Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Contribution margins of nursing-home supply in a German community pharmacy: a single-provider costing analysis of medication logistics, multidose blistering and medication review, benchmarked against walk-in dispensing

Rouven Fabian Riegel

Rouven.Riegel@ruhr-uni-bochum.de

BG University Hospital Bergmannsheil Bochum

Fehske Christian

Rathaus-Apotheke, Internationale Apotheke Dr. Fehske e.K

Kaltenborn Alexander

German Armed Forces Hospital of Westerstede

Sonja Schmidt

BG University Hospital Bergmannsheil Bochum

Marius Drysch

BG University Hospital Bergmannsheil Bochum

Yonca Steubing

BG University Hospital Bergmannsheil Bochum

Oliver Schöffski

Friedrich-Alexander-Universität Erlangen-Nürnberg

Falk von Lübken

German Armed Forces Hospital of Westerstede

Marcus Lehnhardt

BG University Hospital Bergmannsheil Bochum

Maria Füth

BG University Hospital Bergmannsheil Bochum

Research Article

Keywords: community pharmacy, nursing homes, medication review, pharmacoeconomics, medication supply, pharmaceutical services

Posted Date: November 16th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11543327/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: Competing interest reported. CF owns and manages the community pharmacy whose operating data were analysed and supplied those data. The other authors have no relevant financial or non-financial interests to disclose.

Contribution margins of nursing-home supply in a German community pharmacy: a single-provider costing analysis of medication logistics, multidose blistering and medication review, benchmarked against walk-in dispensing

Authors: Riegel RF[1] [ORCID 0009-0007-6903-5278], Fehske C[2], Fiedler A[1] [ORCID 0009-0003-1356-6433], Kaltenborn A[3] [ORCID 0009-0009-8518-1560], Schmidt S[1] [ORCID 0009-0000-3841-9067], Drysch M[1] [ORCID 0000-0001-8447-2694], Steubing Y[1] [ORCID 0009-0003-4299-3995], Schöffski O[4] [ORCID 0000-0002-0048-0302], von Lübken F[3] [ORCID 0000-0001-7723-9261], Lehnhardt M[1] [ORCID 0009-0003-2367-2715], Füth M[1] [ORCID 0009-0009-4977-2398]

[1] Department of Plastic Surgery, BG University Hospital Bergmannsheil, Ruhr University Bochum, Bochum, Germany

[2] Rathaus-Apotheke, Internationale Apotheke Dr. Fehske e.K., Hagen, Germany

[3] Department of Orthopedic and Trauma Surgery, Plastic, Reconstructive and Hand Surgery, German Armed Forces Hospital of Westerstede, Westerstede

[4] Chair of Health Management, Friedrich-Alexander-Universität Erlangen-Nürnberg, Nürnberg, Germany

Corresponding author: Riegel RF, Department of Plastic Surgery, BG University Hospital Bergmannsheil, Bochum, Germany. E-mail: Rouven.Riegel@ruhr-uni-bochum.de

Acknowledgements: the authors thank Wohlbehagen GmbH & Co. KG (J. Scheibe).

Use of generative artificial intelligence: The authors used generative artificial intelligence tools solely for language editing and improvement of readability during manuscript preparation. All content was reviewed and edited by the authors, who take full responsibility for the accuracy, integrity, and originality of the work.

Abstract

Introduction Pharmacy-service costing studies measure what services cost to deliver, and economic evaluations weigh their value to the payer, but to our knowledge none sets the revenue a pharmacy earns from a nursing home against its own costs.

Aim To measure, from the community pharmacy's own perspective, the contribution margins of nursing-home supply and of its separable parts (the logistics layer of package handling and blistering, and medication review), and the effect of billing every medication review.

Method Retrospective contribution-margin analysis of the largest client of one community pharmacy, a four-home group (373 beds) among the eight facilities it supplies, using 2024 operating data at 2025 prices and reported to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022. Staff cost was set per productive hour from the collective wage for experienced staff (€51.46/h pharmacist, €34.16/h technician). Outcomes were the contribution margin and the staff-cost ratio (SCR, staff cost as a share of gross margin, lower is better) against walk-in dispensing, with a billing-rate scenario (0–100%) and one-way sensitivity analyses.

Results A home package took 3.25 times as much staff time as a walk-in package (0.166 vs 0.051 h). The SCR was 25.4% for walk-in dispensing and 77.4% for package handling, an upper bound because its hours include blistering. Medication review reached SCR 28.6%, close to walk-in dispensing, but none was billed in 2024. Packages and blistering gave a modelled annual contribution of €79,425. Billing every eligible review would add up to €30,893, reaching €110,317 (SCR 57.1%). The margin stayed positive across all one-way sensitivity analyses, from €69,846 to €89,003 at current practice. Without cost-centre accounting, shared overheads could not be assigned, so net profitability is uncertain.

Conclusion At the contribution level, nursing-home supply with in-pharmacy multidose blistering is not inherently loss-making. Its weak point is the logistics layer (package handling and blistering), which the measured hours could not separate. Medication review is close to the walk-in benchmark but went unbilled. According to the pharmacy, the barrier is administrative. Whether home supply remains profitable after overheads could not be determined.

Keywords: community pharmacy; nursing homes; medication review; pharmacoeconomics; medication supply; pharmaceutical services

Impact of findings on practice

- Pharmacies should bill every eligible medication review. It is close to the walk-in benchmark in margin efficiency and is the main lever pharmacies control in otherwise low-margin home supply.
- The weak point of home supply is its logistics layer (package handling and blister preparation), which needs about three times the walk-in staff time per package. Pharmacies may streamline the logistics and maintain the service.
- Cost-centre accounting lets pharmacies judge whether a home contract pays.

Introduction

Populations are ageing. About 4.6 million people covered by statutory health insurance were classed as in need of care at the end of 2021, and in 2020 roughly one in five of them lived in a nursing home [1]. Polypharmacy affects about 42% of people over 65 in Germany [2]. Among nursing-home residents, 69% take five or more prescription-only medications at once [3], and 25.5% receive at least one potentially inappropriate medication (PIM) according to the PRISCUS criteria [4]. A large, partly preventable share of hospital admissions and readmissions in older adults is drug-related [5, 6].

