Research Square

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Reducing travel and working time costs in rural primary care: Results from the observational VaO study

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Abstract

Background

Even though delegating routine tasks to non-physician healthcare professionals (HPs) is an established strategy, there is still scope for improvement regarding the organisation of home visits (HVs). The “VERSORGT am ORT” (VaO) model is an intervention that has been developed to address the challenges posed by the delivery of healthcare to mobile patients in rural areas, facing the shortage of general practitioners. The project involves the restructuring of home visits for selected mobile patients, with the objective of facilitating their care by HPs in a VaO room located within their local area. The aim of the study is to determine the extent to which the VaO concept can increase the efficiency and effectiveness of delegated HVs in (potentially) underserved rural areas in the short to medium term.

Methods

An observational study was conducted between May 2023 and May 2025 in the rural Streutal region in Bavaria, Germany. A scenario comparison was performed between the observed VaO scenario and a hypothetical HV-only scenario with the key outcomes distance travelled, non-patient-related working time, and associated travel and personnel costs. Data from 270 valid routes were analysed using paired t-tests.

Results

In comparison with the HV scenario, VaO resulted in a significantly reduced distance (12.68 vs. 13.97 km; $p < .001$) and non-patient working time (20.28 vs. 26.67 minutes; $p < .001$). This led to a 9.23% reduction in distance and a 24.00% reduction in time. Travel costs (5.07 vs. 5.59 euro) and personnel costs (9.09 vs. 11.95 euro) were also significantly lower, resulting in a total cost reduction of 19.27% (14.16 vs. 17.54 euro; $p < .001$). Effect sizes were moderate for distance and large for time and personnel costs.

Conclusions

The VaO model significantly improves the efficiency of delegated HVs in the studied region. While absolute savings are modest, the cumulative impact and scalability potential are substantial and need to be surveyed. Regulatory barriers to reimbursement and uncertainties regarding long-term economic sustainability remain key challenges. Overall, VaO represents a promising organizational innovation to strengthen rural primary care.

Trial registration

German Clinical Trials Register (DRKS00033915), Registration date 19/03/2024

Background

The delegation of routine tasks to healthcare professionals (HPs) is well known as a promising strategy to relieve physicians and expand their capacity as recently highlighted by the Bertelsmann Stiftung. Models designed to ease the workload on general practitioners (GPs) play a key role, particularly in rural areas where GP resources are scarce. In one of the models studied, HPs primarily focus on the care of geriatric patients and on laboratory and technical diagnostics. They also regularly provide wound care, basic cardiological diagnostics and home visits (HVs). For example, by outsourcing HVs, the Birkenallee Medical Centre is estimated to save 614 hours of doctors’ working time per quarter. As a training centre for physician assistants (PAs), it employs such assistants as well as other medically trained staff with further qualifications to a greater extent than conventional practices. On average, the general practices surveyed can expect a reduction in workload of 2–4% per PA or HP, whereas the Birkenallee Medical Centre sees a reduction of up to 69% (1). Building on this potential for reducing the workload, which arises from the delegation of tasks to non-medical staff, the question arises as to what further measures might help to ensure the provision of primary care in rural areas.

Delegation does not address the logistical inefficiencies associated with traditional HVs, delegated HVs are still conducted individually. As a result, they require much travel and substantial non-patient working time. Moreover, due to the rural dispersion and low patient density, HPs are prevented from efficient tour planning (2). Therefore, delegation improves workload distribution but still cannot solve the structural inefficiency of the home-visit model, especially in rural regions. This suggests that structural innovations are needed to enable more efficient, scalable forms of delegated care in rural regions. One such approach designed to address these limitations is the model “VERSORGT am ORT” (VaO, “PROVIDED on SITE”). VaO relocates some of the delegated HV services into decentralized, community-based treatment rooms (VaO rooms) situated close to patients. The patients receiving care in these rooms were selected

by their GPs. Factors such as the patients' mobility and the need for care via HVs played a role in this selection, alongside other inclusion and exclusion criteria. VaO-rooms are equipped to allow HPs to perform the same delegated tasks that are usually carried out during HVs, such as routine clinical measurements, wound care, and blood sampling. The delegation framework and GP supervision remain unchanged, as HPs continue to work under established delegation agreements. By shifting delegated services from patients' homes to nearby fixed locations, VaO seeks to reduce travel distances, to decrease non-patient working time, and to improve the efficiency of delegated care delivery in rural areas (3). The aim of the study is to determine the extent to which the VaO concept can increase the efficiency and effectiveness of delegated HVs in (potentially) underserved rural areas in the short to medium term. To this end, we designed an observational study for which data was collected between May 2023 and May 2025. The trial was registered at the German Clinical Trials Register (DRKS00033915) on 19 March 2024 (3).

