Examining Publicly Available Price Lists - The Case of Hospital Drug Administration Costs in Sweden

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THE SWEDISH INSTITUTE FOR HEALTH ECONOMICS
ENABLING INFORMED DECISION MAKING

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Foreword

Health economic evaluations are essential tools for guiding resource allocation in healthcare systems that face growing demands and limited budgets. By informing decisions about which healthcare interventions provide sufficient value for money, these evaluations help ensure that scarce resources are used efficiently and fairly. As the number of new therapies and treatment options continues to grow, so does the need for granular and fair comparison. At the same time, healthcare budgets remain limited, making it all the more important that associated healthcare costs are estimated accurately and transparently. Drug administration is a key example, as its associated costs can vary substantially between treatments and often represent a significant component in health economic evaluations. Yet, many evaluations continue to rely on standardized tariffs from publicly available price lists, even though these were originally developed for budgeting and reimbursement purposes and may not reflect the true economic value of the resources used.

This report addresses this issue through a case study of the Southern Healthcare Region's price list in Sweden. By combining analysis of tariff structures with real-world data from healthcare personnel, it assesses whether estimates of drug administration costs based on these tariffs reflect actual resource use and align with economic theory. The findings reveal substantial discrepancies, underscoring the risks of relying uncritically on standardized tariffs in health economic evaluations.

IHE's mission is to contribute to informed decision-making in healthcare through independent and high-quality research. We believe this report exemplifies that mission, offering not only practical insights for Swedish stakeholders, but also raising broader questions about how healthcare costs are measured and used in economic evaluations. As our understanding of healthcare delivery and resource use evolves, so must the methods we rely on to evaluate costs and inform decisions — not only to ensure fairer assessments, but also to promote innovation in the healthcare sector. The findings reinforce the need for more accurate, granular, and economically meaningful cost inputs and highlight the importance of refining cost estimation practices in line with economic theory. We hope this work supports more robust, transparent evaluations and better-informed decisions in the context of reimbursement and healthcare resource allocation.

IHE is deeply grateful for the insights gathered from expert interviews with the Contract Group (Avtalsgruppen) in Region Skåne and with healthcare professionals from the Southern Healthcare Region (Södra sjukvårdsregionen). Their time, experience, and insights were invaluable to the development of this report.

Lund, April 2025

Peter Lindgren
Managing Director, IHE

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- Cardiology, Lund University Hospital
- Hematology, Malmö University Hospital
- Neurology, Lund University Hospital
- Oncology, Växjö Central Hospital

Their detailed descriptions of real-world resource use for drug administration were instrumental in capturing the practical aspects of healthcare delivery and informing the analysis.

Summary

Health economic (HE) evaluations play a crucial role in reimbursement decisions in Sweden, ensuring that new therapies provide sufficient clinical benefit relative to their costs. These evaluations often rely on publicly available price lists, such as the Southern Healthcare Region's Price List (SSPL), to estimate drug administration costs. However, the SSPL, originally developed to regulate interregional payments, provides predefined administrative prices (tariffs) that lack transparency and granularity. These tariffs are presented as lump sums without breaking down cost components or explaining their calculation, making it unclear whether they accurately reflect the true economic costs relevant for HE evaluations and cost-effectiveness assessments. In particular, this lump-sum structure prevents distinctions between different levels of resource use, potentially leading to inaccurate cost estimates.

To address these concerns, this study examines the cost components, allocation principles, and calculation methods underlying the SSPL tariffs for drug administration. It also documents real-world resource use across different hospital departments and explores alternative costing approaches that could improve transparency, granularity, and representativeness in HE evaluations. Given that the SSPL tariffs are frequently used in reimbursement applications to Sweden's Dental and Pharmaceutical Benefits Agency (TLV), assessing their accuracy and relevance for HE evaluations is both timely and essential.

The analysis followed a four-step process. First, publicly available SSPL data were collected to obtain standardized drug administration tariffs. Second, interviews were conducted with the Contract Group ("Avtalsgruppen"), responsible for developing the SSPL, to understand the allocation principles and cost components underlying the tariffs. Third, interviews with healthcare personnel across cardiology, hematology, neurology, and oncology departments were carried out to gather insights on real-world resource use for drug administration. Finally, a comparison of three costing approaches was made.

Interviews with the Contract Group

- The SSPL drug administration tariffs consist of five cost components: personnel costs, material costs, capital costs, venue costs, and drug costs, with drug costs accounting for 7% to 76% of the total administration costs, depending on the department.
- Tariffs are calculated based on the cost-price principle, which allocates costs proportionally based on production volumes to cover total operational costs. In practice, these cost allocations reflect administrative pricing structures rather than the actual resource use or the true economic cost of individual services.

Cost components in SSPL drug administration tariffs

Personnel costs
Costs of staff, including physicians, nurses and assistant nurses

Material costs
Costs of medical supplies like syringes, gloves and IV tubes

Capital costs
Costs of equipment and infrastructure depreciation

Venue costs
Expenses for facility use and maintenance (e.g., rent and utilities)

Drug costs
Costs of drugs used at the given department

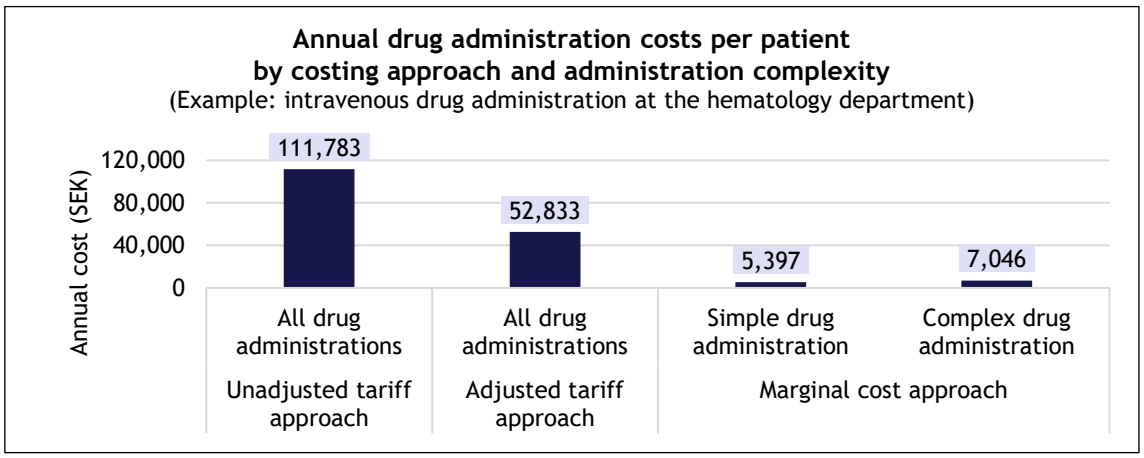
Interviews with healthcare personnel

- The workflow for intravenous and subcutaneous drug administration is standardized across all departments, with nurses carrying the primary responsibility. Physicians and assistant nurses were partially involved based on the complexity of administration and whether it was a first or subsequent administration.
- Overall, complex drug administrations required more personnel time than simple ones across all departments, and first administrations generally took longer than subsequent administrations.
    - For intravenous administrations, personnel time ranged from 43 minutes in cardiology to 120 minutes in neurology for simple administrations, and 90 minutes in hematology to 195 minutes in neurology for complex administrations.
    - For subcutaneous administrations, personnel time ranged from 16 minutes in cardiology to 140 minutes in neurology for simple administrations, and 20 minutes in cardiology to 210 minutes in neurology for complex administrations.

Comparison of alternative costing approaches

The analysis compared three costing approaches using a hypothetical example of intravenous drug administration at the hematology department, assuming that a patient receives intravenous administration every four weeks for up to 12 months. The unadjusted tariff approach was used as a baseline for comparison.

- **Unadjusted tariff approach:** Applying the SSPL tariff without adjustments resulted in a fixed cost of SEK 8,599 per administration, leading to an annual cost of SEK 111,783 per patient. This approach does not account for any differences in administration complexity or between first and subsequent administrations.
- **Adjusted tariff approach:** Since HE evaluations typically account for drug costs separately, this approach excludes them from the SSPL tariff to avoid the risk of double-counting. The adjusted cost per administration is SEK 4,064, resulting in an annual cost of SEK 52,833 — approximately 53% lower than the baseline.
- **Marginal cost approach:** This approach used a micro-costing method that included only variable costs (personnel and material costs) and accounted for administration complexity (simple vs. complex) and treatment occasion (first vs. subsequent administrations).
    - For simple administrations, the annual cost was SEK 5,397 per patient.
    - For complex administrations, the annual cost was SEK 7,046 per patient.
    - These estimates represent approximately 5–6% of the unadjusted tariff's cost and 10–13% of the adjusted tariff's cost.



What are the implications for health economic evaluations?

The findings suggest that using standardized tariffs from publicly available price lists such as the SSPL in HE evaluations may lead to inaccurate cost estimates due to several limitations. First, these tariffs include unrelated costs that are typically accounted for separately in HE evaluations, such as drug costs. Second, the lack of granularity in these tariffs prevents meaningful differentiation between different administration complexities and treatment occasions. Third, the SSPL tariffs are misaligned with economic theory as they reflect departmental factors like production volume rather than the actual cost per service. Together, these limitations raise concerns about the reliability of HE evaluations for informing decision-making and the fair allocation of limited resources. The hypothetical example of intravenous drug administration clearly demonstrated the potential magnitude of cost overestimation when SSPL tariffs are used in HE evaluations. While this example focused specifically on intravenous administration at the hematology department, the underlying challenges related to standardized tariffs may also be relevant in other healthcare contexts.

What should be done?

To ensure more accurate and meaningful cost estimates for drug administration in HE evaluations, the current practice of using unadjusted SSPL tariffs should be reconsidered. Although adjusting these tariffs to exclude certain unrelated costs (i.e., drug costs) offers a partial improvement, the approach still lacks the necessary granularity and remains misaligned with real-world resource use in clinical practice and economic theory. A more appropriate alternative is the marginal cost approach, which draws on real-world clinical practice, better reflects the opportunity cost of each additional administration, and supports more reliable comparisons between treatment alternatives.

Concluding remarks

This analysis highlights the limitations of using unadjusted SSPL tariffs in HE evaluations and reinforces the need for more accurate, granular, and economically meaningful cost inputs. Refining cost estimation practices in line with economic theory can strengthen the validity of HE evaluations and support more informed and transparent decision-making in the context of reimbursement and healthcare resource allocation.

1. Introduction

The rapid introduction of new therapies has transformed treatment options across many disease areas. However, ensuring timely and equitable access to these therapies while maintaining financial sustainability remains a challenge for healthcare systems. To balance innovation with affordability, many countries, including Sweden, have adopted value-based pricing, where reimbursement decisions are informed by health economic (HE) evaluations (1). These evaluations assess whether a therapy provides sufficient clinical benefit relative to its cost, helping policymakers make evidence-based reimbursement decisions.

HE evaluations rely on a combination of clinical evidence and economic modelling to assess cost-effectiveness of new therapies. A critical component of these evaluations is the estimation of the cost of resource use, particularly drug administration costs, which contribute to the total cost of treatment. Drug administration costs should account for the value of the healthcare resources required to prepare, handle, and deliver a drug to a patient. From an economic perspective, it is essential that these costs also reflect opportunity costs to ensure efficient allocation of limited healthcare resources (2).

In many HE evaluations, tariffs sourced from publicly available price lists are used as proxies for the opportunity cost of healthcare services. In this context, tariffs refer to predefined administrative prices assigned to specific services. One such price list is the Southern Healthcare Region's price list (Södra sjukvårdsregionens prislista, SSPL), which provides standardized tariffs for a wide range of services, including drug administration (3). Although originally developed to regulate interregional payments and reimbursement rates, the SSPL has also become a key reference in HE evaluations.

