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Sustaining the Quality of Sports Participation and Life Standards in Aging Men: A Systematic Review of Physical Activity and Urological Health Management

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Abstract

This systematic review formulates an organizational service framework integrating clinical urological data with sports management practices to mitigate disease-induced dropout among aging male athletes. Following PRISMA guidelines, a systematic search of PubMed (2021–2026) yielded 22 primary open-access articles evaluating physical activity, sedentary behaviors, and male urological or renal outcomes. High-volume cohort data confirms a robust inverse relationship between regular physical activity and the severity of lower urinary tract symptoms and erectile dysfunction, though extreme training volumes display a non-linear risk threshold. In clinical rehabilitation phases, supervised technological exercises paired with behavioral compliance models significantly accelerate post-

surgical continence recovery. Longitudinally, overactive bladder symptoms serve as independent predictors of upper-limb grip strength decline and physical frailty. Sports enterprises can optimize service quality and member retention by moving from generic configurations toward age-appropriate, urologically sustainable exercise designs. Practical administrative interventions include expanding facility restroom accessibility to reduce public anxiety and embedding non-invasive urological screening metrics into routine physical assessments to preserve lifelong functional longevity.

Keywords: Lower Urinary Tract Symptoms (LUTS), Sports Management, Service Quality, Active Aging, Participant Retention, Pelvic Floor Muscle Training (PFMT).

1. Introduction

The optimization of health management within contemporary sports networks requires transitioning from generic exercise schedules to demographic-centric service models. Lower urinary tract symptoms, benign prostatic hyperplasia, erectile dysfunction, and related renal disorders have historically been confined to clinical silos, treated as unavoidable consequences of male aging. Within sports administration, these conditions represent critical variables that dictate client retention, member life satisfaction, and institutional service value. When sports facilities fail to accommodate the unique urological profiles of mature male cohorts, they face a persistent, multi-faceted attrition phenomenon known as the silent dropout. The pronounced psychological burden, private distress, and pervasive cultural taboos traditionally associated with bladder outlet obstruction and sexual dysfunction compel aging men to quietly withdraw from public recreational and competitive sporting spaces. This unannounced flight from active environments disrupts healthy aging trajectories and weakens the long-term community engagement models of athletic enterprises. To counteract this loss of human capital, sports management teams must re-evaluate physical activity as a potent, non-pharmacological preventative intervention and an organizational asset requiring deliberate administrative support and specialized environmental configurations [1].

2. Aim

The primary objective of this systematic review is to formulate an evidence-based organizational service framework that integrates clinical urological data with contemporary sports management practices to mitigate the risk of urological disease-induced dropout among aging male athletes and fitness participants. Specifically, this review aims to analyze how physical activity dosage, metabolic profiles, and environmental factors modify the prevalence and severity of lower urinary tract symptoms, benign prostatic hyperplasia, and erectile dysfunction. Furthermore, it aims to evaluate the administrative and rehabilitative efficacy of supervised pelvic floor muscle interventions and behavioral compliance models. Ultimately, the overarching goal is to equip sports facility administrators, club directors, and athletic programmers with a definitive, biomarker-validated structural guide to optimize service quality, overcome social stigma, improve member retention, and enhance the functional longevity and life quality standards of mature male populations in active settings.

