

## Background

- According to the KDIGO (Kidney Disease Improving Global Outcomes), evaluation by a nephrologist is recommended for patients with CKD stage 4 or higher (corresponding to a GFR of 30 or lower).
- Studies have shown that patients who are not referred to a nephrologist or referred later suffer from increased complications of renal disease, accelerated progression to ESRD, and have an increased overall mortality rate.
- At Jefferson Hospital Ambulatory Practice (JHAP), we noted decreased rates of nephrology follow-up in our patients with chronic kidney disease stage 4 and 5.
- We identified that the most prevalent reason for the decreased referral rates is due to the lack of knowledge of the KDIGO guidelines.
- Our goals were to implement an intervention to educate our internal medicine residents and improve the referral rates for advanced chronic kidney disease in our practice.

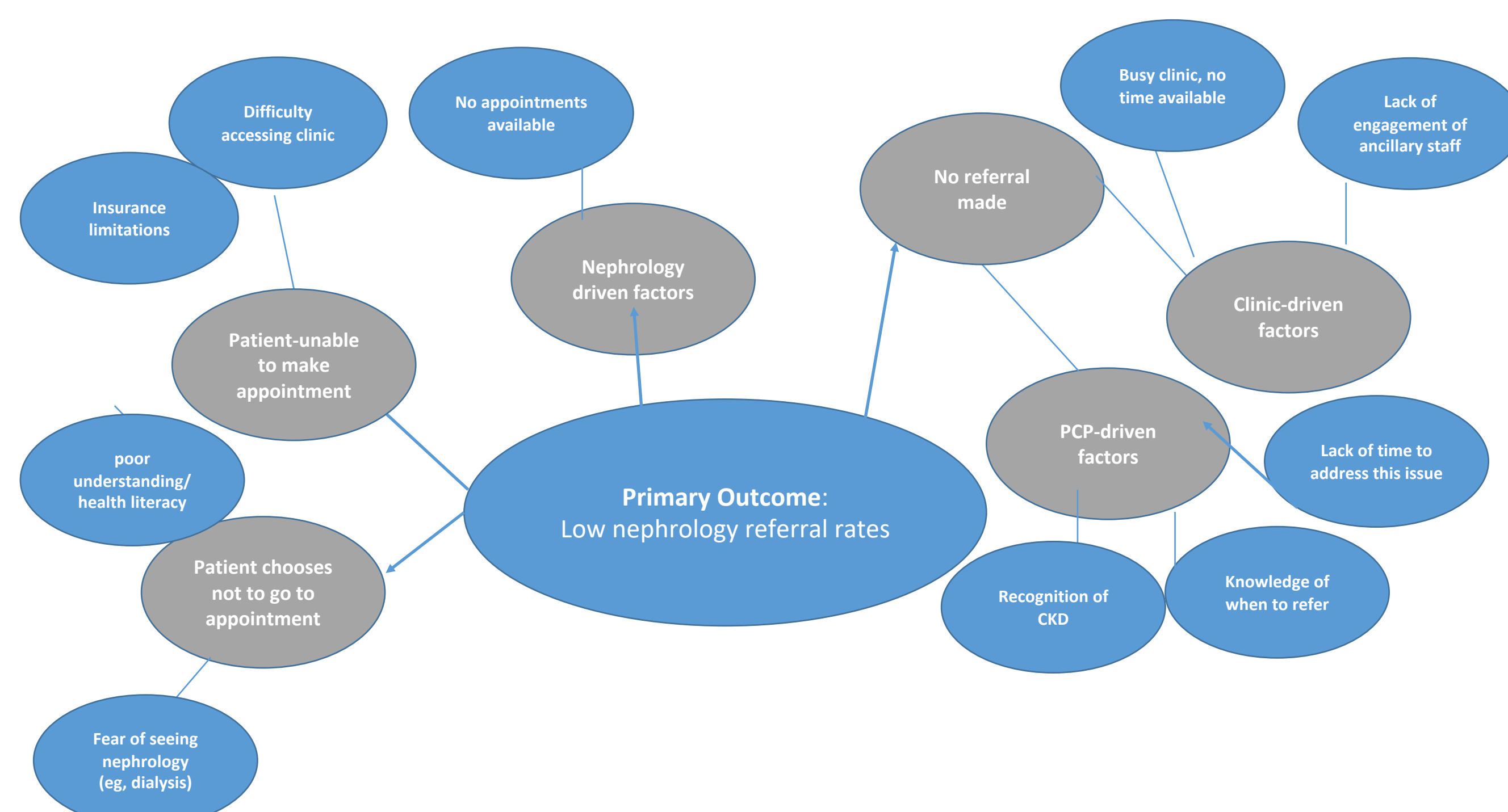
### Summary Outcomes Based on Timing of Referral

