Development and Implementation of an Acute Kidney Injury Remote Patient Monitoring Program

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Introduction

- At least 30% of acute kidney injury (AKI) survivors lack appropriate follow up after hospital discharge.
- AKI survivors have highly dynamic posthospital course which warrants close monitoring to prevent adverse outcomes.
- Remote patient monitoring (RPM) could be used to improve the quality and efficiency of AKI survivor care.
- The objective was to describe development and preliminary feasibility of an AKI RPM program.

Methods

- In October 2021, Mayo Clinic implemented an AKI RPM program for individuals who experienced stage 2/3 AKI and underwent nephrology consultation while hospitalized.
- Patients with organ transplant, expected to discharge on dialysis, to a skilled nursing facility, or who were unable or unwilling to participate in the program were excluded.
- Upon enrollment in the AKI RPM program, AKI education was provided, and home monitoring technology distributed.
- Patients monitored vital signs, weight, and symptoms daily. Weekly serum creatinine and electrolyte evaluations were scheduled.
- Nurses evaluated the data daily and adhered to prespecified protocols for management and escalation of care if needed (Figure 1).
- The maximum program duration was three months.
- AKI RPM participants were eligible for graduation if they remained off dialysis, with a stable creatinine for two consecutive weeks, and no urgent or emergent results in the preceding one-week interval.
- Post-graduation surveys gauged the patient experience.

Figure 1. Escalation of care algorithm based on RPM triggers

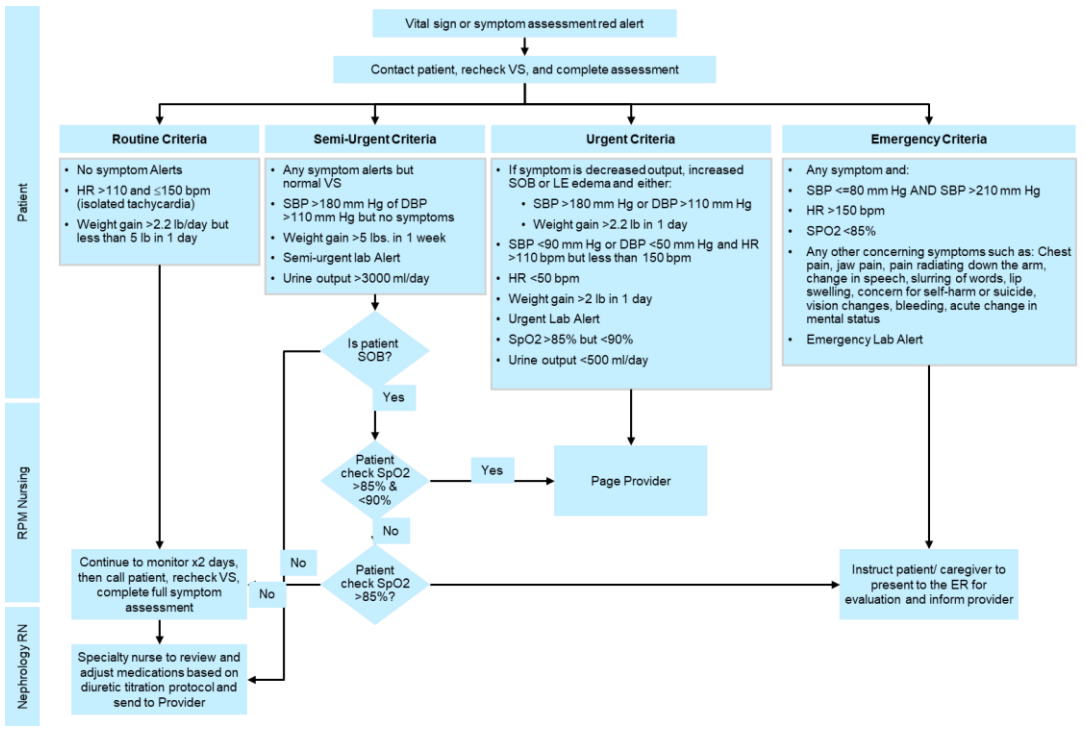
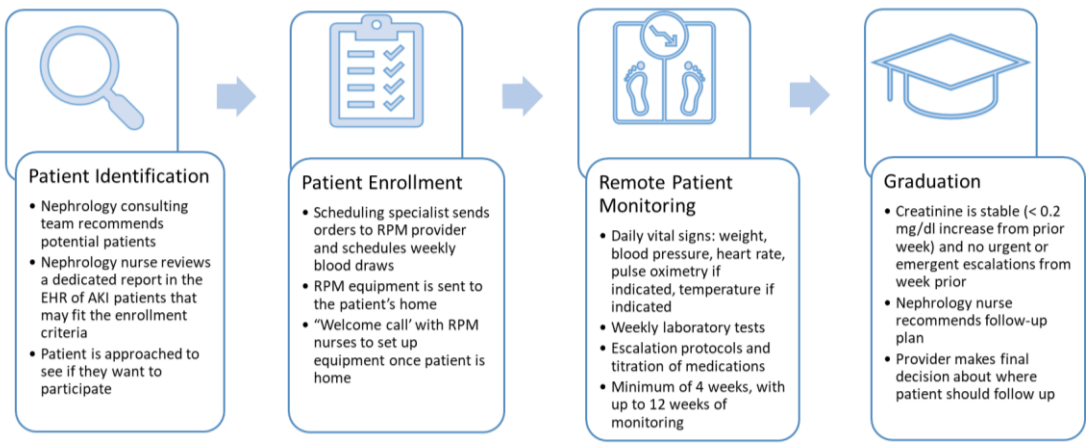
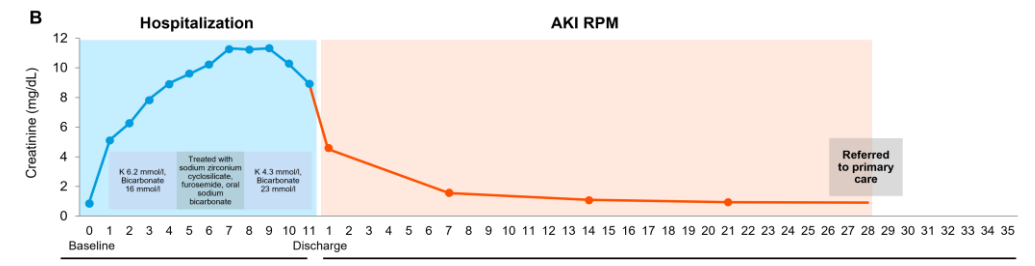


