Contemporary Clinical Trials Communications 14 (2019) 100354

Contents lists available at ScienceDirect

Contemporary Clinical Trials Communications

journal homepage: www.elsevier.com/locate/conctc

Economic outcomes associated with an investigational drug service within a Veterans Affairs health care system

Jamie N. Brown[a,*], Frank Tillman III[a,b], Sherin Jacob[a], Sara R. Britnell[a]

[a] Durham Veterans Affairs Health Care System, 508 Fulton Street (119), Durham, NC, 27705, USA
[b] University of North Carolina Eshelman School of Pharmacy, 301 Pharmacy Lane, Chapel Hill, NC, 27599, USA

ARTICLE INFO

Keywords:
Pharmacy
Research pharmacist
Pharmacoeconomics
Cost avoidance
Cost savings
Clinical research

ABSTRACT

Background: An investigational drug service (IDS) has a foundational role in ensuring the safe and efficient management of investigational drugs. The objective of this assessment is to determine economic value of an IDS within a Veterans Affairs health care system.

Methods: This assessment was a single-center retrospective record review. Study protocols managed by the IDS over a 2-year period were evaluated for cost avoidance, revenue, and waived revenue. Cost avoidance was defined as the cost savings generated when a research subject received sponsor-provided treatment in place of a therapy that would have been otherwise funded by the institution. Revenue from fees charged to investigators and waived revenue based on the standardized IDS fee schedule were also totaled. The total economic value to the institution accounted for the personnel costs of the IDS.

Results: Twenty-three investigational study protocols managed by the IDS resulted in economic outcomes. The total cost avoidance during the two-year period was $482,627.33. The total revenue and waived revenue associated with the IDS was $16,822 and $54,200, respectively. Oncology protocols had the highest contribution to the outcomes of cost avoidance and revenue and mental health protocols had the highest contribution for waived revenue. The overall economic value of the IDS to the institution was $393,649.33.

Conclusions: Over a two-year period, the IDS demonstrated a substantial economic value that was largely driven by cost avoidance. Revenue generation from fees charged to investigators and cost savings to the investigator through waived revenue also contributed economic benefits to the institution.

1. Introduction

Investigational Drug Services (IDSs) provide many valuable services to investigators and institutions to support clinical research and contribute to the advancement of medical practice. These services include research drug supply management, dispensing, documentation, drug information consultation, randomization and blinding, medication safety, and regulatory quality assurance [1–3]. Importantly, the IDS is responsible for maintaining the integrity of investigational drug research by ensuring the safety of human subjects through proper storage, handling, and dispensing of investigational drugs. Ensuring safety is a foundational competency of an IDS, as investigational drug products are not required to follow standardized medication safety practices. Major areas of risk for investigational drug safety include protocol complexity, medication availability, and the processes for packaging, storing, and dispensing trial medications [4–6]. Due to their unique training and expertise in the medication-use process, pharmacists within an IDS have the potential to significantly improve the safety, efficacy, and quality of clinical research within an institution [2].

Investigational drug research can be challenged by various financial implications, including the cost of undertaking clinical studies that oftentimes present no assured benefit to patients, providers, or institutions [7]. This places significant burden on the IDS to demonstrate its value, typically identified through an assessment of revenue generated from charges to investigators or study sponsors. While most IDSs charge fees for the services that they provide, this revenue is often insufficient to cover the full cost of maintaining the service [8,9]. Assessing the economic value of an IDS through an evaluation of cost avoidance can aid in mitigating this discrepancy. Cost avoidance occurs when a research subject receives sponsor-provided treatment in place of therapies that would have been otherwise funded by the institution.