Falls are a common reason for hospital admission among this population. Of patients aged 65 or older who underwent surgery for a distal radius fracture, 42% were taking PIM according to alternative criteria [7]. In addition, most older adults with an upper-limb fragility fracture were receiving fall-risk-increasing medication [8].

Pharmacists can reduce this harm through medication review and multidose blistering. Under the Act to Strengthen Local Pharmacies the German statutory system pays about €90 for an extended review for polypharmacy, billable since the 2022 arbitration award [9-11]. The review has been costed for walk-in practice [12], but not for nursing-home residents under German remuneration. A nursing-home supply contract under § 12a of the German Pharmacy Act lets a pharmacy take over parts of the medication process [13]. However, uptake of the billable services has stayed low, and weekly blistering has no uniform statutory remuneration but is paid under individual contracts. This analysis focuses on in-pharmacy blistering. Review improves prescribing [14] and identifies drug-related problems [15]. Blistering is associated with higher self-reported adherence [16]. Dispensing by the pharmacy has been associated with fewer dispensing errors than dispensing by ward staff [17]. Nevertheless, many patients on multidose dispensing still carry inappropriate prescriptions [18]. Effects also differ by endpoint. In hospital populations, pooled analyses find a small reduction in readmissions but no significant effect on mortality, on moderate- and low-certainty evidence respectively [19, 20], while a German nursing-home trial found no significant difference in hospitalisations and did not assess mortality [21].

Pharmacy numbers fell about 3% in one year, down to 17,041 by the end of 2024 [22]. Costing studies measure what a service costs to deliver [23-26], and economic evaluations measure its value to the payer [27-30], but the pharmacy's own balance sheet is missing. To our knowledge, no study sets the revenue from nursing-home supply against the pharmacy's own costs. Provider-side analyses exist for walk-in practice, where eleven service lines have been set against their revenue [31] and a systematic review counts twenty-one such assessments [32]. For nursing homes, a systematic review reports that the financial consequences of pharmacist services have not been formally evaluated [33].

Aim

To measure, from the community pharmacy's own perspective, the contribution margins of nursing-home supply and of its separable parts, the logistics layer (package handling and blistering) and medication review, each benchmarked against walk-in dispensing, and the effect of billing every eligible review.

Method

Design and perspective. We ran a retrospective contribution-margin analysis of nursing-home supply from one community pharmacy's perspective, reported to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022 [34]. The provider perspective was chosen because the pharmacy alone carries the cost of home supply while the benefit accrues elsewhere. It is a cost-revenue analysis, not a cost-effectiveness analysis, and no health outcomes were valued. No health economic analysis plan was registered. The analysis was specified after the 2024 data were assembled, with outcomes and sensitivity ranges fixed before computation. The time horizon is one year, because contract, fee schedule and staffing are set annually. Volumes are from the 2024 business year and were valued at the tariff, fee and rebate levels in force in 2025, the year of analysis. A single price base therefore applies throughout, without discounting.

Setting and case selection. We screened regional pharmacies and homes for the services already in place and chose an owner-managed pharmacy supplying eight facilities. We analysed its largest client, a four-home group (373 beds, 98.5% mean occupancy), where prescription management, review and weekly blistering were routine. For one home an anonymised resident profile was available (n = 110, mean age 83.6 years, 66% female).

Data sources. The pharmacy gave anonymised operating and financial data for 2024: package volumes by channel, staff hours per channel from the 2024 duty rosters under time recording, compiled by the owner (co-author CF), collective-agreement wages, and service parameters: blister price, review fee and review time. A semi-structured interview with the owner and the home manager, conducted in 2025 for the first author's master's thesis, gave process detail. It preceded the costing and shaped which activities were separated, but no interview datum entered the cost model. Residents and relatives were not involved. Staff costs were re-derived on a productive-hour basis.

Cost and revenue model. Staff cost was set per productive hour, since measured hours are assigned to tasks. Table 1 and its footnote give the build-up from the national collective wage agreement for experienced staff, valid from 1 July 2024 [35], to €51.46/h for pharmacists and €34.16/h for technicians. Home and walk-in work were split 25% pharmacist to 75% technician, blended €38.48/h, and medication review was costed at the pharmacist rate alone. Revenue was the margin the pharmacy keeps: €7.76 per package (Table 1), €90 per extended review [9, 11] and €3.50 per weekly blister less €1.00 of material. Revenues are net of VAT, so the statutory rebate of €1.77 including VAT [36] enters at €1.77/1.19 = €1.49. The home hours cover the whole process (prescription management, medication plans, medication review, blistering and blister control) and were recorded per channel. Package handling and blister preparation therefore could not be separated and are reported as one logistics layer.

Table 1 Model inputs and unit costs.

Parameter	Base value	Range tested	Source
Staff cost (per productive hour)			
Monthly gross wage, pharmacist (national tariff, from 11th professional year)	€4,779	fixed	[35]
Monthly gross wage, pharmacy technician (from 15th professional year)	€3,172	fixed	[35]
Supra-tariff supplement	+10%	+5 to 15%	Study pharmacy
13th monthly salary	included	fixed	[37]
Employer social contributions	+21%	fixed	Statutory [38]
Productive hours per month	133.9	fixed	Calculated; [39] supplies only the mean sick-days input of 14.8 days in 2024
Pharmacist cost per productive hour	€51.46	fixed	Calculated
Technician cost per productive hour	€34.16	fixed	Calculated
Staff mix, home and walk-in (pharmacist / technician)	25% / 75% (blended €38.48)	€36.74–€40.23 (blended rate at 5–15% supra-tariff)	Study pharmacy
Staff mix, medication review	100% pharmacist	fixed	Study pharmacy
Revenue retained per prescription package			
Fixed dispensing fee	€8.35	fixed	[36]
Statutory rebate (2025)	−€1.49 (€1.77 incl. VAT)	fixed	[36]
3% surcharge	+€0.90	€0.60–€0.90	Study pharmacy
Retained margin per package	€7.76	€7.46–€7.76	Calculated
Service parameters and volumes			
Extended medication review fee	€90 per case	fixed	[9, 11]
Review time per case	0.5 h	20–45 min	Study pharmacy
Weekly blister charge	€3.50 per resident-week	€3.15–€3.85	Study pharmacy
Blister material cost	€1.00 per blister	€0.50–€1.50	Study pharmacy
Weekly blisters per resident-year	52.14	fixed	Study pharmacy