3. Materials and methods

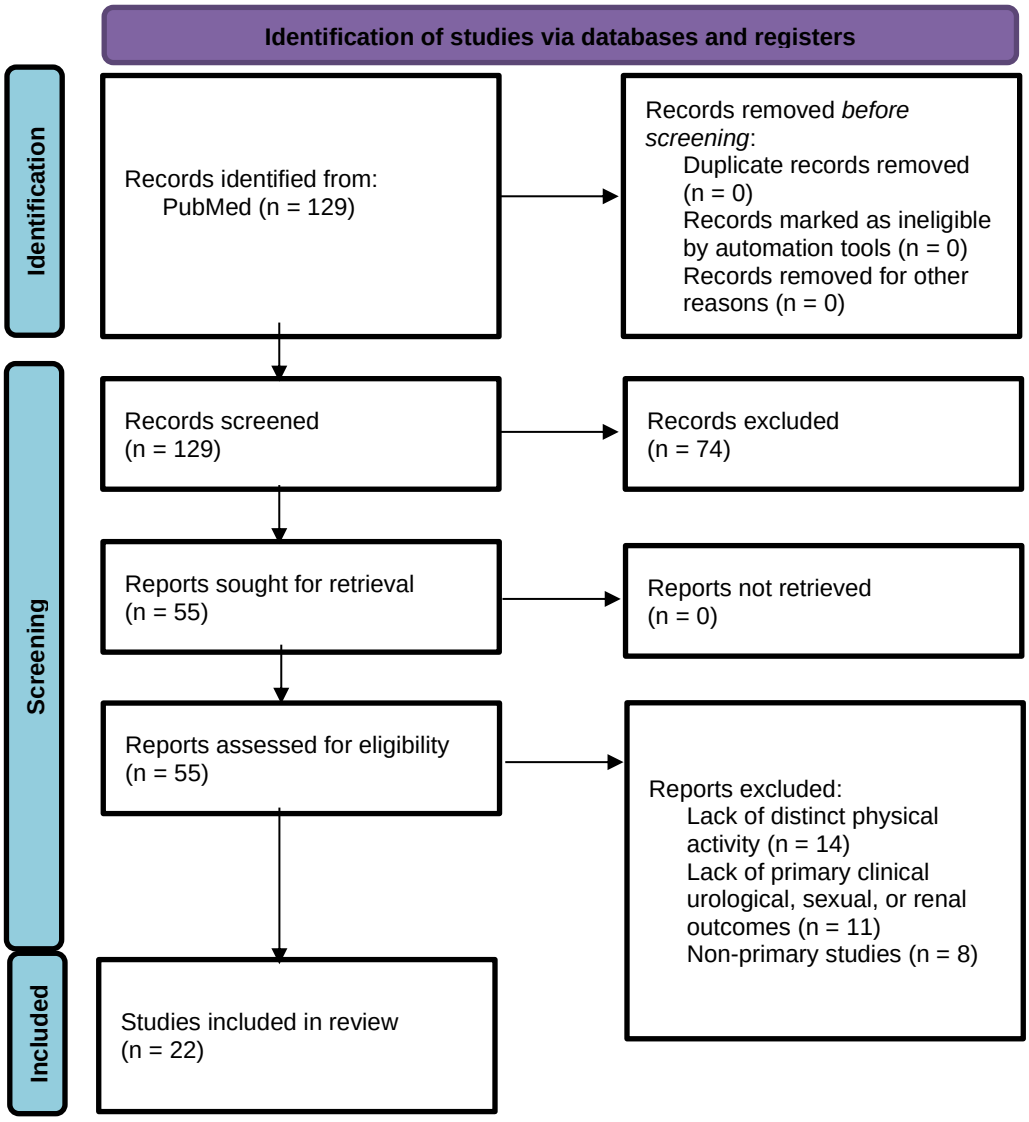
The operational execution of this systematic review adhered strictly to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement guidelines to preserve comprehensive empirical transparency, scientific validity, and replicability across institutional review boards and sports management research processes. The overarching workflow transitioned from broad database queries down to precise synthesis mapping across distinct analytical phases. In the primary phase of the search architecture, a rigorous electronic investigation was deployed across the prominent international database PubMed, restricting the publication window to primary research emerging between 2021 and 2026 to ensure the contemporary relevance of the data. The search architecture utilized highly specific combinations of Medical Subject Heading terms and title or abstract text descriptors combined using Boolean operators to cross-reference exposure variables including motor activity, exercise therapy, physical fitness, and sedentary behavior with various lower urinary tract, sexual, and nephrological outcomes including nocturia, urinary incontinence, overactive bladder, and prostatic hyperplasia.

In the secondary phase, explicit database constraints and filters were applied directly inside the search infrastructure, limiting results to English language publications, human subjects exclusively, and free

full-text availability parameters to guarantee maximum transparency, verification, and immediate operational utility for sports managers. The third phase involved the PRISMA selection funnel quantification, which commenced with 129 initial records extracted from the baseline search strategy. During the title and abstract screening, 74 records were excluded for failing to match the target clinical parameters, such as pediatric cohorts, female-only populations, or standalone pharmaceutical trials. This screening left 55 full-text reports, all of which were successfully retrieved with zero unretrieved documents due to the pre-applied open-access criteria. Following full-text eligibility assessment, an additional 33 articles were excluded with specific justifications, including 14 papers that lacked distinct physical activity or sitting metrics, 11 reports that omitted primary urological or renal endpoints, and 8 documents categorized as secondary editorials, letters, or commentary notes without original primary data.

