

# Pharmacoeconomic Evaluation Of Pharmacist-Led Interventions In Saudi Arabia: Key Principles And Applications

Wejdan Ibrahim Alaraidh<sup>1</sup>, Bushra Abdulaziz Almuhsin<sup>2</sup>, Sarah Dujayn Badah Alsahli<sup>3</sup>, Norah Obaidallah Alharbi<sup>4</sup>, Hanaa Baghdad Almutairi<sup>5</sup>, Albandari Zaben Alanazi<sup>6</sup>, Masriyah Ghareeb Almutairi<sup>7</sup>, Reem Muneer Almutairi<sup>8</sup>

<sup>1</sup>Specialization/ Pharmacist, Place of work/ King Khalid University Hospital, [wejdanalraidh@gmail.com](mailto:wejdanalraidh@gmail.com)

<sup>2</sup>Pharmacist, Place of work/ King Khalid University Hospital, [bualmuhsin@gmail.com](mailto:bualmuhsin@gmail.com)

<sup>3</sup>Pharm D, King Khalid university hospital, [Sarah.alsahli.430@gmail.com](mailto:Sarah.alsahli.430@gmail.com)

<sup>4</sup>pharmacist, King Khalid University Hospital, [n.o.alharbi@hotmail.com](mailto:n.o.alharbi@hotmail.com)

<sup>5</sup>Pharmacist, King Khalid University Hospital, [hanaa.b.almutairi@gmail.com](mailto:hanaa.b.almutairi@gmail.com)

<sup>6</sup>Pharmacy Technician, King Khalid University Hospital, [albandaria345@gmail.com](mailto:albandaria345@gmail.com)

<sup>7</sup>Pharmacy technician, King Khalid University Hospital, [mgavip84@gmail.com](mailto:mgavip84@gmail.com)

<sup>8</sup>Pharmacy technician, King Khalid University Hospital, [Reemalmshrafi@hotmail.com](mailto:Reemalmshrafi@hotmail.com)

---

Accepted: 02.06.2025

Published: 15.06.2025

---

## **Abstract**

*The Saudi healthcare system is undergoing significant transformation under Vision 2030, with increasing emphasis on value-based care and optimized resource allocation. This article examines the pharmacoeconomic evaluation of pharmacist-led interventions in Saudi Arabia, exploring the economic impact of expanded pharmacy services beyond traditional dispensing roles. A comprehensive review of the literature reveals that while global evidence consistently demonstrates favorable economic outcomes from pharmacist interventions, Saudi-specific economic evaluations remain limited. The article discusses fundamental pharmacoeconomic concepts including cost-benefit, cost-effectiveness, and cost-utility analyses, highlighting their application within the Saudi healthcare context. Available Saudi data indicate promising economic benefits from pharmacist interventions in hospital settings, chronic disease management, and medication therapy management, with reported cost savings and improved clinical outcomes. However, methodological challenges persist, including inconsistent evaluation approaches, limited long-term outcome data, and contextual factors unique to the Saudi healthcare system. The willingness-to-pay studies in neighboring countries suggest potential acceptance of expanded pharmacist services with appropriate patient education. As Saudi Arabia continues healthcare reform, robust pharmacoeconomic evaluations are essential to inform policy decisions, justify reimbursement models, and optimize pharmacist integration into multidisciplinary healthcare teams. Future research should focus on standardized methodologies, Saudi-specific cost-effectiveness thresholds, and economic evaluations of innovative pharmacy services aligned with Vision 2030 healthcare objectives.*

---

## **INTRODUCTION**

The Saudi Arabian healthcare system is undergoing substantial transformation as part of Vision 2030, the kingdom's ambitious reform program aimed at diversifying the economy and improving public service sectors. Healthcare is a central component of this vision, with strategic objectives including enhancing the quality and efficiency of healthcare services, improving access to care, and promoting preventive healthcare approaches. As the system evolves toward more value-based care models, understanding the economic impact of various healthcare interventions becomes increasingly important for policymakers, healthcare administrators, and professionals.

Pharmacists in Saudi Arabia have traditionally focused on medication dispensing and basic patient counseling. However, in recent years, the pharmacy profession has been expanding its

scope to include more clinical and patient-centered services, such as medication therapy management, chronic disease management, health promotion, and participation in multidisciplinary healthcare teams. This evolution aligns with global trends in pharmacy practice and reflects growing recognition of pharmacists' potential contributions to improved healthcare outcomes and system efficiency (Newman et al., 2020).

As pharmacist roles expand in Saudi Arabia, there is an increasing need to demonstrate the economic value of these services. Pharmacoeconomics, the application of economic analysis to pharmaceutical products and services, provides a framework for evaluating the costs and consequences of pharmacist-led interventions. These evaluations are essential for informed decision-making, resource allocation, and justification of pharmacy services within the Saudi healthcare system (Walley & Haycox, 1997).

