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EVALUATING HEALTH TECHNOLOGIES: ECONOMIC IMPACT AND POLICY IMPLICATIONS

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ABSTRACT

Over the course of the last three decades, researchers have been examining the extent to which different health care systems and treatments have their financial influence. There have been a great number of significant ideas on technique that have been stated, and the amount of research that has been published has expanded at an exponential pace. On the other hand, those who make decisions about health technology have not shown particularly strong indications of using this study. As a result, this research takes into consideration whether or not economic analysis can appropriately handle policy concerns, or whether or not the conclusions of economic evaluation can significantly enhance policy matters. The findings of our study have shown that economic evaluation has the potential to be used for a wide range of procedures involving the transmission and utilisation of health technology.Additionally, this potential is investigated in the paper in order to strengthen the relevance of economic evaluation to the process of decision making. We come to the conclusion that it is necessary to adhere to methodological standards, create evidence in a timely manner, raise the local validity of research findings, better the distribution of study results, and pay greater attention to the policy tools that are accessible.

Keywords: economic evaluation, health economics, health technology assessment.

INTRODUCTION

For the purpose of ensuring that informed choices are made on the utilisation and adoption of medical technology, health technology assessment (HTA) is an important instrument in the realm of public health affairs. It is essential to conduct health technology assessment (HTA) when it comes to evaluating the clinical, economical, and moral repercussions of health therapies. This is particularly true in light of the fact that healthcare systems are struggling with concerns of accessibility, efficiency, and resource allocation. With that being said, there is still a need for more research into the ways in which HTA techniques influence the decision-making process in the public health sector on actual healthcare. The purpose of this research is to investigate the several ways in which HTA influences the decision-making process in the field of public health.

More specifically, the study will investigate how HTA frameworks influence policy, resources, and clinical practice. By conducting a comprehensive assessment of a broad variety of case studies, conducting an analysis of key policy papers, and engaging with important stakeholders, the overriding objective of this research is to shed light on the intricate link that exists between HTA and the decision-making process in the realm of public health. In addition, the purpose of this research is to assess the opportunities and risks

that are associated with putting the outcomes of the HTA into reality. This will be accomplished by examining aspects such as the accessibility of data, the engagement of stakeholders, and the transformation of evidence into policy. In order to make a meaningful contribution to the ongoing discussion about evidence-based policymaking and the distribution of public health resources, the purpose of this research is to evaluate the advantages and disadvantages of using HTA as a tool for making decisions on healthcare. Within the scope of this investigation, an interdisciplinary approach will be used to give a full evaluation of the impact of HTA. This approach will include perspectives from the fields of health economics, policy analysis, and healthcare administration. Its purpose is to give proposals that may be put into practice to enhance the utilisation and effectiveness of HTA frameworks in public health settings for the purpose of directing healthcare decisions. This will be accomplished via the execution of comprehensive empirical analyses and qualitative assessments. The sections that are to follow will provide a more in-depth examination of the methodology that was utilised, the critical findings that were obtained, and the implications for practice and policy. This will contribute significantly to the ongoing discussion that is taking place regarding how to best incorporate HTA into public health decision-making regarding healthcare.

The Influence of HTA on Policy Formulation

There is a wealth of research that has been conducted on the topic of how Health Technology Assessment (HTA) frameworks influence the formulation and implementation of public health policies. The frameworks for healthcare technology assessment (HTA) provide structured methods for evaluating the clinical, financial, social, and ethical repercussions of healthcare technology. This lays the groundwork for the development of evidence-based policy. In order for those responsible for making decisions on public health to make informed decisions, they are provided with information that is supported by evidence.

Influence on the Distribution of Resources: Frameworks for health technology assessment (HTA) provide significant information on the cost-effectiveness, clinical efficacy, and probable impact on public health outcomes. This information is helpful in the process of resource allocation. In order to make the most efficient use of the resources that are available, policymakers choose therapies that have better benefits based on the findings of HTA (health technology assessment).

Support in Making Decisions: The findings of health technology assessments (HTAs) provide policymakers tangible data to support their decisions about the adoption or rejection of healthcare technology and interventions. Because they provide a comprehensive analysis of the facts, they make it possible to make decisions that are more transparent and well-informed. In order to aid in aligning healthcare policy with public health goals, frameworks that are part of the Healthcare Transformation Agenda (HTA) include a focus on bigger social implications.

