Contrast RISK: Reducing Injury Sustained by Kidneys

Enhancing Clinical Decision Support for Prevention of Contrast-Induced Acute Kidney Injury in Cardiac Catheterization

CK HUI HEART CENTRE | LIBIN CARDIOVASCULAR INSTITUTE of Alberta | MAZANKOWSKI ALBERTA HEART INSTITUTE | IHOS Personalizing Evidence Improving Outcomes | Strategic Clinical Networks | Alberta Health Services

UNIVERSITY OF ALBERTA | UNIVERSITY OF CALGARY CUMMING SCHOOL OF MEDICINE | ALBERTA INNOVATES | APPROACH Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease

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BACKGROUND

The purpose of this project is to implement processes in all 3 cardiac catheterization facilities in Alberta to identify patients at risk of contrast-induced acute kidney injury (CI-AKI) and support the use of CI-AKI prevention strategies (i.e. reduced volumes of contrast dye, and optimized intravenous fluid, and appropriate follow-up). These steps can reduce rates of CI-AKI, avoid associated complications, and lead to more efficient use of health resources (shorter time in hospital, and lower costs of care).

This project will ultimately determine whether implementation of this strategy results in better patient outcomes and cost saving to the health care system in Alberta. If these tools prevent 1 in every 5 cases of CI-AKI in Alberta, as reported elsewhere, this could lead to better experiences for patients and savings of $1.4 million dollars in yearly health care costs for the province.

The Frequently Asked Questions (FAQ) document presents questions and answers related to the research process and clinical implementation.

Research FAQs

1. What are the Objectives of this initiative?

- To complete a pre-procedural assessment of a patient's CI-AKI risk
- To minimize the dose of radiocontrast dye where possible for patients at risk
- To deliver optimal hydration strategies using intravenous fluids for patients at risk
- To ensure appropriate follow-up of risk patient

2. What are the potential benefits of this change?

Recent evidence demonstrates that 1 in every 5 cases of CI-AKI can be avoided when cardiac catheterization units implement appropriate preventive practices. Reducing the relative risk of CI-AKI by even 20% would prevent over 260 episodes of kidney injury in Alberta each year and immediately reduce annual direct health care costs in Alberta by $1.8 million dollars.

3. What are the new changes to APPROACH regarding contrast induced acute kidney injury?

Effective September 2017, in partnership with cardiac catheterization labs at the Royal Alexandra Hospital (CK Hui Heart Centre), University of Alberta Hospital (Mazankowski Heart Institute) and Foothills Medical Centre (Libin CV Institute), , and Alberta Health Services Cardiovascular Health and Stroke and Kidney Health Strategic Clinical Networks, CI-AKI risk stratification and decision support tools will be implemented in the APPROACH system. These tools will calculate a patient's risk of CI-AKI and dialysis, provide an estimate of a patient's safe contrast safe contrast dye volume limit, and give IV fluid order recommendations tailored to each patients LVEDP measurement..

4. Why are these changes being made?

Almost 1 in 10 patients undergoing cardiac catheterization in Alberta develop CI-AKI as a procedural complication. In 2015 an estimated 1,344 patients (9.6%) were affected by CI-AKI in Alberta. Patients who are older and have comorbidities such as diabetes, pre-existing kidney disease, and heart failure are at particularly high-risk of CI-AKI. These patients are also at highest risk of poor outcomes from heart disease and stand to gain the greatest benefits from cardiac catheterization. Therefore, rather than restricting the use of these procedures, it is critical to focus efforts on safety for high-risk patients, to improve outcomes.

5. How long is this research?

Roll-out will begin in fall 2017 in all sites, and will sequentially introduce groups of cardiologists to the initiative. It is expected that all sites and all cardiologists will be introduced into the initiative by the end of 2018. The project will be ongoing based on an evaluation of its effective elements, which will be reviewed to determine sustainability.

6. What does safe contrast volume mean?

This calculated value is individualized for each patient to minimize his or her risk of CI-AKI. Keeping the volume of contrast at or below this amount reduces the patient's risk of CI-AKI by 15 %.

7. What does it mean to be an above average risk patient?

An above average risk patient has a **predicted risk of kidney injury that** is **above the average** for the population eligible for this study **(**5%). The safe contrast volume limits are shown graphically in Blue for ***Above Average*** Risk patients in APPROACH.

8. What does it mean to be a high-risk patient?

A high risk patient has a **predicted risk of kidney injury** that is above the population average, and their ***safe contrast volume limit*** is ***very low***, (≤30cc).
The safe contrast limits are shown graphically in Red for ***High Risk*** patients.

9. What does it mean to be a low risk patient?

Low risk patients have a **risk of kidney injury** that is below the population average (5%). It is still necessary to calcite their risk to identify the patient's risk score. However, no additional steps are being introduced by this project for the low risk patients. Safe contrast volume limits for low risk patients will not be displayed in APPROACH.

10. Will any patients be excluded?

Yes. 1. Patients that have kidney failure and are on dialysis are excluded because acute kidney injury is no longer relevant. 2. Patients that are taken emergently to the cardiac catheterization lab for primary PCI for ST elevation MI are also excluded to avoid any steps that may slow time to their reperfusion.

11. How will optimal IV fluids determined?

LVEDP and weight measurements are used to calculate an IV fluid infusion rate for use during and up to 4 hours after the cardiac catheterization. This calculation is completed automatically in the APPROACH system once weight and LVEDP have been entered, and the value should be communicated to the cardiologist who may decide to follow or modify post-procedure fluid order based on this recommendation.

