Transportation Cost of Anticoagulation Clinic Visits in an Urban Setting

Jamie M. Hwang, PharmD; Jennifer Clemente, PharmD, BCPS; Krishna P. Sharma, PhD; Thomas N. Taylor, PhD; and Candice L. Garwood, PharmD, BCPS

ABSTRACT

BACKGROUND: Patients being managed on warfarin make frequent or regular visits to anticoagulation monitoring appointments. International studies have evaluated transportation cost and associated time related to anticoagulation clinic visits. To our knowledge, no studies have evaluated the cost of transportation to such clinic visits in the United States.

OBJECTIVE: To describe the methods of transportation and estimate the average total cost of transportation to and from an anticoagulation clinic in an urban setting.

METHODS: We prospectively conducted a survey of patients treated at the Harper Anticoagulation Clinic located in Detroit, Michigan, during November 2010. The survey was given to patients while waiting at their regularly scheduled clinic appointments and included questions regarding mode of transportation, distance traveled in miles, parking payment, and time missed from work for clinic appointments. The mean distance traveled was translated into cost assuming 50 cents per mile based on 2010 estimates by the Internal Revenue Service.

RESULTS: Sixty patients responded to the 11-item survey; response rates for individual items varied because participants were instructed to skip questions that did not pertain to them. Of the 47 participants responding to demographic questions, 70.2% were female, and 46.8% were older than 60 years. Transportation by private vehicle (80.0%), either driven by patients (41.7%) or someone else (38.3%), was the most common method reported. Use of private automobile translated into a cost of $11.19 per round trip. Other means of transportation identified include a ride from a medical transportation service (10.0%), bus (5.0%), walking (3.3%), and taxi (1.7%). The mean (SD) distance traveled to the clinic for all methods of transportation was 8.34 (7.7) miles. We estimated the average cost of round-trip transportation to be $10.78 weighted for all transportation modes. This is a direct nonmedical cost that is paid for by most patients.

CONCLUSION: The round-trip cost of transportation to an anticoagulation clinic in an urban setting in the United States, the average round-trip travel cost to a clinic appointment was $10.78 (2010 U.S. dollars).

What is already known about this subject

• Jowett et al. (2008) found that the mean costs of transportation to anticoagulation clinics per visit (adjusted for 2003 euro-dollar exchange rate and inflated to 2010 dollars using the Consumer Price Index) were $5.62 in Australia, $5.49 for primary care in France, $9.49 for secondary care in France, $10.30 in Portugal, $4.02 in Spain, $4.68 in Sweden, and $5.89 in the United Kingdom.

• The costs of transportation and time lost from work have been shown to impose significant financial cost for patients in other countries.

What this study adds

• For patients treated in an anticoagulation clinic in an urban area in the United States, the average round-trip travel cost to a clinic appointment was $10.78 (2010 U.S. dollars).

• The mean (SD) distance traveled to anticoagulation clinic appointments was 8.34 (7.7) miles.

• Private automobile was the most common method of transportation used (80% of participants) to travel to anticoagulation clinic appointments.

Chronic use of warfarin is the mainstay of outpatient anticoagulation therapy for the prevention and treatment of thromboembolism. However, warfarin therapy requires frequent monitoring due to its highly variable pharmacokinetics and a narrow therapeutic range. The American College of Chest Physicians guidelines recommend monitoring patients who are stabilized on warfarin no less than every 4 weeks.¹ Patients who are not stable or those beginning warfarin therapy require more frequent international normalized ratio (INR) monitoring until stable anticoagulation is achieved. Monitoring of unstable patients is case-specific but may occur as often as every week. Therefore, specialized anticoagulation clinics exist to provide frequent monitoring in an attempt to ensure optimal anticoagulation management.

Despite the importance of warfarin monitoring, we have observed that patients on chronic anticoagulation attending our anticoagulation clinic may miss appointments or prolong their monitoring interval due to real-world challenges,
including transportation-related issues. A multinational study investigating the cost of travel in attending anticoagulation clinics concluded that patients incur considerable costs per visit varying among countries ($5.62 in Australia, $5.49 for primary care in France, $9.49 for secondary care in France, $10.30 in Portugal, $4.02 in Spain, $4.68 in Sweden, and $5.89 in the United Kingdom, adjusted for 2003 euro-dollar exchange rate and inflated to 2010 dollars using the Consumer Price Index). A Canadian study found significant expense associated with travel to anticoagulation clinic and laboratory monitoring. While neither of these studies investigated either the effect of transportation cost on clinic attendance or adverse clinical outcomes, they raise the possibility that the accumulation of transportation costs could impose a financial burden on some patients, causing missed or cancelled appointments, and lead to adverse events.