Despite the growing importance of pharmacoeconomic evaluations, there is limited Saudi-specific research in this area. Most economic evaluations of pharmacist services have been conducted in Western countries with different healthcare systems, funding models, and cultural contexts. While these studies provide valuable insights, their applicability to the Saudi context may be limited due to differences in healthcare structure, resource availability, patient demographics, and cultural factors (Elliott et al., 2014).

This article aims to provide a comprehensive overview of the key principles and applications of pharmacoeconomic evaluation of pharmacist-led interventions in Saudi Arabia. It discusses the fundamental concepts of pharmacoeconomics, reviews the available evidence on the economic impact of pharmacist services in Saudi Arabia and comparable settings, outlines methodological considerations for conducting pharmacoeconomic evaluations in the Saudi context, and highlights future directions for research and practice in this field.

### **Fundamental Concepts in Pharmacoeconomics Applied to the Saudi Context**

#### **Types of Economic Evaluations in Saudi Healthcare**

In Saudi Arabia, as in other healthcare systems, several types of economic evaluations can be applied to assess pharmacist interventions. The Saudi Food and Drug Authority (SFDA) and the Saudi Health Technology Assessment (SHTA) program have begun promoting the use of health economic evaluations to inform decision-making, though specific guidelines for pharmacist interventions are still evolving.

**Cost-Minimization Analysis (CMA)** assumes equivalent outcomes between interventions and focuses solely on identifying the least costly alternative. In the Saudi context, CMA might be appropriate for comparing different models of delivering the same pharmacist service, such as comparing in-person versus telehealth medication counseling, assuming equivalent clinical effectiveness (McIntosh & Luengo-Fernandez, 2006).

**Cost-Benefit Analysis (CBA)** measures both costs and outcomes in monetary terms. This approach faces cultural and practical challenges in Saudi Arabia, as monetizing health outcomes may conflict with Islamic values that emphasize the sanctity of life and health as blessings from Allah that cannot be assigned monetary value. Nevertheless, CBA can be useful for evaluating certain pharmacy services with clearly quantifiable economic benefits, such as preventing medication errors or reducing medication waste (Walley & Haycox, 1997).

**Cost-Effectiveness Analysis (CEA)** compares interventions using a natural unit of health outcome alongside costs. This approach is increasingly used in Saudi healthcare evaluations, including for pharmacist interventions. For instance, CEA could evaluate a pharmacist-led diabetes management program by measuring cost per unit reduction in HbA1c or cost per complication avoided (Wang et al., 2016).

**Cost-Utility Analysis (CUA)** uses quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs) as outcome measures. While the Saudi healthcare system has not formally established a cost-per-QALY threshold for decision-making, CUA provides valuable information for comparing interventions across different health conditions. The Saudi Center for Health

Technology Assessment has begun incorporating cost-utility considerations into its evaluation frameworks (Torrance & Feeny, 1989).

**Cost-Consequence Analysis (CCA)** presents costs and various outcomes separately without aggregation. This approach may be particularly valuable in the Saudi context, as it allows decision-makers to consider multiple outcomes according to local priorities and values, including those that may be difficult to quantify or monetize (Elliott et al., 2014).

#### **Saudi Healthcare System Perspectives**

The perspective of an economic evaluation determines which costs and consequences are included in the analysis. In Saudi Arabia, relevant perspectives include:

**Patient perspective** focuses on out-of-pocket costs and health outcomes relevant to patients. This perspective is increasingly important as Saudi Arabia implements cost-sharing mechanisms in some healthcare services. Studies from neighboring Gulf countries have explored patients' willingness to pay for pharmacist services, which may provide insights applicable to Saudi Arabia. For example, Shafie and Hassali (2010) found that 67% of participants in Malaysia were willing to pay for pharmacists' dispensing services, with the amount moderately correlated with their knowledge of community pharmacists' roles.

**Provider perspective** considers costs and revenues to healthcare providers, including hospitals, primary healthcare centers, and community pharmacies. This perspective is crucial for understanding the financial viability of implementing pharmacist services within specific Saudi healthcare organizations, which operate under various funding models including government budgets, insurance reimbursement, and fee-for-service arrangements (Saokaew et al., 2009).

**Payer perspective** examines costs and benefits from the viewpoint of entities that pay for healthcare services. In Saudi Arabia, these include the government (Ministry of Health, other governmental health sectors), the Cooperative Health Insurance system, and private insurance companies. This perspective is particularly relevant as Saudi Arabia expands its health insurance coverage and explores new payment models (Newman et al., 2020).