This meticulous selection process yielded a final definitive cohort of 22 primary research articles. In the fourth phase, the synthesis categorization framework mapped these 22 primary sources into an organizational service model divided into three overlapping analytical matrices, which were classified as epidemiological quality and preventative risk mitigation, clinical intervention efficacy and consumer experience management, and functional longevity and biomarker-driven retention metrics. Each included article was indexed with a consistent numerical identifier throughout the entire synthesis, serving as a reliable structural guide for developing uro-inclusive sports policies.

Figure 1. PRISMA flowchart for conducting the literature search.



4. Results

4.1 Institutional Risk Mapping and Preventative Service Quality

The primary baseline for designing uro-protective sports environments relies on large-scale epidemiological data that maps out the baseline risk configurations of active men. In a comprehensive population study tracking an extensive sample of 20,732 Brazilian men, investigators established a highly significant, independent inverse relationship between quantified physical exertion and symptom development, confirming that all active tiers of baseline movement effectively lowered the adjusted odds of developing debilitating lower urinary tract symptoms [1]. This systemic physical benefit

operates in direct symmetry with outcomes observed in sexual function management, which represents an equally vital dimension of male life quality and behavioral confidence. A parallel epidemiological cohort analysis evaluating 20,789 subjects within the identical geographic and socio-demographic framework determined that both low-intensity and high-intensity physical activity profiles function as powerful protective parameters against the manifestation of erectile dysfunction, delivering an adjusted odds ratio of 0.77 for highly active men when measured against completely sedentary control groups [2]. This global protective trajectory is further substantiated by localized multi-variable data extracted from the National Health and Nutrition Examination Survey covering the years 2007 to 2016, which focused intensely on the distinct clinical and sleep-disrupting challenge of nocturia; this database evaluation concluded that systematic engagement in vigorous physical activity patterns correlates with a minimized vulnerability to frequent nocturnal voiding, thereby preserving sleep architecture and optimizing daytime performance metrics [3].

The complex physiological interface linking physical activity to urological stability is further adjusted by broader lifestyle architectures, metabolic configurations, and external environmental inputs that sports managers must monitor when crafting holistic lifestyle interventions. Recent population-based database modeling reveals that the integration of popular dietary modifications, such as the ketogenic diet, manifests a non-linear, distinct U-shaped correlation with the direct incidence of overactive bladder and nocturia; critically, the clinical severity and manifestation of these diet-induced bladder irregularities are heavily reshaped and suppressed by the individual's concurrent physical activity volume [4]. Environmental parameters similarly intersect with behavioral metrics to determine cellular and structural tissue-level pathology within the prostate and bladder neck. A nationwide longitudinal cohort study tracking more than 2.2 million subjects demonstrated that elevated exercise frequency serves as a critical biological buffer capable of modifying and downregulating the heightened risk of BPH-LUTS development typically triggered by chronic exposure to ambient fine particulate matter [5]. This specific capacity of regular physical movement to offset external environmental hazards helps explain broad demographic variations, as evidenced by national health surveys indicating that pronounced urban-rural disparities in physician-diagnosed BPH are largely mediated and explained by self-reported engagement in moderate daily exercise [6].

Conversely, the severe biological hazard of physical inactivity is clearly illustrated by multi-variable survival models focusing on sedentary behavior. Prolonged sitting time represents a hazardous, low-quality movement paradigm that drives renal and lower urinary tract microvascular decline, a

destructive process mediated by specific kidney function markers that ultimately predicts an elevated risk path for all-cause mortality [7]. To optimize clinical screening and diagnostic precision within these active populations, innovative multi-parameter biochemical measures like the sex-specific HALP score have been validated as reliable biological proxies capable of predicting the underlying prevalence, structural risk, and clinical severity of urinary incontinence [8]. By synthesizing these diverse epidemiological insights, sports administrators can identify high-risk participant groups and proactively modify facility access, environmental exposure guidelines, and preventative programming to safeguard long-term user participation.

