English summary of recommendations

Below is a summary of the recommendations from multidisciplinary evidence-based clinical guideline Safe Use of Contrast Media, part 1. This guideline encompasses the indications and measures to prevent post-contrast acute kidney injury (PC-AKI) when iodine-containing contrast media are being administered. It also gives guidance for the use of contrast media in patients with type 2 diabetes that use metformin and on the use of contrast media in patients that undergo chronic dialysis.

In this summary the scientific evidence and the considerations which have led to these recommendations are missing. For this information the full guideline needs to be consulted. This summary of recommendations should not be used alone. In medical decision making the personal setting and preferences of the patient should be taken into consideration. Treatment and procedures of the individual patient rely on mutual communication between patient, physician en other caregivers.

Chapter 4

How can patients with an increased risk of post-contrast acute kidney injury (PC-AKI) from examinations with injection of intravascular iodine-containing contrast media be identified?

Aim for clinical euvolemia, using normal saline or Ringer's lactate, before administration of intravascular iodine-containing CM, regardless of eGFR.

For patients undergoing intravascular administration of iodine-containing CM:
Consider patients with an eGFR <30 ml/min/1.73m^2 at risk for PC-AKI.

Apply the same recommendations, indicated for patients with bilateral kidneys, to patients with a solitary kidney or kidney transplantation subjected to iodine-containing contrast administration.

Consider that low osmolar contrast media and iso-osmolar contrast media have the same renal safety profile.

Optimal nephrology care should be the primary goal in all chronic kidney disease patients**,** especially with attention to hydration status and medication use.

Consider an alternative imaging technique that does not require iodine-containing CM in all patients with an increased risk of PC-AKI.

Consult a nephrologist/internist for patients with an eGFR <30 ml/min/1.73m^2.

Do not use prediction models or questionnaires to estimate the risk of PC-AKI, since their validity and effect on clinical outcome is unclear.

Chapter 5

How should renal function be measured before and after administration of iodine-containing contrast medium?

Recommendations for physicians requesting laboratory diagnosis

Determine eGFR in each patient scheduled for Computed Tomography or Angiography with or without intervention with use of intravascular iodine-containing contrast media prior to CM administration.

The measurement of eGFR is valid for:

- maximally 7 days when the patient has an acute disease or an acute deterioration of a chronic disease;
- maximally 3 months when the patient has a known chronic disease with stable renal function;
- approx. 12 months in all other patients.

Determine eGFR within 2 to 7 days after intravascular contrast administration in every patient for whom preventive measures against PC-AKI were taken.

If PC-AKI is diagnosed (by KDIGO criteria), follow the patient for at least 30 days post-diagnosis and re-assess serum creatinine.

Recommendations for the clinical chemist

Measure the serum or plasma creatinine using a selective (enzymatic) method.

Implement the creatinine based CKD-EPI formula for estimation of the eGFR.

Consider correcting the eGFR for BSA in the CKD-EPI formula in case that the patient's specific body surface area (BSA) is known.

Chapter 6

Which preventive hydration strategy should be implemented for patients with an increased risk for PC-AKI that will undergo examination with intravascular administration of iodine-containing contrast media?

For patients with an eGFR <30 ml/min/1,73m^2 undergoing intravascular administration of iodine-containing contrast medium either one of the following hydration regimens can be used:

- prehydrate with 3ml/kg/h $NaHCO_3$ 1.4% for 1h (or a total of 250ml) pre-CM administration;
- pre- and posthydrate with 3ml/kg/h $NaHCO_3$ 1.4% for 1h (or a total of 250ml) pre-CM and 1ml/kg/h for 6h (or a total of 500ml) post-CM administration.

Do not use hydration with controlled diuresis for the prevention of PC-AKI in patients undergoing (cardiac) angiography with or without intervention, unless it is performed in a research setting.

Do not use oral hydration as the sole means of prevention of PC-AKI.

Chapter 7

Should statins on top of hydration be recommended to lower the risk of PC-AKI in patients with chronic kidney disease that are scheduled for intravascular iodine-containing contrast media?

Consider giving short term (48 hours) high dose atorvastatin or rosuvastatin in addition to hydration in statin-naïve patients with eGFR <60 ml/min/1.73m^2 undergoing coronary angiography with or without percutaneous coronary intervention.

Should prophylactic N-acetylcysteine on top of hydration be recommended to lower the risk of PC-AKI in patients with normal renal function or chronic kidney disease that are scheduled for intravascular iodine-containing contrast media?

Do not use NAC for the prevention of PC-AKI in patients with a normal or impaired (eGFR <60 ml/min/1,73m^2) kidney function.

Should prophylactic Vitamin C on top of hydration be recommended to lower the risk of PC-AKI in patients with normal renal function or chronic kidney disease that are scheduled for intravascular iodine-containing contrast media?

Do not use vitamin C exclusively for the prevention of PC-AKI in patients with a normal or impaired (eGFR <60 ml/min/1,73m^2) kidney function.

Should nephrotoxic medication be withheld prior to intravascular administration of iodine-containing contrast media to lower the risk of PC-AKI?

Do not routinely withhold ACE-inhibitors, angiotensin II receptor blockers or diuretics prior to intravascular iodine-containing contrast administration. iodine-containing

Withhold NSAIDs prior to intravascular administration of iodine-containing contrast media

The working group recommends nephrology consultation before administering iodine-containing contrast in patients with eGFR <30 ml/kg/1.73m^2 to individualize continuation or discontinuation of ACE inhibitors, angiotensin II receptor blockers, diuretics or nephrotoxic drugs and to weigh this against the potential benefits and harm of the administration of iodine-containing CM

Should prophylactic renal replacement therapy be recommended to lower the risk of PC-AKI in patients with chronic kidney disease stage 4-5 that are scheduled for intravascular administration of iodine-containing contrast media during coronary angiography with or without intervention?

Do not use prophylactic dialysis in patients with chronic kidney disease stage 4 to 5 receiving intravascular iodine-containing contrast medium for coronary angiography

with or without percutaneous intervention, to lower the risk of post contrast acute kidney injury.

Do not use prophylactic hemofiltration routinely in patients with chronic kidney disease stage 4 to 5 receiving intravascular iodine-containing contrast medium for coronary angiography with or without percutaneous intervention.

The scheduling of an iodine-containing contrast-enhanced imaging study does not need to be adapted to the dialysis schedule of the patient (in other words: do not change the schedule of chronic dialysis for the purpose of a iodine-containing contrast-enhanced imaging study).

Chapter 8

Should metformin be withheld to prevent metformin-associated lactic acidosis (MALA) in patients with chronic kidney disease scheduled for intravascular administration of iodine-containing contrast media?

Continue metformin in all patients with an eGFR 30-44 ml/min/1.73m^2 scheduled for imaging to whom intravascular iodine-containing contrast medium is administrated.

Discontinue metformin in all patients with an eGFR < 30 ml/min/1.73m^2 to whom intravascular iodine-containing contrast medium is administrated as soon as this level of kidney dysfunction is detected and inform the requesting and prescribing physician.