Methods

Facing workforce shortages and demographic pressure on healthcare systems, innovative organizational models are needed to strengthen rural primary care. The VaO model integrates existing delegation approaches and changes the service provision to the VaO-rooms with the aim of reducing capacity bottlenecks in GP-led care through improved task distribution and spatial reorganisation. This observational study evaluates whether the partial relocation of delegated services from traditional HVs to VaO rooms improves efficiency in rural primary care, particularly by reducing travel distances and non-patient working time for HPs. To complement the economic evaluation, service providers' perspectives were explored through focus group interviews, and patients reported on their satisfaction with care and health-related quality of life (3).

Patients were treated by five HPs across a total of eight VaO-rooms in the Bavarian region Streutal. As shown in Fig. 1, these are spread across smaller towns in the Streutal valley where the participating GPs do not have own practices. The practices of the three participating GPs are located in Mellrichstadt, Oberelsbach, Fladungen and Ostheim, whilst the VaO rooms are in Stockheim, Hendungen, Oberstreu, Unsleben, Bastheim, Urspringen, Hausen and Oberwaldbehrungen. Both is shown in Fig. 1.

Source: Google Maps, own representation, access 15.04.2026.

The observational study comprised various components. First, health related quality of life (HRQoL) and satisfaction of patients were captured with a repeated measurement method at three different points in time (t0, t1, t2) with the SF-12 for the HRQoL, a validated 12-item questionnaire which covers physical as well as mental health, and the ZUF-8 for patient satisfaction, a short, validated measure of patient satisfaction with treatment and care. This quantitative approach was supplemented by a qualitative second part of the study consisting of focus group interviews with the treating HPs. Those results are to be reported elsewhere, further details can be found in the study protocol (4, 3).

In order to quantify the reduction in workload resulting from the routes saved, the following metrics were defined for the study: kilometres travelled and the total working time spent away from patients (travel, commute and set-up time) as no changes were made to the service provision itself. In combination with the setup times collected in a workshop, the total time needed was calculated. To enable an economic analysis, these two parameters were assigned monetary values. For travel costs, the travel expense reimbursement rates set out in the Bavarian Travel Expenses Act were used as a valid basis (5). As the time component relates exclusively to the HPs' working hours, their staff costs were converted into a monetary value. For this purpose the collective wage agreement for medical assistants was used (4). Job category 4 was selected as the basis for the specialisation and job characteristics of the HPs. At the time of the evaluation, the participating VERAHs were classified in grades 4, 6, 7 and 8 of the collective agreement based on length of professional experience. To investigate the differences resulting from the use of VaO compared with conventional care provided through HVs, we carried out a scenario comparison (VaO scenario vs HV scenario). The VaO scenario is indicative of the reality of the service provision, insofar as it reflects the fact that some individuals receive care in VaO rooms, while others receive care in their own homes – depending on the classification by their GPs. The calculated HV scenario is predicated on the assumption that all patients receive care in their own homes and thus constitutes a hypothetical scenario.

To this end, this publication focuses on comparing scenarios and evaluating the economic aspects of the VaO concept, for which further information can be found in the study protocol (3). This is concretely expressed in the research question: Does the implementation of the VaO model lead to significant changes in the time- and distance-related effort and associated costs for non-patient-related activities?

Sampling and data collection

We collected data for the scenario comparison continuously from May 2023 to May 2025. Therefore, the HPs used a standardised form to document on the services provided and the addresses they drove to as part of their HV routes. Then the latter were entered into the online route planner MapQuest by a person who was not involved in the data evaluation. This was done for each tour on which a VaO room was visited. The two scenarios VaO and HV were planned for each of these tours using the route planner MapQuest with starting point and destination being the doctor's office in every case. In addition to this, it was stipulated that routes should be planned optimally to ensure that the shortest distances were invariably selected. Furthermore, the HPs created lists of the services provided.