While previous studies have demonstrated that the IDS has been able to generate economic benefit through cost avoidance, no studies have been identified that specifically assess the outcomes of an IDS

* Corresponding author. Pharmacy Service (119), Durham VA Medical Center, 508 Fulton St., Durham, NC, 27705, USA.
E-mail address: Jamie.brown2@va.gov (J.N. Brown).

https://doi.org/10.1016/j.conctc.2019.100354
Received 14 December 2018; Received in revised form 19 March 2019; Accepted 4 April 2019
Available online 06 April 2019

within the Veteran Affairs (VA) health care system or evaluate the economic benefits of an IDS gained by investigators through the potential for waived fees [8–10]. The primary objective of this assessment is to determine the cost avoidance associated with an IDS within a VA health care system over a two-year period. Secondary objectives include determining the total of revenue charges, total cost savings for fee-waived studies, and total economic value of the IDS to the institution.

1.1. Practice setting description

The IDS is located within a centralized pharmacy of a 271-bed tertiary care VA medical center. The medical center serves as a referral, teaching, and research facility that provides both inpatient and general and specialty ambulatory services. Several community-based outpatient clinics also operate under the medical center to provide greater access to care for veterans in broader geographical areas. The IDS is staffed by a single clinical pharmacist manager with 0.5 full time equivalents (FTE) dedicated to the IDS. Coverage of the IDS is maintained from 7:30 a.m. to 4:00 p.m. EST Monday to Friday. Additional coverage support is provided by a Post-Graduate Year 2 Drug Information resident as part of a longitudinal IDS learning experience, as well as three clinical pharmacy specialists.

The IDS supports a wide scope of inpatient and outpatient protocols including both local investigator-initiated and multicenter (i.e. VA cooperative, industry-sponsored, and other governmental or externally funded) studies. Revenue to the IDS is generated directly from fees charged to investigators for services provided. The precise fees charged by the IDS vary between studies but are based on a standardized fee schedule that includes fees for the initiation of a protocol, accountability per patient enrolled, and dispensations for each oral and parenteral dose. Per department policy, all IDS fees are automatically waived for protocols directly funded by the Veterans Health Administration.

2. Materials and methods

This assessment was a single-center retrospective record review. All investigational drug protocols with an active enrollment from January 1, 2016 to December 31, 2017 were included for review. Data collection involved documentation of the name of the study protocol, investigational drug name, dose, quantity, duration of therapy, dispensing pharmacist, dispensation time, and applicable study-related fees. Outpatient dispensation time was calculated by averaging the duration of time from prescription processing by the pharmacist until prescription placement for pickup. Dispensation times of less than 10 min and greater than 60 min were removed as outliers to control for technical disruptions that may have led to falsely shortened or prolonged durations. The average duration of inpatient dispensations was determined through an informal survey of average pharmacist and pharmacy resident time spent per dispensation.

The cost avoidance for an investigational drug was defined as the cost savings generated when a research subject received sponsor-provided treatment in place of a therapy that would have been otherwise funded by the institution. Protocols were included in the cost avoidance analysis if they involved either FDA-approved drugs that were provided by the sponsor free of charge or non-FDA-approved drugs for which a marketed alternative already existed. If a non-FDA-approved drug was used, an alternative (i.e. avoided) drug therapy was determined by clinical consultation as described by McDonagh et al. [9]. All patients enrolled in placebo-controlled studies were treated as receiving the active medication. Medical center contract acquisition costs were used to calculate cost avoidance. Protocols were excluded from the cost avoidance assessment if they either involved non-FDA-approved drugs for which no alternative therapy existed or were conducted in patients who would not have received a treatment in absence of the study (e.g. healthy volunteer studies).

Table 1
Characteristics of included investigational drug studies.

