Nephrogenic systemic fibrosis (NSF), described in 2000, is an emerging systemic disorder characterized by widespread tissue fibrosis. NSF is a multi-systemic fibrosing disorder that has a wide distribution of patient age, but no sex or ethnic predilection. While the precise cause of NSF remains a mystery, it is known to occur only in patients with renal disease—generally in those requiring dialysis.

The early clinical manifestations of NSF include pain, swelling, skin erythema, pruritus, transient alopecia as well as gastrointestinal symptoms of nausea, vomiting, diarrhea and abdominal pain. Chronically the skin develops nodules, patches or confluent regions of hyperpigmentation with associated skin thickening and brawny induration. The skin changes usually start in the distal extremities, then spread proximally and may involve the trunk. Progressively, patients may develop stiffness of the joints, myalgia, deep bone pain, muscle weakness, joint contractures and leg restlessness. Yellowish scleral plaques have also been described.

NSF may develop rapidly and can sometimes result in patients becoming confined to a wheelchair within a few weeks. More commonly, the skin thickening is insidious and can be confused clinically with peripheral edema. Pathophysiologically, NSF results in increased tissue deposition of collagen, commonly resulting in thickening and hardening of the skin of the extremities and often culminating in immobility and contractures of the joints. In some patients, there is clinical involvement of other tissues (lung, skeletal muscle, heart, diaphragm, esophagus, etc), although the patient may not be clinically symptomatic. Deep skin biopsy is considered essential for definitive diagnosis of NSF because other clinical condition can mimic NSF, such as scleromyxedema, scleroderma, morphea, eosinophilic fasciitis, eosinophilia-myalgia syndrome, toxic oil syndrome, and calciphylaxis. The exact pathogenesis is unclear, but it likely involves the migration of CD34 and procollagen-1 positive circulating fibrocytes from the blood to the involved tissue as proposed by Cowper. These fibrocytes likely activate a fibrotic response through cytokine production and T-cell activation.

Although there is evidence associating the development of NSF in patients with renal failure with only some, but not all. For the use of all gadolinium-based MR contrast agents in patients with stage 4 or 5 chronic kidney disease (ie, patients maintained with either hemodialysis or peritoneal dialysis) or patients with a GFR of less than 30 mL/min/1.73 m², we follow the approach listed below. We share this solely as our approach rather than as an official recommendation of any kind.

1. In consultation with the ordering physician, we consider alternative imaging or nonimaging modalities that may provide the requested clinical diagnostic data at a lower potential risk.

2. We administer gadolinium-based MR contrast agents to a patient with stage 4 or 5 chronic kidney disease or with acute kidney injury and markedly impaired GFR or who undergoes dialysis. We inform patients of the benefits, risks, and alternatives, based on currently available information, and prospectively record in writing the disclosure and the informed consent.

3. If administration of a gadolinium-based MR contrast agent is deemed necessary, we consider using the lowest dose needed to reliably provide the diagnostic information being clinically sought.

4. We perform any additional nonenhanced...
sequences that may be helpful.

5. For patients maintained with hemodialysis, we ensure hemodialysis treatment as soon as possible, ideally within 3 hours after the administration of the gadolinium-containing contrast agent. A second dialysis session within 24 hours can also be performed if it is clinically safe to do so.

6. We consider hemodialysis for patients undergoing peritoneal dialysis because there are data to suggest that hemodialysis clears the gadolinium-based MR contrast agent more effectively than does peritoneal dialysis.

7. If there is a diagnosis or clinical suspicion of NSF in the patient, we discourage exposure to any gadolinium chelates.

8. In light of the observation that the overwhelming majority of cases of NSF are associated with prior gadodiamide administration specifically, we do not administer this agent to patients with any renal disease.

References