Type of statistical analysis used

Initially, a data cleansing procedure was conducted, during which incomplete datasets were eliminated. In the initial phase of the study, a descriptive evaluation of all the variables employed was conducted using IBM Corp. Released 2023. IBM SPSS Statistics for Windows, Version 29.0.2.0 Armonk, NY: IBM Corp. To examine differences between the VaO and HV scenario, a paired samples t-test was employed. Test assumptions were verified prior to analysis. Normality was assessed using the Shapiro–Wilk test, which indicated a deviation from normal distribution ($p < .05$); this was confirmed through visual inspection of histograms. Given this, the Wilcoxon test was additionally applied as a non-parametric alternative, although the t-test is considered robust to moderate violations of normality for sample sizes larger than $n > 30$. Both the parametric and non-parametric analyses were conducted to ensure robustness of results. A significance level of alpha = 0.01 was set. This was determined on the basis of the various paired t-tests carried out, using the rather conservative Bonferroni correction. For the tests carried out, a power calculation was performed in advance using G*Power. Assuming a medium effect size (f = 0.5), an alpha level of 0.01, and a desired statistical power of 0.95, a minimum total sample size of n = 75 was determined to be necessary for the two tails matched pairs t-test.

Results

The following Table 1 shows the frequencies of room visits by practice by village. Both remain anonymous as agreed. Not all practices were able to offer visits to all areas. Consequently, visits may not be recorded in certain locations. This may result in the table displaying no visits in some instances. Moreover, the process of cleansing the data has resulted in the eradication of 98 incomplete records, which lead to a reduction of datasets from n = 368 to n = 270. This deletion has reduced the figures shown in the following overview table and, in some cases, results in no entry, even though care was provided in the rooms.

Table 1
Frequencies of VaO room visits by practice

GP 1	**Town 1**	**Town 2**	**Town 3**	**Town 4**	**Town 5**	**Town 6**	**Town 7**	**Town 8**	**∑**
	20	**0**	**0**	**12**	**0**	**20**	**0**	**0**	**52**
GP 2	0	0	0	0	18	3	0	0	21
GP 3	0	13	55	39	0	73	17	0	197
∑	20	13	55	51	18	96	17	0	270

Source: Own representation.

The descriptive analysis of the dataset (n = 270) revealed an average of 20.28 hours for working time away from patients in the VaO scenario. The mean number of kilometres driven was 12.68. The calculated HV scenario was characterised by an average duration of 26.6 minutes of non-patient-related working time, alongside an average distance travelled of 13.97 kilometres. In addition, the standard deviations and standard errors were determined, as shown in Table 2.

Table 2
Descriptive statistic of distance per route, working time away from patient, travel and personnel costs

n = 270	VaO			HV		
variable	**mean**	**SD**	**SE**	**mean**	**SD**	**SE**
distance (km)	12.68	6.74	.41	13.97	7.34	.45
travel cost (€)	5.07	2.69	.16	5.59	2.94	.18
time (min)	20.28	8.89	.54	26.67	9.47	.58
personnel cost (€)	9.09	4.02	.24	11.95	4.28	.26
total cost (€)	**14.16**	**6.33**	**.39**	**17.54**	**6.59**	**.40**

Source: Own representation.

A paired t-test was performed to statistically verify the differences in mean values, comparing the two scenarios with each other. The t-tests revealed that both distance in kilometers (12.68 vs. 13.97; t = -11.29; df = 269; p < .001) and time in minutes (20.28 vs. 26.67; t = -21.66; df = 269; p < .001) were lower in the VaO-scenario. Results demonstrated a large effect on reducing time (d = -1.32) and medium effect on distance (d = − .69). The analyses revealed consistently lower costs for VaO across all categories. Travel costs in euro were significantly lower in VaO than in HV (mean difference = − 0.52, t = − 11.29, df = 269, p < .001). Similarly, personnel costs were significantly reduced (mean difference = − 2.86, t = − 21.65, df = 269, p < .001). There was a medium effect on travel cost (d = − .69) and a large effect on personnel costs (d = -1.31). As a result, total costs were also significantly lower in VaO compared to standard HVs with a mean difference of − 3.38 euro (t = − 21.27, df = 269, p < .001). Overall, these findings indicate a robust and statistically significant reduction in costs associated with the VaO model.