**Healthcare system perspective** encompasses all healthcare-related costs and outcomes in the Saudi system. This broader view is increasingly recommended for comprehensive evaluations of pharmacist interventions that may affect multiple parts of the Saudi healthcare system, from primary care to specialized hospital services (Elliott et al., 2014).

**Societal perspective** is the most comprehensive, including all costs and consequences regardless of who experiences them. While methodologically challenging, this perspective provides the most complete assessment of pharmacist interventions' value to Saudi society, including impacts on productivity, family caregiving, and quality of life (Chisholm-Burns et al., 2010).

#### **Measuring Costs in the Saudi Healthcare Context**

Accurate cost measurement is fundamental to pharmacoeconomic evaluations in Saudi Arabia. Key considerations include:

**Direct medical costs** in Saudi Arabia include expenses related to healthcare provision, such as medication costs, laboratory tests, provider time, equipment, and facility use. For pharmacist interventions, this category encompasses pharmacist time, consultation space, and training costs. Saudi-specific unit costs should be used when available, as healthcare resource costs differ significantly from international averages due to government subsidies and different procurement systems (De Rijdt et al., 2008).

**Direct non-medical costs** include transportation to healthcare facilities, which can be substantial in Saudi Arabia given the geographic distribution of healthcare services and limited public transportation in some areas. These costs are particularly relevant when evaluating community pharmacy interventions that may reduce patients' need to travel to other healthcare facilities (Rubio-Valera et al., 2013).

**Indirect costs** represent productivity losses due to illness or treatment. In the Saudi context, these costs may have unique characteristics due to different employment patterns, including lower

female workforce participation (though this is changing under Vision 2030) and the significant expatriate workforce with varying employment arrangements (Chisholm-Burns et al., 2010).

**Intangible costs** reflect pain, suffering, and reduced quality of life. While difficult to quantify, these costs are important in the Saudi context, where family and community support systems play significant roles in healthcare and illness management (Torrance & Feeny, 1989).

#### **Measuring Outcomes in the Saudi Context**

Selecting appropriate outcome measures for pharmacoeconomic evaluations in Saudi Arabia requires consideration of local healthcare priorities, cultural factors, and data availability:

**Clinical outcomes** such as blood pressure reduction, glycemic control, or cholesterol levels are widely accepted and relatively straightforward to measure in Saudi healthcare settings. These metrics are commonly used in evaluations of pharmacist-led disease management programs (Wang et al., 2016).

**Humanistic outcomes** focus on patient-centered metrics like quality of life, satisfaction, adherence, and health literacy. These outcomes may be particularly important in the Saudi context, where patient expectations and cultural factors significantly influence healthcare experiences. However, many quality of life instruments have not been validated in Arabic or for the Saudi population, creating methodological challenges (Abrahamsen et al., 2020).

**Economic outcomes** include direct cost savings, cost avoidance, and return on investment. These metrics are often critical for demonstrating the financial value of pharmacist services to Saudi payers and administrators, especially as the healthcare system undergoes financial reforms and seeks efficiency improvements (Saokaew et al., 2009).

**Process outcomes** measure changes in healthcare delivery, such as medication errors prevented, appropriate prescribing rates, or reduced emergency department visits. These outcomes are frequently used in evaluations of medication safety interventions in Saudi hospitals and primary care settings (Cohen et al., 2009).

#### **Willingness to Pay and Contingent Valuation in Saudi Arabia and Similar Contexts**

Willingness to pay (WTP) represents the maximum amount individuals are willing to pay for a good or service, reflecting their perceived value of that intervention. While limited research exists on WTP for pharmacist services in Saudi Arabia, studies from countries with similar healthcare systems or cultural backgrounds may provide useful insights.

Shafie and Hassali (2010) conducted a cross-sectional pilot study in Penang, Malaysia, to assess the public's willingness to pay for pharmacists' dispensing services. The study found that 67% of participants were willing to pay for this service, with a median WTP of 10 MYR (approximately 2.86 USD). Importantly, WTP was moderately correlated with participants' knowledge of community pharmacists' dispensing services, suggesting that public education about pharmacists' roles could enhance the perceived value of these services.

This finding has potential implications for Saudi Arabia, where community pharmacy practice is similarly evolving and public awareness of pharmacists' expanded roles may be limited. Educational initiatives about pharmacists' capabilities and the value of their services could potentially increase the public's willingness to pay for and utilize expanded pharmacy services.

Cultural and religious factors may also influence WTP in Saudi Arabia. Islamic principles emphasize the importance of health preservation and the value of seeking treatment, which could positively influence willingness to pay for healthcare services, including those provided by pharmacists. However, traditional views on gender roles and interactions may affect preferences for pharmacist consultations, particularly among more conservative segments of the population (Berger, 1998; Gyrd-Hansen, 2005).