4.2 Clinical Intervention Efficacy and Consumer Experience Management

When preventative lifestyle thresholds are crossed and community members transition through surgical treatments for advanced urological pathologies, the service mandate of sports organizations focuses heavily on post-operative care delivery, program adherence tracking, and managing customer friction. For participants navigating the recovery phase following radical prostatectomy, the rapid and stable restoration of urinary continence represents the primary driver of post-surgical quality of life and subsequent physical reintegration into active community settings. Randomized and controlled clinical trials comparing various pelvic floor muscle training interventions have confirmed that highly structured, professionally supervised training models yield significantly faster, more robust, and more complete continence recovery when contrasted with self-directed, independent home-based exercise protocols [9]. Technological and mechanical refinement within these supervised frameworks further accelerates physiological recovery. Cohort data indicates that advanced electrical pudendal nerve stimulation delivers superior clinical outcomes for post-radical prostatectomy incontinence compared to standard pelvic floor muscle training combined with transrectal electrical stimulation, highlighting the distinct benefits of precise technological deployment within modern clinical exercise science [10]. This therapeutic synergy is reinforced by clinical models showing that pairing targeted electroacupuncture with a regimen of supervised pelvic floor muscle exercises results in rapid restoration of urinary control and lower levels of patient distress [11].

The mechanical success of these rehabilitative exercise patterns is heavily reliant on the behavioral and psychological frameworks guiding their programmatic administration. Integrating the Health Belief Model into standardized post-operative pelvic floor muscle training schedules for benign

prostatic hyperplasia patients recovering from electrocautery has been shown to dramatically enhance medical compliance behavior, improve dietary and fluid management, and reduce post-surgical symptom scores [12]. Health professionals and sports managers can objectively quantify and track the physiological trajectory of this pelvic floor recovery using validated clinical metrics like the Insert Test, which provides a concrete, standardized measurement of muscle endurance and pad-weight reduction over time [13].

However, managing these clinical exercise programs requires ongoing sensitivity to user experiences and psychological barriers. Qualitative research into patient perspectives reveals that while the deployment of invasive mechanical devices during pelvic floor rehabilitation can optimize raw muscle activation, it simultaneously introduces a substantial psychological burden and logistical friction that can severely undermine long-term training adherence [14]. Similar behavioral compliance challenges are documented in holistic multi-disciplinary interventions. For instance, randomized controlled trials evaluating the application of cognitive-behavioral therapy for weight loss in patients suffering from advanced chronic kidney disease indicate that while structured lifestyle adjustments are therapeutically vital, achieving long-term behavioral consistency remains a significant administrative hurdle [15]. These intervention barriers highlight that sports and fitness managers must move past a one-size-fits-all model, especially when treating specialized athletic cohorts. Evidence from elite sports science reveals a distinct dose-dependent relationship wherein extreme, high-intensity training and repetitive intra-abdominal pressure can paradoxically increase the prevalence of pelvic floor dysfunction in male athletes, indicating a pressing need for tailored uro-protective conditioning protocols within high-performance training environments [22].

4.3 Functional Longevity and Biomarker-Driven Retention Metrics

The final component of this sports health management framework involves the utilization of urological and renal function indicators as early predictors of physical capacity decline and long-term user participation. A critical 4-year longitudinal investigation conducted within the framework of the Iwaki Health Promotion Project successfully demonstrated that the severity of baseline overactive bladder symptoms serves as an independent longitudinal predictor for a decline in upper-limb grip strength among community-dwelling men [16]. This remarkable connection establishes that localized urological dysfunction acts as a clinical bellwether for systemic sarcopenia, physical frailty, and

accelerated functional decline, offering fitness managers a powerful predictive matrix to identify members at risk of physical deterioration [16]. This systemic overlap is further confirmed by geriatric assessments highlighting a potent, direct correlation between advanced physical frailty and the presence of albuminuria, an essential biomarker reflecting underlying renal microvascular stress and filtration breakdown [17]. Preserving this delicate microvascular and filtration capability is directly tied to regular exercise habits. Longitudinal tracking of cohorts recently diagnosed with type 2 diabetes indicates that consistent physical activity is inversely associated with the development of persistent albuminuria, proving that active lifestyles safeguard the vascular structures shared by both the renal and lower urinary tracts [18].