Figure 2 shows the key metrics for the evaluated scenarios. Compared to HV, the VaO scenario results in reductions of 9.23% in distance, 24.00% in time and 19,27% in total costs (of which 84.62% in personnel costs, 15.38% in travel costs). Across all evaluated dimensions, VaO is significantly associated with lower resource use.

Source: Own representation.

Discussion

This study aimed to examine the practical cost and time saving potential associated with the VaO model from the perspective of medical practices. Therefore, a scenario comparison was conducted, in which the innovative VaO approach was contrasted with a calculated HV scenario, employing a paired t-test. Based on our findings, several conclusions can be drawn.

First, our findings show that the implementation of VaO is associated with a consistent reduction in costs compared to standard HV, particularly with regard to travel, personnel, and overall expenditures. These results suggest that VaO may offer an economically advantageous alternative for primary care practices, especially in rural settings where resource constraints and efficiency are of increasing importance. Despite the relatively modest absolute savings achieved through VaO, the proportion of VaO room including routes (encompassing incomplete datasets) compared to the totality of all HV routes from practice 3 is 55.33%. This practice was selected for illustration because it was the only one whose service delivery was not temporarily and severely restricted by staff shortages, and whose staff were able to visit the premises regularly. The high proportion highlights the potential inherent in this care model if being well-established. As displayed in the interim evaluation, the VaO care model has been shown to deliver significant savings in terms of time (21%) and travel (8%). These benefits have actually increased further with regard to the final evaluation (6). This potential for savings could be further increased by broadening the eligibility criteria for patients or expanding the range of services offered in the VaO rooms. For example, the Bertelsmann Foundation study identified additional tasks that could be delegated – and potentially be carried out in VaO rooms. In addition to services that already can be delegated and invoiced according to the provisions of the Uniform Assessment Standard (EBM), a few more services are likely to be provided there for which a means of billing would be necessary. At the Birkenallee Medical Centre, for example, tasks such as infusion therapy, preventive health check-ups and Disease Management Program heart failure monitoring are also carried out by HPs (1). Expanding the range of services offered in VaO-rooms could significantly increase the potential savings described above, as confirmed by the study by Hildebrandt et al.

Second, the extension of delegation faces the obstacle of the legally defined locations where medical services are provided, either by the doctor in person or by delegation. The locations specified in Annex 8 of the Federal Framework Agreement for Doctors (patients' homes, care homes or other residential care facilities) exclude VaO rooms, meaning that services provided there cannot currently be billed under standard care regulations in the German health care sector (7)(8). As the EBM defines the reimbursable outpatient medical services and their billing conditions in the German statutory health insurance system, a corresponding billing code would be necessary to enable reimbursement of delegated services provided in VaO rooms (9). Consequently, it is imperative to further promote the delegation of medical services with a view to reducing the workload and to make this process more flexible, so that the untapped potential of HPs can be utilised more effectively when considered in conjunction with the novel care model that was evaluated in this study, it may facilitate the optimised utilisation and distribution of limited resources in rural regions.

Third, it is important to note that the calculations presented above focus on personnel and travel costs. Costs related to rent and furnishing of the VaO rooms were excluded in order to reflect the running costs incurred by the participating practices accurately. From this analytical perspective, the rooms are categorized as externally provided resources, as they were contributed by local authorities and thus did not constitute direct expenditures for the practices themselves. We did not include such costs to avoid the risk of introducing a systematic bias by attributing expenses that were not borne by the practices. Furthermore, this approach is consistent with the specific organisational context of VaO, in which the three participating practices share some of the specially selected rooms. Future research could adopt alternative analytical perspectives, for instance by incorporating infrastructure-related costs, in order to provide a more comprehensive assessment of total resource use and overall costs.