Direct costs refer to those that are completely attributable to health care intervention. Thus, while treatment costs, dispensed medication, laboratory tests, and clinic visits are considered direct medical costs, the cost of transportation to clinic appointments is a direct nonmedical cost that is usually the responsibility of the patient. In some cases, transportation costs may be covered by the patient’s medical insurance. A medical transportation service may directly bill the patient’s insurance provider if that patient qualifies for transportation benefits to nonemergency medical appointments. This may be the case when a patient meets criteria of being disabled. Furthermore, when government-sponsored insurance programs, such as Medicare or Medicaid, provide transportation coverage, there is a societal expense incurred.

To our knowledge, the cost of transportation for patients managed at an anticoagulation clinic in the United States has never been formally evaluated. Therefore, for patients managed through face-to-face clinic appointments in an anticoagulation clinic in an urban U.S. setting, we aimed to (a) describe the various methods of transportation used; (b) estimate the patients’ out-of-pocket costs associated with transportation; and (c) estimate the time lost from work because of attending a clinic visit.

## Methods

The study was approved by the Human Investigations Committee at Wayne State University and received authorization from the Detroit Medical Center. It was conducted at the Harper Anticoagulation Clinic (HAC), a pharmacist-run anticoagulation clinic at Harper University Hospital, which is part of the Detroit Medical Center. The HAC is located in Detroit, Michigan, serving patients living in the metropolitan Detroit area who require anticoagulation. Each 20-minute clinic visit is managed by face-to-face contact with a pharmacist requiring physical presence of the patient. The average follow-up interval for the patients seen in the anticoagulation clinic is 2.5 weeks.

We proposed to survey a representative sample of approximately 15% of the total clinic population, which consists of 400 patients. Eligible participants were patients actively enrolled at the HAC on chronic warfarin therapy, attending a clinic appointment during the 2-week survey period, and agreeing to participate in the survey developed by the study investigators (Appendix). The self-administered survey was offered by clinic staff to patients who were waiting for their regularly scheduled clinic visits. Patients were unassisted in answering the survey unless they solicited help.

The survey included 11 questions, developed by the investigators, that appeared in a combination of multiple-choice and free-text formats for responses written at a Flesch-Kincaid grade level of 4.3 Survey item development was conducted by 2 investigators and reviewed for achievement of the survey objective, comprehension, and clarity by the 2 other investigators. The survey questions specifically sought to quantify the approximate miles traveled, methods of transportation, parking costs associated with clinic visits, and missed work time.

In order to determine the average cost of transportation to the clinic, we first determined the method of transportation used by patients attending the HAC by a multiple-choice question on the survey. Then, the frequency of each method of transportation was calculated. In order to estimate round-trip transportation cost to the HAC, we determined the unit cost for each mode of transportation. For automobile transportation, the participants were asked to report the number of miles they drove to the clinic. If they were unable to report the miles, patients had the option to estimate the travel time to the clinic, which was then used to approximate the miles traveled to an appointment. The cost of using a private automobile was assumed to be the same whether the patients drove themselves or they reported being driven by someone else. Therefore, the sum of patients reporting automobile transportation, regardless of who drove, was utilized in cost calculations. The participants were also asked to report the cost of parking if automobile was the mode of transportation. In order to estimate the total cost of transport by car, we multiplied the total miles traveled (both ways) by the unit cost of 50 cents per mile as reported by the Internal Revenue Service (IRS) and added the parking cost if applicable. We assigned zero cost of transport to those who walked to the clinic. In order to estimate the cost of taxi, medical transport service, or bus, we asked the actual amount paid for the visit. We used the estimated or self-reported cost of transportation for each patient to calculate the average cost for each method of transportation. All costs were reported and evaluated as U.S. dollars (USD) in 2010. The overall average cost of transportation was determined by multiplying the average cost per mode of transportation by the proportion of patients traveling by that mode, then summing those values across all modes of transportation.
Transportation Cost of Anticoagulation Clinic Visits in an Urban Setting