Resident turnover (deceased within 365 days of admission)	35.4%	35.1–35.7%	[40]
Polypharmacy share (≥5 drugs)	69%	69–95%	[3], upper bound from study pharmacy
Review billing rate (current practice)	0%	0–100%	Study pharmacy
Blister coverage	100% of residents	fixed	Supply contract

Productive hours: 2,028 contractual hours a year (39-hour week [37]) less 29.17 days of annual leave, ten public holidays and 14.8 sick days [39], each at 7.8 h, giving 1,607.1 h a year or 133.9 h a month. Hourly rate: monthly tariff wage plus 10% supra-tariff supplement, times 13/12 for the 13th salary and 1.21 for employer contributions, divided by 133.9 h. The upper bound of the polypharmacy range is taken from study pharmacy records. Study pharmacy, anonymised operating data of the analysed pharmacy.

Outcomes. For each activity and channel we computed the contribution margin (gross margin minus attributable staff and material cost) and the staff-cost ratio (SCR; staff cost as a share of gross margin, lower being better). Both were benchmarked against walk-in dispensing, defined as every package handed to a patient over the counter. Because pharmacy, staff and retained margin per package are the same in both channels, any difference reflects the home process itself.

Population eligible for review and blister volume. Occupied beds plus admissions gave the annual population, with turnover set at 35.4% (95% CI 35.1–35.7%), the share deceased within 365 days of admission in German claims data on 113,829 residents [40]. Of these, 69% were assumed to meet polypharmacy criteria [3], giving 343.3 analysable patients, a modelled expected value. Blister volume was 52.14 blisters per resident per year. Variation between the four homes could not be estimated, because hours were recorded per channel across all eight facilities supplied.

Scenarios and sensitivity analysis. The base case is current practice in 2024, with every eligible review performed but none billed (€79,425). The main scenario varies the billing rate from 0% to 100%, its upper end the fully billed service (€110,317). One-way analyses varied the supra-tariff share (5–15%), blister price (±10%), blister material (±50%), the polypharmacy share (69–95%), review time (20–45 min), turnover (35.1–35.7%) and the 3% package surcharge (€0.60–€0.90, a mean package value of €20 to €30, the €0.90 being the pharmacy's own current figure).

Ethics approval

The study was conducted in line with the principles of the Declaration of Helsinki. It used only anonymised, aggregated operating and financial data, and no patients or residents took part. The Ethics Committee of the Medical Association of Westphalia-Lippe, Münster, Germany, confirmed exemption from formal review (reference 2026-610-f-N).

Results

Home versus walk-in dispensing. In 2024 the pharmacy dispensed 430,000 packages to walk-in patients and 59,000 to the homes it supplies, 23,000 to the analysed group. Walk-in dispensing returned €2,491,360 at an SCR of 25.4%, while home packages returned a positive but much smaller €31,533 at 82.3% (€80,890 at the same SCR across all eight facilities supplied). The difference reflects staff time: a home package required 0.166 productive staff hours compared with 0.051 at the counter (3.25-fold), at an identical retained margin of €7.76 per package.

Component decomposition (Table 2, Fig. 1a). The component analysis attributed the low margin to the logistics layer. Billed in full, the review would earn €30,893 against €8,832 of pharmacist time, an SCR of

28.6% against the walk-in benchmark of 25.4%. Those hours sit inside the recorded home pool, so the €8,832 is an imputed share of it and the logistics row carries the remaining €138,175. Package handling and blister preparation could not be separated within that row, so its 77.4% SCR is an upper bound for package handling.

Table 2 Contribution margin and staff-cost ratio by activity component.

Component	Gross margin (€/yr)	Staff cost (€/yr)	Contribution margin (€/yr)	SCR (%)
Medication review (343.3 patients)	30,893	8,832	22,061	**28.6**
Walk-in dispensing (benchmark)	3,337,920	846,560	2,491,360	25.4
Home package logistics	178,540	138,175	40,365	77.4

SCR, staff-cost ratio. Review revenue is modelled as fully billed; no reviews were billed in 2024. The review staff cost (€8,832) is an imputed share of the recorded home staff pool and is deducted from the logistics row. Recorded hours were 9,800 for all eight facilities and 22,000 at the counter; the analysed group carries the resulting rate per package for its 23,000 packages.