Protocol therapeutic area	No. cost avoidance studies	No. non-cost avoidance studies	Total no. studies
Oncology	3	3	6
Cardiovascular	3	2	5
Infectious Disease	2	2	4
Mental Health	0	4	4
Gastrointestinal/ Nutrition	1	1	2
Pain Management	0	2	2
Totals	9	14	23

Revenue was calculated by totaling the initiation fees, per-patient study maintenance fees, and per-dose dispensing fees for each applicable study protocol. Waived revenue was calculated by utilizing the standardized IDS fee schedule and totaling the waived fees for each applicable study. The total economic value of the IDS to the institution was determined by subtracting IDS personnel costs from the summation of cost avoidance, revenue, and waived revenue. The personnel costs were established as $160,000 for the two-year period, which represents 0.5 FTE and incorporates salary plus benefits [11]. Descriptive statistics were used for all assessments.

3. Results

During the period from January 1, 2016 to December 31, 2017, the IDS supported 23 active protocols and a total of 1,370 dispensations. Of these, 1,331 dispensations originated from outpatient study protocols and 39 originated from inpatient protocols. The average time per dispensation for outpatient prescriptions was 21.6 min and 60 min for inpatient prescriptions. Of the included protocols, 9 (39.1%) studies resulted in cost avoidance (Table 1), with only one included protocol involving a non-FDA-approved therapy. The total drug cost avoidance was determined to be $482,627.33, representing a cost savings of $224,388.63 in 2016 and $258,238.70 in 2017. Table 2 summarizes the individual cost avoidance savings attributed to each applicable therapeutic area. The therapeutic areas associated with the highest contribution to cost avoidance were oncology and infectious disease.

The total revenue and waived revenue associated with the IDS were $16,822 and $54,200, respectively. Table 3 represents revenue and waived revenue based on therapeutic area. Oncology and cardiovascular investigational studies had the largest contribution to revenue. Conversely, mental health and pain management protocols contributed the most to waived revenue. After accounting for personnel costs, the total economic value of the IDS during the two-year study period was $393,649.33 (Table 4).

4. Discussion

This evaluation demonstrates a comprehensive approach for measuring the economic value of an IDS by assessing the individual

Table 2
Cost avoidance outcomes of the investigational drug service.

Protocol therapeutic area	Cost avoidance, $		
	Total	Mean per protocol	Median per protocol
Oncology (n = 3)	390,813.73	130,271.24	66,887.96
Cardiovascular (n = 3)	39,970.06	13,323.35	1,335.76
Infectious Diseases (n = 2)	51,771.54	25,885.77	25,885.77
Gastrointestinal/Nutrition (n = 1)	72.00	72.00	72.00
Totals (n = 9)	482,627.33	53,625.26	20,012.14

Table 3
Revenue and waived revenue outcomes of the investigational drug service.

Protocol therapeutic area	Revenue, $	Waived revenue, $
Oncology (n = 6)	7,975	5,425
Cardiovascular (n = 5)	5,472	0
Infectious Diseases (n = 4)	3,100	0
Mental Health (n = 4)	0	37,775
Gastrointestinal/Nutrition (n = 2)	0	1,775
Pain Management (n = 2)	275	9,225
Totals (n = 23)	16,822	54,200

Table 4
Total economic value assessment of the investigational drug service.

Economic category	Economic value, $
Cost Avoidance	482,627.33
Revenue	16,822.00
Waived Revenue	54,200.00
Personnel Costs [11]	(160,000.00)
Total Value	393,649.33

contributions of the IDS based on cost avoidance, revenue, and waived revenue. These findings suggest that the IDS demonstrated substantial economic benefit which was sustained after subtracting personnel costs. When assessing the individual outcomes of the evaluation, cost avoidance and revenue have a positive impact on the budget of the pharmacy department by lowering costs or increasing available funds, but waived revenue has a neutral effect. Instead, the economic benefit of waived fees from the IDS is received by the investigators of the respective protocols. Per department policy, fees are waived only for those protocols funded by the Veterans Health Administration. Thus, while the pharmacy department does not directly benefit from the waived fees, the institution benefits from lowered administrative costs to conduct the clinical studies. Waived fees serve to decrease the overall financial burden and allow the investigator the opportunity to reinvest resources in other research capacities to further promote the advancement of clinical research within the institution. To our knowledge, this is the first assessment that evaluates the economic value of an IDS by including outcomes related to both the pharmacy department and those received by the institution-affiliated investigator.