These wider social consequences include equity, accessibility, and sustainability of healthcare services. Due to the fact that HTA processes provide a rigorous and evidence-based approach, decisions are made in a manner that is closer to transparency and accountability. They make it easier for individuals who have a vested interest in the topic to understand the reasoning that goes into policy choices. When taken together, these references have the effect of highlighting the direct role that HTA frameworks play in the process of formulating public health policy. They emphasise the ways in which evidence-based evaluations have the

potential to increase accountability and transparency in policymaking by guiding resource allocation, strengthening decision-making, and putting policies in line with greater public health objectives.

Economic Impact

Health care may be a product as a method to improve health. Prioritisation and resource allocation need an analytical tool that compares the costs and benefits of different projects. This tool guides decision-making. Economic evaluation analyses costs and benefits, making it a valuable decision-making tool.

Cost includes project preparation and launch. The marginal cost, not the average cost, is estimated because in principle, the cost of manufacturing one extra unit is what counts most. The "utility," or value, of the health outcome for the patient and their family is the benefit side. Due to budget constraints, publicly funded health care systems cannot provide all feasible therapies for all patients. Effective health care treatments must be prioritised, and supporting one causes cuts to others. Indian health experts don't investigate health economics adequately. Economic assessments influence pharmacological treatments, other health care interventions/programs, investments in new technologies or research, and decision-making styles.

Randomised clinical studies could verify a new medicine was safe. Cost-effectiveness assessments (CEAs) determine affordability. Often based on randomised clinical trial results, they may not predict benefits. Health outcomes databases might improve cost estimates by revealing resource use and long-term toxicity. The phrase "comparative effectiveness research" (CER), originated in pharmacoeconomics, has been defined differently by different organisations but has important similarities.

CER would integrate real-world data with randomised clinical studies to provide a comparative evidence framework. A pharmacoeconomic study's perspective determines which expenses to quantify. Various methods may be used for critical evaluation reviews (CERs). Experimental and nonexperimental research like pragmatic clinical trials and retrospective and prospective studies let patients and doctors choose treatments. Many countries have pharmacoeconomic guidelines to help with pricing and reimbursement considerations.

These standards offer producers with requirements and information for product evaluation. Australia set standards in 1992, and Canada followed in 1993. Government-mandated economic studies before health policy choices and pharmacoeconomic recommendations might enhance Indian pharmacoeconomic research. The medical professionals and patients in India are world-class. Additionally, the country has many competent IT professionals. These tools may be used to develop CER-required electronic health records and databases. India has the most competitive generic drug business in the world. Thus, with good planning and coordination, the government should be able to execute CER and HTA of patent and generic drugs. Both India and other countries with similar economies might benefit from this study.

OBJECTIVES

1. Evaluate Health Technologies' Economic Effect on Healthcare Systems
2. Consider the Policy Consequences of Adoption of Health Technology

RESEARCH METHODOLOGY

In the context of public health, the purpose of this research is to evaluate Health Technology Assessment (HTA), with a particular emphasis on the ways in which it affects decision-making about healthcare. In spite of the fact that HTA plays a key role in analysing the clinical, financial, and ethical ramifications of healthcare treatments, there is a need for additional study to be conducted on the extent to which it influences the decision-making process regarding public health. This study is being conducted with the intention of shedding light on the intricate ways in which HTA influences public health policy, financing, and clinical practice.

Through an analysis of a variety of case studies, policy documents, and the participation of stakeholders in the decision-making processes, the purpose of this research is to shed light on the intricate link that exists between HTA methodologies and actual healthcare decisions. Engaging stakeholders, making data available, and translating research into successful policy are all areas that this investigation intends to discover as possible challenges and opportunities for putting HTA conclusions into action. For the goal of assisting public health decision-makers in making more effective use of HTA frameworks, the objective of this study is to conduct an evaluation of HTA in order to shed light on its strengths and limitations within the field. The research adopts an interdisciplinary approach, using perspectives from the fields of healthcare administration, policy analysis, and health economics while conducting its analysis. The purpose of this initiative is to improve the contribution of HTA to public health policies that are founded on evidence and the distribution of resources via the use of empirical analysis and qualitative assessments.

Table 1. Types of Health Applications of Artificial Intelligence

TYPES OF AI	DESCRIPTION
Knowledge-based or expert systems	Using a high degree of expertise to address certain issues. Complex rules, such as 'if-then' statements, are frequently its foundation. Fuzzy logic, a system of mathematical concepts for representing knowledge based on uncertainty and probability, has advanced in this area.
Machine learning	A technique for automating data analysis via the use of algorithms that repeatedly discover and learn from data patterns. Supervised learning, unsupervised learning, and reinforcement learning are the three main types of machine learning applications. Patterns in previously collected data, known as training data, are used in supervised learning.
Natural language processing	Discover the text's meaning by using methods that enable computers to recognise important terms in unstructured written material, often known as natural language corpora. The goal of topic modelling, a subfield of natural language processing, is to automatically extract document

	subjects by drawing connections between words that appear often.
Artificial intelligence-powered scheduling and planning	Dedicated to accomplishing a goal by planning, organising, and prioritising tasks while navigating complicated, interconnected restrictions.
Signal and image processing	Data processing including massive volumes of pictures and signals (i.e., information on the properties of a certain physical event). Signal feature analysis and data categorisation using tools like artificial neural networks (ANNs) are common steps in image and signal processing methods.