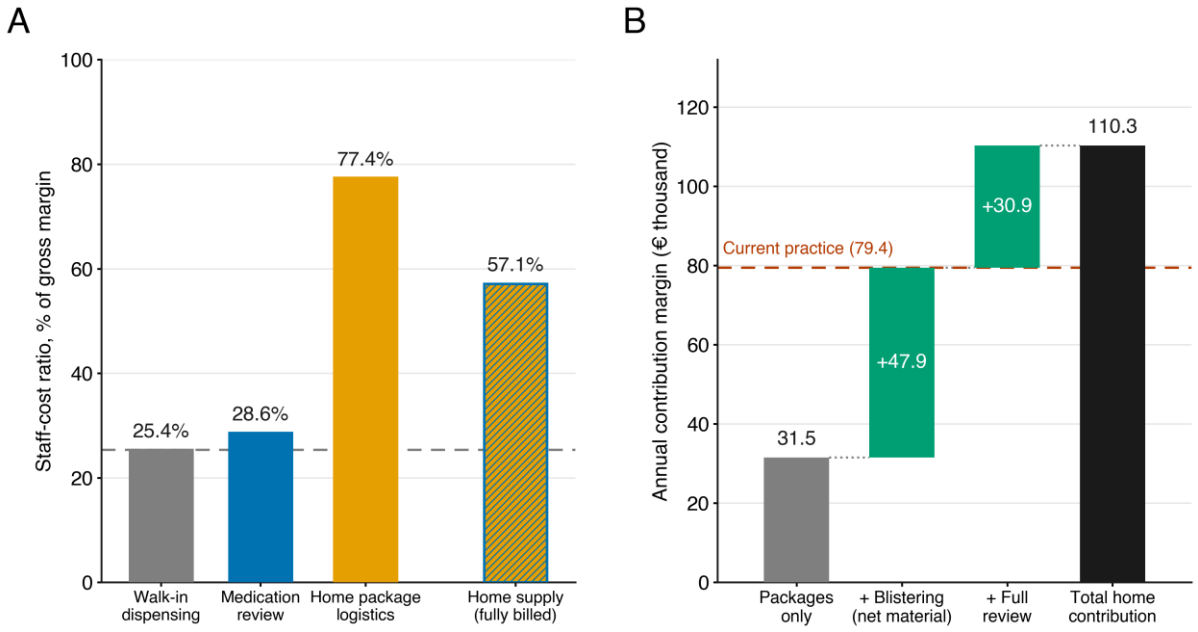


Fig. 1 Staff-cost ratio by activity and build-up of the home contribution margin. (a) Staff-cost ratio (SCR, staff cost as a share of gross margin) for medication review, walk-in dispensing (benchmark, dashed line), home package logistics and the whole home business with fully billed review. Blistering hours could not be separated from package handling. (b) Annual home contribution margin (€ thousand): packages alone, plus blistering net of material (current practice, dashed line), plus every eligible review billed

Combined result and billing-rate scenario (Table 3, Fig. 1b). Adding weekly blistering (19,156 blisters, €47,891 net of material) raised the combined contribution to €79,425 at an SCR of 64.9%, the pharmacy's modelled 2024 position. Billing every eligible review would raise it to €110,317 and 57.1%, a €30,893 gain before any extra billing time; the €90 fee would cover up to 1.75 pharmacist hours per case. Billing is the largest lever the pharmacy controls, though it depends on each resident's consent.

Table 3 Build-up of the home-supply contribution margin and the effect of billing medication reviews.

Home-supply state	Gross margin (€/yr)	Staff cost (€/yr)	Contribution margin (€/yr)	SCR (%)
Packages only	178,540	147,007	31,533	82.3
+ blistering (net of material)	226,431	147,007	**79,425**	**64.9**
+ fully billed medication review	257,324	147,007	110,317	57.1

SCR, staff-cost ratio. Blister revenue is net of material cost (€1.00 per blister, €19,156/yr). Blistering and review add no staff cost, because both sit within the recorded home staff pool (€147,007). Review revenue as in Table 2.

Sensitivity (Fig. 2). The contribution stayed positive across every one-way analysis, from €69,846 to €89,003 at current practice and from €100,739 to €121,958 when every review is billed. The billing rate moves the margin furthest. Among the other inputs, blister material moves it most (€19,156), then the blister price (€13,410) and the supra-tariff share (€13,333). The number of billable reviews determines how far the billing lever reaches. In a two-way analysis with the polypharmacy share and resident turnover both at the upper ends of their ranges, full billing returns €122,052. Review time moves the margin on neither anchor, because those hours sit inside the fixed home staff pool.

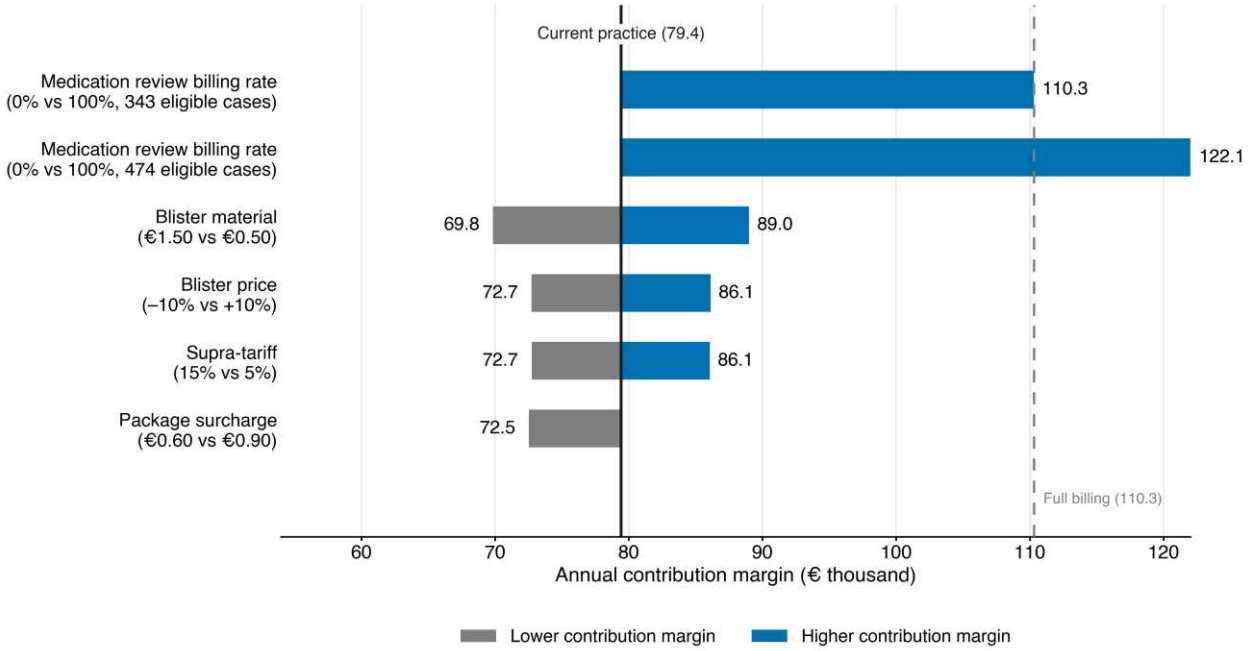


Fig. 2 One-way sensitivity of the annual contribution margin around current practice (€79.4k, solid line). Each row sets one input to both ends of its tested range; rows are ordered by influence. Inputs that do not change revenue at this anchor are not shown. Billing rate shown with 343 eligible cases (€110.3k) and with both case-count inputs at their upper bounds (474 cases, €122.1k)

Margin per staff hour (Fig. 3). Per productive staff hour a walk-in package leaves €113.24 of contribution against €11.06 for a home package. The review leaves €128.54, because its fee is paid per case, independent of package volume.