	Early Referrals Mean (SD)	Late Referrals Mean (SD)	Risk Ratio or difference (95% CI)	P-Value
Overall mortality (%) [n= 12,018]	11 (3)	23 (4)	1.99 (1.66-2.39)	< .0001
Duration of hospitalization after renal replacement therapy initiated (measured in days)	13.5 (2.2)	25.3 (3.8)	12 (8-16.1)	.0007
1-year mortality (%) [n = 4,777]	13 (4)	29 (5)	2.08 (1.31-3.31)	0.028

Referenced from [https://www.amjmed.com/article/S0002-9343\(07\)00664-X/fulltext#tbl3](https://www.amjmed.com/article/S0002-9343(07)00664-X/fulltext#tbl3)

## AIM Statement

**SMART AIM:** In the primary care setting, for patients with GFR <30 (CKD4 and CKD5), we aim to improve the rates of nephrology referral to 60-80% over the next 1 year.



## Intervention and Approach to Analysis

### Target Population:

Internal Medicine Resident-physicians of the Jefferson Hospital Ambulatory Clinic (JHAP) were targeted for intervention. This population was chosen based on data from the electronic medical record, which revealed that there may be a significant gap in knowledge in this group as it pertains to nephrology-referral appropriateness.

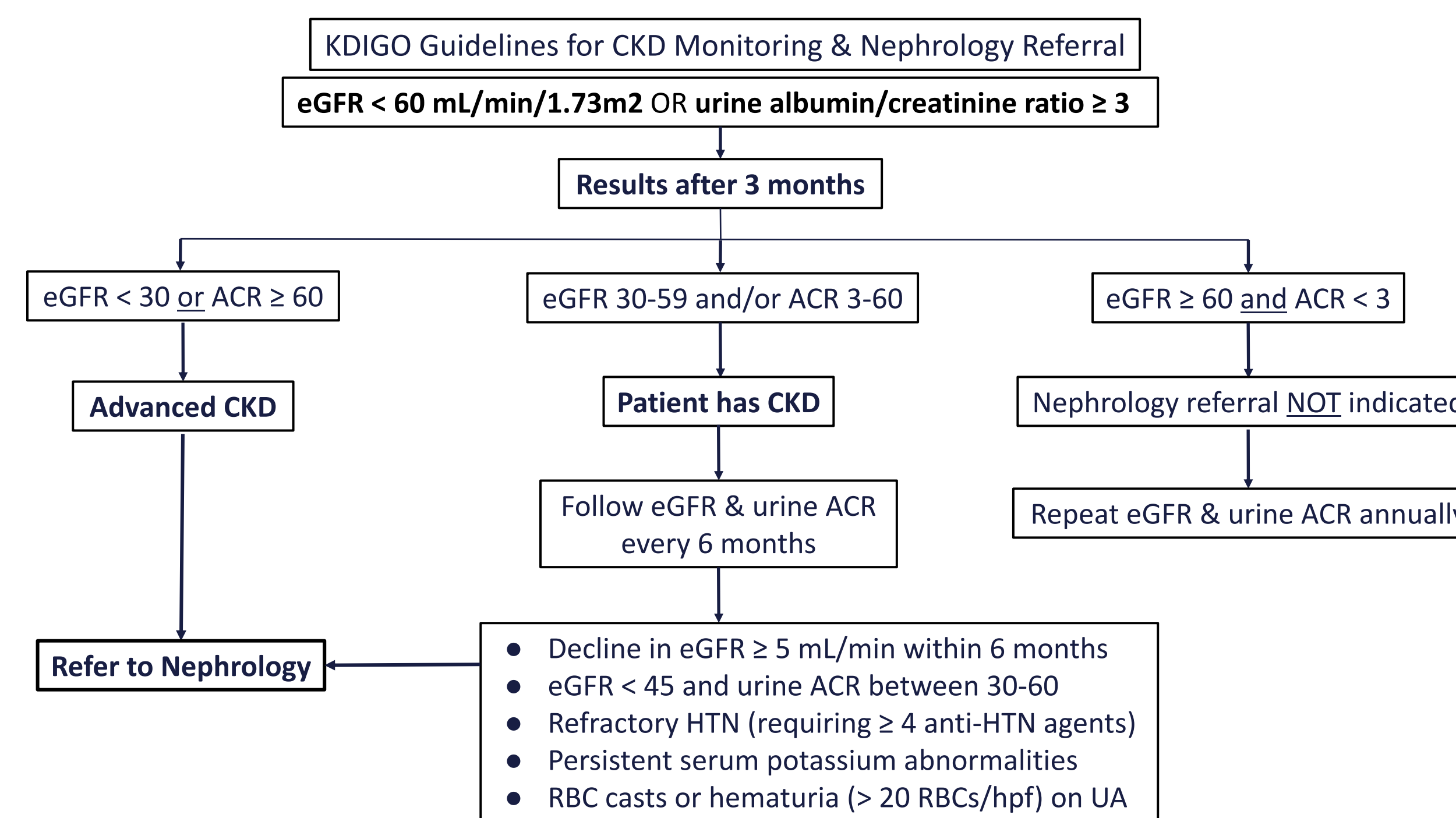
### Intervention:

Our intervention started with the creation of a short educational module that included the clinical definition of chronic kidney disease (CKD), evidence-based factors that highlight the importance of early referral to nephrology in those with CKD (below), and a KDIGO-guideline-driven algorithm (below) that encompasses the specific indications for appropriate nephrology referral in those with CKD.

This educational module was then dispersed to all JHAP residents (in both PowerPoint and video format), alongside a pre- and post-survey questionnaire, with the intent to analyze the effectiveness of such intervention at educating the target population about the above-mentioned module components.

### Approach to Data & Analysis:

After reviewing the results of the pre- and post-surveys, we then utilized the electronic medical record database (using a built-in program called SlicerDicer) to prospectively assess whether the above intervention led to a significant clinical change regarding nephrology referral appropriateness. Specifically, we compared the ratio of advanced CKD patients who were appropriately referred to nephrology clinic in the 1-month pre-intervention to ratio of advanced CKD patients who were referred to nephrology clinic in the 1-month post-intervention.



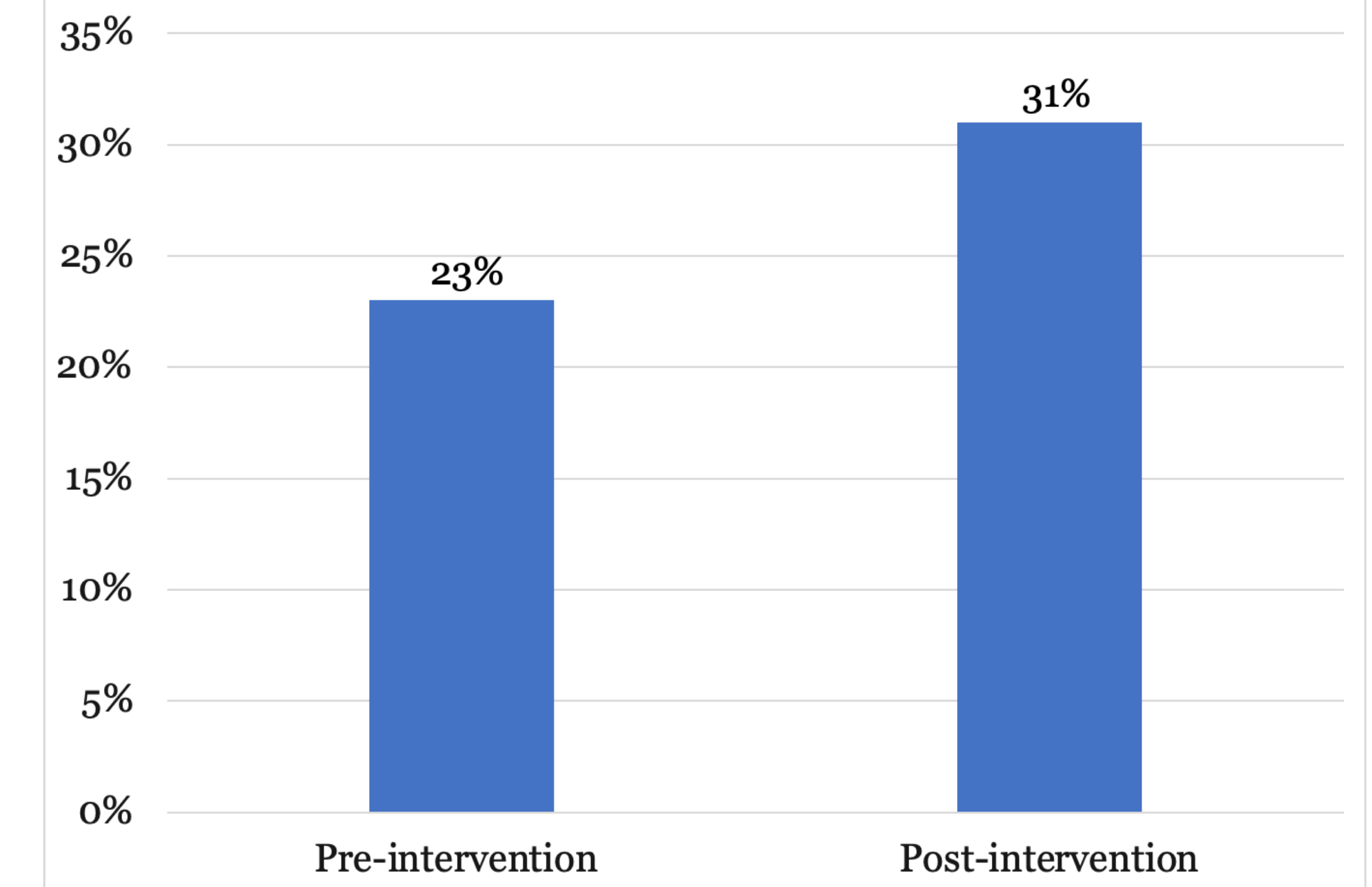
## Results

Based on our survey results, residents demonstrated an increase in knowledge about CKD, benefits of timely referral, and KDIGO guideline-based management. A comparison of rates of nephrology visits in SlicerDicer showed a modest increase.

### Percentage of correct responses

Time survey administered	Question 1: CKD Definition	Question 2: Benefits of timely referral	Question 3: Guideline based management	Question 4: Guideline based management