In practice, the resource use required for drug administration may vary significantly depending on whether the administration is "simple" or "complex". Simple administrations involve short preparation and minimal monitoring for adverse events, while complex administrations require extended preparation and monitoring. This variation may be especially relevant for intravenous administration, where technical administration time can differ substantially between drugs. Such differences may influence resource use, particularly healthcare personnel time, which is an important cost driver in HE evaluations. In Sweden, this is especially important to consider given the frequent use of the SSPL's tariffs for intravenous administration in HE evaluations and reimbursement applications submitted to the Dental and Pharmaceutical Benefits Agency (Tandvårds- och läkemedelsförmånsverket, TLV) (4-8).

Publicly available price lists often lack granularity and transparency. The SSPL is no exception — its tariffs offer no breakdown of cost components or insight into their calculation methodology. As a result, evaluators might rely on these tariffs without a clear understanding of whether they accurately reflect economic costs relevant for HE evaluations, such as opportunity costs and marginal costs. A key example is drug administration tariffs, which are reported as lump sums, preventing distinctions between simple and complex administrations and limiting the precision required for accurate cost-effectiveness analysis.

These limitations underscore the need for a critical evaluation of cost allocation methods in publicly available price lists. To our knowledge, no formal assessment has been conducted to determine whether SSPL tariffs align with resource use in clinical practice or fundamental economic principles of cost measurement. Instead, these tariffs are often adopted as a practical convention in HE evaluations, without consideration of whether they provide a theoretically sound basis for estimating economic costs.

1.1 Objectives

The main purpose of this study is to evaluate whether tariff-based estimates for drug administration costs accurately reflect real-world resource use in clinical practice, and whether they can adequately reflect economic costs for HE evaluations. To do so, this study aims to:

1. Examine the cost components, allocation principles (how shared costs are distributed), and calculation methods (how individual costs are estimated) underlying tariffs for drug administration in publicly available price lists, using the SSPL as a case study.
2. Document real-world resource use for drug administration across different hospital departments.
3. Explore alternative approaches that could improve the transparency, granularity, and representativeness of cost assessments, ensuring better alignment with the requirements of accurate HE evaluations.

2. Some theoretical aspects of costs and tariffs

2.1 Costing concepts and their relevance in healthcare

Economic analyses for different healthcare programs or initiatives usually require accurate cost estimation to assess potential benefits, costs, and to inform resource allocation decisions. Therefore, a clear understanding of different cost concepts is crucial to accurately evaluate resource use and efficiency.

In economic theory, a fundamental distinction is made between financial costs and economic (or opportunity) costs. Financial costs represent the actual expenditures incurred by healthcare providers, such as salaries, equipment, and maintenance, and often include the depreciation of capital resources over time. In contrast, economic costs reflect the full value of resources based on their best alternative use, not just their market price (2, 9). For example, if a building is used for a particular healthcare service, the opportunity cost is the value of the most valuable alternative use of that building.

Economic costs are generally preferred before a decision to implement a healthcare intervention has been made, as they capture the opportunity cost of resources. This is essential for assessing the value for money and efficiency of different policy options and for deciding how to best allocate limited resources. On the other hand, financial costs are more appropriate after the decision to implement has been made, as they reflect the actual cash outflows required for budgeting and financial planning within a defined budget (2). This distinction ensures that resources are allocated optimally before implementation and that budgeting is realistic once a decision is reached.

Tariffs from publicly available price lists in healthcare are often used as proxies for economic costs in HE evaluations, as direct measurement of opportunity costs can be challenging. However, they may not always accurately reflect resource use due to factors such as administrative fees or negotiated prices. In cases where market prices or tariffs do not accurately reflect the opportunity costs, the use of shadow pricing (an estimated or adjusted value) can help approximate the true economic cost of resources.

The appropriateness of using tariffs depends significantly on the context and the perspective of the analysis. Tariffs based on average costs can be suitable for ensuring financial sustainability in healthcare organizations, such as clinics or wards, by distributing costs across all treatments or services provided. However, these tariffs may not accurately reflect costs for specific programs or interventions that differ from the average. For instance, if a tariff is applied to a subgroup of patients requiring more intensive care, it may underestimate the actual costs. Conversely, it might overestimate costs for routine or simpler cases.

Marginal cost is a critical concept for decision-making in healthcare. It represents the additional cost of producing one more unit of output, such as treating an extra patient (9). Initially, marginal costs may decrease due to economies of scale — that is, the reduction in average cost per unit as fixed costs are spread over a larger number of patients. However, beyond a certain point, marginal costs can increase if additional resources or investments are required. Understanding marginal costs helps healthcare organizations decide when it is profitable to expand services or when to invest in additional capacity.

For clarification on relevant cost categories, refer to the info box below.

Info Box – Costs and definitions		
Total Cost (TC)	=	*FC + VC: cost of producing a given quantity of output*
Fixed Cost (FC)	=	*Costs that do not vary with the quantity of output in the short run (~1 year)*
Variable Cost (VC)	=	*Costs that vary with the level of output*
Average Cost (AC)	=	*TC/Q = the average cost per unit of output, where Q is total quantity*
Marginal Cost (MC)	=	*TC of (x + 1) – TC of (x) = The additional cost of producing one more unit of output, where x is the current output level*

2.2 Overhead costs

Overhead costs in hospitals, such as administrative work, housekeeping, and other support services, must be allocated to different programs or departments. However, there is no universally "correct" way to allocate overhead costs. Various methods can be used depending on the context and the importance of the cost item. A simple method is to identify a unit of output that is as homogeneous as possible with respect to cost. For example, square meters of floor space can be used to allocate housekeeping costs, staff working hours for administrative costs, and kilograms of laundry for laundry services. In addition, more structured approaches such as direct allocation, step-down allocation, and simultaneous allocation can be used to distribute overhead costs more accurately (9).

It is also important to consider the opportunity cost of overhead resources. For example, if a hospital room is used for administrative purposes, the opportunity cost would be the most valuable alternative use of that space, such as for clinical services. In this context, marginal analysis can help determine which overhead costs would change if a program were added or removed, providing a clearer picture of relevant costs (9).

Overhead costs can be fixed or variable. Fixed costs remain unchanged in the short term regardless of the number of patients treated, such as building rent and administrative salaries. Variable overhead costs vary with the level of output, such as utilities and disposable supplies.

The average cost is calculated by dividing the total cost by the total number of units produced. As mentioned earlier, average costs differ from marginal costs, which represent the additional cost of producing one more unit of output. Average costs can be practical for covering the financial sustainability of healthcare organizations, such as clinics or wards, by ensuring that all operating costs are covered through standardized tariffs.

Many tariffs are based on average costs to simplify full-cost recovery and can be practical for ensuring financial sustainability in healthcare organizations. However, these tariffs may not always reflect the true resource use for specific patient groups, especially those requiring more complex or intensive care. For example, a standard tariff might underestimate costs for programs involving specialized drugs or intensive monitoring, while it might overestimate costs for simpler cases requiring fewer resources.

This explains why some organizations adjust tariffs for different patient groups or programs. Higher tariffs might be applied for more complex diagnosis-related groups (DRG) to account for the additional resources required, while lower tariffs could be used for less complex cases. Recognizing both the strengths and limitations of tariffs helps ensure that cost estimates are both realistic and fair.

By understanding the different methods of allocating overhead costs and the implications of using average costs in tariffs, healthcare decision-makers can make more informed choices about resource allocation and cost recovery strategies.

2.3 Practical example: Drug administration analysis

How can the theory of costs be applied to the context of drug administration? To illustrate this, consider a hospital setting where chemotherapy infusions are administered. The hospital's investment in infrastructure, such as treatment chairs, intravenous pumps, and permanent staff, represents fixed costs that remain constant in the short term regardless of the number of infusions administered. Including fixed costs in per-infusion estimates would increase the calculated cost per patient but may not reflect the additional cost of treating one additional patient.

The marginal cost of each additional infusion, however, includes only the variable costs, which are the additional resources required to administer one more treatment. These variable costs typically include:

- Intravenous fluids and infusion sets,
- Disposable supplies such as gloves, syringes, alcohol wipes, etc.,
- Additional nursing time and other personnel involvement for preparation, administration, and monitoring of the infusion.

Using tariffs based on average costs can simplify cost recovery but may not reflect true marginal costs for specific services or subgroups of patients. By distinguishing between fixed and variable costs and understanding how they relate to marginal costs and tariffs, healthcare decision-makers can achieve a more accurate assessment of resource use and cost-effectiveness in specific programs or treatments.

3. Methods

This study was carried out in four steps. First, publicly available price list data were collected to obtain drug administration tariffs (Section 3.1). Second, interviews with key individuals involved in cost development were conducted to gain insight into the cost components and allocation principles underlying these tariffs (Section 3.2). Third, interviews with healthcare personnel were conducted to document real-world workflows, personnel involvement, and resource use in drug administration across different hospital departments (Section 3.3). Finally, different costing approaches were illustrated and compared, integrating empirical data, micro-costing, and economic costing principles to assess the representativeness of tariffs (Section 3.4).

3.1 Collection of drug administration tariffs

This study collected drug administration tariffs from the SSPL (3). The SSPL provides predefined tariffs used for pricing and reimbursement within the Southern Healthcare Region, which includes the regions of Blekinge, Kronoberg, Skåne, and southern Halland (municipalities of Halmstad, Laholm, and Hylte). The SSPL is updated annually and approved by the Southern Regional Care Board (Södra regionvårdsnämnden) following negotiations between the regions.

The annual SSPL reflects tariffs that are calculated according to the cost-price principle ("*självkostnadsprincipen*"): municipalities and regions may not charge fees higher than the corresponding costs of the services or goods they provide (10). These are calculated using a standard three-year methodology: expenses incurred by healthcare providers (costs) are divided by the production volume in *Year 1* (e.g., 2022), indexed over two years for inflation and salary changes (Landstingsprisindex med kvalitetsjusterade löner, LPIK) (11), and finalized as tariffs for *Year 3* (i.e., 2024) following final negotiations.

The SSPL includes tariffs for drug administration, categorized under "*Klassifikation av vårdåtgärder*" (KVÅ) codes. These cover subcutaneous (DT012), intravenous (DT016), and intrathecal (DT021) administration; see Table 1 for an overview of their departmental availability and corresponding 2024 tariffs. While the initial mapping included all three administration routes, the analysis focused specifically on intravenous (IV) and subcutaneous (SC) administration, given their common use in HE evaluations and reimbursement applications submitted to the TLV.

Table 1: Tariffs for drug administration by route and department - SSPL (2024)

KVÅ code	Administration route	Available departments	Tariff (SEK)
DT012	Subcutaneous	Hematology	6,709
DT016	Intravenous	Hematology	8,599
		Cardiology	5,353
		Neurology	10,660
DT021	Intrathecal	Hematology	7,044

Notes: Tariffs are sourced from the 2024 Southern Healthcare Region's Price List (Södra sjukvårdsregionens prislista, SSPL) (3).

3.2 Examination of drug administration tariff structures

In this phase, the composition of tariffs associated with drug administration, as presented in the 2024 SSPL, was analyzed based on the distinct DT012 and DT016 codes. Specifically, the key focus was to identify the cost components included in these tariffs and to gain insight into their allocation principles.

Data collection approach

Two semi-structured interviews were conducted with representatives from the Southern Healthcare Region's Contract Group (Avtalsgruppen), a regional collaboration group responsible for preparations of financial matters such as developing price and reimbursement models and negotiating prices and reimbursements for the Southern Healthcare Region (12). The Contract Group includes economists and accountants from the regions of Blekinge, Kronoberg, Skåne, and Halland, who are appointed by their respective regions.