With the incorporation of the user-focused DHI taxonomy developed by the WHO and the functionality of artificial intelligence, the DHI economic evaluation approach results in three primary intervention categories:

1. Digital health interventions that do not involve features that enable artificial intelligence, such as sending simple patient reminders via text message, are under the first category.

2. Digital health solutions that are enabled by artificial intelligence, such as machine learning-based radiological diagnostics

3. Health treatments that are not digital but are made feasible by artificial intelligence, such as identifying persons who are at risk for community health worker deployment by analysing demographic and clinical data.

A portion of the underlying architecture and information systems of the digital health system includes each and every one of the components that have been stated above. The predictive analytics that prepare the way for the more conventional "non digital" (or analogue) therapies are an important part of this paradigm. These interventions may need new types of analysis that go beyond the ones that are often employed in economic assessment. Including the spread of artificial intelligence research into fields that are not connected to health-related treatments is not included in the framework. In this context, "investment cases" for artificial intelligence (AI), research institution capacity development, and artificial intelligence (AI) analytical teams are all integral components.

Evaluation methods

A randomised controlled trial approach was used in the bulk of the research (n=583, almost 91%) in order to evaluate the treatments. When it came to the other studies, quasi-experimental procedures were used. Although some studies did incorporate an economic assessment framework, the majority of those studies just reported the costs or saves rather than utilising any specific economic evaluation technique. This is despite the fact that some were included in the study. The method of economic evaluation that was utilised

the most often was the cost-effectiveness analysis (n=63), with the cost utility analysis coming in a close second (n=28). There was one study that reported on cost reduction techniques, and there were two studies that reported on cost consequence evaluations. None of the studies that was mentioned made use of cost-benefit analysis in any of their procedures.

RESULT

A limited number of research have investigated the impact that DHIs have on long-term health outcomes such as mortality, quality of life, and the amount of money spent on healthcare. In the majority of research, the only things that were considered were immediate effects and health outcomes that could be readily quantified, such as the number of times patients went to the doctor. A very small number of studies have been conducted that give either a summary or an intermediate level of health outcomes. It is organised according to the DHI theory of change (TOC) casual path, which travels from outputs to effects, and the health outcomes that were reported by the study are structured in this manner. Additionally, the results of the procedure (which were not therapeutic) were deemed to be outputs for this research, along with knowledge and beliefs. Alterations in behaviour, happiness on the part of both clients and providers, health status as assessed in natural units, the consequences of the therapeutic process, and the use of health care are all instances of intermediate outcomes. Both the quality of service and the health status (summary units) are what constitute the final findings. Based on this categorisation, the bulk of the outcomes that were reported by the study that was included are considered to be intermediate (n=2,306), followed by impact (n=342) and outputs (n=296).