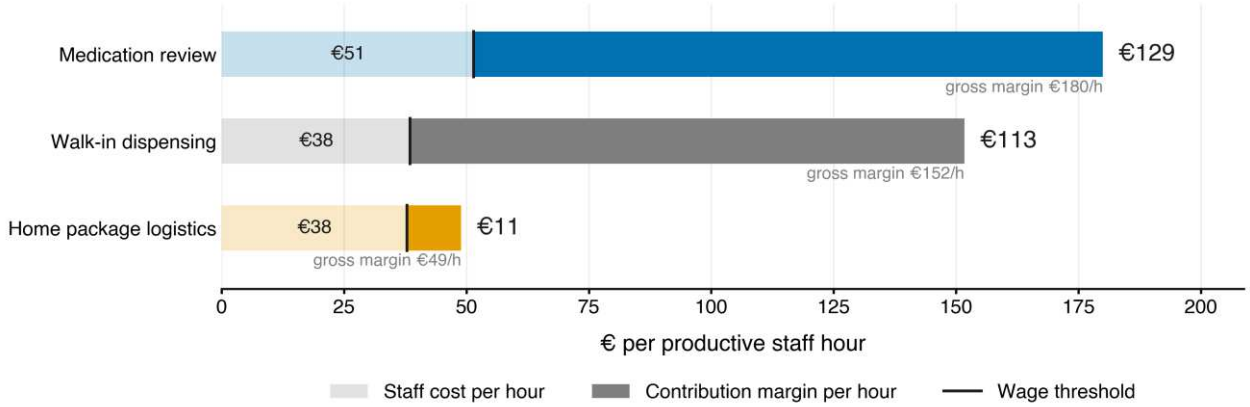


Fig. 3 Gross margin per productive staff hour by activity, split into staff cost (pale segment) and contribution margin (solid segment). Staff cost per hour: €51.46 for medication review (pharmacist rate), €38.48 for walk-in dispensing and €37.87 for home package logistics, whose hours exclude the review hours (Table 2)

Discussion

Nursing-home supply was contribution-positive, the review was close to the walk-in benchmark, and the weakness lay in the logistics layer, at three times the staff time per package.

Comparison with published evidence. Few studies cost pharmacy services from the provider's side, and those that do differ in unit and cost base, summarised in Online Resource 1. Our labour-only costs of €1.97 per walk-in and €6.39 per home package straddle the €3.16–4.29 total cost reported for one dispensing episode [25]. Cognitive-service comparators are per patient and broader than a single review, so they exceed our roughly €26 of pharmacist time [23, 24]. Whole-pharmacy analyses may report gross margin or break-even volumes [41, 42]. Provider-side costing of a whole service line has so far come from walk-in trade [31, 43]. For in-pharmacy multidose dispensing, the one published cost base we identified is a Portuguese micro-costing study. It reported first-year costs of €70,986, including €41,223 of staff cost, and a break-even at about 700 users paying €10 per month [44].

The remaining studies take the payer's perspective and estimate what the service saves the system. Estimated savings of €43.62 per resident a year [30], better medication appropriateness at an estimated £374 more per resident but no significant difference in falls, admissions or deaths [27], and savings mainly in lower drug spend [28] on an inconsistent cost-effectiveness base [29] all describe the payer's side. These findings are compatible with ours, because provider margin and payer cost are assessed from different perspectives. Blistering has no uniform statutory remuneration, and the German health technology assessment found it cost-neutral only above €73.17 of weekly drug cost per resident, on an assumed weekly blister price of €3.00 and a 4.1% waste reduction, on an evidence base it judged insufficient [45].

Distribution of costs and benefits. The distribution analysed here concerns the actors involved: pharmacy, home and payer. The pharmacy carries prescription management, blister infrastructure, clean-room rules and fragmented rebate contracts. The benefits fall elsewhere: the home gains a safer, better-documented medication process, and the payer spends less on drugs and on waste (study pharmacy observation). Review is unlikely to free much nursing time, because statutory minimum staffing means the shift is staffed regardless of the medication workload.

Equity. Equity effects were not assessed. A concentration of home supply among fewer, larger providers could, however, disadvantage residents of small and rural facilities, where case numbers may be too low to finance dedicated review staff.

Contribution versus net profit. What the contribution margin omits is unassigned overhead. Although staff costs and blister material costs were captured, deliveries, premises, software and unpaid documentation could not be allocated to home supply in the absence of cost-centre accounting. Whether these overheads consume the fully billed €110,317 cannot be determined from the present analysis.

Barriers to billing. On the owner's account, the reason is administrative. Billing needs full standard-operating-procedure documentation, repeated signatures and a separate claim per case [10]. Paperwork yielded the main workload and outran the €90 fee, although the owner estimated the 0.5 h to cover it. He considered dedicated review staff necessary, which would be viable only with sufficient case numbers at the current fee.

Implications. First, cut the documentation and billing burden. Standardised forms and a software link are the obvious targets, although neither was measured here. The benefit of reviews also depends on prescriber uptake. In one German study, about one third of recommendations were implemented [15]. Second, target the logistics: the 2026 Pharmacy Supply Development Act lets prescriber and pharmacy agree to send the electronic prescription direct until the end of 2028 [46]. Third, outsourcing routine blisters would spread the fixed costs.

Limitations. This is an exploratory analysis of one pharmacy and its nursing homes. The absolute figures are specific to this setting; the transferable value lies in the costing method. The €3.50 weekly blister charge is close to the €3.52 mean reported for self-paying customers in a German survey, a benchmark if anything above typical nursing-home rates [47], and the resident profile matches German figures [40].

Without cost-centre accounting the analysis stays at the contribution-margin level and cannot show net profit. The staff hours per package (0.166 home versus 0.051 walk-in) are recorded channel hours, not observed handling times. They drive every staff-cost figure here. The 77.4% logistics ratio is an upper bound for package handling, because the two share one recorded pool of hours. For blistering alone it yields no bound. Separate time recording for blistering, as reported for a dedicated unit [44], would close this gap. The recorded hours exclude delivery driving, inspections, training and courier runs, so home staff cost is understated. The owner's estimate of 0.5 h per review included billing paperwork, although he named this paperwork as the main reason the fee did not cover the effort. Review time may therefore be underestimated.