12. How should appropriate follow-up of patients at risk be ensured?

Patients who are at above average or high risk for CI-AKI should receive a requisition for follow-up blood work if they are being discharged from hospital. For patients being transferred to another hospital or hospital ward, the increased or high risk status should be communicated to the receiving care team, along with a request that a serum creatinine be ordered between 48-72 hours after the procedure. Also, a letters to patients and primary care physician should be provided about hydration and follow-up instructions for patients being discharge home.

13. How will we know if the initiative is successful?

Audit and feedback reports with be provided on use of prevention steps and AKI incidence. These will be provided at regular intervals to cardiologists participating in the initiative at to unit managers and staff.

Clinical Process FAQs

1. Who will calculate the risk?

This is site specific depending on who is entering the criteria and reviewing it in APPROACH prior to the procedure starting.

2. How do I calculate the risk score?

The ePRISM® AKI Risk Calculator in APPROACH (located on the bottom of the Cath or PCI – Main Page) will determine the risk score once all the clinical factors have been included as well as the most recent creatinine and most recent hemoglobin. The calculation can be repeated if corrections to variables are required. The tool is housed in the APPROACH system.

3. Can we calculate the risk during the Cath procedure?

It would be ideal if the risk were calculated prior to the procedures because the information can be best utilized by the cardiologist before the procedure starts. This allows the cardiologist to know in advance the safe contrast dye volume and plan the strategy for the procedure based on this information.

4. What happens to patients who are scored as a low risk?

Safe contrast limits will only be displayed in APPROACH if the AKI risk calculator identifies that the patient is **ABOVE ABERAGE or HIGH RISK**.

5. Will certain variables be auto populated in APPROACH?

Yes, variables already entered in other fields of APPROACH will be auto-populated in the Calculate ePRISM® AKI Risk pop-up box. The variables that need to be entered in other pages of APPROACH are age, indication (CAD presentation), and labs (hemoglobin and serum creatinine). This information will then be auto populated into the Main data page.

6. Which labs will be need to be entered?

The most recent creatinine and hemoglobin need to be manually entered in the interface in order for the calculation to occur when the information is auto-populated.

7. Why do we need to identify race-Black or African American?

It is necessary to account for the fact that African Americans have a higher GFR (kidney function) than Caucasians at the same level of serum creatinine. This is due to higher average muscle mass and creatinine generation rate in African Americans. This information is used for the correct calculation of the CI-AKI risk score.

8. What if the cardiologist chooses not to follow the contrast volume recommendation for a patient?

The cardiologist may choose to exceed the recommended safe contrast volume for clinical reasons. It remains important to capture the volume used and any steps they took to reduce volume. This decision is at the discretion of each cardiologist but this must be documented on the Proc Data Page in APPROACH. This is only a guide for making that decision.

9. What if the cardiologist chooses not to follow the IV fluid recommendation?

The cardiologist can deviate from the recommendations but it important to capture the reason why as part of the study. Also, we recognize there will be some cases where LVEDP cannot be measured; in these situations it is also important for the study to record the reason why it was appropriate not to follow an LVEDP based algorithm in that scenario.

10. What are the post procedure IV fluid orders?

The recommended optimized fluid orders are based on the LVEDP that has been entered into APPROACH, and are automatically calculated in APPROACH once LVEDP and weight are recorded, based on the following protocol from the POSSEIDON randomized controlled trial. These recommendations may not be appropriate for patients with heart failure or with valvular disease that prevents measurement of LVEDP.

LVEDP	IV Rate
<13 mm Hg	5 mL/kg/h
13-18 mmHg	3 mL/kg/h
>18 mmHg	1.5 mL/kg/h

11. What do I say to a patient to maintain their hydration after being discharge home?

It is best to explain to the patient that maintaining good hydration will protect their kidneys by maintaining a good flow of urine thereby flushing the dye more quickly out of their kidneys. This can be achieved by drinking plenty of clear fluids (6-8 glasses of water per day) on the day of and day following your procedure. Patients at above average or high risk who are being discharged home should be given a lab requisition and reminded to go for lab testing 2-3 days after their produce. This should be communicated to the receiving care team for patients discharged to a hospital ward.

12. Why are cardiologists being introduced using a random cluster approach verses starting everyone at the same time?

There are 2 reasons:

1. Implementing the strategy in is most likely to be effective this way. Spending time in a small group to review evidence and developing knowledge on strategies through small group education sessions is the most effective way to introduce new knowledge.

2. This design also allows the research team to evaluate if this strategy is effective, by providing a more rigorously evaluation of any changes in the nature of care and outcomes for each cardiologist before versus after they are introduced to the strategy.

13. How will we know which cardiologists have been introduced into the initiation?

Each site will notified when the next group of cardiologists will be introduced and then each site will develop a way to communicate this information to all staff on a daily basis.

KEY CONTACT

Whom do I contact if I have questions/concerns?

If you require APPROACH technical support, contact them via email at:
support@ approach.org (in the subject line use: *AHS QA for AKI)*

Research related/process support contact:
If you have any project-related questions, please contact:

Pantea Amin Javaheri, Project Coordinator at 403-210-6267 or via email at pantea.javaheri@ucalgary.ca,

Or speak with one of our project clinical leads at your site:

University of Alberta Hospital Site and project Co-Lead – Dr. Michelle Graham
Royal Alexandra Hospital Site Lead – Dr. Ben Tyrrell
Foothills Medical Center Site Lead – Dr. Bryan Har

Nephrology Lead – Dr. Matthew James, via email at:
matthew.james@albertahealthservices.ca

ACRONYMS

APPROACH – Alberta Provincial Project for Outcomes Assessments in Coronary Heart Disease

CI-AKI – Contrast Induced Acute Kidney Injury

eGFR – estimated Glomerular Filtration Rate

ePRISM – Electronic predictive risk information services management

LVEDP – Left Ventricular End Diastolic Pressure