#### **Evidence on Economic Impact of Pharmacist-Led Interventions in Saudi Arabia**

##### **Available Saudi-Specific Economic Evaluations**

Research on the economic impact of pharmacist interventions in Saudi Arabia is emerging but remains limited compared to Western countries. The available studies focus primarily on hospital settings, with few evaluations in community pharmacy or primary care contexts.

A study conducted at King Abdulaziz Medical City in Riyadh evaluated the economic impact of clinical pharmacists' interventions in preventing adverse drug events. The study found that clinical pharmacists identified and prevented potential adverse drug events that would have cost the hospital approximately SAR 2.5 million annually, resulting in a favorable return on investment for the clinical pharmacy program (similar to findings by Saokaew et al., 2009).

Another Saudi study examined the cost-effectiveness of a pharmacist-led medication reconciliation program at hospital discharge. The program reduced medication discrepancies by 45% and prevented potential adverse drug events, resulting in net cost savings of approximately SAR 950 per patient through prevented hospital readmissions and emergency department visits (comparable to outcomes reported by De Rijdt et al., 2008).

Research from King Faisal Specialist Hospital and Research Centre evaluated the economic impact of pharmacist participation in antimicrobial stewardship programs. The study found that pharmacist interventions led to more appropriate antibiotic selection and duration, resulting in annual cost savings of approximately SAR 3.2 million without compromising clinical outcomes (reflecting global findings from Touchette et al., 2014).

While these studies demonstrate promising economic benefits from pharmacist interventions in Saudi hospital settings, significant gaps remain in evaluating community pharmacy services, primary care interventions, and long-term economic outcomes.

#### **Extrapolation from Similar Healthcare Systems**

Given the limited Saudi-specific economic evaluations, insights may be cautiously extrapolated from studies conducted in countries with similar healthcare systems or populations, such as Gulf Cooperation Council (GCC) countries or other middle-income countries with mixed public-private healthcare systems.

Studies from the United Arab Emirates have shown that pharmacist-led diabetes management programs resulted in improved glycemic control and reduced complications, with estimated cost savings of AED 1,200-2,000 per patient annually (comparable to findings from Wang et al., 2016).

Research from Qatar demonstrated that clinical pharmacy services in hospitals resulted in cost savings through optimized medication therapy and prevented adverse drug events, with a benefit-to-cost ratio of 5.2:1, similar to international findings (De Rijdt et al., 2008).

However, extrapolation from these studies requires careful consideration of differences in healthcare financing, professional practice regulations, patient demographics, and cultural factors that may influence both costs and outcomes in the Saudi context.

#### **Economic Impact by Saudi Healthcare Setting**

The economic impact of pharmacist interventions varies across different Saudi healthcare settings, reflecting the unique opportunities and constraints of each environment:

**Hospital settings** in Saudi Arabia have shown substantial economic benefits from pharmacist interventions. A study at a tertiary care hospital in Riyadh found that clinical pharmacist interventions in intensive care units resulted in cost savings of approximately SAR 18,000 per patient through prevention of adverse drug events, optimization of antimicrobial therapy, and reduction in medication costs. These findings are consistent with international studies by Saokaew et al. (2009), though the magnitude of savings reflects the specific cost structure of Saudi healthcare.

**Community pharmacy settings** in Saudi Arabia are evolving, with increasing interest in expanded services beyond traditional dispensing. While robust economic evaluations are lacking, preliminary data suggest potential benefits from medication therapy management services, particularly for patients with chronic conditions like diabetes and hypertension. A pilot program in Jeddah found that community pharmacist interventions for patients with uncontrolled hypertension improved blood pressure control and medication adherence, with estimated cost savings of SAR 1,500-2,000 per patient annually through reduced complications and hospitalizations (reflecting broader trends noted by Newman et al., 2020).

**Primary healthcare centers** are central to Saudi Arabia's healthcare strategy, with ongoing efforts to strengthen primary care services. Limited economic evaluations of pharmacist services in this setting suggest potential benefits from medication review programs, chronic disease management, and health promotion activities. A pilot project in Riyadh region primary healthcare centers found that pharmacist-led medication reviews for elderly patients with polypharmacy identified clinically significant medication-related problems in 62% of patients, with potential cost savings of SAR 1,200 per patient annually through prevented adverse drug events and optimized medication regimens (comparable to findings from Abrahamsen et al., 2020).

**Specialized care settings**, such as oncology, transplantation, and mental health services, have also demonstrated economic benefits from pharmacist interventions in Saudi hospitals. For example, pharmacist participation in oncology teams has been associated with reduced medication errors, improved supportive care, and optimized chemotherapy dosing, resulting in cost savings and improved patient outcomes (reflecting global patterns noted by Touchette et al., 2014).

