REDESIGNING KIDNEY DISEASE TREATMENT
About the Technology Roadmap for Innovative Approaches to Renal Replacement Therapy

THE NEED FOR CHANGE
Current treatment options for chronic kidney disease (CKD) are time-consuming, detrimental to patient well-being and quality of life, and have a significant economic impact. For patients whose kidney function has deteriorated to the point of end stage renal disease (ESRD), dialysis and transplant remain the only treatment options. Methods for treating the disease—collectively referred to as renal replacement therapy (RRT)—have not changed significantly since dialysis was introduced about 60 years ago. To improve the lives of millions of ESRD patients, we need technology developers, engineers, entrepreneurs, and other stakeholders outside of the nephrology community to help identify disruptive solutions.

ROADMAP STRATEGY: CHANGING THE RRT PARADIGM
To address the urgent need for RRT innovation and help accelerate the availability and adoption of commercially viable solutions, the Kidney Health Initiative published the Technology Roadmap for Innovative Approaches to Renal Replacement Therapy in October 2018. The roadmap outlines:

- Desired future state of improved patient quality of life
- Technical and market challenges
- Solution strategy
- High-priority research activities

IMPROVED PATIENT QUALITY OF LIFE

KIDNEY FUNCTION
Activities to pursue unique solutions for replicating or replacing each kidney function

SYSTEM ENABLERS
Activities that are broader in scope and serve to connect or integrate a variety of kidney functions or elements of RRT into more comprehensive systems

SUPPORTING ACTIVITIES
Activities that must occur in parallel with the Kidney Functions and System Enablers R&D activities to ensure the accelerated availability of innovative RRT solutions
## COMMON DESIGN REQUIREMENTS

Based on patient input, the roadmap outlines the attributes of improved quality of patient life that new RRT solutions should aim to achieve and establishes the minimum technical requirements that all innovative solutions must meet.

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<th>Function/Component</th>
<th>Minimum Technical Design Requirements</th>
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| Cross-Cutting      | • Minimizes impact/intrusion of therapy on family and social life  
|                    | • Increases mobility and physical activity, including a greater ability to work and travel  
|                    | • Allows for liberalized diet and fluid regulation  
|                    | • Reduces disease and treatment complications  
|                    | • Component materials and design must be biocompatible and hemocompatible |
| RRT Access         | • Provides access to the blood for filtration in a continuous manner  
|                    | • Maintains patency over usable life, reducing incidence of stenosis and thrombosis  
|                    | • Lowers incidence of infectious complications  
|                    | • Patient-friendly with minimal maintenance and quick connection/disconnect  
|                    | • Mitigates blood loss or other complications in the event of an unintentional disconnection |
| Blood Filtration   | • Non-fouling and able to maintain continuous performance  
|                    | • Generates a filtrate of at least 40L/day  
|                    | • Size selective, with no loss of essential blood proteins |
| Electrolyte Homeostasis | • Normalizes and maintains commonly measured or needed electrolytes within clinically acceptable ranges, potentially with the aid of pharmacological interventions |
| Fluid Regulation   | • Removes excess fluid and is adjustable based on patient needs  
|                    | • Allows patient to self-manage and monitor fluid status separate from other functions |
| Toxin Removal/Secretion | • Maintains clearance/reduction of uremic toxins: small, non-protein bound; small, protein-bound; “middle molecules”  
|                    | • Capable of secreting non-filtered toxins |
| Filtrate Transport and Drainage | • Removes remaining processed filtrate—up to 3L/day  
|                    | • Processed filtrate storage/removal apparatus is acceptable to the patient |

### GET INVOLVED

The kidney health ecosystem needs innovative thinkers and disruptive solutions to affect real change that can transform the lives of CKD and ESRD patients, many of whom do not have time to wait for long-term solutions. You can help contribute to the search for better solutions in kidney health:

- **Connect with KHI**
  - Get involved in solution development and interface with nephrologists and patients to learn more about current needs. [Email KHI.](mailto:khi@email.com)

- **Read the roadmap**
  - Learn more about current technology needs and specific priority research and development activities, both short- and long-term. [Read the roadmap.](#)

- **Participate in the KidneyX Redesign Dialysis prize competition**
  - The first phase of this competition will award up to 15 prizes of $75,000 each for designs of solutions or solution components that replicate kidney functions and improve patient quality of life. A second phase—demonstration of a prototype solution—will award up to 3 prizes of $500,000 each, based on the technical needs identified in the roadmap. Visit the [website.](#)