### Results

Sixty surveys were given to HAC patients during their regularly scheduled anticoagulation clinic visits during a 2-week period in November 2010. While 100% (n = 60) of surveys were returned, the response rate varied by item because participants either were instructed to skip questions that did not pertain to them or did not answer demographic data questions (Table 1). Those older than age 60 years comprised 46.8% (n = 22 of 47) of patients responding to demographic questions (age range of respondents was 18-89 years). Participants were predominately female (70.2%; n = 33 of 47). Eighty percent (n = 48 of 60) of the study participants stated that a personal automobile was driven for transportation to clinic visits. Of those participants, 52.1% (n = 25 of 48) stated that they drove their own automobile, and 47.9% (n = 23 of 48) had a friend or a family member providing assistance in driving. Smaller percentages of the study participants reported using public transportation, such as taxi or bus, using a medical transportation service, or walking to the clinic (Table 2).

The mean (standard deviation [SD]) distance for all patients who traveled to clinic via automobile was 8.34 (7.7) miles one way. All respondents answered whether they did or did not pay for parking. Of the study participants reporting that they did pay for parking (n = 17), the mean (SD) parking fee was $2.85 ($1.00). Table 2 includes the identified modes of transportation and each of the estimated round trip costs for clinic visits. Therefore, the estimated cost of transportation was $10.78 round trip per clinic visit.

### Missed Work Time

Seven of the 60 participants (11.7%) took time off from work for clinic visits. Among those 7, the mean (SD) missed work time (including travel time) was 1.75 (0.48) hours, of which 20 minutes is unavoidable missed work time spent in the clinic visit. The most frequent reported total missed for an appointment was 2 hours. Eighty-eight percent (n = 52 of 59) of participants stated that they do not take any time off for clinic visits.

### Discussion

We estimated that patients being managed at face-to-face anticoagulation clinic appointments spend approximately $10.78 per trip for transportation occurring at least once monthly, or a total annual cost of approximately $130 for monthly visits and $560 for weekly visits. The cost of transportation may potentially become burdensome and lead to lack of adherence to monitoring. Canceled or missed appointments at our anticoagulation clinic due to transportation difficulties are frequently observed. Adherence to monitoring is critical to ensure safe anticoagulation, since poorly managed anticoagulation therapy can lead to adverse patient outcomes. Although there is no

---

**Table 1: Response Rates for Transportation Survey Questions**

<table>
<thead>
<tr>
<th>Question or Item</th>
<th>Respondents&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Total N = 60</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did you get to the Harper Anticoagulation Clinic for your appointment today?</td>
<td>60 (100.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you drove to the clinic, how far was your trip (one way)?</td>
<td>45 (75.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you are not sure how far, how long does a car ride to the clinic usually take?</td>
<td>49 (81.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you pay for parking?</td>
<td>60 (100.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you take time off work to get to your appointment?</td>
<td>59 (98.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you drove with someone (family member or friend), did he/she take time off work?</td>
<td>52 (86.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you took the medical transportation service to get to your appointment, how much did you pay?</td>
<td>29 (48.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you took a taxi, bus, or other method of transportation, how much did you pay per trip one way?</td>
<td>28 (46.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does your insurance cover your ride to the clinic? Number giving &quot;Yes&quot; response (% of respondents to the question)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>44 (73.3)</td>
<td>9 (20.5)</td>
<td></td>
</tr>
<tr>
<td>Please indicate your gender</td>
<td>47 (78.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please indicate your age</td>
<td>47 (78.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>The rate of response was calculated as a proportion of the total number surveyed because some survey respondents answered no and others skipped questions that did not apply to them.

<sup>b</sup>Of the 9 respondents who indicated that they had insurance coverage for clinic transportation, 3 stated that they were fully covered, 1 reported having a copayment, and 5 did not respond regarding copayment information.

