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Letter to Editor

Sustainability Management Utilization in Medical Microbiology Laboratories: Strategic Innovations to Enhance Diagnostic Efficiency

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Introduction

The rising healthcare costs in the United Kingdom and increasing antimicrobial resistance worldwide necessitate effective utilization management in clinical microbiology. Unlike routine laboratory testing, microbiology requires skilled personnel for manual or semi-automated analysis. Consequently, testing in microbiology laboratories substantially impacts healthcare costs, primarily due to decisions regarding antimicrobial use, infection control, patient safety, laboratory resource allocation, and diagnostic turnaround times. The increasing complexity of microbiological testing further underscores the importance of optimizing test selection, processing, and reporting to avoid unnecessary expenditure and ensure timely, accurate results. The existing literature on utilization management in clinical microbiology is limited; however, successful strategies have been implemented in various institutions to enhance diagnostic efficiency, cost-effectiveness, and overall patient outcomes. This letter reviews key utilization management initiatives in microbiology, detailing their benefits in reducing unnecessary tests, optimizing resources, improving workflows, supporting antimicrobial stewardship, and improving healthcare delivery efficiency.

Utilization Management Initiatives in the Microbiology Division

Decision Support Systems for Cytomegalovirus Assays

Cytomegalovirus testing offers a range of options, including antigenemia testing, quantitative polymerase chain reaction, and serology. Given the complexity of test selection and the rapid advancements in this field, Massachusetts General Hospital developed a decision support tool integrated into the electronic order entry system, which directs clinicians to the most appropriate test. This tool minimizes inappropriate test orders and facilitates updates as testing preferences evolve, optimizing resource utilization and diagnostic accuracy (1).

Reducing Blood Culture Contamination

Contamination in blood cultures, often due to improper collection techniques, leads to false positives and elevated healthcare costs. Strategies to mitigate contamination include staff training, restricted blood culture collection roles, and repeated testing guidelines. Studies indicate that reducing blood culture contamination decreases hospital stays, lowers pharmacy charges, and reduces unnecessary antibiotic administration (2,3).

Optimizing Microbiology Report Formatting

The clarity and design of microbiology reports can directly impact clinician interpretation and patient outcomes. A study at a teaching hospital showed frequent misinterpretation of reports, prompting inappropriate testing and antibiotic usage. Standardized, clear, and concise microbiology reporting formats that align with physician understanding have proven beneficial in enhancing diagnostic accuracy and minimizing

unnecessary tests.

Rapid Bacterial Identification Using Matrix-Assisted Laser Desorption-Ionization Time-of-Flight Mass Spectrometry

MALDI-TOF MS rapidly identifies pathogens, significantly reducing turnaround time compared to conventional methods. This tool enables clinicians to initiate effective antimicrobial therapy sooner, reducing overall antimicrobial usage and healthcare costs. Studies report MALDI-TOF MS as cost-effective and efficient in decreasing diagnostic delays and optimizing patient management (4).

Antimicrobial Stewardship for High-Cost Agents

The indiscriminate use of high-cost, broad-spectrum antibiotics, such as carbapenems, can increase resistance rates and treatment expenses. Massachusetts General Hospital implemented a stewardship program wherein microbiologists review antimicrobial orders daily, recommending alternatives based on susceptibility data. This intervention reduced carbapenem use, and these antibiotics were removed from the institution's "top 10" list of expensive drugs (5).

Rapid Point-of-Care Testing

Point-of-care testing (POCT) provides immediate diagnostic results that guide timely clinical decisions. For instance, rapid tests for influenza and Group A Streptococcus significantly reduce laboratory and antibiotic use while also decreasing emergency department length of stay. POCT also supports rational antibiotic prescribing, thus reducing unnecessary treatments and associated costs (6).

Methicillin-Resistant Staphylococcus aureus Screening With Polymerase Chain Reaction Testing

Hospitals employ contact precautions for patients colonized with MRSA, which necessitates additional resources. However, MRSA colonization can be transient, allowing decolonized patients to be managed without these precautions. PCR testing for MRSA screening enables quick determination of colonization status, conserving hospital resources and facilitating efficient infection control (7).

Screening Urinalysis to Reduce Unnecessary Urine Cultures

Many uncomplicated urinary tract infections can be diagnosed without urine culture, especially in cases that meet the criteria for empirical treatment. Screening with dipstick urinalysis provides a high negative predictive value, helping to rule out bacteriuria in low-risk patients. This approach reduces urine culture orders, reducing laboratory workload and costs without compromising patient outcomes (8).

Restricting Stool Examinations in Hospital-Acquired Diarrhea

Routine stool cultures and ova-and-parasite tests are often unnecessary for patients with hospital-acquired diarrhea. Instead, tests for *Clostridium difficile* are emphasized due to its relevance to nosocomial infections. This restriction prevents the unnecessary use of diagnostic resources while also ensuring timely identification of nosocomial pathogens (9).

Utilizing Viral Panels for Inpatient Bed Management

Respiratory virus infections are common among hospitalized patients, especially during epidemics. Rapid testing for specific viruses allows hospitals to manage bed assignments efficiently, avoiding transmission through cohorting infected patients. This practice optimizes bed utilization, enhances patient flow, and supports infection control, proving cost-effective during viral outbreaks (10).

Application of Evidence-Based Medicine

The application of evidence-based practices is paramount in optimizing microbiology testing. For instance, specialized fungal blood cultures, while costly, rarely yield additional diagnostic value over routine blood cultures for detecting candidemia and cryptococcosis. Analysis of this approach at one institution revealed no significant clinical benefit, leading to the discontinuation of specialized fungal blood cultures, thereby conserving resources (11).

Molecular Diagnostics in Microbiology

Recent advancements in molecular diagnostics offer rapid and sensitive testing options, providing unique insights that conventional methods may not. Molecular diagnostics have been essential for high-volume tests, such as viral load assays for human immunodeficiency virus, hepatitis B, and coronavirus disease 19 in recent years (12,13). However, low-frequency molecular tests often incur higher costs and are outsourced to reference laboratories. Hospitals can achieve cost savings and reduce turnaround times by bringing certain high-need molecular tests, such as Epstein-Barr virus testing, in-house (14).

Conclusion

Effective utilization management in clinical microbiology is integral to the modern healthcare setting. Decision support tools, clear report formatting, rapid diagnostic methods, and antimicrobial stewardship collectively enhance the precision and efficiency of microbiology services. These strategies contribute to significant downstream cost reductions by optimizing antimicrobial use, streamlining laboratory workflows, and supporting efficient patient management. As healthcare systems face continuous pressure to improve care while managing costs, the role of utilization management in microbiology will undoubtedly grow, underscoring the need for targeted and innovative approaches in this critical area.

Authors' Contribution

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Competing Interests

None.

Ethical Approval

Not applicable.

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