531

Lowder J[1], Berry A[2], Brady S[3], Fok C[3], Gahagan S[4], Hebert-Beirne J[5], Lewis J[6], Lewis B[7], Low L[8], Palmer M[9], Smith A[10], Lukacz E[4]

1. *Washington University in St Louis,* ***2.*** *The Children's Hospital of Philadelphia,* ***3.*** *University of Minnesota,* ***4.*** *UC San Diego Health System,* ***5.*** *University of Illinois at Chicago,* ***6.*** *Yale University,* ***7.*** *University of Alabama at Birmingham,* ***8.*** *University of Michigan,* ***9.*** *University of North Carolina at Chapel Hill,* ***10.*** *University of Pennsylvania*

DEFINING BLADDER HEALTH IN WOMEN AND GIRLS: IMPLICATIONS FOR RESEARCH, CLINICAL PRACTICE, AND PUBLIC HEALTH

Hypothesis / aims of study

This original work was designed to demonstrate a novel approach to the study of prevention for lower urinary tract symptoms (LUTS) in women and girls. While prevalence and risk factors for LUTS have been extensively studied, there has been little work in the area of LUTS prevention or "bladder health" promotion. This, in part, is due to the lack of a commonly accepted definition of optimal "bladder health." The general misconception that a response of "no" to LUTS questions implies "bladder health" has hindered our ability to appropriately identify modifiable risk factors. Epidemiologic studies classically use this methodology to define referent groups when calculating risk factors for LUTS. But, this does not ensure that those in the referent group are without other unassessed LUTS. Yet, strategies to mitigate risk factors have been suggested based on these false assumptions, particularly during pregnancy or in older women; and there has been little to no focus on primordial or primary prevention in girls, adolescents or younger women. Thus, to accurately identify and promote "bladder health," a systematic approach to defining "bladder health" across the life course is needed. This abstract describes the process by which a working definition of "bladder health" was developed to establish a foundation for developing instruments, and assessing outcomes of LUTS prevention and bladder health promotion in scientific research, clinical practice, and public health initiatives.

Study design, materials and methods

A transdisciplinary research consortium comprised of U.S. experts in adolescent medicine, pediatrics, geriatrics, female pelvic medicine & reconstructive surgery, preventive medicine, community health science, psychology, nursing, medical sociology, behavioral science, epidemiology, and biostatistics was assembled to identify "bladder health" as a state to preserve and protect. We explored lessons from other health promotion research (e.g. cardiovascular health) and determined that there was insufficient evidence in "bladder health" to apply similar models. Thus, we proceeded in defining it using an iterative process starting with expert opinion (consortium members) to develop a framework for focus group exploration and population-based testing. Consistent with the World Health Organization (WHO) definition of "health," we propose that the absence of particular LUTS is insufficient to define "bladder health," and emphasize the ability of the bladder to adapt to short term physical, social, and psychological challenges [2,3]. Further, in addition to the commonly defined phases of bladder function: 1) bladder storage and 2) bladder emptying, we identified 3) protection of the individual from infection, neoplasia, and other biologic threats as a third function.[3] This third bioregulatory function was added to reflect the increasing knowledge surrounding relationships between urothelial function, urinary markers, proteins and biomes associated with LUTS. After defining overall "bladder health", we used currently accepted LUTS definitions to capture various dysfunctions of the bladder and developed "healthy" counterparts to a variety of bladder functions. This iterative process began with a subgroup of investigators and then was validated by the larger consortium, and continues to be refined. Definitions were created recognizing that definitions of "bladder health" may vary across the life course; with development of continence in children reliant on bladder maturation and appropriate neurodevelopmental function, while storage capacity and emptying efficiency may change with advanced age.

Results

The working definition of "bladder health" developed by the consortium is: "A complete state of physical, mental, and social well-being related to bladder function, and not merely the absence of LUTS. Healthy bladder function permits daily activities, adapts to short term physical or environmental stressors, and allows optimal well-being (e.g. travel, exercise, social, occupational or other activities)." A comprehensive table was developed to categorize dysfunction and health for each of the three bladder phases (Storage, Emptying and Bioregulatory). The table below is an excerpt of the working version of our tool to identify gaps in knowledge and areas for future "bladder health" research. Additional domains under each phase are described as "functions" Subjective and objective measures to assess health in each of these domains are proposed.