The results presented here are based on data collected in the Streutal region of Bavaria and thus derive from a sample of three participating practices. Given the very strong regional focus, regional effects may come into play and potentially influence the results. Nevertheless, given the VaO principle's low-threshold requirements, it can be applied to other regions as well. The concept is currently also being trialled in a practice in the Aub region of Lower Franconia. A further distortion could arise from the planning tool's use of optimal route planning, which might result in an overly conservative estimate of the savings. The outcome of the VaO study provides important insights into the potential benefits of this care model, while highlighting key economic uncertainties as well. By that, it is not possible to determine the number of patients required for the operation of such a facility to become financially viable. The available data do not allow for a precise estimation of cost coverage or break-even points, which limits conclusions regarding long-term sustainability.

Furthermore, the findings suggest that the organisational effort associated with operating the VaO rooms may be disproportionately high when only a single patient is treated per route. This imbalance between resource input and patient volume gives rise to concerns regarding efficiency, particularly in low-utilisation scenarios. Consequently, the model may require a minimum level of demand or patient throughput to ensure that the benefits outweigh the administrative and logistical burden.

VaO, primarily intended to mitigate the ever-widening gaps in healthcare provision in rural areas, complements existing research in German-speaking countries on the benefits of delegating tasks. Thus, the finding by Dini et al. that 70% of the respondents in their study cited the potential time savings from delegating HV tasks as the main added value can be supplemented by VaO. The findings of the same study suggest that delegation plays a key role, particularly in rural areas. Indeed, more delegation took place in rural areas than in urban ones (10).

The study also has methodological limitations. For instance, 98 datasets had to be excluded during the data cleaning process because they were either incomplete or could not be analysed. Despite extensive training being provided to the HPs, the standardised questionnaires were completed incorrectly or incompletely, which resulted in the exclusion of the datasets. This deficit may be attributable to the fact that HPs were assigned these tasks in addition to their standard workload. A potential solution to this deficit in subsequent research endeavours might involve the utilisation of study nurses. Furthermore, for each patient receiving care within their own home, a duration of one minute is assumed for the journey from the parked car to the house and back. It is important to note that these times have not been measured and therefore represent a conservatively assumed value based on estimates provided by the participating HPs.

Conclusions

In conclusion, the VaO model demonstrates considerable potential to improve the efficiency of delegated care delivery in rural primary care settings. The relocation of services from individual HVs to VaO rooms has been demonstrated to engender significant reductions in travel distance, non-patient working time, and associated costs. The findings of this study indicate that VaO represents a potentially

effective organisational innovation with the potential to alleviate capacity constraints in delegated primary care, particularly in underserved rural regions facing workforce shortages.

Facing few limitations concerning the economic sustainability of the model, the research has demonstrated that delegated service provision is effective within the VaO setting, and that significant cost savings can be achieved. It is therefore recommended that future research efforts concentrate on conducting comprehensive economic evaluations, encompassing infrastructure and overhead expenses, in addition to conducting analyses of utilisation patterns and scalability. It is imperative that such investigations are conducted to ascertain the conditions under which the VaO model can be integrated into routine care in a sustainable manner and effectively contribute to the strengthening of primary care provision in rural areas.

Abbreviations

EBM
German Uniform Assessment Standard
GP
general practitioner
HP
healthcare professional
HrQoL
Health related quality of life
HV
home visit
VaO
VERSORGT am ORT (PROVIDED on SITE)

Declarations

Ethics approval and consent to participate

The study received approval from the ethics committee of the University of Bayreuth in May 2023 (application number 23-014, reference number O 1305/1 – GB). In accordance with the ethics committee of the University of Bayreuth, we follow the Guidelines for Safeguarding Good Research Practice of the German Research Foundation. In line with their recommendations, informed consent was obtained from all the participants.

Consent for publication

Not applicable.

Availability of data and materials

The calculation data that support the findings of this study are available from the corresponding author, but restrictions apply to the availability of the primary data, which were used under license for the current study, and are not publicly available.

Competing interests

The authors declare no competing interests.

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Authors' contributions

The study was designed by RH, RL and JB. JB coordinates the participating parties. JB drafted the manuscript. RH, ME and RL edited the manuscript. JB led and ME supervised the calculations. All authors approved the final version of the manuscript.