Figure 2. AKI RPM workflow

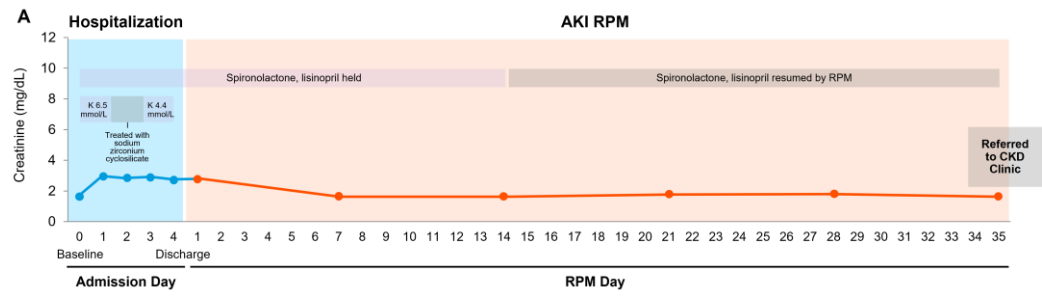


Results

- 20 patients were enrolled in AKI RPM in the first 5 months.
- Median [interquartile range (IQR)] age was 67 years (61, 72), 13 (65%) were men, and all identified as non-Hispanic Caucasians.
- Median duration of AKI RPM participation was 36 (31, 40) days.
- Eight patients (40%) experienced an unplanned readmission, or an emergency department visit, half (N = 4) of which were attributed to AKI and related circumstances.
- Of the 9 post-graduation survey respondents, all were satisfied with the RPM program and majority of them (90%) would recommend RPM to others with similar conditions



Case 1. 54-year-old man who was admitted to the hospital for AKI. He had underlying CKD stage 3 and had been lost to follow-up by his prior nephrologist. During the hospitalization, the patient's creatinine increased to 3.1 mg/dl from baseline of 1.65 mg/dl due to presumed acute tubular necrosis in the setting of ruptured appendix. Due to hyperkalemia (K 6.5 mmol/L), spironolactone, torsemide and lisinopril were initially held and he received sodium zirconium cyclosilicate. On day 4, the patient was eager to discharge and was enrolled in AKI RPM. Over his post-discharge course his potassium and creatinine decreased to baseline and his spironolactone and lisinopril were restarted. After 4 weeks in the program, he met graduation criteria and was referred to the chronic kidney disease clinic.



Case 2. A 56-year-old man was admitted to the ICU for septic shock. His baseline creatinine concentration was 0.9 mg/dl. On presentation the serum creatinine was 5.15 mg/dl and it peaked at 11.32 mg/dl on day 4. He was otherwise clinically and metabolically stable by hospital day 11, except for a persistently elevated creatinine at 9.0 mg/dl. It was unclear whether he would begin to autodiuresis after the acute tubular necrosis event or whether he would have need for ongoing diuretic therapy. He was enrolled in AKI RPM and discharged. He did not develop any AKI related complications and did not require escalation of care. His creatinine improved to 1.3 mg/dl after 4 weeks and he was referred to primary care.

Discussion

- To the best of our knowledge, use of RPM for AKI survivors has not been characterized.
- Our experience suggests that AKI RPM may facilitate earlier hospital discharge, allow for close monitoring of electrolytes and recovering kidney function, facilitate rapid titration of kidney active medications, enable direct handoff to the long-term care provider (nephrology specialist or primary care).
- Overall, preliminary results showed that patients were satisfied with the AKI RPM program, they felt comfortable using RPM equipment, and enjoyed the interaction with the team.

Conclusions

Digital health solutions such as RPM offer a unique opportunity to bridge the care transition from hospital to home and increase access to quality care for the most vulnerable AKI survivors.

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