When these biomarkers of kidney and urinary health—specifically eGFR and the urine albumin-to-creatinine ratio—begin to decline, they exhibit a powerful relationship with broader aging trajectories. Long-term multitrajectory group analyses reveal that compromised renal filtration markers are robustly linked to dual, synchronous declines in both physical function and cognitive performance in older adults, solidifying urological tracking as a cornerstone of comprehensive longevity medicine [19]. This biological unity is deeply rooted in systemic inflammatory pathways. Recent cross-sectional mappings have validated that distinct pan-immuno-inflammatory and systemic immune-inflammation indices serve as reliable predictors of clinical symptom severity in BPH patients; individuals maintaining low baseline physical activity levels consistently exhibit elevated systemic inflammation scores and more severe bladder outlet obstruction [20]. To counteract these inflammatory and degenerative patterns, specific mechanical loading strategies may offer distinct, genetically verifiable benefits. Mendelian randomization studies exploring causal relationships between localized physical tasks and pelvic integrity have demonstrated that engagement in heavy do-it-yourself tasks exerts a direct, causal protective effect against stress urinary incontinence, likely due to the intense, reflexive core stabilization and pelvic floor co-contraction required by heavy mechanical labor [21]. Armed with these functional insights, fitness managers can integrate subtle urological screening parameters into routine physical assessments, utilizing them as early diagnostic indicators to optimize program design, prevent membership churn, and extend the athletic careers of aging participants.

5. Discussion

The systematic synthesis of these 22 primary research articles provides a comprehensive and definitive endorsement of urological health as a primary baseline parameter governing life quality and athletic

career sustainability in men. The clear empirical convergence observed across vast population-level databases, such as the high-volume Brazilian and American NHANES projects, verifies that systematic physical movement significantly drives down the baseline epidemiological prevalence of LUTS, erectile dysfunction, and sleep-disrupting nocturia [1, 2, 3]. However, when viewed through the modern lens of sports organization management and institutional facility programming, this body of evidence introduces a complex dose-response paradox that challenges simple, unguided physical fitness mandates. The discovery of a non-linear, U-shaped risk threshold regarding hyper-intense athletic output and highly restrictive metabolic diets indicates that unguided, extreme training volumes can inadvertently compromise pelvic floor stability, alter intra-abdominal pressure dynamics, and worsen lower urinary tract conditions [4, 22]. Sports administrators, fitness directors, and multi-disciplinary facility operators must therefore transition away from generic, one-size-fits-all conditioning models toward specialized, age-appropriate, and urologically sustainable exercise designs.

From a practical service quality perspective, the administrative implications are immediate, concrete, and highly actionable. Given the documented, widespread prevalence of lower urinary tract symptoms and the intense psychological anxiety tied to public symptom management in aging male populations, sports and fitness organizations can directly optimize member retention and consumer satisfaction metrics by ensuring deliberate, barrier-free restroom accessibility across endurance courses, public running trails, cycling circuits, and commercial fitness centers. Furthermore, the demonstrated clinical efficacy of the Health Belief Model and structured, professional post-operative pelvic floor training emphasizes that modern fitness complexes should actively incorporate pelvic floor muscle education into mainstream senior conditioning classes and master-athlete coaching certifications [9, 12].

Perhaps the most profound paradigm shift generated by this review lies in the documented longitudinal link between overactive bladder symptoms and subsequent musculoskeletal grip strength decline [16]. This clear connection transforms urological symptom tracking from an isolated, private medical concern into a vital predictive tool for assessing broader physical frailty and biological age trajectories. By actively creating supportive, low-stigma environments that offer targeted, preventative core stabilization regimes alongside professional, supervised rehabilitative protocols, sports management networks can effectively transition from simple recreational providers into crucial partners for public health preservation, institutional inclusivity, and lifelong functional longevity.

6. Conclusion

This systematic review confirms that physical activity operates as a critical, multi-dimensional protective variable for male urological and renal integrity, fundamentally shaping an individual's career longevity and somatic quality of life. The synthesized evidence from 22 recent free full-text sources demonstrates that while regular, moderate physical activity provides systemic protection against conditions like BPH and ED, high-intensity performance environments necessitate precise pelvic floor monitoring to prevent mechanical overload and structural dysfunction. The documented benefits of supervised post-surgical rehabilitation, behavioral compliance tracking, and early microvascular biomarker mapping provide sports and fitness organizations with an actionable template for enhancing their broader matrix of member care. Ultimately, by eliminating the social stigma surrounding urological wellness and incorporating specialized conditioning exercises into mainstream adult programming, the sports management community can successfully safeguard the health, structural performance, and systemic well-being of the aging male population.

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Declaration of use of artificial intelligent

Generative artificial intelligence (AI) tools, specifically Google’s Gemini, were used exclusively as assistive instruments during manuscript preparation. Their use was limited to improving language

clarity, coherence, academic style, and manuscript organization. All scientific content, including study selection, data interpretation, critical analysis, and formulation of conclusions, was independently performed and verified by the authors. Human oversight was maintained throughout all stages of the research and writing process.

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