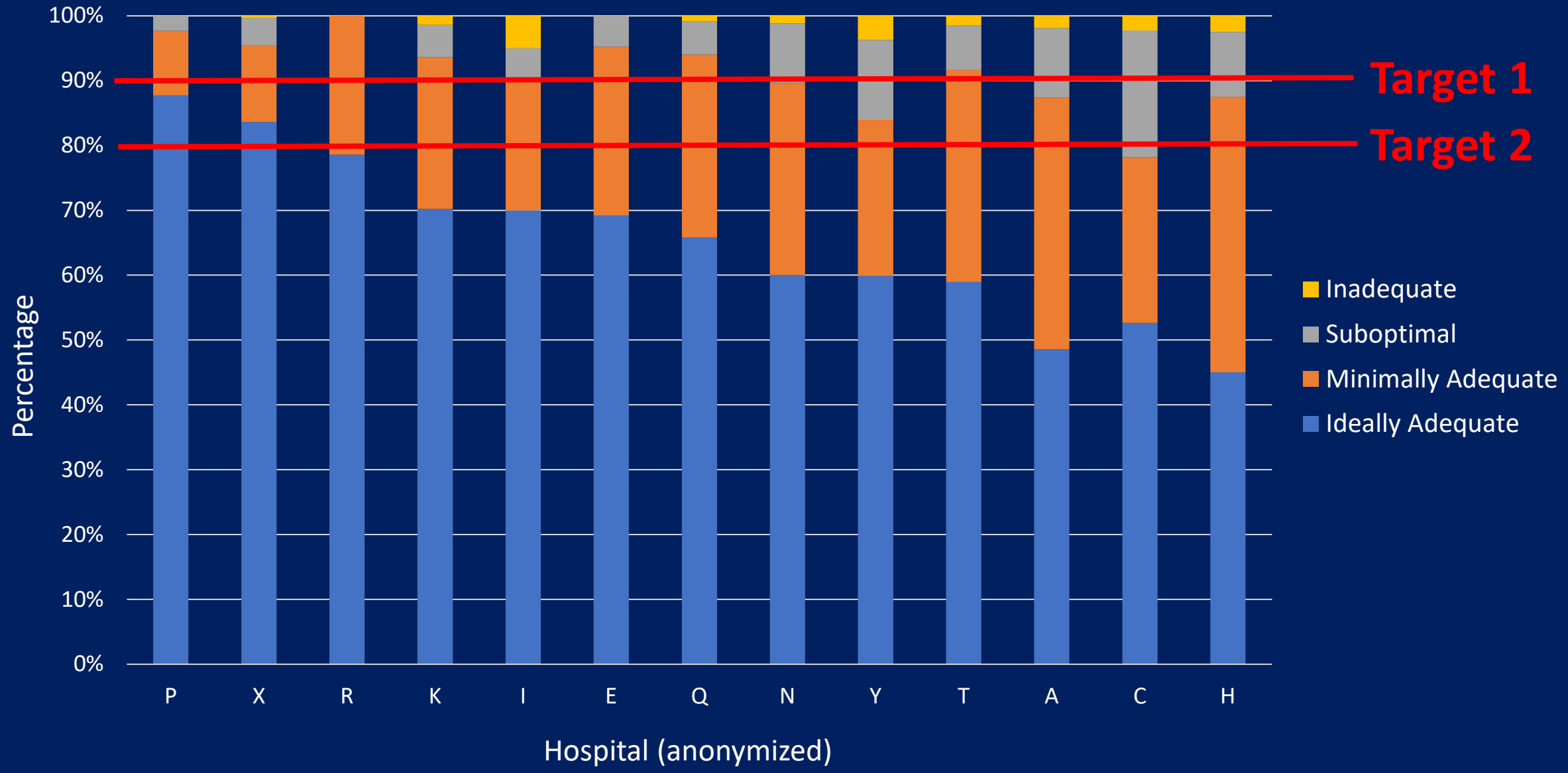
- #1: Inadequate & suboptimal < 10% of biopsies
- #2: Ideally adequate ≥ 80% of biopsies

[1]Luciano RL, Moeckel GW. Update on the native kidney biopsy: core curriculum 2019. Am J Kidney Dis 2019;73(3):404-15. DOI: 10.1053/j.ajkd.2018.10.011.
[2]Najalian B, Lusco MA, Alpers CE, Fogo AB. Approach to kidney biopsy: core curriculum 2022. Am J Kidney Dis 2022;80(1):119-31. DOI: 10.1053/j.ajkd.2021.08.024.

Pre-intervention: provincial adequacy



Pre-intervention adequacy by hospital



Summary of survey data

- Variable training levels of pathology technologist
- Variable methods for sample collection & assessment
- The two hospitals with the lowest adequacy rates are the only sites without pathology technologist support at the time of biopsy
- Preferred interventions include:
  - Improving feedback from pathology on specimen adequacy to radiologists
  - Provide assessment & allocation training for pathology technologists, as well as reference resources

Intervention 1: Feedback to radiologists

- Adequacy feedback within the pathology report (began May 2021)

IMMUNOFLUORESCENCE MICROSCOPY:
The tissue submitted for immunofluorescence microscopy contains 1 glomerulus, which is globally sclerosed. There is diffuse interstitial fibrosis and tubular atrophy. On a scale of 0-3+, there is no tubular basement membrane or interstitial staining for IgG, IgM, IgA, C1q, C3, fibrinogen, kappa or lambda light chains, or albumin. Tubular casts stain for IgM (few), IgA, and kappa and lambda light chains. The arterioles stain for C3 only.

