Role of Health-Economics Application in Enhancing Personalized Medicine: A Comprehensive Systematic Review

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INTRODUCTION

- Rare disorders, which collectively affect millions globally despite the rarity of individual conditions, often lack sufficient research, treatment options, and awareness, leading to delayed diagnoses and limited therapeutic interventions.
- In recent years, there has been a growing emphasis on integrating patient perspectives into research for rare disorders. This approach aims to ensure that treatments and interventions are more aligned with patient needs, improving overall quality of life and care experiences.

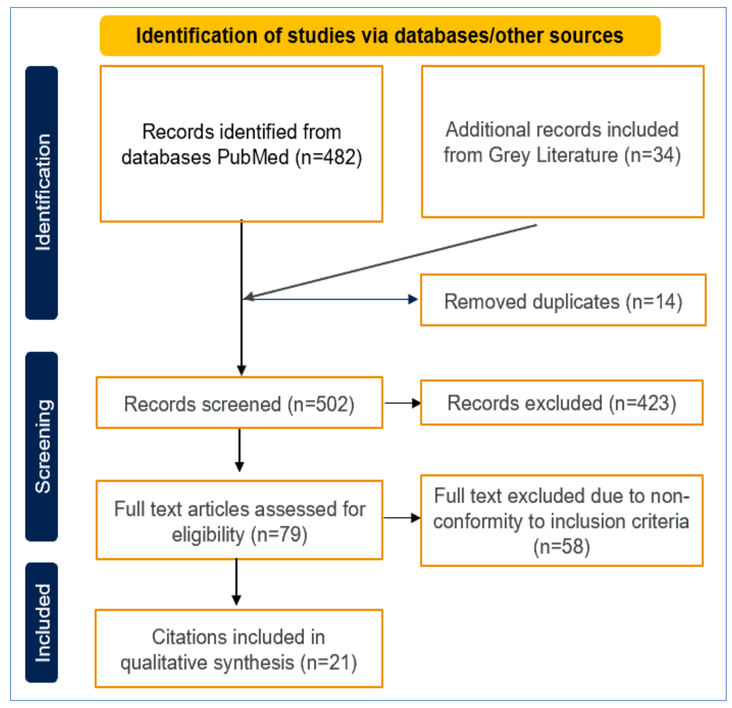
OBJECTIVE

- The objective is to highlight key findings, assess types of health economics and outcomes research (HEOR) methodologies adopted, and identify the obstacles encountered during the deployment of personalized medical interventions that incorporate HEOR methodologies.

METHOD

- A literature search was conducted across databases such as PubMed/MEDLINE and Google Scholar.
- The systematic literature review was performed to identify studies that utilized HEOR methodologies to evaluate personalized medicine strategies and the challenges that emerged.
- Main keywords included "Precision Medicine," "Personalized Medicine," "Health Economics," "Outcomes Research," and "Cost-Benefit Analysis.“
- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to conduct review (Figure 1).

Figure 1: PRISMA checklist



RESULTS

- The database search and grey literature resulted in 516 studies, of which 79 were selected for secondary screening and 21 included in final analysis (Figure 1).
- The United States led with five studies, followed by United Kingdom (n=4), Netherlands (n=3), Germany (n=2), and other countries (n=7).
- Oncology was the most commonly studied in therapeutic focus (n=9), followed by cardiovascular, musculoskeletal, and rheumatic studies (n=3 each), and liver disease, neurological, psychiatric conditions, and autoimmune diseases (n=2 each).
- Precision medicine strategies included risk-stratified screening (n=5), molecular profiling (n=3), genotype-guided therapy (n=3), personalized discharge protocols (n=3), dose reduction strategies (n=4), customized implants (n=2), and bio-mathematical modeling (n=1) as outlined in table 1.
- HEOR methodologies included cost-effectiveness analysis (n=9), Markov state transition models (n=4), and microsimulation models (n=3).
- Comparative studies were most common (n=12), followed by randomized controlled trials(n=9).
- The implementation of these strategies revealed several challenges, such as nonadherence to screening, ethical management of risk profiles, balancing disease incidence reduction, accurate dosing, cost considerations, genomic assay reliability, reimbursement issues, and complexities in large-scale trials and treatment predictions.

Table 1: Summary of studies on Health Economics in personalized medicines

HEOR Methodology	Therapeutic Area	Precision Approach
Cost-effectiveness analysis	Acute coronary syndrome (ACS)	The personalized medicine approaches studied in the article are clopidogrel and subsequent phenotype and genotypes
	Opioid or cocaine dependence	Psychosocial intervention tailored to each patient's needs and circumstances
Comparative effectiveness Analysis (CEA)	Patients with single brain metastasis	Creating a decision tree of treatment strategies for single brain metastases, conducting a comparative effectiveness analysis
Cost-consequence analysis	Prostate cancer	A personalized, nurse-led, psycho-educational intervention for prostate cancer survivors
Cost-utility analysis	Basal cell carcinoma	A personalized discharge letter for low-risk basal cell carcinoma (BCC) patients
	Parkinson's disease	The personalized medicine approach studied is the PDSAFE program, an individually-tailored, physiotherapist-delivered, balance, strength and strategy training program
	Coronary heart disease	Nurse-led personalized care intervention for primary care CHD patients with probable depression and current chest pain, focusing on enhancing self-efficacy and addressing individual needs.
Markov model	Prostate cancer	Personalized mammography screening strategies that stratify women into different risk groups
	Breast cancer	Decipher genomic classifier (GC) assay to guide personalized treatment decisions for prostate cancer
	Hepatitis	Bio-mathematical model to guide treatment decisions
Value of information análisis	Breast cancer	Use of molecular tests to identify breast cancer patients who can safely avoid chemotherapy.
	Atrial fibrillation, pulmonary embolism, or deep vein thrombosis	Pharmacogenomic-based approach Clinical-based approach

CONCLUSIONS

- The integration of HEOR with personalized medicine reveals several challenges, including adherence, ethical issues, and data accuracy.
- Despite these obstacles, personalized medicine has the potential to improve patient outcomes and reduce healthcare costs.

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