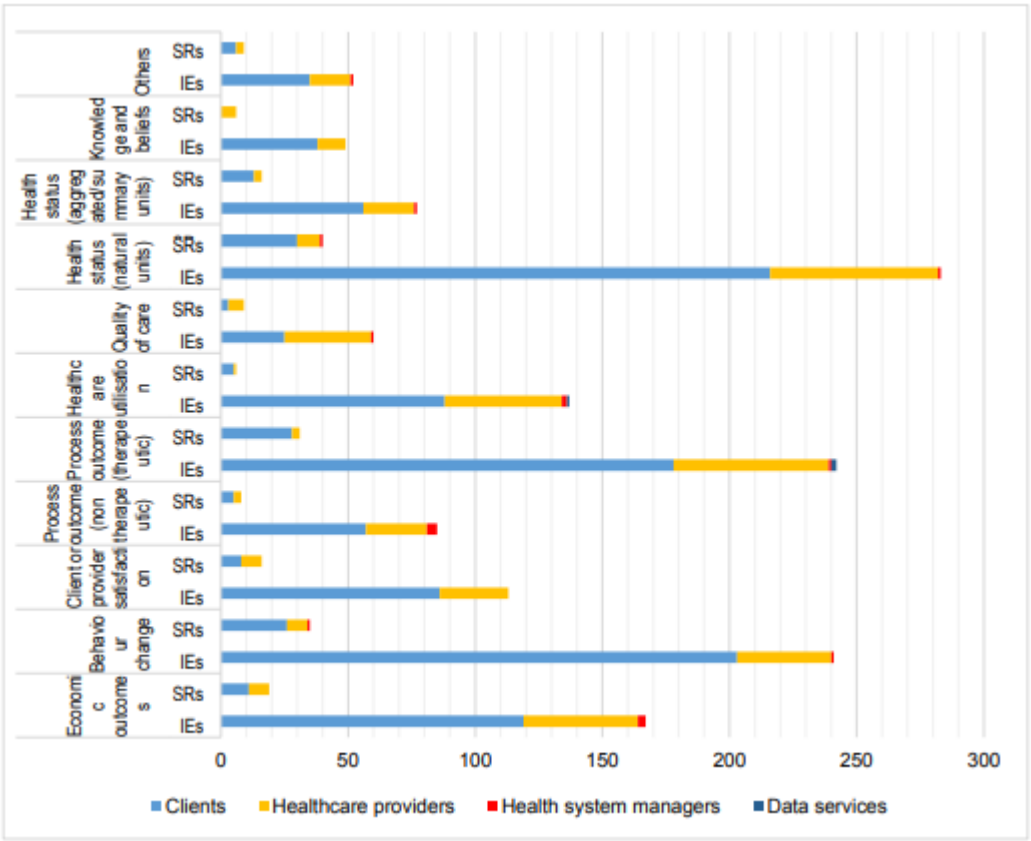

Fig.1. Results from the DHI Evidence Base broken down by kind of intervention

Economic outcomes

The statistics on the costs of interventions are seldom released. Approximately eighty percent of the studies, which totalled 632, did not provide any cost data. Furthermore, of the studies that did provide cost data, more than fifty percent just reported costs without doing any further analysis, including cost-effectiveness analyses. The majority of the research that used CEA concentrated on DHIs for clients and health care professionals. The number of participants in these studies ranged from 45 IEs and 8 SRs to 119 health care providers and 11 health care providers.

There were only three IEs that reported their financial outcomes, and none of the SRs that addressed DHIs for people in charge of health systems disclosed their findings. As can be seen in Figure 4, no cost data was included into any of the studies that were conducted on data health indices (DHIs) for data services. According to the DHI's Theory of repercussions causal chain, the claimed economic repercussions of the study are further classified as simple, intermediate, and summary/impact.

When we speak of "simple economic outcomes," we are referring to the reporting of expenses in isolation from any mention of health or wellbeing outcomes, such as expenditures incurred or savings. This is what we mean when we hear the term "simple economic outcomes." Some people concentrate on the inputs, such as the cost per user or the number of people contacted, while others concentrate on the outputs. A significant number of studies that report on fundamental economic conclusions are, in reality, only variations on costing evaluations. There is a connection between the data on intervention costs and specific health outcomes via the use of intermediate and summary economic outcomes.

The two are differentiated from one another by the degree of aggregation and the fact that the health impact is permanent. Long-term health outcomes, such as cost per life saved or cost per quality-adjusted life-year gained, are referred to as summary results. Intermediate outcomes, on the other hand, focus on more immediate or natural consequences, such as cost per infection averted. In spite of the fact that the articles that were included did not include any cost-benefit analyses, highly aggregated findings such as net benefits that were established by the use of a cost-benefit analysis approach would also be considered summary outcomes.