For this study, the chairperson of the Contract Group was contacted to initiate the process of participant selection. The chairperson subsequently identified and invited relevant representatives with direct involvement in the development of the SSPL to participate in the interviews, allowing for targeted yet adaptable discussions with first-hand sources. The interviews, conducted in November and December 2024, aimed to provide a comprehensive overview of the tariff development process in the 2024 SSPL.

Interview design

The first interview exclusively focused on establishing a foundational understanding of the tariff structures associated with the drug administration codes DT012 and DT016 in the 2024 SSPL. This included a targeted discussion about the specific elements comprised by the drug administration tariffs and the allocation methods applied by the Contract Group. Specifically, this one-hour interview explored topics related to:

- The identification of cost components in the SSPL tariffs for drug administration
- The allocation and relative proportions of different cost components within the tariffs
- Potential department-specific factors influencing differences in tariff calculations

The second interview built on the foundational understanding attained in the first interview. The primary aim was to clarify specific questions arising from the detailed breakdowns of the drug administration tariffs, generated from the initial findings. This follow-up interview addressed questions related to:

- The underlying cost allocation principles and specific formulas applied in the development of the tariffs
- The internal validity of the tariffs (i.e., how accurately the 2024 SSPL tariffs reflect the actual costs incurred by healthcare providers)

3.3 Documentation of drug administration practices

In this phase, real-world drug administration processes were documented, and resource inputs in clinical practice were identified. Specifically, the aim was to understand personnel involvement, time estimates, and workflow structures for IV and SC administration across different departments. These insights serve as a reference for later comparisons to standardized cost assumptions, such as SSPL tariffs, in HE evaluations.

Data collection approach

Semi-structured interviews with healthcare personnel directly involved in IV and SC drug administration, including physicians and nurses were employed in January and February 2025. Interviews were conducted across four departments within the Southern Healthcare Region: cardiology[1], hematology[2], neurology[3], and oncology[4]. These departments were selected to capture a range of drug administration practices and potential differences in clinical workflows, personnel involvement, and resource requirements across medical specialties.

Before the interviews, participants were asked to select two examples for each administration route, IV and SC. One example represented a simple drug administration and the other a complex drug administration. No predefined drug list was provided. Instead, participants independently selected examples based on their experience. The classification of drugs as "simple" or "complex" was determined by their professional judgment, reflecting factors such as preparation time, technical administration time, monitoring for adverse events, and the complexity of administration steps.

To account for variations in personnel workload, participants provided separate time estimates for first and subsequent administrations of each selected example. First administrations often involve additional steps, such as patient education, baseline assessments, and closer monitoring. Capturing both scenarios allowed for a more thorough assessment of resource use.

Interview design

The interviews focused on department-specific drug administration practices, capturing workflow structures, personnel roles, time estimates, and key factors influencing resource use. Discussions explored:

- Workflow structure and identification of all steps in drug administration
- Personnel involvement at each step, including roles and responsibilities
- Time estimates for all steps in the administration process
- Factors influencing time requirements, such as drug complexity and monitoring needs

A flexible, interactive format was used, allowing participants to elaborate on their responses while ensuring both standardized workflows and department-specific variations were captured.

[1] Cardiology, Lund University Hospital, Sweden.

[2] Hematology, Malmö University Hospital, Sweden.

[3] Neurology, Lund University Hospital, Sweden.

[4] Oncology, Växjö Central Hospital, Sweden.

3.4 Illustration of different costing approaches

This section presented a comparison of different approaches to estimating drug administration costs, with the aim of enhancing transparency, granularity, and accuracy in HE evaluations. The objective was to assess how well each of these approaches aligned with economic theory and reflected the real-world resource costs incurred in clinical practice. To illustrate the implications of these methods, IV drug administration at the hematology department was used as a case study, given the relevance of its SSPL tariff in HE evaluations in Sweden.

Three costing approaches are applied: the unadjusted tariff approach, the adjusted tariff approach, and the marginal cost approach. Each costing approach is based on a distinct set of inputs and cost construction methods, as detailed in later sections. The unadjusted and adjusted tariff approaches use department-level prices based on the SSPL's allocation principles and standardized assumptions, while the marginal cost approach uses micro-costing techniques based on clinical time inputs and direct resource use. A complete breakdown of inputs and resulting estimates for all three costing approaches, along with a methodological clarification of how these were calculated, is provided in the Appendix (see Table A2).

Unadjusted tariff approach

This approach applies the SSPL tariff for IV drug administration at the hematology department without any modifications. As this approach is currently used in most TLV applications and evaluations (4-8), it was used here as a baseline for comparison to other possible costing approaches.

Adjusted tariff approach

This approach applies a modified version of the SSPL tariff based on insights from interviews with the Contract Group (Section 4.1). The objective was to isolate the costs directly associated with the administration process more accurately, avoiding potential overlap with cost components that are accounted for separately in HE evaluations. However, it retains the SSPL's underlying cost allocation structure and pricing assumptions.

Marginal cost approach

Unlike the other two approaches, the marginal cost approach is independent of the SSPL and does not rely on any component of its tariff structure. Instead, a micro-costing approach was applied to estimate drug administration costs, focusing on the marginal cost (i.e., the additional cost incurred when administering a drug to one additional patient). In this approach, only variable costs — those that increase directly with each drug administration — were included in the calculations. Specifically, this includes healthcare personnel costs and material costs.

Healthcare personnel costs were estimated based on the time required for each staff category (physicians, nurses, and assistant nurses) to administer a drug in the clinical setting. Time estimates were obtained from interviews with healthcare personnel at the hematology department (see Figure A2, Panel A). These estimates capture variations in time spent for simple and complex IV administrations, as well as for first and subsequent administrations. The marginal cost approach accounts for these variations to ensure accuracy in cost estimation.

The time-cost of healthcare personnel was used as a proxy for the opportunity cost of their time, recognizing that the time spent on drug administration could otherwise be allocated to other tasks within the department. Unit costs for each staff category were derived from wage

statistics from Statistics Sweden (Table 2). The total personnel cost per administration was calculated by multiplying the time spent by the unit cost per minute for each staff category and summing the results:

$$\text{Total personnel cost per administration} = \sum_{i=1}^{n} (\text{Time}_i \times \text{C}_i) \quad (1)$$

where i represents each staff category (physicians, nurses, and assistant nurses); Time_i denotes the time in minutes spent by each staff category per administration; and C_i refers to the cost per minute for each staff category.

Material costs include all consumables required before, during, and after drug administration, such as IV sets, gloves, syringes, alcohol wipes, etc. These items were identified based on standard clinical procedures and insights from healthcare personnel across four departments, with procurement costs sourced from regional procurement price lists (Table 2). The total marginal cost per administration was then calculated as the sum of personnel and material costs.

It is important to note that the marginal cost approach does not include costs related to adverse events associated with drug administration, such as the time spent managing these events by healthcare personnel. In HE evaluations, adverse costs are typically accounted for separately based on data from clinical trials, making this exclusion a deliberate choice to avoid the risk of double counting.

Table 2: Unit costs associated with drug administration (SEK, 2024 prices)

Type of resource	Unit cost (SEK)	Source
Standard unit of material utilization before, during and after administration		
IV	88.73	Interviews with healthcare personnel. Prices from (13)
SC	8.10	Interviews with healthcare personnel. Prices from (13)
Healthcare personnel time, per minute		
Physician	12.08	(14-16)
Nurse	6.34	(14-16)
Assistant nurse	4.50	(14-16)

Notes: The standard unit of material utilization for intravenous (IV) and subcutaneous (SC) administrations reflects consumable costs before, during, and after administration. The unit costs for healthcare personnel are based on wage statistics and employer social security contributions ("sociala avgifter"). All costs are presented in 2024 prices (SEK).

4. Results

4.1 Cost breakdown interviews

4.1.1 Cost components

The tariffs for drug administration presented in the SSPL consist of five distinct cost components, reflecting the resource categories consumed during the administration process:

	Cost component	Definition
	Personnel costs	Costs of staff, including physicians, nurses, and assistant nurses.
	Material costs	Costs of materials utilized within the department (e.g., syringes, medical gloves, IV tubes).
	Capital cost	Costs related to the financing and depreciation of equipment and infrastructure within the department.
	Venue costs	Costs related to the use and maintenance of physical facilities within the department (i.e., rent and utilities).
	Drug costs	Costs associated with drugs used within the department.

4.1.2 Allocation principles and cost per category

Tariffs in the SSPL are calculated based on the cost-price principle as outlined in the Municipality Act (2017:725), Chapter 2, Section 6: municipalities and regions may not charge fees higher than the corresponding costs of the services or goods they provide (10). However, the cost-price principle does not require that fees (i.e., negotiated tariffs in the SSPL) for individual healthcare services precisely reflect the actual costs incurred by the healthcare providers to deliver those services. Instead, it requires that the total revenue collected from these fees must not exceed the total operational costs of healthcare providers over a longer period of time (17).

This approach serves as the foundation for SSPL's cost allocation principles, which aim to ensure that total annual costs incurred by regional healthcare providers are fully covered following annual price and reimbursement negotiations. In practice, this framework does not aim to reflect the precise costs of individual healthcare services but rather distribute the total operational costs across all provided services.

Personnel costs

Personnel costs are allocated across all healthcare services involving staff within the given department (i.e., the cost-price principle), and calculated using a cost per minute. This allocation principle relies on three elements:

1. **Total annual departmental costs** for each staff category, including salaries, hospital-level and regional overheads, and other associated staff-related expenses.
2. **Total annual production time**, defined as the total time spent by each staff category on all listed healthcare services within the department.
3. **Personnel time estimates** for specific healthcare services, such as drug administration, which serve as allocation keys to distribute personnel costs across individual services.

The personnel cost for a specific healthcare service is calculated as:

$$\text{Personnel cost per service } i = \left(\frac{\text{Total annual personnel costs}}{\text{Total annual production time (min) for personnel}}\right) \times \text{Time}_i \qquad (2)$$

where Time_i represents the estimated personnel involvement time (minutes) for the specific service *i*. Equation 2 introduces a negative relationship between departmental productivity and minute costs: departments with higher production volumes report lower minute costs, while those with higher production volumes incur higher costs per minute for personnel.

Table 3 presents the estimated personnel time, cost per minute, and resulting cost per administration for drug administration across different departments and staff categories.

Table 3: Estimated personnel time, cost per minute, and cost per administration for drug administration by staff category (SSPL 2024)

KVÅ code	Administration route	Department	Physician	Nurse	Assistant nurse	Total Personnel
			Time (min)	Time (min)	Time (min)	Time (min)
DT012	Subcutaneous	Hematology	45	15	30	90
DT016	Intravenous	Hematology	30	90	10	130
		Cardiology	20	40	–	60
		Neurology	2	90	10	102
			Cost/min	Cost/min	Cost/min	Cost/min
DT012	Subcutaneous	Hematology	32.09	26.56	25.92	84.57
DT016	Intravenous	Hematology	32.09	25.37	25.17	82.63
		Cardiology	25.87	11.90	–	37.77
		Neurology	70.73	92.06	67.48	230.27
			Cost/admin	Cost/admin	Cost/admin	Cost/admin
DT012	Subcutaneous	Hematology	1,444	398	778	2,620
DT016	Intravenous	Hematology	963	2,284	252	3,499
		Cardiology	517	476	–	993
		Neurology	141	8,285	675	9,101

Notes: Personnel time estimates and costs were obtained from interviews with the Contract Group (Avtalsgruppen). According to the Contract Group, differences in nurse and assistant nurse minute costs between DT012 and DT016 in hematology result from cost allocation between inpatient and outpatient care. Standardized minute costs are calculated separately for each setting, and the final minute cost reflects a weighted average based on the distribution of DT012 and DT016 across these settings. Since total annual costs and production time for nurses and assistant nurses differ between inpatient and outpatient care, slight variations in minute costs arise. Physician costs are not sensitive to this allocation.