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Figures



Figure 1

Map of the Streutal valley showing GP practices and VaO-rooms

Source: Google Maps, own representation, access 15.04.2026.

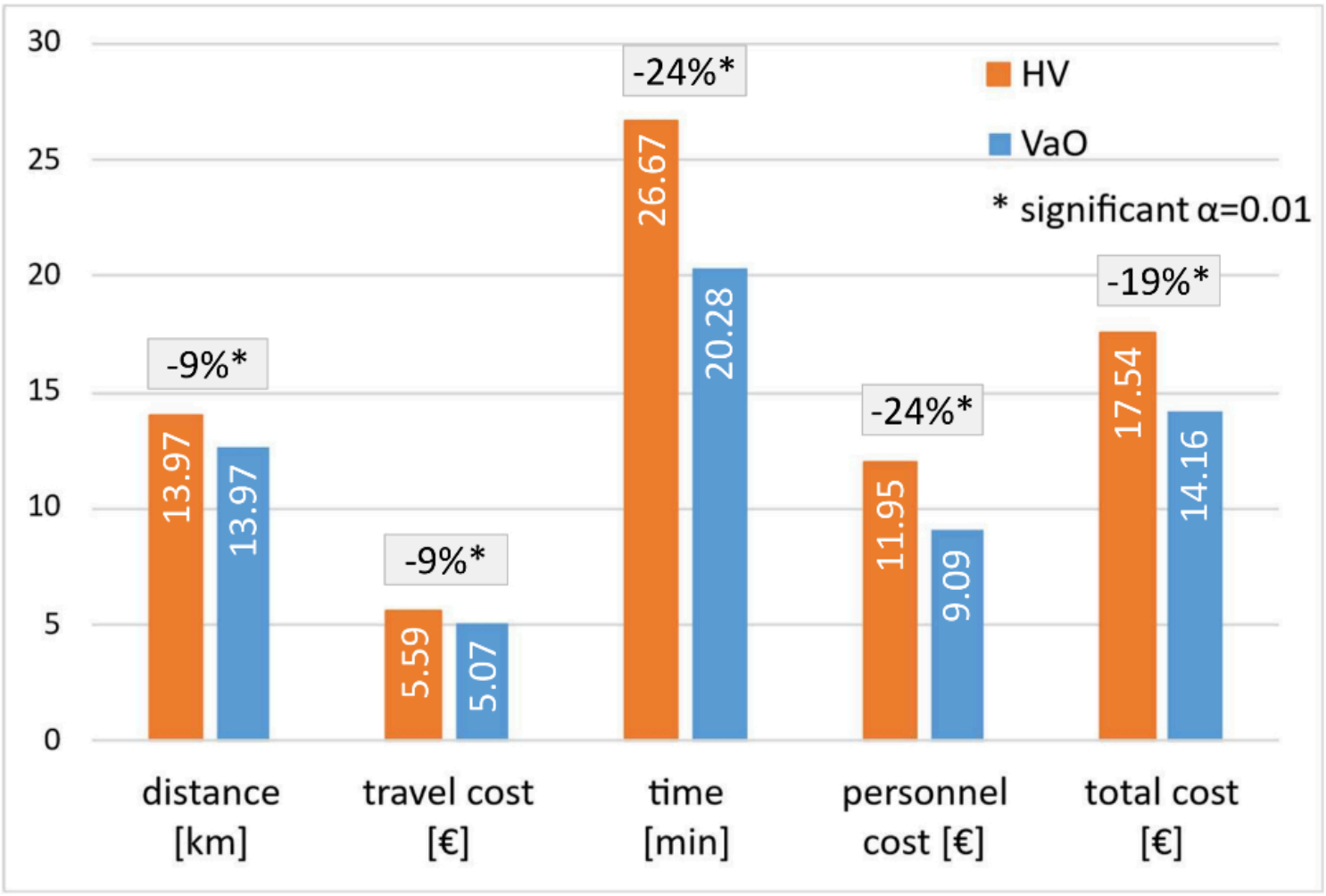


Figure 2

Comparison of resource use and costs between the HV and the VaO model

Source: Own representation.