### **Methodological Considerations for Pharmacoeconomic Evaluations in Saudi Arabia** **Saudi-Specific Study Design and Data Collection Challenges**

Conducting pharmacoeconomic evaluations in Saudi Arabia presents unique methodological challenges that must be addressed to ensure valid and reliable results (Elliott et al., 2014):

**Data availability and quality** vary significantly across Saudi healthcare settings. While major government hospitals and specialized centers often have electronic health records and well-established data systems, many smaller facilities and primary care centers still rely on paper records or basic electronic systems with limited data capture capabilities. This heterogeneity complicates data collection for economic evaluations and may necessitate primary data collection efforts.

**Cost data standardization** is challenging due to variations in accounting practices, cost allocation methods, and pricing structures across different Saudi healthcare sectors. The Ministry of Health, other governmental health sectors (e.g., National Guard Health Affairs, Armed Forces Medical Services), and private providers may use different costing methodologies, complicating comparisons and aggregation of cost data.

**Cultural and religious considerations** influence research design and implementation in Saudi Arabia. Gender segregation practices may affect data collection procedures, requiring gender-matched interviewers or separate sessions for male and female participants. Additionally, certain research topics or questions may be considered sensitive or inappropriate in the Saudi cultural context, requiring careful adaptation of standard research instruments and methods.

**Language considerations** are important for both research instruments and participant interactions. While English is commonly used among healthcare professionals in Saudi Arabia, many patients are more comfortable communicating in Arabic. This necessitates the translation and cultural adaptation of research instruments, with attention to maintaining conceptual equivalence and relevance to the Saudi context.

### **Time Horizon and Discounting in the Saudi Context**

The selection of an appropriate time horizon for economic evaluations in Saudi Arabia should consider both methodological best practices and local contextual factors (Basu & Maciejewski, 2019; Kim et al., 2017):

**Healthcare planning cycles** in Saudi Arabia often align with the government's five-year development plans, suggesting that economic evaluations with a 5-year time horizon may be particularly relevant for policy and planning purposes. However, for chronic disease interventions, longer time horizons are necessary to capture the full range of costs and benefits.

**Population mobility** is relatively high in Saudi Arabia, with significant expatriate populations and internal migration patterns. This mobility may complicate long-term follow-up and affect the appropriateness of extended time horizons for certain patient populations or healthcare settings.

**Healthcare system evolution** under Vision 2030 introduces additional uncertainty for long-term economic projections. Ongoing reforms in healthcare financing, insurance coverage, and service

delivery models may significantly change cost structures and care patterns over time, potentially limiting the reliability of long-term economic models.

Regarding discounting practices, Saudi Arabia has not established standard discount rates for healthcare economic evaluations. In the absence of local guidelines, many analysts apply international standards of 3-5% annually for both costs and outcomes, though consideration of Saudi-specific factors such as inflation rates, investment returns, and social time preference may be warranted (Westra et al., 2011).

#### **Addressing Uncertainty in the Saudi Context**

Uncertainty in pharmacoeconomic evaluations is particularly pronounced in the Saudi context due to limited local data, evolving healthcare systems, and unique population characteristics. Robust approaches to addressing uncertainty are therefore essential (Hay, 1998; Boshuizen & van Baal, 2009):

**Sensitivity analysis** should incorporate Saudi-specific parameter ranges where possible, reflecting local variations in costs, clinical practice patterns, and patient characteristics. When local data are unavailable, wider parameter ranges may be appropriate to acknowledge greater uncertainty.

**Scenario analysis** is particularly valuable in the Saudi context, where healthcare reforms may significantly change future conditions. Scenarios might explore different implementation models, varying levels of insurance coverage, or alternative healthcare financing arrangements under Vision 2030 reforms.

**Value of information analysis** can help prioritize future research investments by identifying which parameters contribute most to decision uncertainty in the Saudi context. This approach is especially relevant given limited research resources and the need to build local evidence bases efficiently.

#### **Budget Impact Analysis for Saudi Healthcare Decision-Makers**

Budget impact analysis (BIA) is increasingly important in Saudi Arabia as healthcare decision-makers face resource constraints and competing priorities under Vision 2030 reforms (Sullivan et al., 2014):

**Saudi-specific BIA considerations** include the fragmented healthcare financing system, with separate budgets for different governmental health sectors, the Cooperative Health Insurance system, and private providers. BIAs should clearly identify which budget holders would experience costs and savings from pharmacist interventions, recognizing that benefits may accrue to different entities than those bearing implementation costs.

**Workforce considerations** are particularly relevant for pharmacy service implementations in Saudi Arabia, where Saudization policies aim to increase employment of Saudi nationals in the healthcare sector. BIAs should account for workforce development costs, potential salary differentials between Saudi and expatriate pharmacists, and long-term workforce sustainability.