Since all departmental personnel expenses are distributed across reported healthcare services, the personnel cost per service reflects not only time spent delivering care directly, such as drug administration, but also indirect activities not linked to a specific service in the SSPL (e.g., administrative tasks). As such, the costs in Table 3 represent an average allocation of total personnel expenses rather than costs based solely on the actual time required for the service.

Material, capital, and venue costs

Material, capital, and venue costs in the SSPL are not directly linked to the actual resources consumed during each service. Instead, these costs are allocated proportionally across all services within a department based on their relative production volumes, in line with the cost-price principle. This allocation method ensures that services with higher production volumes receive a proportionally larger share of the costs. The material (M), capital (C), or venue (V) costs per service *i* are calculated by the following equation:

$$\text{Cost per service (M, C, V)} = \frac{\text{Total annual costs (M, C, V)} \times \text{W}_{service_i}}{\text{Total annual production volume of service } i} \quad (3)$$

$$where\ \text{W}_{service_i} = \frac{\text{Annual production volume of service } i}{\text{Total annual production volume in the department}}$$

Here, $\text{W}_{service_i}$ represents the relative production volume of a specific service *i* (e.g., DT016) as a proportion of the department's total production volume. The total annual costs for material, capital, or venue are proportionally allocated to each service based on this weight, ensuring that services with a larger relative production volume receive a proportionally larger share of the costs. Dividing the allocated share of costs by the annual production volume of the specific service converts it into a cost per service.[5]

Material, capital, and venue costs for drug administration vary considerably both across administration routes within the same department and for the same route across different departments (Table 4). These variations reflect the SSPL's cost allocation principles, which distribute costs proportionally based on production volumes rather than actual resource use. As a result, the reported costs per administration illustrate the allocation methodology rather than actual differences in resource utilization.

Table 4: Material, capital, and venue costs for drug administration (2024 SSPL)

KVÅ code	Administration route	Department	Material costs (SEK)	Capital costs (SEK)	Venue costs (SEK)
DT012	Subcutaneous	Hematology	80	11	355
DT016	Intravenous	Hematology	106	15	445
		Cardiology	173	–	117
		Neurology	116	44	686

Notes: Costs were obtained from interviews with the Contract Group (Avtalsgruppen).

[5] Hypothetical example: Total annual material costs in the departmental = SEK 500,000. Total production volume in the department = 1,000 services. Service *i* volume = 200 services. Relative production volume of service *i* = $W_{\text{service}_i} = \frac{200}{1{,}000} = 0.2$. The material cost per service *i* $= \frac{\text{Total annual material costs} \times W_{\text{service}_i}}{\text{Total annual production of service } i} = \frac{500{,}000 \times 0.2}{200} = \text{SEK } 500$. The same principle applies to capital, venue, and drug costs.

Drug costs

Similar to material, capital, and venue costs, drug costs in the SSPL are not directly linked to the actual drugs consumed during each service. Instead, they are allocated across all services within a department based on relative production volumes, in line with the cost-price principle. At the departmental level, drug costs are divided into two categories based on their unit price:

1. **High-cost drugs**: Drugs costing SEK 1,200 or more per treatment occasion are excluded from the SSPL tariffs for drug administration. These are treated as patient-specific costs and listed separately under "dyrare läkemedel" in the SSPL (3).
2. **Other drugs**: For drugs costing less than SEK 1,200 per treatment occasion, total annual drug costs are pooled and distributed across all healthcare services within the department according to their relative production volumes. This allocation method results in services with higher production volumes receiving a proportionally larger share of the costs. The cost per service is then calculated as follows:

$$\text{Cost per service} = \frac{\text{Total annual drug costs} \times \text{W}_{service_i}}{\text{Total annual production volume of service } i} \quad (4)$$

$$\text{where } \text{W}_{service_i} = \frac{\text{Annual production volume of service } i}{\text{Total annual production volume in the department}}$$

Drug costs for administration vary substantially both across administration routes within the same department and for the same route across different departments; see Table 5. This variation reflects the SSPL's allocation method rather than actual drug-specific consumption. For instance, in the hematology department, IV administration incurs higher allocated drug costs (SEK 4,535) compared to SC administration (SEK 3,643), reflecting its larger relative production volume rather than a higher cost of SC drugs.

Table 5: Drug costs for drug administration (2024 SSPL)

KVÅ code	Administration route	Department	Drug costs (SEK)
DT012	Subcutaneous	Hematology	3,643
DT016	Intravenous	Hematology	4,535
		Cardiology	4,069
		Neurology	713

Notes: Drug costs were provided by the Contract Group (Avtalsgruppen) during interviews. These costs include only "non-high-cost drugs" i.e., drugs costing less than SEK 1,200 per treatment occasion.

4.1.3 Tariff composition

Building on the detailed cost category analysis presented in Section 4.1.2, this section illustrates the proportional contribution of each cost component to the overall tariffs for drug administration. The findings from the semi-structured interviews with representatives from the Southern Healthcare Region's Contract Group are presented in Figure 1, showing the breakdown of drug administration costs for the two administration routes (SC and IV). For a detailed numerical breakdown of these tariffs, see Table A1 in the appendix.

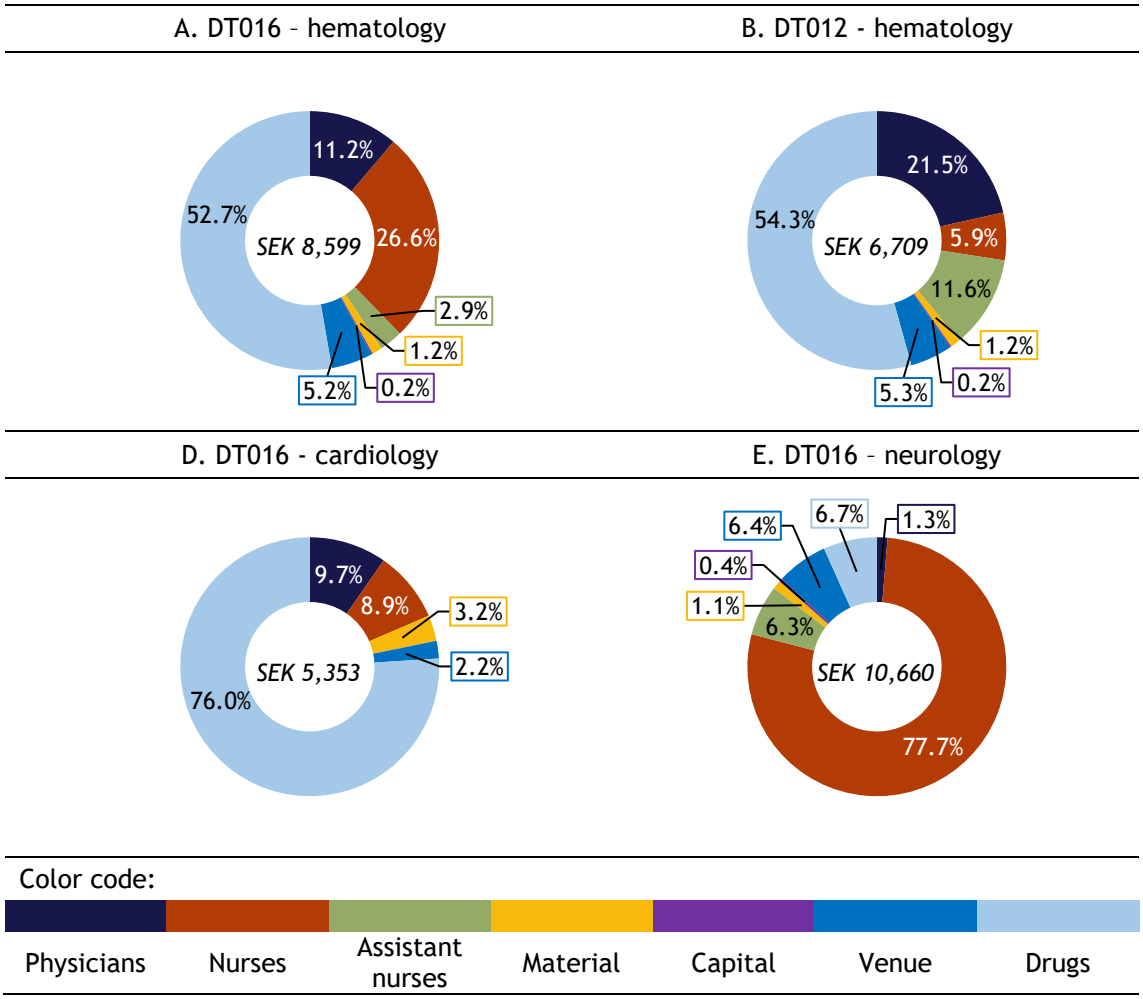


Figure 1: Proportional breakdown of cost components for drug administration in the 2024 SSPL by department and administration route

Notes: DT012 = subcutaneous (SC) drug administration. DT016 = intravenous (IV) drug administration. Tariffs for drug administration are presented within the circle diagrams and are sourced from the 2024 Southern Healthcare Region's Price List (Södra sjukvårdsregionens prislista, SSPL) (3). Calculations are based on cost allocation principles provided by the Contract Group (Avtalsgruppen) during interviews.

The interviews revealed that, although the five cost components presented in Section 4.1.1 collectively form the basis of all drug administration tariffs, their proportional contribution to the tariffs varies significantly by administration route and department; see Figure 1. As noted earlier, contributing factors to this variability include differences in required resources, total departmental productivity, and volume of drug administration (i.e., the number of drug administrations performed annually).

Personnel costs represent one of the primary cost components of drug administration tariffs in the 2024 SSPL; see Figure 1. These costs are assigned to physicians, nurses, and assistant nurses, when applicable, across two drug administration routes (SC and IV) and three departments (hematology, cardiology, and neurology). For IV drug administration (DT016), they constitute approximately 19% in the cardiology department, 41% in hematology, and 85% in neurology. For SC drug administration (DT012), they constitute about 39% of the tariff in the hematology department.

Material, capital, and venue costs constitute a relatively small share of the drug administration tariffs in the 2024 SSPL; see Figure 1. For IV drug administration (DT016), they constitute

approximately 5.4% in the cardiology department, 6.6% in hematology, and 7.9% in neurology. For SC drug administration (DT012) in the hematology department, these costs constitute 6.7%.

Drug costs represent the final and often most substantial cost component of drug administration tariffs in the 2024 SSPL; see Figure 1. For IV drug administration (DT016), they constitute approximately 7% in the neurology department, 53% in hematology, and 76% in cardiology. For SC drug administration (DT012) at the hematology department, these costs account for approximately 54%.

4.2 Healthcare personnel interviews

4.2.1 Drug administration workflow and personnel roles

Interviews with healthcare personnel across four departments — cardiology, hematology, neurology, and oncology — confirmed a standardized workflow for drug administration that is applicable to both IV and SC routes in clinical practice. This workflow outlines the roles and responsibilities of physicians, nurses, and assistant nurses across key steps, from patient preparation to follow-up; see Figure 2.

Across all departments, nurses consistently carry the primary responsibility in the drug administration process and are involved in every step. In contrast, the involvement of physicians and assistant nurses is more variable and depends on the complexity of administration and whether it is a first or subsequent administration; see Section 4.2.2. In other words, the inclusion of physicians and assistant nurses in Figure 2 reflects their roles in drug administration when they are involved, rather than universal participation across all departments.

