Economic Benefit of "Modern" Nonemergency Medical Transportation That Utilizes Digital Transportation Networks

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Objectives. To determine the economic benefit of "modern" nonemergency medical transportation (NEMT) that utilizes digital transportation networks compared with traditional NEMT in the United States.

Methods. We used the National Academies' NEMT cost-effectiveness model to perform a baseline cost savings analysis for provision of NEMT for transportation-disadvantaged Medicaid beneficiaries. On the basis of a review of the literature, commercial information, and structured expert interviews, we performed a sensitivity analysis to determine the incremental economic benefit of using modern NEMT. We estimated confidence intervals (CIs) by using Monte Carlo simulation.

Results. Total annual net savings for traditional NEMT in Medicaid was approximately $4 billion. For modern NEMT, estimated savings on ride costs varied from 30% to 70%. In comparison with traditional, modern NEMT was estimated to save $268 per expected user (95% CI = $248, $288 per member per year) and $537 million annually (95% CI = $496 million, $577 million) when scaled nationally.

Conclusions. Modern NEMT has the potential to yield greater cost savings than traditional NEMT while also improving patient experience.

Public Health Implications: Barriers to NEMT are a health risk affecting high-need, economically disadvantaged patients. Economic arguments supporting modern NEMT are important given decreased support for human services spending. (*Am J Public Health.* 2019;109:472–474. doi:10.2105/AJPH.2018.304857)

Barriers to nonemergency medical transportation (NEMT) cause 3.6 million individuals to forego or delay medical care annually, resulting in 25% to 50% of missed appointments.[1,2] These patients disproportionately suffer from multiple chronic conditions and behavioral health problems.[1,3]

Traditional NEMT has a mixed track record of remedying the access problem of the transportation-disadvantaged. "Traditional" NEMT includes taxi vouchers, direct provision of transportation, and contracts with local transportation providers. A 2005 National Academies analysis estimated that NEMT is cost-saving or cost-effective for all conditions evaluated with or without adjustment for patient health status.[1] If 1% of NEMT rides led to an avoided hospitalization, the return on investment has been estimated to be 11 to 1.[4] In reality, there is scant evidence to support these findings.

"Modern" NEMT brokers contract with transportation network companies such as Uber and Lyft, but also have several other transportation modalities in their repertoire, such as vans and ambulettes, and can therefore deploy vehicles based on the needs of the patient. Early partnerships between health care and transportation network companies have produced some encouraging results; for instance, CareMore's pilot program with Lyft generated an average per-ride cost reduction of 32.4% in 2 months and $1 million in cost savings in 1 year.[5,6] Given this new approach to NEMT, we sought to estimate the marginal economic benefit of modern versus traditional NEMT.

METHODS

We used the National Academies' NEMT cost-effectiveness model[1] to estimate the baseline economic effect of traditional NEMT for the total Medicaid population of 67 683 496 individuals.[7] We modified the original model inputs with available data to reflect the Medicaid population.[8] Approximately 2.95% of this population (3 600 000 individuals) is transportation-disadvantaged.[1] We assumed that NEMT intervention uptake would be 56% based on the acceptance rate of a ridesharing service in a similar Medicaid population,[9] though this is likely conservative as it reflects ridesharing offered to all Medicaid beneficiaries rather than only the transportation-disadvantaged. In sensitivity analysis, we considered a low uptake estimate of 40% and a high estimate of 70%.

To develop estimates of the incremental economic benefit of modern NEMT, we began with a detailed review of the literature and commercial information. In addition, we conducted structured interviews with experts. Companies interviewed or researched included Circulation, SafeRide, and Roundtrip, in addition to the CareMore partnership with Lyft. A sensitivity analysis used a base case representative of the average scenario, with

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TABLE 1—Cost-Effectiveness of Traditional Nonemergency Medical Transportation (NEMT) for Medicaid Population: United States

	Estimated Value
Missed trips, no.	
Trips for chronic care	3 599 766
Trips for preventive care	1 113 876
Induced demand (8%)	377 091
Total trips, $	5 090 733
Transportation and medical costs	
Transportation costs	284 749 510
Additional medical costs	593 811 811
Total costs, $	878 561 321
Gross savings	
Savings for chronic conditions	4 792 331 000
Savings for prevention	98 651 363
Total gross savings	4 890 982 363
Total net savings	4 012 421 042
Cost–benefit ratio	6.07

Note. Adjusted to 2018 dollars with Consumer Price Index.

Source. Based on National Academies' nonemergency medical transportation cost-effectiveness model.[1]

replications using low-range and high-range assumptions. Following the method used in the National Academies' report, we applied a 31% expected increase in cost associated with lower quality-adjusted life years for patients in the chronic disease subgroups.

Monte Carlo simulation for the base case used 1000 replications with variation on costs (mean = $670 million; SD = $200 million), health status adjusted savings (mean = $4890 million; SD = $1200 million), and percentage savings per ride share (mean = 50%; SD = 20%). We conservatively used a sample size of 100 to calculate the standard error in addition to estimates that use the full 1000 replications (see Appendix, available as a supplement to the online version of this article at http://www.ajph.org).

