



CAIRIBU URO-AGING RESEARCH INTEREST GROUP (UroAging RIG)

CAIRIBU URO-AGING KNOWLEDGE EXCHANGES

EXECUTIVE SUMMARY

6/22/2026

Goal: Facilitate knowledge exchange and spur collaborations in uro-aging research and adjacent fields

Summary

Dr. Becky Clarkson: Situational Incontinence: Addressing the Brains Role In Bladder Behavior

Introduction to Situational Incontinence

- Dr. Clarkson provided background information on situational incontinence, referring to it as “latch-key incontinence” or “key in door syndrome”, where specific environmental cues trigger urgency and leakage.
- Situational incontinence is often associated with urge urinary incontinence (UI) and overactive bladder (OAB) syndrome.
- Common triggers include seeing or hearing water running, seeing a bathroom, arriving home, or other individual cues. In contrast, familiar and relaxing environments may serve as safe spaces associated with reduced urgency.
- In prior work, **52% of women with UI reported urgency and 26% reported leakage triggered by situational cues.**

Physiological Response to Situational Triggers

- Dr. Clarkson’s team investigated whether situational incontinence represented a true physiological response rather than solely a learned behavior.
- In a study with 12 women over the age of 60 with situational incontinence, participants viewed personalized images representing their individual trigger and safe spaces.
- Exposure to trigger images resulted in urgency and leakage, confirmed through urodynamic testing, demonstrating that environmental cues can activate a bladder response.
- **Safe-space images were associated with reduced urgency**, supporting the concept that bladder symptoms are influenced by learned associations between environmental contexts and bladder control.

Brain Mechanisms with Situational Incontinence

- Dr. Clarkson’s team conducted functional MRIs of the brain while participants viewed trigger images.
- Brain imaging showed increased brain activation in regions associated with memory, processing, motor control, and awareness/arousal regulation when patients were exposed to triggering cues.

Targeting Brain Mechanisms to Improve Continence

- Dr. Clarkson evaluated three non-invasive interventions designed to reduce conditioned urgency responses: mindfulness training, transcranial direct current stimulation (tDCS), and a combined approach to both interventions.
- Women over the age of 40 were randomized into the three intervention groups and completed four treatment sessions over one week by being exposed to personalized trigger cues during the intervention.
- Mindfulness training was designed to promote non-judgmental awareness of bladder sensations, while tDCS targeted the prefrontal cortex to enhance neural circuits involved in bladder control and self-regulation.

Treatment Outcomes and Clinical Implications

- **All three interventions resulted in reductions in trigger-related leakage episodes.**
 - More than 60% of participants reduced leakage episodes by at least 50%, and 20% became dry following the intervention.
 - Participants demonstrated significant improvements in symptom severity and quality of life measures at a four-week follow-up.

Summary

- **Key points:** Situational incontinence involves measurable physiological responses driven by interactions between environmental cues, bladder sensation, and brain mechanisms.
- Brain imaging studies highly the role of memory, emotional processing, and regulatory networks in generating urgency responses.

FEATURED SPEAKERS

BECKY
CLARKSON, PHD

SHACHI TYAGI
MD, MS

CAIRIBU EVENTS URO-AGING RIG

JUNE 22, 2026
3PM-4PM ET



- **Using low burden, non-invasive alternative to pharmaceutical treatments has potential for improving continence by targeting brain-bladder control.**
- Future research will focus on identifying additional brain regions involved in bladder control, optimizing tDCS stimulation strategies, understanding the mechanisms underlying treatment response, and determining which behavioral interventions may best complement neuromodulation approaches.

Dr. Shachi Tyagi: Nocturia in Older Adults: Breaking Etiologic Silos

Introduction to Nocturia

- Dr. Tyagi defined nocturia as waking one or more times per night to void, with sleep preceding and following the voiding episode.
- **Nocturia increases in prevalence with age, affecting up to 75% of adults over the age of 65.**
- This condition is multifactorial and may result from abnormalities in urinary storage, increased nighttime urine production (nocturnal polyuria), sleep disruption, or a combination of these factors.

Circadian Regulation and Urine Production

- Dr. Tyagi reviewed evidence demonstrating that older adults produce a larger proportion of their daily urine volume at night compared to younger adults.
- **Circadian rhythm studies suggest aging alters the normal timing of urine production**, contributing to nocturnal polyuria, the most common cause of nocturia.

Hormonal Control of Fluid Balance

- Two antagonizing fluid and sodium regulation systems were emphasized: (1) vasopressin (ADH) and the renin-angiotensin-aldosterone system (RAAS), which promote water and sodium retention, and (2) atrial natriuretic peptide (ANP), which promotes fluid excretion.
- Research examining altered sleep schedules and hormone regulation showed that ADH, aldosterone, and plasma renin activity (PRA) normally peak during sleep, supporting water and sodium reabsorption and reducing nighttime urine production, while ANP and cortisol rise in the early morning.
- **Sleep-associated increases in ADH and aldosterone likely contribute to water and sodium reabsorption leading to a reduced nighttime urine production.**

Sleep as a Therapeutic Target

- Aging is associated with reduced deep sleep and increased nighttime awakenings, both of which contribute to nocturia.
- Dr. Tyagi emphasized the relationship between sleep and nocturia, where sleep disruption can worsen urinary symptoms, and nocturia can further impair sleep quality.
- Sleep may represent a potential therapeutic target for nocturia and nocturnal polyuria, particularly for older adults where pharmacologic therapies may carry additional risks.

The Role of the Bladder in Water Regulation

- Emerging evidence suggests that **the bladder may play a more active role in fluid regulation** via aquaporin-2 (AQP-2) water channels in bladder urothelium, challenging traditional views that the bladder is a passive storage reservoir.
- Research in children with nocturnal enuresis demonstrated altered nighttime AVP and AQP2 regulation, suggesting a role for bladder water transport in overnight urine handling.
- Studies of overnight bladder capacity identified distinct patterns of bladder filling and storage during sleep, indicating that **bladder physiology may contribute to nocturia independently of kidney urine production.**

Summary and Future Directions

- **Key points:** Nocturia is a multifactorial condition influenced by circadian biology, sleep physiology, hormonal regulation, kidney function, and bladder storage mechanisms.
- Sleep plays a critical role in regulating urine production and may represent an underutilized treatment target for nocturia and nocturnal polyuria.
- Emerging evidence suggests that the bladder may actively participate in water regulating through AQP-2 mediated mechanisms.
- Future research is needed to better understand the interaction between sleep, hormones, kidney function, and bladder physiology and to determine whether these pathways can be targeted to improve nocturia in older adults.

Becky Clarkson, PhD, is currently an Assistant Professor of Medicine and Director of the Continence Research Unit. Dr. Clarkson originally trained as a physicist, and her doctoral research focused on developing clinical tests and diagnostic tools related to bladder dysfunction. She has since transitioned to studying the role of the brain in bladder dysfunction. Her NIH-funded research focuses on the link between the brain and the bladder in urge urinary incontinence, specifically environmental triggers of urinary leakage. In addition, she is using her expertise in medical technology to investigate brain-based therapies for urge incontinence, including transcranial direct current stimulation and de-conditioning strategies such as cue exposure and mindfulness.

Shachi Tyagi, MD, MS, is a geriatrician certified in internal medicine and geriatric medicine by the American Board of Internal Medicine. Dr. Tyagi is an Assistant Professor of Medicine and is supported by an NIH-R01 and R21. Her research interests include lower urinary tract symptoms, especially nocturia, and insomnia: their causes, treatment, and impact, both on each other and on the risk of falls.