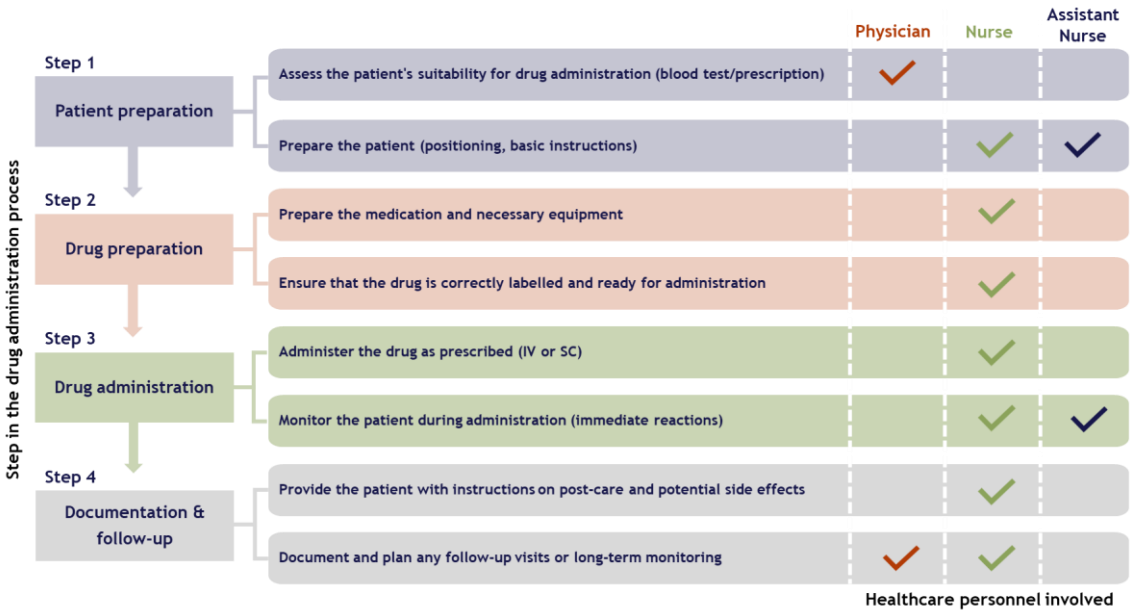


Figure 2: Overview of drug administration workflow and role distribution

Notes: IV = intravenous, SC = subcutaneous. The workflow and responsibilities were validated during interviews by healthcare personnel across four departments: cardiology and neurology at Lund University Hospital, hematology at Malmö University Hospital, and oncology at Växjö Central Hospital. The involvement of physicians and assistant nurses varies by department, administration complexity, and treatment occasion (first vs. subsequent administrations) and is shown based on their roles when involved.

4.2.2 Department-specific personnel time allocation for drug administration

This section presents the total personnel time[6] required for IV and SC drug administration across four hospital departments, based on data obtained from interviews with healthcare personnel. The focus is on variations by drug administration complexity (simple vs. complex) and administration occasion (first vs. subsequent). A detailed breakdown by department, including time allocation by individual staff categories and specific steps in the administration process, is presented in the appendix (see Figure A1-A4).

Summary of main findings

Total personnel time for IV administration (see Figure 3-6)**:**

- For simple administrations, the total time ranges from 43 minutes (cardiology) to 120 minutes (neurology) for first administrations and from 29 minutes (cardiology) to 90 minutes (neurology) for subsequent administrations.
- For complex administrations, the time ranges from 90 minutes (hematology) to 195 minutes (neurology) for first administrations and from 70 minutes (hematology) to 165 minutes (neurology) for subsequent administrations.

Total personnel time for SC administration (see Figure 3-6)**:**

- For simple administrations, the total time ranges from 16 minutes (cardiology) to 140 minutes (neurology) for first administrations and from 16 minutes (cardiology) to 80 minutes (neurology) for subsequent administrations.
- For complex administrations, the time ranges from 20 minutes (cardiology) to 210 minutes (neurology) for first administrations and from 18 minutes (cardiology) to 105 minutes (neurology) for subsequent administrations.

Overall, complex drug administrations consistently require more personnel time than simple administrations across all departments, and first administrations generally require more time than subsequent administrations.[7]

Detailed findings from interviews (see Figure A1-A4 in the appendix):

- Nurses account for the majority of personnel time across all departments, independent of administration route, drug complexity, and administration occasion.
- Physicians are primarily involved in initial patient assessments and documentation, with limited involvement in the actual administration process.
- Assistant nurses are rarely involved and have a limited role when they are included.

[6] Personnel time refers to the total time personnel are actively involved throughout the administration process (see Figure 2), not the technical infusion or injection time as specified in product labeling (often referred to as “chair time” in clinical settings).

[7] The IV and SC examples presented here do not represent the same drug, and thus these results should not be interpreted as a direct head-to-head comparison. However, interviews indicate that SC administration can sometimes demand more total personnel time than IV administration because personnel must remain present for the entire SC injection. By contrast, once an IV infusion is initiated, they can attend to other tasks. Hence, as observed in neurology (Figure 5) and oncology (Figure 6), total personnel involvement can at times be higher for SC than IV, particularly for first administrations.

In addition to the main findings, the interviews with healthcare personnel provided some additional observations regarding the administration of SC and oral treatments, which, although outside the primary scope of this study, offer relevant perspectives. These observations are discussed further in Section 5.

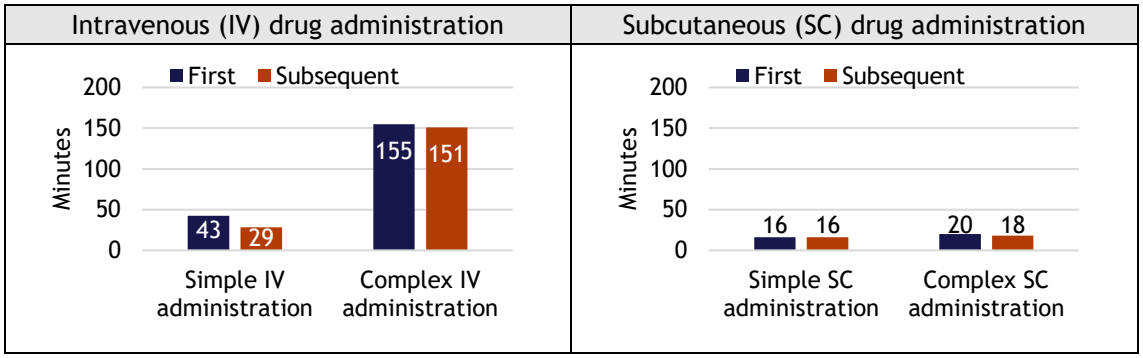


Figure 3: Total personnel time for IV and SC drug administration in the cardiology department

Notes: Data were obtained from interviews with healthcare personnel at the cardiology department of Lund University Hospital. Time reflects the duration required for simple and complex administrations, distinguishing between first and subsequent administrations. See Figure A1 in the Appendix for detailed time allocation by individual staff categories and specific steps in the administration process.

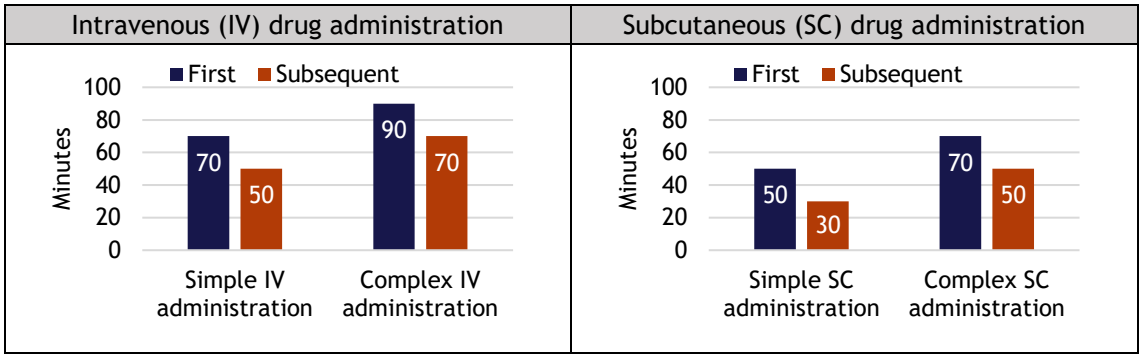


Figure 4: Total personnel time for IV and SC drug administration in the hematology department

Notes: Data were obtained from interviews with healthcare personnel at the hematology department of Malmö University Hospital. Time reflects the duration required for simple and complex administrations, distinguishing between first and subsequent administrations. See Figure A2 in the Appendix for detailed time allocation by individual staff categories and specific steps in the administration process.

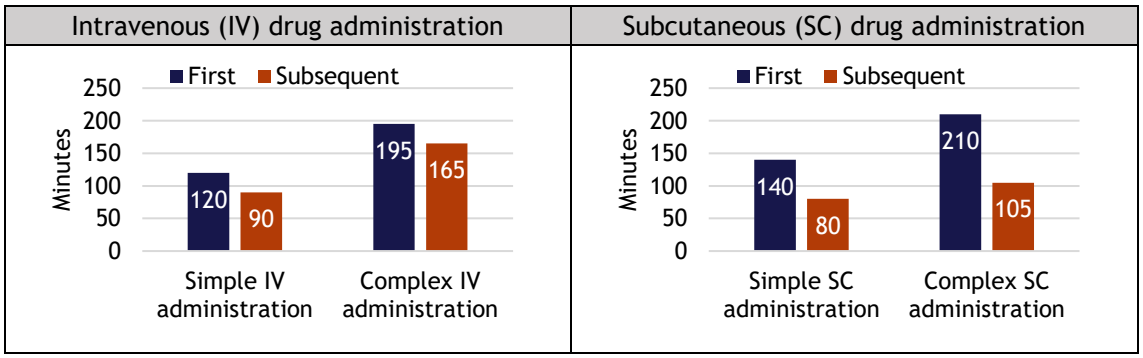


Figure 5: Total personnel time for IV and SC drug administration in the neurology department

Notes: Data were obtained from interviews with healthcare personnel at the neurology department of Lund University Hospital. Time reflects the duration required for simple and complex administrations, distinguishing between first and subsequent administrations. See Figure A3 in the Appendix for detailed time allocation by individual staff categories and specific steps in the administration process.

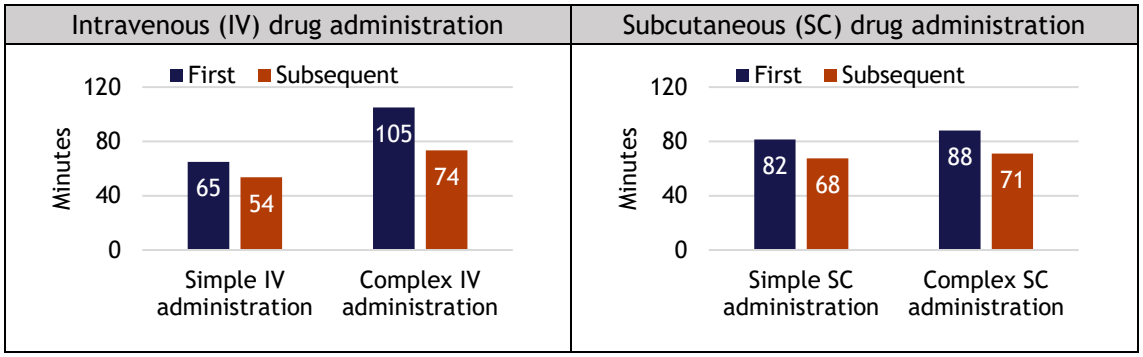


Figure 6: Total personnel time for IV and SC drug administration in the oncology department

Notes: Data were obtained from interviews with healthcare personnel at the oncology department of Växjö Central Hospital. Time reflects the duration required for simple and complex administrations, distinguishing between first and subsequent administrations. See Figure A4 in the Appendix for detailed time allocation by individual staff categories and specific steps in the administration process.