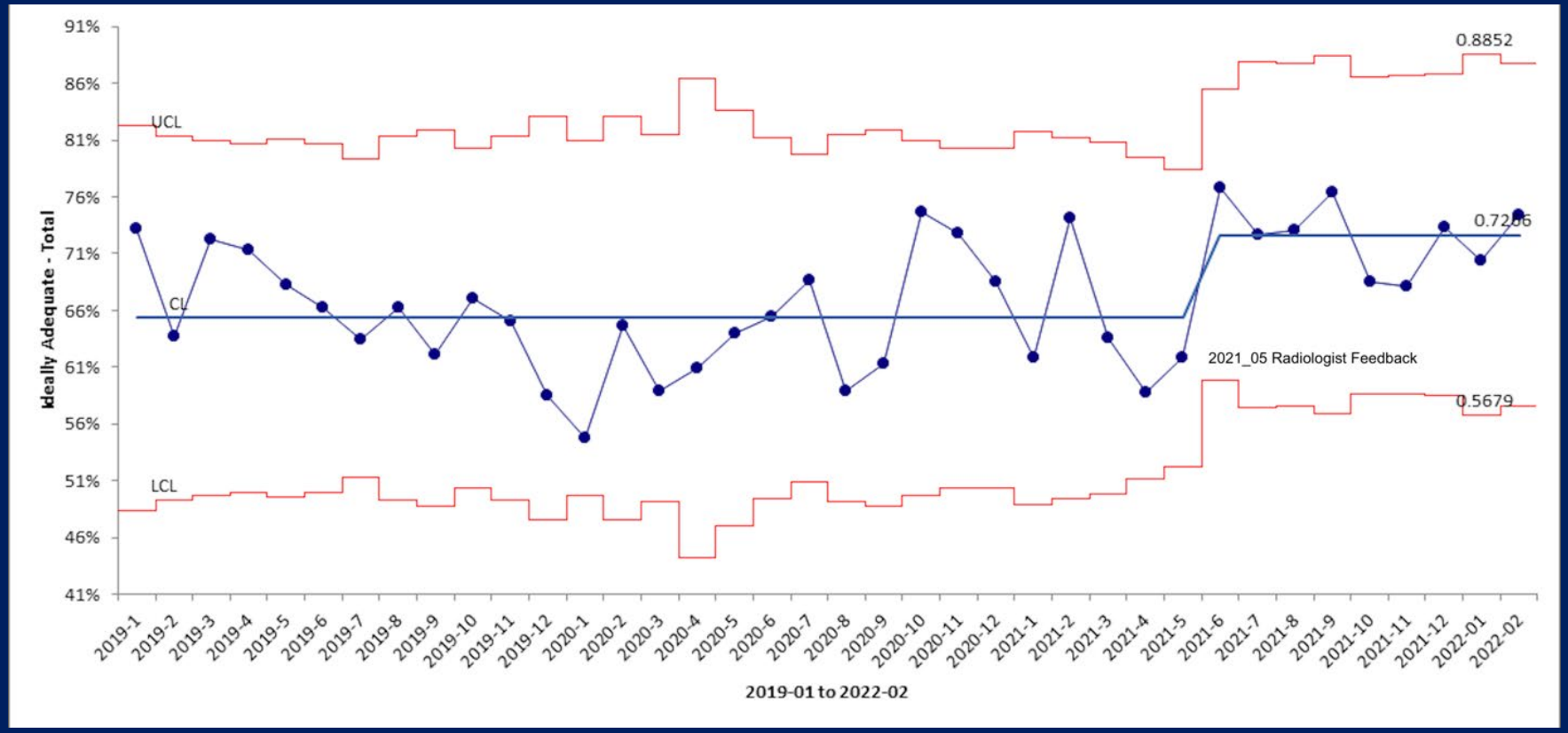
A limited immunofluorescence microscopy panel is performed on the paraffin embedded tissue. On a scale of 0-3+, there is granular mesangial staining in the patent areas of the segmentally sclerosed glomeruli for IgA (1+). Tubular casts stain for IgA. There is no tubular basement membrane, interstitial, or vascular staining.

ELECTRON MICROSCOPY:
Routine and deeper semi-thin sections stained with Toluidine blue do not contain glomeruli. The tubulointerstitial findings are similar to light microscopy. Ultrastructural evaluation is not performed.

RAD: minimally adequate

Summary: Severe sclerosis of the kidney

Intervention 1: Results



- Control chart analysis revealed sustained process change in ideally adequate rate after implementing the first intervention

Conclusions

- Ideally adequate rate 66% overall
  - 80% target achieved by some hospitals & likely achievable for others
- Although there is heterogeneity in biopsy technique, the only significant factor from survey data was presence of pathology technologist at time of biopsy
- Limitation: comparison of adequacy to literature challenging due to variable adequacy definitions
- Future interventions:
  - Standardize biopsy kits at a provincial level
  - Visit hospitals to enable site specific assistance
  - Further improve feedback to radiology