A regulation of 3 June 2026 raises the package fee from €8.35 to €9.00 from 1 July 2026 and to €9.50 from 1 January 2027 [36]. For the analysed group the first step is worth about €15,000 a year against about €4,400 from the 3% collective pay rise of 1 January 2026 [48], both own calculations, so the pattern is unchanged. The €90 fee itself is uncertain since the national price agreement was terminated in 2026 [9]. The model assumes one review per eligible resident a year, conservatively: the entitlement can exceed one where medication changes. Replication and prospective micro-costing of the logistics layer are the natural next steps.

Conclusion

The statutory system pays for a review intended to reduce the harm of polypharmacy. To our knowledge, what home supply earns the pharmacy had not been measured before. At the contribution level, home supply with in-pharmacy blistering covers the direct costs recorded here. It remains open whether it also covers overheads. The review is contribution-positive but under-billed, which pharmacies can address. The logistics layer earns the provider least while benefiting the home and the payer, an imbalance that calls for reform of remuneration and regulation.

References

1. Schwinger A, Jürchott K, Tsiasioti C, Matzk S, Behrendt S. [Epidemiology of long-term care: prevalence and utilisation as well as the healthcare of long-term care recipients in Germany]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 2023;66(5):479–89. https://doi.org/10.1007/s00103-023-03693-5.
2. Moßhammer D, Haumann H, Mörike K, Joos S. Polypharmacy-an Upward Trend with Unpredictable Effects. Dtsch Arztebl Int. 2016;113(38):627–33. https://doi.org/10.3238/arztebl.2016.0627.
3. Hoffmann F, Schmiemann G, Dörks M. [Assessment of polypharmacy: A question of definition and underlying data]. Z Evid Fortbild Qual Gesundhwes. 2016;113:27–35. https://doi.org/10.1016/j.zefq.2016.03.004.
4. Weinand S, Thürmann PA, Dröge P, Koetsenruijter J, Klora M, Grobe TG. [Potentially Inappropriate Medication of Nursing Home Residents: An Analysis of Risk Factors Based on National Claims Data (AOK) for 2017]. Gesundheitswesen. 2022;84(5):448–56. https://doi.org/10.1055/a-1335-4512.
5. El Morabet N, Uitvlugt EB, van den Bemt BJF, van den Bemt P, Janssen MJA, Karapinar-Carkit F. Prevalence and Preventability of Drug-Related Hospital Readmissions: A Systematic Review. J Am Geriatr Soc. 2018;66(3):602–8. https://doi.org/10.1111/jgs.15244.
6. Kim WY, Suh Y, Ah YM, Choi JY, Kim KI, Lee JY. Medication-Related Acute Care Admission and Inappropriate Polypharmacy of Nursing Home Residents. J Am Med Dir Assoc. 2023;24(2):242–9 e7. https://doi.org/10.1016/j.jamda.2022.11.011.
7. Nagai T, Nagaoka M, Tanimoto K, Tomizuka Y, Uei H, Nakanishi K. Relationship between potentially inappropriate medications and functional prognosis in elderly patients with distal radius fracture: a retrospective cohort study. J Orthop Surg Res. 2020;15(1):321. https://doi.org/10.1186/s13018-020-01861-w.
8. Cox N, Ilyas I, Roberts HC, Ibrahim K. Exploring the prevalence and types of fall-risk-increasing drugs among older people with upper limb fractures. Int J Pharm Pract. 2023;31(1):106–12. https://doi.org/10.1093/ijpp/riac084.
9. Mueller A. DAV kuendigt pDL-Preise. Pharmazeutische Zeitung. 2026. https://www.pharmazeutische-zeitung.de/dav-kuendigt-pdl-preise-162878/. Accessed 15 Sep 2026.
10. Bundesapothekerkammer. Standardarbeitsanweisung – Erweiterte Medikationsberatung bei Polymedikation im Alten- und Pflegeheim (SOP). Bundesapothekerkammer, hosted by ABDA. 2023. https://www.abda.de/fileadmin/user_upload/assets/Pharmazeutische_Dienstleistungen/pDL/Medikationsberatung/pDL_MB_APHeime_SOP.pdf. Accessed 15.09.2026.
11. Deutscher Apothekerverband; GKV-Spitzenverband. Rahmenvertrag über die Arzneimittelversorgung nach § 129 Absatz 2 SGB V, Lesefassung mit Anlage 11 und Schiedsspruch vom 19. Juni 2022 zu den pharmazeutischen Dienstleistungen. ABDA – Bundesvereinigung Deutscher Apothekerverbände. 2022. https://www.abda.de/fileadmin/user_upload/assets/Pharmazeutische_Dienstleistungen/pDL/Rahmenvertrag_nach___129.pdf. Accessed 15 Sep 2026.
12. McDonough RP, Harthan AA, McLeese KE, Doucette WR. Retrospective financial analysis of medication therapy management services from the pharmacy's perspective. J Am Pharm Assoc (2003). 2010;50(1):62–6. https://doi.org/10.1331/JAPhA.2010.08154.
13. Gesetz über das Apothekenwesen (Apothekengesetz – ApoG), § 12a. https://www.gesetze-im-internet.de/apog/__12a.html. Accessed 28 Sep 2026.
14. Sadeq A, Strugaru M, Almutairi M, Stewart D, Ryan C, Grimes T. Interprofessional Interventions Involving Pharmacists and Targeting the Medicines Management Process Provided to Older People Residing in Nursing Homes: A Systematic Review and Meta-Analysis of Randomised Controlled Trials. Drugs Aging. 2022;39(10):773–94. https://doi.org/10.1007/s40266-022-00978-3.
15. Bitter K, Pehe C, Krüger M, Heuer G, Quinke R, Jaehde U. Pharmacist-led medication reviews for geriatric residents in German long-term care facilities. BMC Geriatr. 2019;19(1):39. https://doi.org/10.1186/s12877-019-1052-z.
16. Kwint HF, Stolk G, Faber A, Gussekloo J, Bouvy ML. Medication adherence and knowledge of older patients with and without multidose drug dispensing. Age Ageing. 2013;42(5):620–6. https://doi.org/10.1093/ageing/aft083.
17. Maier S, Kreuzenbeck CCJ. Patientenindividuelle Verblisterung im Pflegeheim reduziert Fehlerhaeufigkeit. Praev Gesundheitsf. 2025;20(1):61–7. https://doi.org/10.1007/s11553-024-01118-y.
18. Josendal AV, Bergmo TS, Granas AG. Potentially inappropriate prescribing to older patients receiving multidose drug dispensing. BMC Geriatr. 2020;20(1):272. https://doi.org/10.1186/s12877-020-01665-x.
19. Bülow C, Clausen SS, Lundh A, Christensen M. Medication review in hospitalised patients to reduce morbidity and mortality. Cochrane Database of Systematic Reviews. 2023(1):1–178. https://doi.org/10.1002/14651858.CD008986.pub4.
20. Carollo M, Crisafulli S, Vitturi G, Besco M, Hinek D, Sartorio A et al. Clinical impact of medication review and deprescribing in older inpatients: A systematic review and meta-analysis. J Am Geriatr Soc. 2024;72(10):3219–38. https://doi.org/10.1111/jgs.19035.
21. Junius-Walker U, Krause O, Thürmann P, Bernhard S, Fuchs A, Sparenberg L et al. Drug Safety for Nursing-Home Residents-Findings of a Pragmatic, Cluster-Randomized, Controlled Intervention Trial in 44 Nursing Homes. Dtsch Arztebl Int. 2021;118(42):705–12. https://doi.org/10.3238/arztebl.m2021.0297.