4.3 Alternative costing approaches

This section presents an illustrative comparison of three alternative approaches for estimating annual IV drug administration costs per patient: the unadjusted tariff approach, the adjusted tariff approach, and the marginal cost approach. The case of IV drug administration at the hematology department is used to demonstrate how each approach translates into different cost estimates under a standardized annual treatment scenario: a patient receives IV drug administration every four weeks for 12 months, assuming no discontinuation due to toxicity or disease progression. For clarification on the calculation methodology, see Appendix (Table A2).

Unadjusted tariff approach

The unadjusted tariff approach applies the SSPL tariff for IV drug administration without modifications. Since the SSPL tariff does not differentiate between administration complexity (simple vs. complex) or treatment occasion (first vs. subsequent administrations), the cost per IV administration for the hematology department remains fixed at SEK 8,599 irrespective of which IV drug is administered. Under the assumed treatment scenario, the annual administration cost per patient amounts to SEK 111,783 (Figure 7).

Adjusted tariff approach

To align more closely with standard HE evaluation practices, this approach adjusts the SSPL tariff by excluding drug costs, which are typically modeled separately. The goal is to focus more closely on the costs associated with delivering the administration rather than the drug itself. By removing the department-specific drug cost component, the adjusted cost per IV administration is SEK 4,064, resulting in an annual administration cost per patient of SEK 52,833 (Figure 7). This represents a reduction of approximately 53% compared to the unadjusted tariff approach, highlighting the inflationary impact of including drug costs within the tariff.

Marginal cost approach

This approach applies a micro-costing method focused solely on variable costs and reflects the economic principle of marginal cost. In the context of drug administration, this refers to time-related personnel costs and the material costs incurred before, during, and after each administration. Unlike the two previous approaches, it is entirely independent of the SSPL tariff structure. Inputs are based on direct personnel time and material use in clinical practice.

The cost per administration was calculated by summing personnel and material costs. Personnel costs were derived by multiplying the estimated time per staff category (see Figure A2, Panel A) by wage-based unit costs per minute (see Table 2). Material costs were based on regional procurement prices for all consumables used before, during, and after administration (see Table 2). A detailed breakdown of the marginal cost calculations is presented in the Appendix (see Table A2).

For simple IV administration, the cost per first administration is approximately SEK 638, while the cost per subsequent administration is SEK 397. For complex IV administration, the cost per first administration is approximately SEK 765, and the cost per subsequent administration is about SEK 523. Assuming one first administration followed by twelve subsequent administrations annually, the total annual administration cost per patient is SEK 5,397 for simple administrations and SEK 7,046 for complex administrations (Figure 7).

These estimates are substantially lower than those produced by the tariff-based approaches. Depending on whether the administration is simple or complex, the marginal cost approach accounts for approximately 5–6% of the unadjusted tariff's annual cost and 10–13% of the adjusted tariff's cost. While the exclusion of fixed costs contributes to this difference, the primary driver is the use of micro-costing, which captures only direct resource inputs. The SSPL tariffs reflect a full-cost recovery model that allocates all departmental expenses — including administrative overhead, downtime, and indirect activities — across services. In contrast, the marginal cost approach isolates the specific economic cost of delivering an additional administration. This difference in input structure and cost attribution drives the observed divergence between approaches.

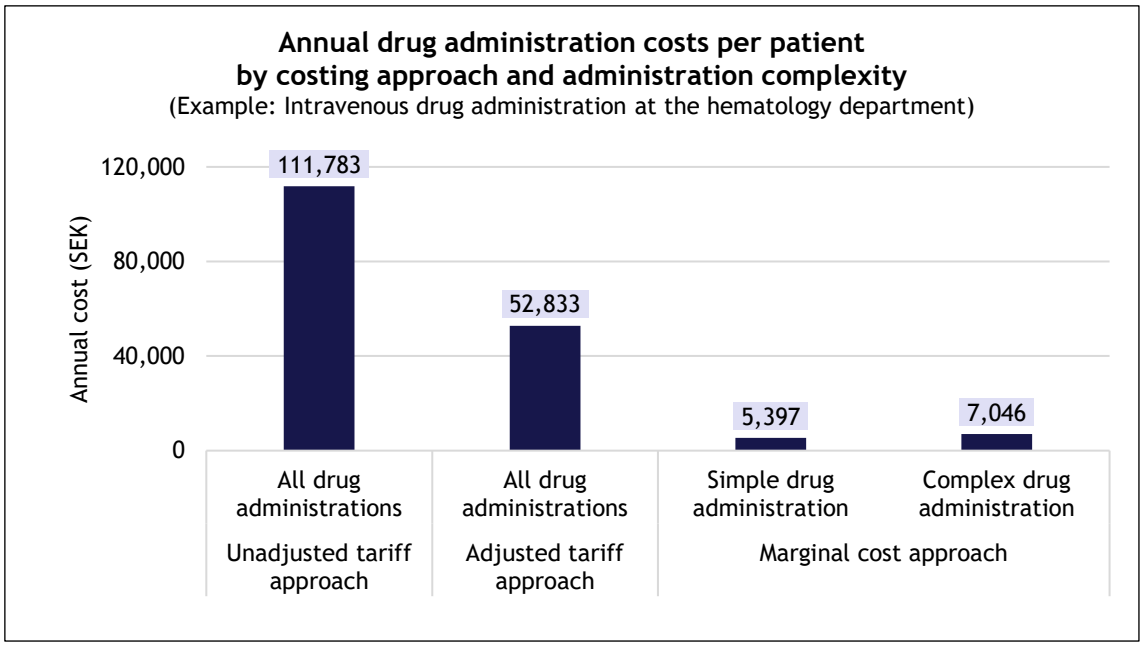


Figure 7: Annual administration costs per patient for IV drug administration using different costing approaches (SEK, 2024 prices)

Notes: The cost estimates for the unadjusted and adjusted tariff approaches are based on the 2024 Southern Healthcare Region's Price List (SSPL) for intravenous (IV) drug administration at the hematology department, supplemented by insights from interviews with the Contract Group (Avtalsgruppen) (Section 4.1). The marginal cost estimates are based on clinical time data obtained from interviews with healthcare personnel at the hematology department of Malmö University Hospital (Figure A2), combined with wage statistics from Statistics Sweden and material prices from regional procurement data (Table 2). For a detailed breakdown of inputs and calculations, see Table A2 in the Appendix.

5. Discussion

Health economic evaluations rely on accurate and representative cost inputs to inform sound reimbursement decisions. However, many evaluations still rely on tariffs designed for accounting and budgeting — not for capturing the true economic cost of delivering services. This study illustrates how different costing approaches can yield vastly different results, and why the choice of method matters.

The findings of this study suggest that tariff-based estimates for drug administration costs, as provided in the SSPL, do not accurately reflect real-world resource use in clinical practice and may therefore not serve as adequate proxies for economic costs in HE evaluations. This calls into question the continued use of SSPL tariffs as direct cost inputs in economic models intended to inform healthcare decisions.

Limitations of using SSPL tariffs in HE evaluations

A fundamental limitation of using SSPL tariffs in HE evaluations is that they were not designed to capture the true economic cost of individual healthcare services. Instead, they follow the cost-price principle, aiming to ensure that total revenues cover total operational costs at hospital departments across all provided services, not the actual resource use of each service.

For example, this study identified a significant mismatch between personnel costs in the SSPL tariffs and actual wage costs. While the 2024 wage cost for a physician per minute, including social contributions, is approximately SEK 12, the SSPL assigns a cost per minute of SEK 26 in cardiology, SEK 32 in hematology, and SEK 71 in neurology. These variations reflect the SSPL's cost allocation principles, which distribute personnel costs based on total annual departmental costs and production volumes rather than actual wage levels. Consequently, departments with lower production volumes report higher costs per minute, potentially leading to distorted cost estimates in HE evaluations. In addition, because all departmental costs, including administrative overhead and non-service-specific activities, must be fully allocated, SSPL tariffs include a mix of direct and indirect costs. This means that the reported costs per administration do not represent the marginal resource use required but instead reflect an average distribution of total department-level expenses.

Another critical limitation is the inclusion of drug costs within the administration tariffs. The analysis found that drug costs accounted for up to 76% of the SSPL's total administration costs. Since HE evaluations typically account for drug costs separately, the use of unadjusted SSPL tariffs risks double-counting and substantially inflated cost estimates. Adjusting the tariff by excluding drug costs partially mitigates this issue; however, this approach requires access to micro-level data on the annual SSPL, which are not publicly available.

The lack of granularity in the SSPL tariffs further complicates their use in HE evaluations. The SSPL's standardized time estimates for IV drug administration across hospital departments (60-130 minutes) significantly diverge from the real-world range (29-195 minutes) obtained from healthcare personnel interviews. Such standardization fails to differentiate between simple versus complex administrations and first versus subsequent administrations. Since first administrations typically involve more preparation and monitoring than subsequent administrations, applying standardized time estimates risks misallocating costs — potentially overestimating costs for simpler or follow-up administrations while underestimating those for more complex or initial treatments.

Importantly, the SSPL provides drug administration tariffs only for hematology, cardiology, and neurology. However, HE evaluations submitted in reimbursement applications to the TLV for oncology drugs often rely on the hematology tariffs (4-7). This practice, by extension, assumes that resource use for drug administration is similar across departments. Findings from this report challenge this assumption. Interviews with healthcare personnel revealed key differences beyond just required personnel time (50–90 minutes in hematology vs. 54–105 minutes in oncology; see Figure A2 and Figure A4). In oncology, physicians were involved in both first and subsequent administrations, whereas in hematology, they were only involved in first administrations. Additionally, assistant nurses — consistently involved in IV administration in hematology — were not involved at all in oncology. Given that personnel costs constitute a major share of drug administration costs, oncology's greater reliance on higher-cost physicians and absence of lower-cost assistant nurses indicates that using hematology tariffs significantly misrepresents actual resource use. Consequently, applying hematology tariffs to oncology introduces entirely unrelated departmental costs, potentially leading to systematically inaccurate cost estimates and misguided reimbursement decisions.

Interviews with healthcare personnel revealed additional insights that suggest further limitations of the SSPL tariffs. At the neurology department, healthcare personnel reported that many SC drugs are administered at the department only for the first administration, after which patients are trained to self-administer at home. This practice indicates that, for certain drugs, applying SSPL tariffs to subsequent administrations in HE evaluations may lead to overestimated costs, as the actual administration step might not occur at the department. Additionally, interviews with healthcare personnel at the oncology department highlighted an intriguing insight: oral treatments often require substantial follow-up and patient support, extending well beyond the act of administration itself. Although this aspect was outside the scope of this analysis, it prompts the question of where these potentially "hidden" costs ultimately get allocated in a tariff system not designed to account for oral treatments. Future attention to this anecdotal input is particularly important for HE evaluations comparing oral, IV, or SC treatments, where oral drugs are typically assumed to carry no administration cost (18).

Implications for health economic evaluations

The findings imply that using unadjusted SSPL tariffs in HE evaluations risks producing inaccurate estimates of resource use and economic costs, which could undermine the reliability of decisions based on these evaluations. A hypothetical analysis of IV drug administration at the hematology department demonstrated that adjusting the SSPL tariffs to exclude drug costs would reduce the annual administration cost by approximately 53% (SEK 52,833 vs. SEK 111,783). Applying a marginal cost approach, which isolates only the additional personnel and material resources used for each administration, reduced the annual cost further to SEK 5,397–7,046 depending on administration complexity.

Importantly, these differences are not driven solely by the exclusion of fixed costs. The marginal cost approach reflects a fundamentally different methodological framework, grounded in economic theory and designed to estimate the true opportunity cost of delivering a healthcare service to one additional patient. Rather than relying on department-level averages that embed indirect, administrative, and unrelated costs (as in the SSPL), it uses micro-costing to capture direct, marginal resource use based on real-world clinical input.