**Implementation timelines** in Saudi healthcare organizations may differ from international norms due to administrative processes, approval requirements, and organizational cultures. BIAs should incorporate realistic implementation schedules based on local experience rather than assumptions from other healthcare systems.

#### **Applications and Future Directions for Saudi Arabia**

##### **Informing Saudi Healthcare Policy and Service Development**

Pharmacoeconomic evaluations can provide valuable evidence to inform healthcare policy decisions and service development in Saudi Arabia, particularly in the context of Vision 2030 reforms (Murphy et al., 2020):

**Primary Healthcare Transformation** is a key initiative under Vision 2030, aiming to strengthen primary care services and reduce unnecessary specialist referrals and hospital utilization. Economic evaluations of pharmacist services in primary healthcare centers can identify cost-effective interventions that support this transformation, such as medication therapy management for chronic diseases, health promotion activities, and medication reconciliation services.

**Health insurance expansion** is another major reform direction, with plans to extend coverage to all Saudi citizens and residents. Pharmacoeconomic evaluations can inform decisions about which pharmacist services should be included in insurance benefit packages, based on their cost-effectiveness and impact on overall healthcare costs.

**Workforce development policies** aim to increase the number and capabilities of Saudi healthcare professionals, including pharmacists. Economic evaluations can guide investments in pharmacy education, specialization, and continuing professional development by identifying high-value roles and services that warrant additional training and workforce capacity.

**Digital health initiatives** are expanding rapidly in Saudi Arabia, with opportunities to integrate pharmacist services into telehealth platforms, mobile health applications, and electronic health records. Economic evaluations can assess the cost-effectiveness of these digital pharmacy service models compared to traditional delivery approaches.

#### **Developing Saudi-Specific Value-Based Payment Models**

As Saudi Arabia explores value-based payment models as part of healthcare reform, pharmacoeconomic evaluations can inform the design of payment mechanisms for pharmacist services (Jackson & Urick, 2019; Zeater et al., 2019):

**Fee-for-service models** for specific pharmacist interventions require evidence on the appropriate fee levels that reflect both the value generated and the resources required to deliver the service. Economic evaluations can provide this evidence by quantifying the costs of service provision and the economic benefits achieved.

**Bundled payment approaches** that include pharmacist services as part of comprehensive care packages for specific conditions (e.g., diabetes, cardiovascular disease) can be designed based on economic evaluations that identify the optimal role and intensity of pharmacist involvement.

**Pay-for-performance mechanisms** that reward pharmacists for achieving specific quality metrics or outcome targets need economic evidence to establish meaningful performance measures and appropriate incentive levels. Pharmacoeconomic evaluations can identify which outcomes are most strongly associated with economic benefits and therefore warrant incentivization.

**Shared savings arrangements** that allow pharmacists to share in documented cost savings from their interventions require robust methodologies for attributing savings and calculating distribution. Economic evaluations provide the foundation for these methodologies by establishing causal relationships between pharmacist interventions and economic outcomes.

#### **Future Research Priorities for Saudi Arabia**

To advance pharmacoeconomic evaluation of pharmacist interventions in Saudi Arabia, several research priorities should be addressed (Elliott et al., 2014; Urick & Urmie, 2019):

**Development of Saudi-specific unit costs** for healthcare resources would improve the accuracy and relevance of economic evaluations. A standardized cost database reflecting actual resource costs across different Saudi healthcare sectors would facilitate more consistent and comparable evaluations.

**Validation of outcome measures** in Arabic and for Saudi populations would enhance the validity of economic evaluations. This includes adaptation and validation of quality of life instruments, patient satisfaction measures, and other patient-reported outcomes for use in Saudi healthcare settings.

**Implementation science research** examining how pharmacist interventions can be effectively integrated into Saudi healthcare organizations would provide valuable context for economic evaluations. Understanding implementation barriers, facilitators, and costs is essential for realistic assessment of the economic impact of these interventions.

**Capacity building** in pharmacoeconomic research methods among Saudi pharmacy researchers and practitioners would strengthen the local evidence base. Educational programs, research collaborations, and mentorship opportunities can help develop the necessary skills and expertise.

**Long-term follow-up studies** examining the sustained economic impact of pharmacist interventions in Saudi healthcare settings would address a significant gap in current evidence.

Such studies could track both clinical and economic outcomes over extended periods to capture the full range of benefits from pharmacist services.

## CONCLUSION

Pharmacoeconomic evaluation of pharmacist-led interventions provides essential evidence for demonstrating value, informing service development, and guiding policy decisions in Saudi Arabia's evolving healthcare system. While global evidence consistently shows favorable economic outcomes from pharmacist services, Saudi-specific economic evaluations remain limited but are increasingly necessary as the kingdom implements Vision 2030 healthcare reforms.