Table 1		Subjective Experience and Objective Measures of Health	
Bladder Phase	**Bladder Function**	**Lower Urinary Tract Symptom(s)**	**Bladder Health**
Storage	**- Frequency Daytime** **- Frequency Night** **- Continence Day** **- Continence Night** **- Urge** **- Comfort**	**LUTS Subjective Experience:** Symptoms that occur during the storage phase-urinary frequency, nocturia, urinary incontinence, nocturnal enuresis, urgency, bladder pain and pressure **LUTS Objective Measures:** Measurable findings related to LUTS during storage phase (i.e. detrusor overactivity, leakage, etc.)	**BH Subjective Experience:** Ability to hold urine for a reasonable duration of time (based on state of knowledge about bladder filling and storage), without fear of or concern about leakage, urgency or discomfort.* *Storage function permits daily activities, adapts to short term physical or environmental stressors, and allows optimal well-being (e.g. travel, exercise, social, occupational or other activities) **BH Objective Measures:** Need data in order to define range of healthy bladder measures associated with absence of symptoms (i.e. healthy first sensation, strong desire to void, maximum capacity, functional capacity, duration of time between urge and void, frequency, toileting behavior, etc.)
Emptying	**- Voiding Position** **- Voiding Initiation** **- Voiding Efficacy** **- Stream Speed** **- Stream Character** **- Stream Continuity** **- Post Void** **- Continence** **- Comfort**	**LUTS Subjective Experience:** Symptoms that occur during the emptying phase– hesitancy, straining to void (at initiation and to completely empty), slow stream, interrupted stream, spraying/splitting, dysuria, incomplete emptying, post-void dribble or inability to sense when flow is complete. **LUTS Objective Measures:** Signs that occur during the emptying phase of the bladder (i.e. flow rate, pattern, stream, etc.	**BH Subjective Experience:** The ability to empty the bladder in a timely, efficient, effortless and comfortable manner.** 1. Time to go from urge (delay in initiation of void) 2. How long to empty (duration of emptying) 3. Completeness of emptying ** Emptying function does not impact daily activities on a routine basis, is adaptable to short term physical or environmental stressors, and allows a woman to pursue her optimal well-being (e.g. travel, exercise, social, occupational or other activities). **BH Objective Measures:** Need data in order to define healthy objective measures associated with absence of symptoms (i.e. duration to initiation of stream, duration of total void, character of stream, acceptable post void residual urine volume, etc.)
Applicable across both bladder phases	**Bioregulatory** **- Biosis Barrier** **- Physical, Chemical & Cancer Barrier**	**LUTS Subjective Experience:** NA **LUTS Objective Measures:** A breakdown in the protective and communication functions of the bladder resulting in LUTS (i.e. infection, inflammation, collagen degradation, malignancy, etc.)	**BH Subjective Experience:** NA **BH Objective Measures:** Need data in order to define healthy bioregulatory measures (i.e. adaptable to short-term physical or environmental stressors, able to completely recover from disruption of the barrier layer, without long term or persistent sequelae: biomarkers, microbiota, etc.)

The bioregulatory category – the most novel element of the table – is organized in terms of three main bioregulatory functions: host defense/biosis barrier, chemical/physical barrier, and cancer barrier. We recognize that the bladder functions in a bi-directional manner to communicate with the environment, prevent systemic and/or local infection, transmit appropriate physiologic signals, and regulate cellular function. Possible biomarkers for LUTS prevention research were also compiled as targets of study as we move forward in our novel approach to understanding the healthy bladder.

Interpretation of results

This is the first report of a definition of “bladder health” that has been systematically developed for purposes of studying LUTS prevention and bladder health promotion. Future efforts of this consortium include refining definitions, and developing and validating measures of bladder health for use in scientific research, clinical practice, and public health initiatives. We plan to describe the healthy bladder experience using community engagement and focus group methods, and intend to collect normative objective data for the three bladder functions. With this foundational work, we hope to lay the groundwork for development of survey instruments and other assessment tools to explore risk and protective factors for bladder health.

Concluding message

This work provides a bladder health framework for research, clinical practice, and public health promotion.

References

1. World Health Organization. (2006). Constitution of the World Health Organization – Basic Documents, Forty-fifth edition, Supplement, October 2006.
2. McEwen, B. S. (1998). Stress, adaptation, and disease: Allostasis and allostatic load. Annals of the New York Academy of Sciences, 840, 33-44.
3. A.J. Wein et al. (eds.), Bladder Dysfunction in the Adult: The Basis for Clinical Management, Current 19 Clinical Urology, DOI Springer Science+Business Media New York 2014

Disclosures

Funding: Support by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) through cooperative agreements (grants DK106786, DK106853, DK106858, DK106898, DK106893, DK106827, DK106908, DK106892). **Clinical Trial:** No **Subjects:** NONE