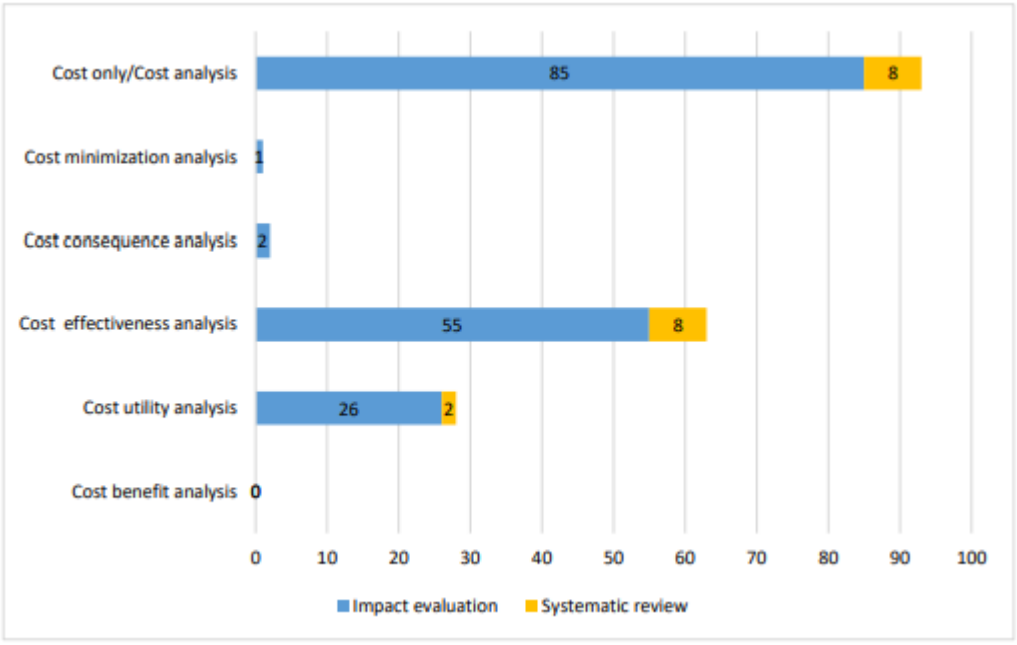

Fig. 2 Reports on economic outcomes from the DHI Evidence Base

Deficits in the evidence of synthesis

According to the Expert Group Meeting (EGM), a number of distinct types of DHI have significant gaps in their evidence synthesis. In terms of social responsibility, the themes that were covered the most often were health care use, economic outcomes, client/provider satisfaction, health status (natural units), and the effects of behaviour modification.

The health records of patients and the actions that are carried out with the assistance of health care decision support systems provide opportunities for possible synthesis. There are a number of studies that have been conducted to investigate the effect of client health records; however, there is currently no high-quality SR that is accessible. These studies have focused on health care usage, care quality, and health status (natural units). One further potential subject for synthesis is the connection that exists between practitioner decision support systems and the utilisation of health care, the results of the process (whether they are therapeutic or non-therapeutic), and the quality of treatment.

The consequences of telemedicine on health care use, health status (aggregated/summary units), knowledge and attitudes, process result (non-therapeutic), and process outcome (therapeutic) are some of the additional synthesis issues that need to be addressed in future research.

Because there is considerable evidence for all of the outcomes of interest in this EGM for telemedicine, it is one of the therapies that is most often used. The key outcomes that have been investigated in the bulk of studies may be broken down into three categories: health status (natural units), process result (therapeutic units), and health care utilisation. We discovered a collection of telemedicine evaluations that are either completed or in the process of being completed; however, we only have a high level of confidence in two of them (in the categories of client/provider satisfaction, economic outcomes, and behaviour change).

In addition, there are gaps in synthesis across the various targeted digital health communication initiatives. This is due to the fact that the bulk of the included SR are of very low quality. A large number of studies have been conducted to evaluate the relationship between targeted digital health communication and health care usage (n=56), process result (n=47), health status (n=134), and client/provider satisfaction (n=67). The outcome of this is that this particular form of DHI was given the greatest attention in the literature that was included.

CONCLUSION

Assessment of technologies requires economic assessment, which is also an essential component of high-quality medical research. This evaluation is required in order to evaluate technologies. If all went according to plan, researchers would simultaneously collect data on clinical cases and economic conditions. A combination of high-quality cost data and epidemiological information is the most effective method for producing accurate cost-effectiveness estimates. The Health Technology Assessment (HTA) may provide the foundation for future comparative research on health care investments in developing nations such as India for example. By using HTA, it is possible to compare and contrast medical, surgical, and public health initiatives side by side. Choices in policy need to be supported by facts, and the purpose of health economic evaluation is to do just that. The goal of research should always be to attract the attention of those who make decisions. It is possible for this to become a reality if healthcare groups, academic institutions, and policymakers collaborate proactively. A very little amount of research money has been allocated to health economics at the micro level in India. There is a fundamental transformation that has to take place in the way that the government functions in order to evaluate health care policies effectively. There is a need to raise spending on health care in order to reduce the amount of money that individuals have to pay out of pocket for medical treatment. The majority of individuals who are employed should have access to private health insurance that is optional, and those who are employed in the informal sector should be allowed to adopt a model that is comparable to community-based health insurance. In addition to the clinical and economic realities of Indian health care, these methodologies can be used to inform decisions regarding pricing, reimbursement, and future investments in the Indian health care system. However, it is important to note that these methodologies require adjustments to take into account the cultural, ethical, and philosophical factors that are relevant to the process of policy generation at the local level.

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