The overall economic value of the IDS to the institution was largely driven by cost avoidance, with oncology and infectious disease protocols contributing to the majority of that total. This is comparable to previous IDS studies, in which oncology protocols represented the largest proportion of cost avoidance, followed by infectious disease studies [8–10]. While the total cost avoidance is lower than previously reported for an IDS, it is likely due to the size of the IDS and number of protocols that were supported within the two-year time frame. Yet, the average cost avoidance per protocol for this assessment is very similar to previous publications [8,9]. Unique to this assessment, mental health and pain management protocols had the largest proportion of contribution to waived revenue. This is most likely due to the research focus of the Veterans Health Administration on these specific patient populations and thus the increased likelihood of these protocols being directly funded by the Veterans Health Administration.

It is also worth noting that the total revenue charged during this timeframe only accounted for approximately 10% of the personnel costs of the IDS. Similar to previous studies, the IDS was not able to collect enough revenue to cover the cost of maintaining the service [8,9]. This could imply that IDSs need to increase fees charged to investigators for supporting investigational drug studies. Alternatively, this consistent discrepancy between revenues and cost of maintaining the service could further validate the need to assess more than revenue when measuring the economic viability of an IDS. Additionally, markedly increasing fees may disincentivize a sponsor from conducting a clinical trial within an institution, create a financial burden for the investigator, and increase the overall cost of clinical research. Increased costs for conducting clinical research through increased IDS fees may even counterproductively increase costs to the health care system once the investigational drug becomes a marketed medication. For instance, the sponsor of the IDS protocol may attempt to recoup research costs by setting higher acquisitions prices for the medication after it reaches the market.

In the context of economic outcomes of an IDS, it is important to note that an IDS does not solicit or dictate which protocols it supports [12,13]. Instead, an IDS can only support a research protocol that has been sponsored by a principal investigator and has received approval from the organization's institutional review board. Therefore, the current assessment is restricted only to studies and therapeutic areas of research that investigators within the institution were pursuing. Specifically, the findings suggest that oncology and cardiovascular protocols were of clinical or professional interest to investigators, as the IDS supported the highest number of protocols in these therapeutic areas. Additionally, there are multiple therapeutic areas, such as organ transplant, respiratory, ophthalmology, or dermatology, which represent opportunities for the expansion of investigational research within the institution. Increasing the number of protocols would also have the potential to increase the economic outcomes of the IDS.

In addition to the economic outcomes collected, this assessment was also able to measure dispensing workload within the IDS. Of the 0.5 FTE designated for the IDS pharmacist, the total amount of time related to dispensing within the IDS only represented approximately 25% (259/1040 h) of the FTE. Thus, this provides the pharmacist with additional workload opportunities to support auxiliary responsibilities of the IDS such as quality assurance, audit support, regulatory committee membership, and inventory management. While the economic value of these auxiliary responsibilities is not likely measurable, they are foundational to the role of the pharmacist within the IDS [2,5]. Therefore, the IDS should be staffed in a capacity to appropriately support both the dispensation and administrative requirements of the IDS. Additionally, the total of the economic outcomes of this assessment were nearly 3.5 times the personnel costs. By providing more value than the cost to staff the IDS, this assessment may justify additional pharmacist or technician personnel to expand the services of the IDS. Previous studies have demonstrated that more than a quarter of pharmacists working in the IDS characterized the workload in the IDS as too heavy and over 80% indicated some level of concern related to medication safety [6]. The expansion of personnel in the IDS has the potential to mitigate both concerns through additional workload support.