Pre-intervention (n=15)	67%	27%	47%	20%
Post-intervention (n=12)	100%	75%	67%	83%
Absolute change in % correct	33%	48%	20%	63%

### % Nephrology Visit Rate for Advanced CKD



## Discussion

Resident knowledge is a good process measure for appropriate nephrology visits amongst CKD patients and the initial surveys we conducted at our ambulatory site supported this view, so we decided to base our intervention on this by creating an educational video. Our pre- vs post-intervention survey data suggest that the video was effective in increasing awareness amongst residents in knowing when to refer a patient to nephrology. However, it remains to be determined if this effect would last a longer such as throughout the entire residency.

Additionally, the data show a modest increase in the percent of nephrology visit in the month following the intervention as compared to one month before. But this effect was prone to error due to the short time span of our data measurement and since we were unable to extract out reasons for nephrology visits from SlicerDicer other than advanced CKD which are potential confounders in our data.

Another limitation of our project was that we were only able to conduct our survey and intervention at a few resident ambulatory sites and had low response rates thus making our data prone to nonresponse bias.

Some next steps for our project would be to make the video available to a larger target audience which may include ambulatory attendings and take additional steps such as posting the flow chart at the clinic sites for reference and follow the difference in rates of nephrology referrals out for a longer period.

## References

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