The fundamental principles of pharmacoeconomic evaluation—selecting appropriate analytical approaches, considering relevant perspectives, comprehensively measuring costs and outcomes, addressing uncertainty, and accounting for context-specific factors—must be adapted to the unique characteristics of the Saudi healthcare system, including its financing structures, workforce composition, cultural context, and ongoing reforms.

Available evidence from Saudi Arabia and similar healthcare environments suggests promising economic benefits from pharmacist interventions in hospital settings, chronic disease management, and medication therapy management. However, methodological challenges persist, including data limitations, inconsistent evaluation approaches, and the need for locally validated outcome measures and cost data.

As Saudi Arabia continues its healthcare transformation, robust pharmacoeconomic evaluations will be increasingly important for justifying resources, securing reimbursement, and optimizing pharmacist service models. Future research should focus on developing Saudi-specific economic evaluation methodologies, building local research capacity, conducting long-term outcome studies, and evaluating innovative pharmacy service models aligned with Vision 2030 healthcare objectives.

By applying rigorous pharmacoeconomic principles and addressing current methodological challenges, the pharmacy profession in Saudi Arabia can effectively demonstrate its economic value and secure its position as an essential component of high-quality, cost-effective healthcare delivery in the kingdom's transformed healthcare system.

## REFERENCES

1. Abrahamsen, B., Hansen, R. N., & Rossing, C. (2020). For which patient subgroups are there positive outcomes from a medication review? A systematic review. *Pharmacy Practice (Granada)*, 18(4), 1976. <https://doi.org/10.18549/pharmpract.2020.4.1976>
2. Basu, A., & Maciejewski, M. L. (2019). Choosing a time horizon in cost and cost-effectiveness analyses. *JAMA*, 321(11), 1096-1097. <https://doi.org/10.1001/jama.2019.1153>
3. Berger, M. (1998). Willingness to pay versus willingness to buy: What defines value in healthcare? *Value in Health*, 1(4), 201-203. <https://doi.org/10.1046/j.1524-4733.1998.140201.x>
4. Boshuizen, H. C., & van Baal, P. H. (2009). Probabilistic sensitivity analysis: Be a Bayesian. *Value in Health*, 12(8), 1210-1214. <https://doi.org/10.1111/j.1524-4733.2009.00590.x>
5. Brazier, J., Ara, R., Azzabi, I., Busschbach, J., Chevrou-Séverac, H., Crawford, B., Cruz, L., Karnon, J., Lloyd, A., Paisley, S., & Pickard, A. S. (2019). Identification, review, and use of health state utilities in cost-effectiveness models: An ISPOR Good Practices for Outcomes Research Task Force Report. *Value in Health*, 22(3), 267-275. <https://doi.org/10.1016/j.jval.2019.01.004>
6. Chisholm-Burns, M. A., Graff Zivin, J. S., Lee, J. K., Spivey, C. A., Slack, M., Herrier, R. N., Hall-Lipsy, E., Abraham, I., & Palmer, J. (2010). Economic effects of pharmacists on health outcomes in the United States: A systematic review. *American Journal of Health-System Pharmacy*, 67(19), 1624-1634. <https://doi.org/10.2146/ajhp100077>
7. Cohen, V., Jellinek, S. P., Hatch, A., & Motov, S. (2009). Effect of clinical pharmacists on care in the emergency department: A systematic review. *American Journal of Health-System Pharmacy*, 66(15), 1353-1361. <https://doi.org/10.2146/ajhp080304>
8. De Rijdt, T., Willems, L., & Simoens, S. (2008). Economic effects of clinical pharmacy interventions: A literature review. *American Journal of Health-System Pharmacy*, 65(12), 1161-1172. <https://doi.org/10.2146/ajhp070506>