The substantial divergence in cost estimates between approaches underscores the importance of aligning cost inputs more closely with actual resource use to ensure the accuracy and relevance of HE evaluations.

Policy implications

Clearly, the current practice of using unadjusted SSPL tariffs in HE evaluations is inappropriate. At minimum, the adjusted approach offers a partial improvement by excluding drug costs and thereby addressing double-counting concerns, yet it retains significant methodological limitations, including lack of alignment with economic costing principles, limited granularity, and department-specific distortions.

A more methodologically sound and practically relevant alternative is the marginal cost approach. It captures real-world resource use more accurately by using detailed time inputs from clinical personnel directly involved in drug administration. Unlike standardized tariffs, it distinguishes between first and subsequent administrations — a key consideration that standard tariffs fail to capture and one that significantly influences resource requirements. Critically, it aligns with economic theory by isolating costs that vary with each additional administration, avoiding the inclusion of fixed and indirect costs embedded in top-down allocation models. Since HE evaluations inform decisions about resource allocation — such as choosing between drug A and drug B — cost inputs must reflect the true opportunity cost of resources consumed.

Although exploring the impact of a more granular approach to administration costs on the cost-effectiveness ratios of specific interventions was beyond the scope of this study, the findings suggest that incorporating more granular data on resource use could improve the validity of HE evaluations. The marginal cost approach represents a transparent and consistent framework for estimating administration costs in such evaluations. Importantly, this approach reflects a methodological costing principle but does not prescribe a method for collecting the underlying input data. While this study used retrospective interviews with healthcare personnel to derive time estimates for drug administration, other sources such as direct observational methods, time-motion studies, or estimates obtained during clinical development may also be valid depending on context and data availability. Ultimately, some degree of methodological standardization and involvement of clinical staff responsible for drug administration is likely necessary to ensure consistency and credibility in future evaluations.

Improving the accuracy of administration cost estimates also holds value across stakeholder groups. For pharmaceutical companies, it enables more precise cost modeling in reimbursement applications. For HTA bodies and healthcare systems, it supports more valid and equitable comparisons of treatment alternatives and, by extension, better-informed decisions on the allocation of limited resources. For patients, more accurate cost estimates may help enable access to effective treatments in cases where reimbursement decisions are sensitive to cost assumptions. By enhancing the realism and relevance of cost inputs, the marginal cost approach contributes to more informed and transparent healthcare decision-making.

Methodological considerations and limitations

While this study provides valuable insights, some methodological limitations should be acknowledged. First, the reliance on interviews with healthcare personnel for time estimates introduces a degree of subjectivity. Previous research has indicated that the time nurses spend on drug administration can vary significantly depending on individual and contextual factors (19). Direct observational methods or time-motion studies could further validate key findings.

Second, the analysis was limited to the SSPL. Although it is one of the most widely used price lists in Sweden, it is unclear whether similar limitations apply to other tariff systems. Notably, cost estimates from Norway and Denmark appear closer to those of the adjusted SSPL approach, though potential differences or similarities in cost allocation methods remain unknown. Norway uses a standardized unit cost database, with a cost of NOK 3,555 in 2023 (approximately SEK

3,500 in 2024 prices) for IV administration (20), while Denmark employs DRG reimbursement rates based on disease category and department, with IV administration costs ranging from DKK 1,183 (SEK 1,813) to DKK 2,111 (SEK 3,235) in 2024 (21). Future research should examine whether the limitations associated with SSPL tariffs outlined in this report also apply to other publicly available tariff systems, both in Sweden and internationally.

Additionally, the costs associated with preparing IV drugs at hospital pharmacies were not included in this study because interviewees indicated that, in most cases, drugs are prepared directly at the clinic. However, in cases where drugs are prepared at the pharmacy before delivery to the clinic, these costs should be accounted for to provide a more complete estimate of administration costs (22, 23).

It should be noted that this study does not consider potential economies of scale — that is, how the average cost per drug administration might decrease as volume increases. Modeling such effects would require volume projections and broader long-term system-level assumptions, which fall outside the scope of this analysis.

For future research

Further research is warranted to explore the applicability of the marginal cost approach to other healthcare services beyond drug administration. Comparative studies examining different tariff systems within Sweden and across other European countries could help determine whether the limitations observed in the SSPL are more broadly applicable.

Future work could also examine the impact of integrating more granular cost data into HE evaluations, which may help refine the use of tariff-based inputs. Observational methods, such as time-motion studies, could complement interview-based estimates and provide more objective data on personnel involvement in drug administration.

Conclusion

This study demonstrates significant limitations in using unadjusted SSPL tariffs as direct inputs for estimating drug administration costs in HE evaluations. While adjusted tariffs partially mitigate these issues, they still fall short of accurately representing clinical practice and aligning with economic costing principles. The marginal cost approach provides a robust and methodologically sound alternative, incorporating granular data on real-world resource use and aligning directly with economic theory. These findings suggest that more broadly refining tariff-based estimates to better reflect true economic costs could substantially enhance the validity of HE models, ultimately supporting more informed decision-making.

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Appendix

Table A1: Full breakdowns of 2024 SSPL drug administration tariffs

KVÅ code	Administration route	Department	Physician time (min)	Nurse time (min)	Assistant nurse time (min)	Physician cost/min (SEK)	Nurse cost/min (SEK)	Assistant nurse cost/min (SEK)	Total physician cost (SEK)	Total nurse cost (SEK)	Total assistant nurse cost (SEK)	Material cost (SEK)	Capital cost (SEK)	Venue cost (SEK)	Drug cost (SEK)	Tariff
DT012	Subcutaneous	Hematology	45	15	30	32.09	26.56	25.92	1,444	398	778	80	11	355	3,643	6,709
DT016	Intravenous	Hematology	30	90	10	32.09	25.37	25.17	963	2,284	252	106	15	445	4,535	8,599
		Cardiology	20	40	–	25.87	11.90	–	517	476	–	173	–	117	4,069	5,353
		Neurology	2	90	10	70.73	92.06	67.48	141	8,285	675	116	44	686	713	10,660

Notes: Tariffs for drug administration are sourced from the 2024 Southern Healthcare Region's Price List (Södra sjukvårdsregionens prislista, SSPL) (3). Personnel time estimates and cost component data were provided by the Contract Group (Avtalsgruppen) during two semi-structured interviews.

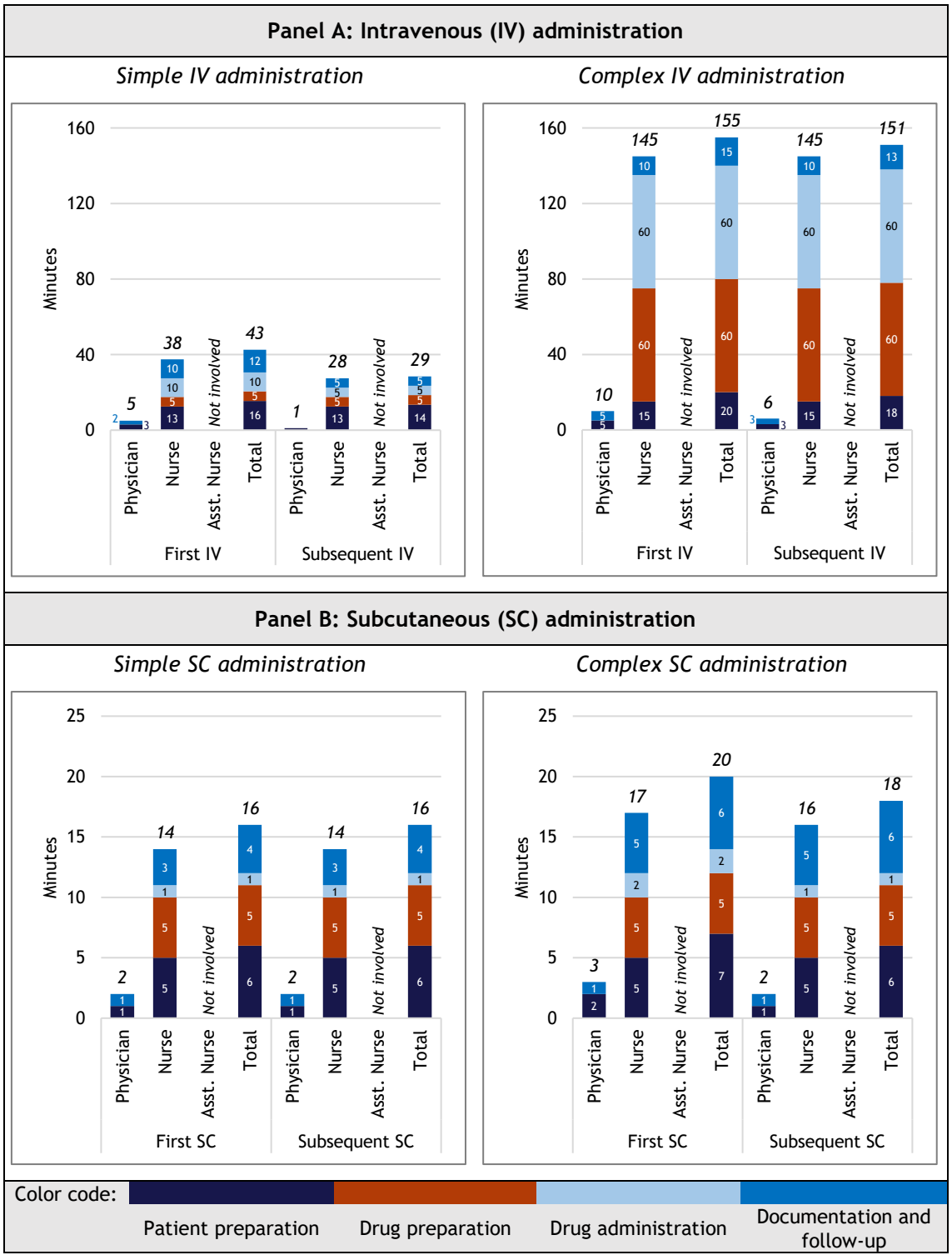

Figure A1: Cardiology personnel time (minutes) allocation for first and subsequent administrations, by administration route and complexity

Notes: Time estimates were obtained from interviews with healthcare personnel at the hematology department of Lund University Hospital. “Simple” and “complex” drug administrations were identified by healthcare personnel prior to the interviews, based on their own clinical experience. See Section 3.3 for methodological details. ”Not involved” indicate cases where the specific staff category was not reported to participate in drug administration at the cardiology department.

