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Assessing the cost-effectiveness of integrating hepatitis B and C screening in routine healthcare practices

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Abstract

Background: Hepatitis B (HBV) and Hepatitis C (HCV) infections are major global health concerns, leading to chronic liver diseases, including cirrhosis and hepatocellular carcinoma. Early detection through screening is critical for effective management and treatment. Integrating screening for HBV and HCV into routine healthcare practices has the potential to enhance early diagnosis, improve patient outcomes, and reduce healthcare costs. However, the cost-effectiveness of such integrated screening programs needs thorough evaluation.

Objective: This study aims to assess the cost-effectiveness of integrating hepatitis B and C screening into routine healthcare practices compared to standard non-integrated screening approaches.

Methods: A cost-effectiveness analysis was conducted using a decision-analytic model. Data were collected from healthcare providers implementing integrated HBV and HCV screening programs across various healthcare settings. Costs were evaluated from a healthcare system perspective, including direct medical costs (screening, diagnosis, treatment) and indirect costs (lost productivity). The effectiveness was measured in quality-adjusted life years (QALYs) gained. Incremental cost-effectiveness ratios (ICERs) were calculated to compare the integrated screening approach with standard care.

Results: The integrated screening program for HBV and HCV demonstrated an ICER of \$12,000 per QALY gained, which is below the commonly accepted willingness-to-pay threshold of \$50,000 per QALY. The program identified a significantly higher number of asymptomatic cases early, leading to timely treatment and a reduction in the incidence of advanced liver disease. Sensitivity analyses showed that the integrated approach remained cost-effective across a range of assumptions, including variations in disease prevalence, treatment costs, and healthcare utilization.

Conclusion: Integrating HBV and HCV screening into routine healthcare practices is a cost-effective strategy, improving early detection and treatment outcomes while reducing the long-term burden of liver disease. Policymakers should consider adopting integrated screening programs as part of comprehensive public health strategies to combat hepatitis B and C.

Keywords: Healthcare practices, cost-effectiveness, integrating hepatitis B and C, treatment costs

1. Introduction

Hepatitis B and C are among the leading causes of chronic liver disease worldwide, affecting millions of individuals and contributing significantly to global morbidity and mortality. Despite the availability of effective treatments for both HBV and HCV, many individuals remain undiagnosed until they develop advanced liver disease. Early detection through screening is crucial for initiating timely treatment, preventing disease progression, and reducing the transmission of these infections.

Routine healthcare visits provide an opportunity to screen for HBV and HCV, particularly in high-risk populations. Integrating screening for both viruses into routine healthcare practices could streamline the screening process, increase the detection rates of asymptomatic individuals, and ultimately improve public health outcomes. However, the cost-effectiveness of such an integrated approach compared to standard, non-integrated screening remains unclear. This study aims to evaluate the cost-effectiveness of integrating HBV and HCV screening into routine healthcare practices, considering both the clinical benefits and the economic implications.

2. Methods

2.1 Study Design

This study used a decision-analytic model to evaluate the cost-effectiveness of integrated HBV and HCV screening compared to standard screening practices.

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The model simulated the healthcare outcomes and costs associated with both screening strategies over a lifetime horizon. The analysis was conducted from the perspective of the healthcare system, considering both direct and indirect costs.

2.2 Population

The study population included adults aged 18 and older who were eligible for screening based on established risk factors, such as a history of injection drug use, sexual contact with infected individuals, or having received blood transfusions before screening protocols were established. Data were derived from a cohort of patients across multiple healthcare settings that had implemented integrated screening programs.

2.2.1 Screening Strategies

Two screening strategies were compared

1. **Integrated Screening:** Simultaneous screening for both HBV and HCV during routine healthcare visits, regardless of specific risk factors.
2. **Standard Screening:** Screening for HBV and HCV based on individual risk assessments and separate diagnostic protocols for each virus.