22. ABDA – Bundesvereinigung Deutscher Apothekerverbände. Nur noch 17.041! Immer mehr Apotheken schließen, immer weniger werden neu eröffnet. ABDA – Bundesvereinigung Deutscher Apothekerverbände, Berlin. 2025. https://www.abda.de/aktuelles-und-presse/newsroom/detail/nur-noch-17041-immer-mehr-apotheken-schliessen-immer-weniger-werden-neu-eroeffnet/. Accessed 15 Sep 2026.
23. Noain A, Garcia-Cardenas V, Gastelurrutia MA, Malet-Larrea A, Martinez-Martinez F, Sabater-Hernandez D et al. Cost analysis for the implementation of a medication review with follow-up service in Spain. Int J Clin Pharm. 2017;39(4):750–8. https://doi.org/10.1007/s11096-017-0454-2.
24. Sach TH, Desborough J, Houghton J, Holland R. Applying micro-costing methods to estimate the costs of pharmacy interventions: an illustration using multi-professional clinical medication reviews in care homes for older people. Int J Pharm Pract. 2015;23(4):237–47. https://doi.org/10.1111/ijpp.12162.
25. Gregório J, Russo G, Lapão LV. Pharmaceutical services cost analysis using time-driven activity-based costing: A contribution to improve community pharmacies' management. Res Social Adm Pharm. 2016;12(3):475–85. https://doi.org/10.1016/j.sapharm.2015.08.004.
26. Carroll NV, Rupp MT, Holdford DA. Analysis of costs to dispense prescriptions in independently owned, closed-door long-term care pharmacies. J Manag Care Spec Pharm. 2014;20(3):291–300. https://doi.org/10.18553/jmcp.2014.20.3.291.
27. Desborough JA, Clark A, Houghton J, Sach T, Shaw V, Kirthisingha V et al. Clinical and cost effectiveness of a multi-professional medication reviews in care homes (CAREMED). Int J Pharm Pract. 2020;28(6):626–34. https://doi.org/10.1111/ijpp.12656.
28. Hasan SS, Thiruchelvam K, Kow CS, Ghori MU, Babar ZU. Economic evaluation of pharmacist-led medication reviews in residential aged care facilities. Expert Rev Pharmacoecon Outcomes Res. 2017;17(5):431–9. https://doi.org/10.1080/14737167.2017.1370376.
29. Amritlal ST, Chandler R, Mahboub-Ahari A, Paterson L, Avery AJ, Ashcroft DM et al. Economic Evaluations of Medication Safety Interventions in Primary and Long-Term Care: A Systematic Review. Pharmacoeconomics. 2026;44(3):299–316. https://doi.org/10.1007/s40273-025-01567-z.
30. Jänese J, Žēpers L, Lublóy A. Cost savings from medication reviews in community pharmacies for nursing home residents in Estonia: a case study. BMC Health Serv Res. 2024;24(1):1119. https://doi.org/10.1186/s12913-024-11504-z.
31. Doucette WR, McDonough RP, Mormann MM, Vaschevici R, Urmie JM, Patterson BJ. Three-year financial analysis of pharmacy services at an independent community pharmacy. J Am Pharm Assoc (2003). 2012;52(2):181–7. https://doi.org/10.1331/JAPhA.2012.11207.
32. Zeater S, Benrimoj SI, Fernandez-Llimos F, Garcia-Cardenas V. A model for the financial assessment of professional services in community pharmacy: A systematic review. J Am Pharm Assoc (2003). 2019;59(1):108–16.e1. https://doi.org/10.1016/j.japh.2018.04.029.
33. Lee SWH, Mak VSL, Tang YW. Pharmacist services in nursing homes: A systematic review and meta-analysis. Br J Clin Pharmacol. 2019;85(12):2668–88. https://doi.org/10.1111/bcp.14101.
34. Husereau D, Drummond M, Augustovski F, de Bekker-Grob E, Briggs AH, Carswell C et al. Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. BMJ. 2022;376:e067975. https://doi.org/10.1136/bmj-2021-067975.
35. Adexa – Die Apothekengewerkschaft Arbeitgeberverband Deutscher Apotheken. Gehaltstarifvertrag für Apothekenmitarbeiter (ADA), gültig ab 1. Juli 2024. Tarifvertrag. 2024. https://www.adexa-online.de/fileadmin/user_upload/Rubrik/1_Tarife/Tarifvertr%C3%A4ge/ADEXA_GeTV_ADA_ab_1.7.2024.pdf. Accessed 15 Sep 2026.
36. ABDA – Bundesvereinigung Deutscher Apothekerverbände. Faktenblatt Apothekenhonorierung, Stand Juni 2026. ABDA. 2026. https://www.abda.de/fileadmin/user_upload/assets/Faktenblaetter/Faktenblatt_Apothekenhonorierung.pdf. Accessed 15 Sep 2026.
37. Adexa – Die Apothekengewerkschaft Arbeitgeberverband Deutscher Apotheken. Bundesrahmentarifvertrag für Apothekenmitarbeiter, gültig ab 1. August 2024. ADEXA / ADA (collective agreement). 2024. https://www.adexa-online.de/fileadmin/user_upload/Rubrik/1_Tarife/Tarifvertr%C3%A4ge/ADEXA_BRTV_ab_1.8.2024_web.pdf. Accessed 15 Sep 2026.
38. Finanzverwaltung Nordrhein-Westfalen. Sozialversicherungswerte 2024-2025 (Beitragssätze und Rechengrößen). Finanzverwaltung Nordrhein-Westfalen, Düsseldorf. 2024. https://www.finanzverwaltung.nrw.de/system/files/media/document/file/uebersicht-sozialversicherungswerte-2024-2025.pdf. Accessed 15 Sep 2026.
39. Statistisches Bundesamt. Krankenstand in Deutschland 2024: Arbeitnehmerinnen und Arbeitnehmer waren im Mittel 14,8 Arbeitstage krank gemeldet. Statistisches Bundesamt, Wiesbaden. 2025. https://www.destatis.de/DE/Themen/Arbeit/Arbeitsmarkt/Qualitaet-Arbeit/Dimension-2/krankenstand.html. Accessed 15 Sep 2026.