RESULTS

For modern NEMT, reported estimated savings on ride costs varied from 30% to 70%. Base case ride cost reduction was assumed to be the average, or 50%. These values were applied to the transport and medical costs from the NEMT cost-effectiveness model outputs as base case (50%), low-range (30%), and high-range (70%) assumptions (Tables 1 and 2).

The model assumed a 56% uptake for the intervention based on an analysis by Chaiyachati et al.[9] We recognize that individuals with mental health problems may be less likely to use NEMT. To address this concern, the sensitivity analysis used a low value of 40% and a high value of 70% in addition to the base case of 56%. In comparison with the base case estimate of $268.41 for the difference between traditional and modern NEMT per member per year (PMPY), a 40% uptake rate increases PMPY cost to $374.24, and an uptake rate of 70% decreases it to $212.57.

The Monte Carlo analysis suggested that there would be a 95% chance that cost, defined as the sum of transportation and medical costs, would be between $297.3 million and $363.9 million (mean = $330.6 million; SD = $170.2 million) if scaled nationally. The simulation also suggested that there would be a 95% probability that net savings would be between $4330 million and $4811 million (mean = $4571 million; SD = $1224 million). Compared with traditional NEMT, modern NEMT was projected to save approximately $268 per expected user (95% confidence interval [CI] = $248, $288 PMPY) and $537 million annually (95% CI = $496 million, $577 million). The sensitivity analysis considered a wider range of cost savings estimates. A 30% estimated savings on ride costs yielded a projected $263 million or $132 PMPY, while a 70% savings suggested net savings would offer a difference of $614 million ($308 PMPY). In the Appendix (available as a supplement to the online version of this article at http://www.ajph.org), we offer alternative CIs that calculate standard errors of the mean by using a sample size of 1000 rather than 100. The result is narrower confidence intervals, but the conclusions are not affected.

DISCUSSION

In fiscal year 2013, Medicaid spent $2.9 billion on 103.6 million NEMT rides.[10] Our analysis suggests that, in comparison with traditional NEMT, modern NEMT saves approximately $268 PMPY. These savings will likely only be realized if the NEMT benefit is targeted to transportation-disadvantaged patients, as randomly offering ridesharing to all beneficiaries has not been shown to have an impact on rates of missed appointments.[9]

Modern NEMT offers other important advantages. In contrast to traditional NEMT, modern NEMT brokers have on-demand scheduling, an electronic record for transparent monitoring, direct routes, and greater reliability with higher customer satisfaction rates.[9,11] Outsourcing of scheduling and dispatching functions to modern NEMT brokers also eliminates the need for a health plan to devote resources to this task and allows for operational simplicity with a single transportation contract. Modern NEMT may be quickly scalable because it builds on existent software and infrastructure. Adjusting the analysis by uptake rate and percentage of potential users with a mental health problem affected the estimates but did not affect the general conclusions.

TABLE 2—Sensitivity Analysis for Modern Nonemergency Medical Transportation Cost Reduction: United States

	Base, 50% (Low Range, 30%–High Range, 70%)
Transport and medical costs, $	330 613 317 (263 568 396–614 992 925)
Net savings, $	
Total	4 571 014 623 (4 275 989 438–4 627 413 967)
PMPY	2285 (2138–2314)
ROI	13.6 (7.0–17.6)
Difference in net savings, $	
Total	536 816 077 (263 568 396–614 992 925)
PMPY	268 (132–308)

Notes. PMPY = per member per year; ROI = return on investment. For base case, values are means from Monte Carlo simulation. Adjusted to 2018 dollars with Consumer Price Index.

Despite multiple advantages, modern NEMT is not without challenges that currently impede widespread implementation. In some states, rules governing Medicaid transportation benefits prohibit integration of transportation network companies into the brokerage network. In addition, transportation network companies remain underdeveloped in rural areas and small towns.[5] There are also concerns about this population's access to smartphones. However, the majority of brokers are not operating through patient-facing apps, but rather through care coordinators who book rides on behalf of patients via call-based or electronic platforms.

An important limitation is that many of the values used in our modeling exercise are based on expert opinion. We also assume that all of the transportation-disadvantaged are in Medicaid, and there are limited data about prevalence of specific chronic conditions in this population. Furthermore, costs of transportation vary widely based on negotiated rates, and thus it is difficult to generate nationally relevant estimates. Now that improved record-keeping is possible, future investigators should gather data and perform more robust analyses of financial impact.

Modern NEMT has the potential to generate substantial cost savings compared with traditional NEMT while also improving the health care experience of vulnerable, high-need patients. AJPH

CONTRIBUTORS

D. H. Rochlin acquired data and drafted the initial article. R. M. Kaplan performed the statistical analysis. All authors made substantial contributions to conceptualization and design and were involved in critically revising for intellectual content. All authors read and approved the final article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not needed as human participants were not involved in this study.

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