**Table 2: Modes of Transportation and Estimated Cost Per Round Trip**

<table>
<thead>
<tr>
<th>Transportation Mode</th>
<th>Participants Reporting Use of Transportation</th>
<th>Average Estimated Round Trip Cost &lt;sup&gt;3&lt;/sup&gt; $ (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drove myself&lt;sup&gt;1&lt;/sup&gt;</td>
<td>25 (41.7)</td>
<td>11.19</td>
</tr>
<tr>
<td>Someone else drove me&lt;sup&gt;1&lt;/sup&gt;</td>
<td>23 (38.3)</td>
<td>11.19</td>
</tr>
<tr>
<td>Medical transportation&lt;sup&gt;2&lt;/sup&gt;</td>
<td>6 (10.0)</td>
<td>12.00</td>
</tr>
<tr>
<td>Taxi&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1 (1.7)</td>
<td>12.00</td>
</tr>
<tr>
<td>Bus&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3 (5.0)</td>
<td>7.66</td>
</tr>
<tr>
<td>Walked&lt;sup&gt;2&lt;/sup&gt;</td>
<td>2 (3.3)</td>
<td>0</td>
</tr>
</tbody>
</table>

<sup>1</sup>For patients reporting use of a private automobile, transportation costs were calculated as average cost of parking ($2.85 per appointment) plus the product of miles traveled (either self-reported miles or an estimate of miles based on self-reported travel time) times $0.50 per mile. The cost of using a private automobile was assumed to be the same whether driven by the patient or by someone else; therefore, cost was calculated for the 48 patients using automobile as mode of transportation.

<sup>2</sup>Patient-reported costs for each transportation mode were averaged across the count of patients using that mode.

<sup>3</sup>The overall average cost of transportation was determined by multiplying the average cost per mode of transportation by the proportion of patients traveling by that mode, then summing those values across all modes of transportation.

USD = U.S. dollars.
evidence in the literature that transportation cost adversely affects adherence to clinic visits, and our study was not designed to test this hypothesis, our study does quantify the average transportation cost for patients in our anticoagulation clinic. Additional research is necessary to examine this question, and managed care organizations should examine the effects of transportation barriers, if any, in patients requiring regular clinic attendance. Transportation costs related to face-to-face anticoagulation clinic visits may be a reason for the clinician to explore alternative anticoagulation management models, such as telephonic management, home monitoring services, self-monitoring, and online automated management, as each has demonstrated decreased rates of thromboembolism.7-9

Additionally important to managed care, our findings are potentially applicable to many nonanticoagulation-related, face-to-face medical clinic appointments across the United States for several reasons. First, we used IRS data,6 which include the national average gas price and vehicle depreciation per mile traveled, in order to calculate the cost of driving an automobile. Second, we found that a large proportion (80%) of the present study sample used automobiles for attending clinic visits. Although it is unknown if the modes of transportation used by other populations attending outpatient clinic visits follow the same pattern as those in our clinic, it may be presumed that automobile use is predominant across most patient groups in the United States. Furthermore, the per capita motor vehicle registration rate of 0.43 in the state of Michigan is the same as the national average; therefore, use of vehicles in Michigan may well represent average use across the nation.10

Third, our anticoagulation clinic is a hospital-based clinic located in a large medical center with many other medical clinics in close proximity. Thus, transportation patterns, distances traveled, and parking fees for automobiles would be similar across a variety of types of medical appointments.

We found that our clinic population does not readily utilize public transportation. Three survey participants (5.0%) reported taking the bus in order to attend their clinic visits. There were no other forms of public transportation use reported in the survey, which is representative of the lack of alternative public transit system such as a rail system. Although the Detroit metropolitan area is urbanized, our study findings may not apply to patient populations that rely on more extensive public transportation systems to attend clinic visits. Therefore, the transportation cost reported in this study may be more applicable to face-to-face clinic visits in rural or metropolitan areas where patients live within a 16-mile radius of the clinic, and public transportation is not readily accessible.

We found a very small proportion (11.7%) of survey participants who reported missed work time due to attending clinic visits. This finding is not unexpected given that a large proportion of our clinic population is of retirement age (older than 65 years). Additionally, the Detroit unemployment rate is 12.5%, which is above the national average of 9.1% as of July 2011.11 Although employment status was not assessed in the survey, it is possible that unemployed survey participants below retirement age were included. Of the 7 study participants who reported missed work time for clinic visits, an average of 1.75 hours of work was missed per appointment. While we found that a low proportion of our patients missed work time to attend appointments, this finding may be different in a population where employment rates are higher, and the average age of patients is lower. The mean amount of time lost from work (1.75 hours) is most likely similar to that of other health care visits scheduled for 20 minutes.