The findings of this analysis are limited by the evolving nature of the IDS. Differences in the number and types of protocols within an IDS occur on an ongoing basis, so it is not practical to assume the findings of this assessment will remain constant over time. To mitigate this limitation, the evaluation was conducted over a two-year period to better represent the economic outcomes over a longer duration. Additionally, this assessment was not able to incorporate the auxiliary costs of operating an IDS (e.g. electricity, temperature monitoring, work space, etc.) into the economic analysis. Lastly, this analysis did not incorporate clinical outcomes into the economic assessment. This includes informal consultations or interventions that occurred within the IDS that led to the avoidance of negative clinical outcomes such as adverse drug events, drug interactions, or medication errors and the associated institutional costs that would occur as a result of managing these negative outcomes.

5. Conclusion

Over a 2-year period, the IDS was able to demonstrate substantial economic value within a VA health care system. This value was established through an assessment of cost avoidance, revenue, and

waived revenue and these economic outcomes collectively contributed to the benefit received by the pharmacy department, investigator, and institution.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Funding source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.conctc.2019.100354.

References

[1] J. Rothman, Investigational drug services- a challenge and opportunity for pharmacists, J. Pharm. Pract. 9 (1996) 420–436.
[2] S.C. Kay, D.G. Luke, H.R. Tamer, ASHP guidelines for the management of investigational drug products, Am. J. Health Syst. Pharm. 75 (2018) 561–573.
[3] S.R. Amin, J.S. Lee, J.G. Avila, R. Enos, M.J. Boron, K. Galus, et al., HOPA investigational drug service best practice standards. Hematology/Oncology Pharmacists Association, http://www.hoparx.org/images/hopa/resource-library/professional-tools/HOPA16_IDS_Guidelines.pdf , Accessed date: 12 December 2018.
[4] L.M. Young, C.M. Haakenson, J.H. Weber, T.J. Tosch, National survey of pharmacy-coordinated investigational drug services, Am. J. Hosp. Pharm. 41 (1984) 1792–1796.
[5] J.N. Brown, S.R. Britnell, A.P. Stivers, J.L. Cruz, Medication safety in clinical trials: role of the pharmacist in optimizing practice, collaboration, and education to reduce errors, Yale J. Biol. Med. 90 (2017) 125–133.
[6] J.L. Cruz, J.N. Brown, Safety risks with investigational drugs: pharmacy practices and perceptions in the Veterans Affairs health system, Ther. Adv. Drug Saf. 6 (2015) 103–109.
[7] D.P. Wermeling, L.T. Percoro, T.S. Foster, Financial impact of clinical research on a health system, Am. J. Health Syst. Pharm. 54 (1997) 1742–1751.
[8] J. LaFleur, L.S. Tyler, R.R. Sharma, Economic benefits of investigational drug services at an academic institution, Am. J. Health Syst. Pharm. 61 (2004) 27–32.
[9] M.S. McDonagh, S.A. Miller, E. Naden, Cost and savings of investigational drug services, Am. J. Health Syst. Pharm. 57 (2000) 40–43.
[10] L.J. Shen, H. Chou, C.F. Huang, G.M. Chou, W.K. Chan, F.L. Wu, Economic benefits of sponsored clinical trials on pharmaceutical expenditures at a medical center in Taiwan, Contemp. Clin. Trials 32 (2011) 485–491.
[11] R.B. Britt, M.G. Hashem, W.E. Bryan, R. Kothapalli, J.N. Brown, Economic outcomes associated with a pharmacist-adjudicated formulary consult service in a Veterans Affairs Medical Center, J. Manag. Care. Spec. Pharm. 22 (2016) 1056–1061.
[12] C. Bredin, M. Eliasziw, R. Syme, Drug cost avoidance resulting for cancer clinical trials, Contemp. Clin. Trials 31 (2010) 524–529.
[13] L.L. Zullig, J. Pathman, S.D. Melnyk, J.N. Brown, L.L. Sanders, C. Koropchak, et al., A protocol to evaluate the efficacy, perceptions, and cost of a cholesterol packaging approach to improve medication adherence, Contemp. Clin. Trials 39 (2014) 106–112.