40. Jacobs H, Stiel S, Völkel A, Schleef T, Burger B, Stahmeyer JT et al. Change over time in characteristics and survival of residents newly admitted to nursing homes: an analysis of health insurance claims data from 2011 to 2020 in Germany. Eur J Ageing. 2025;22(1):34. https://doi.org/10.1007/s10433-025-00871-z.
41. Keast SL, Jacobs E, Harrison D, Farmer K, Thompson D. Future economic outlook of Nebraska rural community pharmacies based on break-even analysis of community operational costs and county population. Res Social Adm Pharm. 2010;6(3):209–20. https://doi.org/10.1016/j.sapharm.2009.07.003.
42. Urick BY, Urmie JM, Doucette WR, McDonough RP. Assessing changes in third-party gross margin for a single community pharmacy. J Am Pharm Assoc (2003). 2014;54(1):27–34. https://doi.org/10.1331/JAPhA.2014.13083.
43. Martinez LA, Garcia C, Moreno L. Cost Evaluation of Professional Services in a Rural Community Pharmacy: A Monocentric Exploratory Approach. Pharmacy (Basel). 2023;11(5):156. https://doi.org/10.3390/pharmacy11050156.
44. Reis A, Jesus Â, Martín ML. Cost Analysis of Multidose Drug Dispensing (MDD) System Implementation in a Community Pharmacy in Portugal. Pharmacy (Basel). 2025;13(6):175. https://doi.org/10.3390/pharmacy13060175.
45. Grundke S, Neubauer G, Haag S, Schiller S, Altenhofen L, Balg C et al. Patientenindividuelle Verblisterung. Rapid Report. Köln: Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen; 2019.
46. Gesetz zur Weiterentwicklung der Apothekenversorgung (Apothekenversorgung-Weiterentwicklungsgesetz, ApoVWG) vom 26. Juni 2026. BGBl. 2026 I Nr. 195. https://www.recht.bund.de/bgbl/1/2026/195/VO.html. Accessed 27 Sep 2026.
47. Schmid T, Hörbe L. Verblisterung für Selbstzahler - welches Honorar ist möglich. Deutsche Apotheker Zeitung. 2021;161(6):58–60.
48. Pharmazeutische Zeitung. Welche Angestellten bekommen eine Gehaltserhöhung. Pharmazeutische Zeitung (trade press). 2026. https://www.pharmazeutische-zeitung.de/welche-angestellten-bekommen-eine-gehaltserhoehung-162228/. Accessed 15 Sep 2026.

Statements and Declarations

Funding: the authors declare that no funds, grants or other support were received during the preparation of this manuscript.

Competing Interests: CF owns and manages the community pharmacy whose operating data were analysed and supplied those data. The other authors have no relevant financial or non-financial interests to disclose.

Ethics approval: The study was conducted in line with the principles of the Declaration of Helsinki. It used only anonymised, aggregated operating and financial data, and no patients or residents took part. The Ethics Committee of the Medical Association of Westphalia-Lippe, Münster, Germany, confirmed exemption from formal review (reference 2026-610-f-N).

Consent to participate: informed consent was obtained from the two interview participants, the pharmacy owner and the nursing-home group manager, for the interview, for the use of their statements and for being named in the acknowledgements; the owner's statements are attributed to him with his consent (co-author CF), and the manager's statements are reported without attribution. No residents or patients were enrolled and no individual-level health data were used.

Consent to publish: Consent was obtained from CF and J. Scheibe. The manuscript contains no individually identifiable data.

Author contributions: RFR, MF, ML and OS developed the research question. RFR designed the cost model, analysed the data and wrote the first draft. CF provided the operating data and contributed to the cost model. OS, YS and MD developed the cost and remuneration inputs of the model. SS and AK conducted the literature review and data extraction for Online Resource 1. AF independently recomputed the model and its results. AK and FvL designed the sensitivity analyses, and FvL assessed the reporting against CHEERS 2022. ML and MF supervised the project. All authors contributed to the interpretation of the results, critically revised the manuscript, approved the final version and agree to be accountable for all aspects of the work.

Data availability: the aggregated data supporting the findings are contained within the article and its supplements.

Prior publication: this analysis is based on the first author's master's thesis (MHBA, 2025), which was submitted for a degree and has not been published as a journal article. The present manuscript asks a different question: what each component of home supply contributes, benchmarked against the same pharmacy's walk-in trade. It reworks the material with extended data, a revised cost model, a national collective-wage basis, an updated 2025 price base and additional analyses. It is not under consideration elsewhere.

Reporting: the study is reported to CHEERS 2022. The completed checklist is uploaded as a separate submission item, annotated with manuscript section.

Supplementary information: Online Resource 1, comparison with published provider-side costing studies. The CHEERS 2022 checklist is uploaded as a separate submission item.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CHEERS2022ChecklistRiegelIJCP.pdf
- ESM1.pdf