Limitations
First, the sample size of this study (60 patients) is relatively small, although it does represent a significant proportion of our clinic population (15%). Second, while the survey had a 100% response rate, not everyone answered all of the questions included in the survey (Table 1). Third, the surveys were self-administered, and transportation costs were estimated based on patient self-reported information. Self-administration of the survey required patients to be literate at approximately a fourth grade level. Misinterpretation of some of the questions may have been possible, particularly if the patient had a lower level of literacy. We did not evaluate study participants’ literacy but based the literacy level on our health system’s requirements for reading level appropriate to our patient population.

Fourth, we were unable to determine the degree of financial burden that patients experience due to transportation. To avoid any potential antagonism in completion of the survey, we did not ask individual income or financial information.

We did find that 20% of patients (n=9 of 44) responding to a question about insurance coverage for transportation to the clinic reported having such coverage. Billing for this benefit is handled between the transportation service provider and the patient’s insurance carrier. The costs of such services are not transparent to our clinic; therefore, we relied solely on patient self-report to calculate cost of medical transportation. Consequently, the costs of insurance-covered transportation may not be fully represented in our findings because insurance benefits vary, and our survey captured only self-reported costs.

Fifth, the survey did not collect information regarding the frequency of anticoagulation monitoring appointments. However, the average return visit rate is approximately every 2.5 weeks at the study anticoagulation clinic. Similarly, the study did not assess the frequency or reason for missed clinic appointments. Therefore, we can only speculate, based on in-clinic patient feedback, that transportation is related to missed clinic appointments. Lastly, our calculation for transportation cost is a reflection of a weighted average per frequency of use in mode of transportation. Therefore, the actual cost of transportation will vary depending upon the proportions of a
Conclusion

Patients living in the metropolitan Detroit area spent approximately $10.78 in 2010 U.S. dollars per anticoagulation clinic visit. Although study findings are based on 1 practice site, we believe our results are applicable to patient populations living in large metropolitan areas with limited use of public transportation. Costs of transportation may become financially burdensome as patients make visits at least monthly, and more frequently if anticoagulation control is unstable. In such cases, alternate practice models may be considered to optimize anticoagulation management.

DISCLOSURES

The authors report no financial or other conflicts of interest related to the subject of this article. This research was presented in part as a poster abstract at the 11th National Conference on Anticoagulant Therapy, Anticoagulation Forum, May 6, 2011, Boston, Massachusetts.

Concept and design were performed primarily by Garwood, Taylor, and Hwang. Data were collected by Hwang, Garwood, and Clemente and interpreted by Garwood, Hwang, Sharma, and Taylor. The manuscript was written primarily by Hwang and revised primarily by Garwood and Hwang.

REFERENCES


### Patient Transportation Questionnaire

Please read all questions and answer them to the best of your ability. If the question does not apply to you, you can skip the question.

1. How did you get to the Harper Anticoagulation Clinic for your appointment today?
   - Drove myself
   - Someone drove me (friend/family member)
   - Walked
   - The bus
   - A medical transportation service
   - A taxi
   
   Other, please describe:

2. If you drove to the clinic, how far was your trip (one way)? ________ miles
   - Not sure how far

3. If you are not sure how far, how long does a car ride to the clinic usually take?
   - Less than 10 min
   - Less than 20 min
   - Less than 30 min
   - Less than 40 min
   - Less than 50 min
   - Greater than 1 hour

4. If you rode in a car, did you pay for parking?
   - Yes, how much: $__________  
   - No

5. Did you take time off work to get to your appointment?
   - Yes, how much time off? ________ hours
   - No

6. If you drove with someone (family member or friend), did he/she take time off work?
   - Yes, how much time off? ________ hours
   - No

7. If you take the medical transportation service to get to your appointment, how much do you pay?
   - $5 per round trip
   - $10 per round trip
   - $20 per round trip
   - My insurance pays for my trip
   - Other, specify: $__________

8. If you took a taxi, bus, or other method of transportation, how much did you pay per trip one way? $__________

9. Does your insurance cover your ride to the clinic?
   - Yes
   - No
   - But, I have a co-pay: $__________
   - I am fully covered (I pay $0)

10. Please indicate your gender.
    - Female
    - Male

11. Please indicate your age.
    - 18-29
    - 30-39
    - 40-49
    - 50-59
    - 60-69
    - 70-79
    - 80-90
    - Greater than 90