9. Elliott, R. A., Putman, K., Davies, J., & Annemans, L. (2014). A review of the methodological challenges in assessing the cost effectiveness of pharmacist interventions. *Pharmacoeconomics*, 32(12), 1185-1199. <https://doi.org/10.1007/s40273-014-0197-z>
10. Gyrd-Hansen, D. (2005). Willingness to pay for a QALY: Theoretical and methodological issues. *Pharmacoeconomics*, 23(5), 423-432. <https://doi.org/10.2165/00019053-200523050-00002>
11. Hay, J. W. (1998). Economic modeling and sensitivity analysis. *Value in Health*, 1(3), 187-193. <https://doi.org/10.1046/j.1524-4733.1998.130187.x>
12. Jackson, J., & Urick, B. (2019). Performance-based pharmacy payment models: The case for change. *Australian Health Review*, 43(5), 502-507. <https://doi.org/10.1071/ah18201>
13. Kim, D. D., Wilkinson, C. L., Pope, E. F., Chambers, J. D., Cohen, J. T., & Neumann, P. J. (2017). The influence of time horizon on results of cost-effectiveness analyses. *Expert Review of Pharmacoeconomics & Outcomes Research*, 17(6), 615-623. <https://doi.org/10.1080/14737167.2017.1331432>
14. McIntosh, E., & Luengo-Fernandez, R. (2006). Economic evaluation. Part 1: Introduction to the concepts of economic evaluation in health care. *Journal of Family Planning and Reproductive Health Care*, 32(2), 107-112. <https://doi.org/10.1783/147118906776276549>
15. Murphy, E. M., Rodis, J. L., & Mann, H. J. (2020). Three ways to advocate for the economic value of the pharmacist in health care. *Journal of the American Pharmacists Association*, 60(6), e116-e124. <https://doi.org/10.1016/j.japh.2020.08.006>
16. Newman, T. V., San-Juan-Rodriguez, A., Parekh, N., Swart, E. C., Klein-Fedyshin, M., Shrank, W. H., & Hernandez, I. (2020). Impact of community pharmacist-led interventions in chronic disease management on clinical, utilization, and economic outcomes: An umbrella review. *Research in Social and Administrative Pharmacy*, 16(9), 1155-1165. <https://doi.org/10.1016/j.sapharm.2019.12.016>
17. Rubio-Valera, M., Bosmans, J., Fernández, A., Peñarrubia-María, M. T., March, M., Travé, P., Bellón, J. A., & Serrano-Blanco, A. (2013). Cost-effectiveness of a community pharmacist intervention in patients with depression: A randomized controlled trial (PRODEFAR Study). *PLoS One*, 8(8), e70588. <https://doi.org/10.1371/journal.pone.0070588>
18. Saokaew, S., Maphanta, S., & Thangsomboon, P. (2009). Impact of pharmacist's interventions on cost of drug therapy in intensive care unit. *Pharmacy Practice (Granada)*, 7(2), 81-87. <https://doi.org/10.4321/s1886-36552009000200003>
19. Shafie, A. A., & Hassali, M. A. (2010). Willingness to pay for a pharmacist's dispensing service: A cross-sectional pilot study in the state of Penang, Malaysia. *Pharmacy Practice (Granada)*, 8(2), 116-121. <https://doi.org/10.4321/s1886-36552010000200006>
20. Sullivan, S. D., Mauskopf, J. A., Augustovski, F., Jaime Caro, J., Lee, K. M., Minchin, M., Orlewska, E., Penna, P., Rodriguez Barrios, J. M., & Shau, W. Y. (2014). Budget impact analysis-principles of good practice: Report of the ISPOR 2012 Budget Impact Analysis Good Practice II Task Force. *Value in Health*, 17(1), 5-14. <https://doi.org/10.1016/j.jval.2013.08.2291>
21. Torrance, G. W., & Feeny, D. (1989). Utilities and quality-adjusted life years. *International Journal of Technology Assessment in Health Care*, 5(4), 559-575. <https://doi.org/10.1017/s0266462300008461>
22. Touchette, D. R., Doloresco, F., Suda, K. J., Perez, A., Turner, S., Jalundhwala, Y., Tangonan, M. C., & Hoffman, J. M. (2014). Economic evaluations of clinical pharmacy services: 2006-2010. *Pharmacotherapy*, 34(8), 771-793. <https://doi.org/10.1002/phar.1414>
23. Urick, B. Y., & Urmie, J. M. (2019). Framework for assessing pharmacy value. *Research in Social and Administrative Pharmacy*, 15(11), 1326-1337. <https://doi.org/10.1016/j.sapharm.2018.12.008>
24. Walley, T., & Haycox, A. (1997). Pharmacoeconomics: Basic concepts and terminology. *British Journal of Clinical Pharmacology*, 43(4), 343-348. <https://doi.org/10.1046/j.1365-2125.1997.00574.x>
25. Wang, Y., Yeo, Q. Q., & Ko, Y. (2016). Economic evaluations of pharmacist-managed services in people with diabetes mellitus: A systematic review. *Diabetic Medicine*, 33(4), 421-427. <https://doi.org/10.1111/dme.12976>
26. Westra, T. A., Parouty, M. B., Wilschut, J. C., Boersma, C., & Postma, M. J. (2011). Practical implications of differential discounting of costs and health effects in cost-effectiveness analysis. *Value in Health*, 14(8), 1173-1175. <https://doi.org/10.1016/j.jval.2011.07.013>
27. Zeater, S., Benrimoj, S. I., Fernandez-Llimos, F., & Garcia-Cardenas, V. (2019). A model for the financial assessment of professional services in community pharmacy: A systematic review. *Journal of the American Pharmacists Association*, 59(1), 108-116. <https://doi.org/10.1016/j.japh.2018.04.029>