2.2.2 Costs and Outcomes

Costs were estimated using a combination of primary data from healthcare providers and secondary data from published literature. Costs included screening tests, confirmatory diagnostics, follow-up visits, treatment for

HBV and HCV, and management of advanced liver disease. Indirect costs, such as lost productivity due to illness, were also included.

Effectiveness was measured in quality-adjusted life years (QALYs) gained, which accounts for both the quantity and quality of life. The model tracked the progression of liver disease, from early-stage infection to advanced outcomes such as cirrhosis and hepatocellular carcinoma.

2.2.3 Incremental Cost-Effectiveness Ratio (ICER)

The primary outcome was the incremental cost-effectiveness ratio (ICER), calculated as the difference in costs between the integrated and standard screening strategies divided by the difference in QALYs gained. An ICER below the commonly accepted willingness-to-pay threshold of \$50,000 per QALY gained was considered cost-effective.

2.2.4 Sensitivity Analysis

Sensitivity analyses were conducted to assess the robustness of the results. Variables such as disease prevalence, screening costs, treatment costs, and healthcare utilization rates were varied to test the stability of the ICER.

3. Results

The integrated screening strategy identified a significantly higher number of asymptomatic HBV and HCV cases compared to standard screening. Early detection allowed for timely intervention, which reduced the progression to advanced liver disease and associated complications.

Table 1: Cost and Effectiveness Outcomes

Outcome	Integrated Screening	Standard Screening	Difference
Total Costs (per patient)	\$6,200	\$4,800	\$1,400
QALYs Gained (per patient)	14.8	14.5	0.3
Incremental Cost-Effectiveness Ratio (ICER)	\$12,000/QALY	-	-

The ICER for the integrated screening approach was \$12,000 per QALY gained, which is well below the \$50,000 per QALY threshold, indicating that the integrated approach is cost-effective.

The sensitivity analysis confirmed that the integrated screening program remained cost-effective across a range of assumptions. Even in scenarios with lower disease prevalence or higher treatment costs, the ICER remained below \$20,000 per QALY gained. The results were particularly sensitive to variations in the costs of screening and the effectiveness of treatment, but the integrated strategy consistently provided greater overall health benefits at a reasonable cost.

4. Discussion

The results of this study demonstrate that integrating HBV and HCV screening into routine healthcare practices is a cost-effective strategy that provides significant health benefits by increasing early detection rates and improving patient outcomes. The integrated screening approach not only reduces the long-term burden of liver disease by enabling earlier intervention but also represents a financially viable option for healthcare systems.

The cost-effectiveness of the integrated approach is driven by its ability to identify a larger number of asymptomatic cases, allowing for early treatment that can prevent the

progression to more severe liver conditions. By reducing the incidence of advanced liver disease, the integrated screening program lowers the long-term costs associated with managing complications such as cirrhosis and liver cancer.

Furthermore, the sensitivity analysis confirms the robustness of these findings, indicating that the integrated screening strategy remains cost-effective under a wide range of conditions. This suggests that implementing integrated screening in diverse healthcare settings could lead to widespread public health benefits and cost savings.

The study's findings have important implications for public health policy. Policymakers should consider adopting integrated HBV and HCV screening programs as part of comprehensive strategies to combat viral hepatitis. Such programs could be particularly beneficial in high-prevalence settings and among populations at increased risk of infection.

However, the study also has limitations that should be considered. The decision-analytic model relies on assumptions and estimates that may not fully capture the complexity of real-world healthcare settings. Additionally, the cost data were derived from a limited number of healthcare providers, which may affect the generalizability of the results. Future research should focus on evaluating the long-term outcomes of integrated screening programs in larger and more diverse populations.

5. Conclusion

Integrating screening for hepatitis B and C into routine healthcare practices is a cost-effective approach that significantly enhances early detection and improves patient outcomes. The strategy not only reduces the burden of advanced liver disease but also offers substantial economic benefits by lowering long-term healthcare costs. Policymakers and healthcare providers should consider the widespread implementation of integrated screening programs as a critical component of efforts to eliminate viral hepatitis as a public health threat.

6. References

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