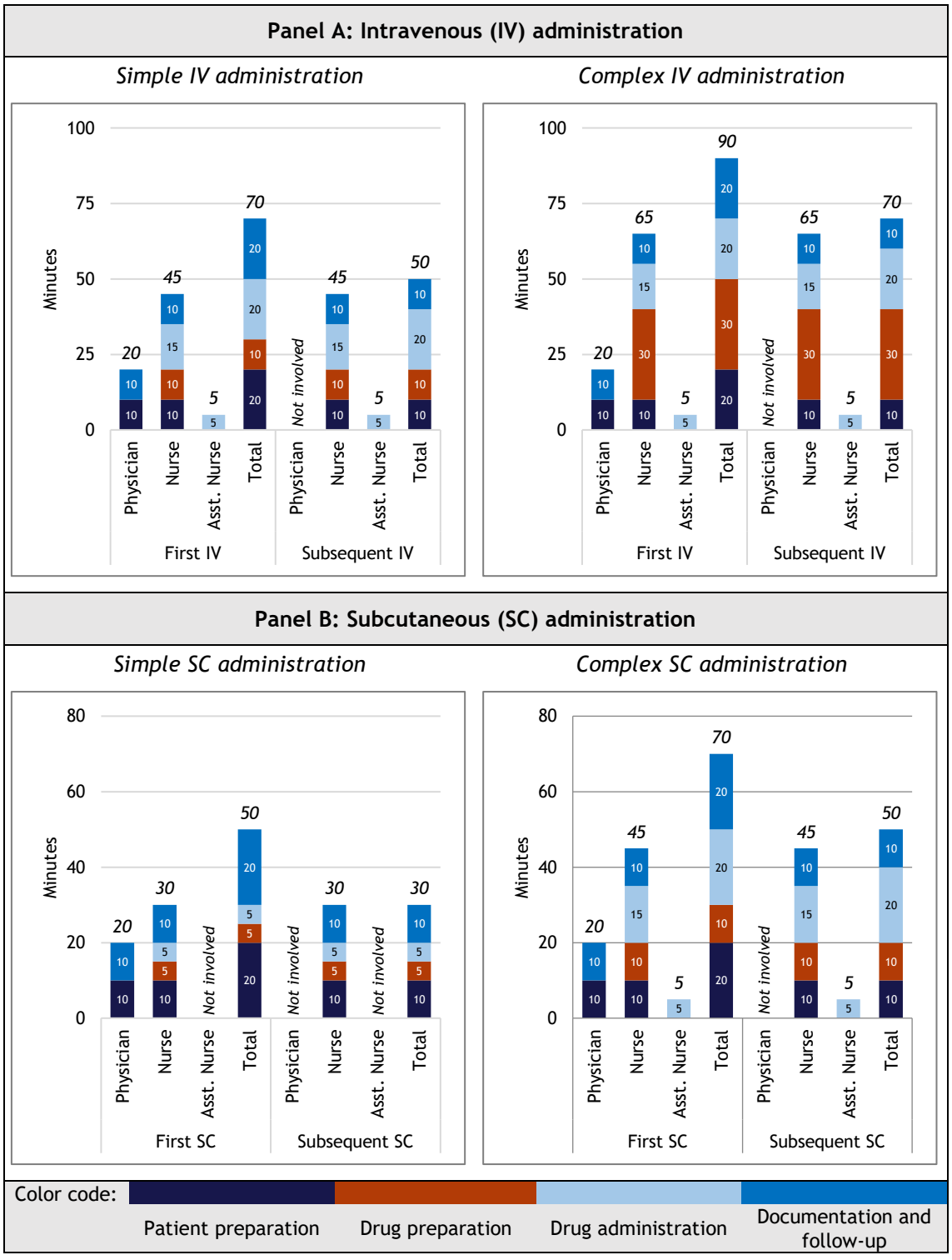

Figure A2: Hematology personnel time (minutes) allocation for first and subsequent administrations, by administration route and complexity

Notes: Time estimates were obtained from interviews with healthcare personnel at the hematology department of Malmö University Hospital. "Simple" and "complex" drug administrations were identified by healthcare personnel prior to the interviews, based on their own clinical experience. See Section 3.3 for methodological details. "Not involved" indicate cases where the specific staff category was not reported to participate in drug administration at the hematology department.

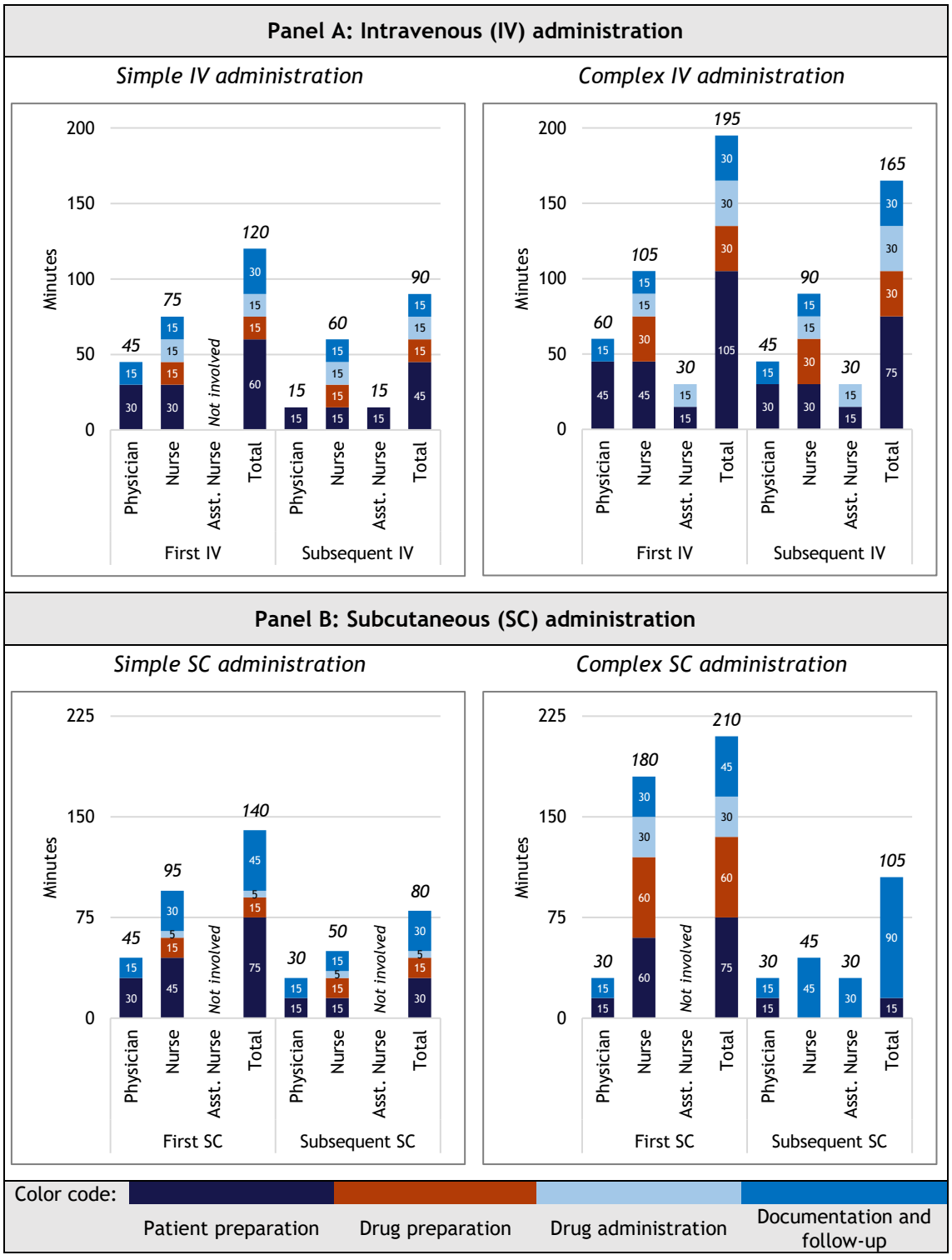

Figure A3: Neurology personnel time (minutes) allocation for first and subsequent administrations, by administration route and complexity

Notes: Time estimates were obtained from interviews with healthcare personnel at the neurology department of Lund University Hospital. “Simple” and “complex” drug administrations were identified by healthcare personnel prior to the interviews, based on their own clinical experience. See Section 3.3 for methodological details. ”Not involved” indicate cases where the specific staff category was not reported to participate in drug administration at the neurology department.

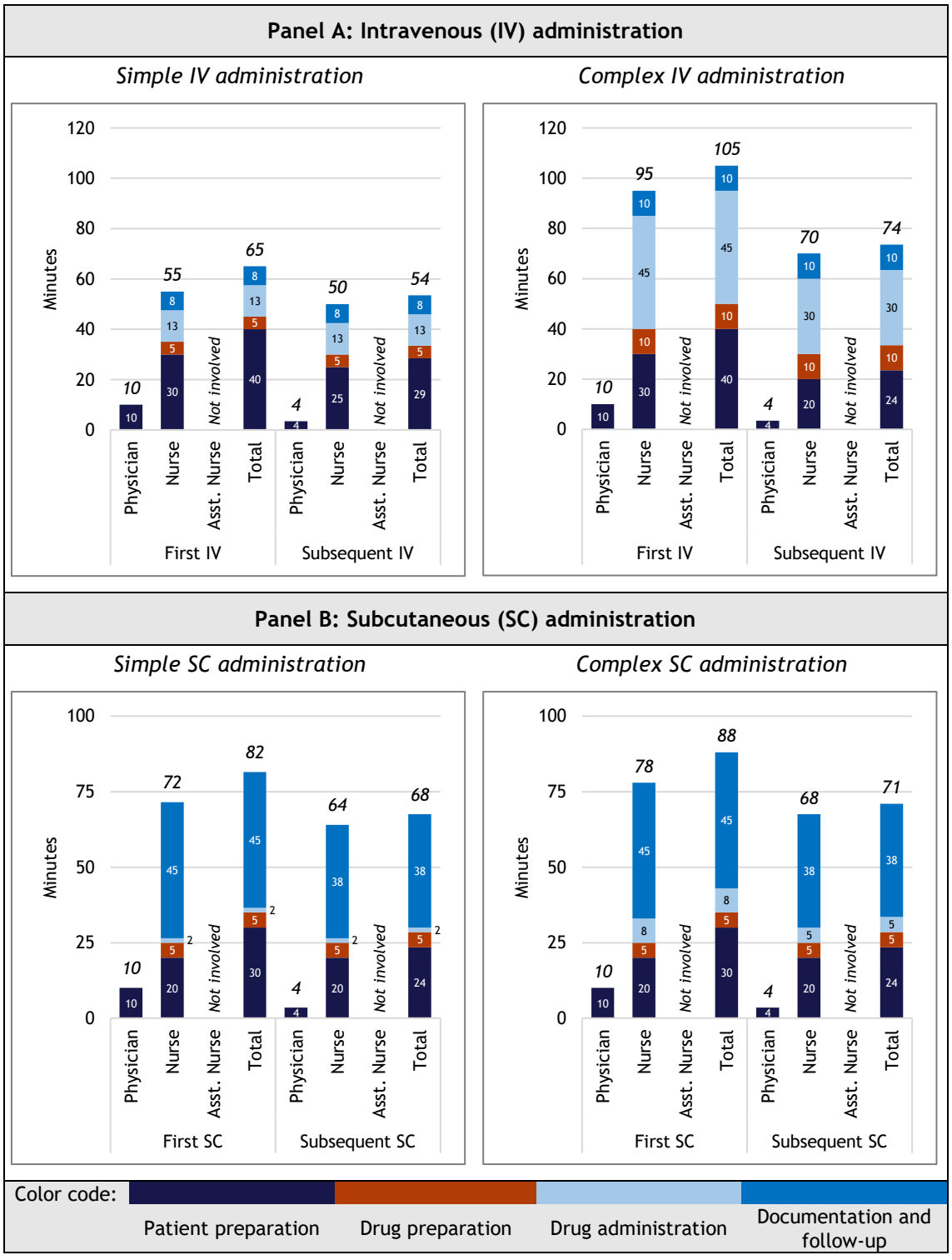

Figure A4: Oncology personnel time (minutes) allocation for first and subsequent administrations, by administration route and complexity

Notes: Time estimates were obtained from interviews with healthcare personnel at the oncology department of Växjö Central Hospital. “Simple” and “complex” drug administrations were identified by healthcare personnel prior to the interviews, based on their own clinical experience. See Section 3.3 for methodological details. ”Not involved” indicate cases where the specific staff category was not reported to participate in drug administration at the oncology department.

Table A2: Detailed breakdown of IV drug administration cost calculations by costing approach

Costing approach	Admin type	Treatment occasion	Physician time (min)	Nurse time (min)	Assistant nurse time (min)	Physician cost/min (SEK)	Nurse cost/min (SEK)	Assistant nurse cost/min (SEK)	Physician cost per admin (SEK)	Nurse cost per admin (SEK)	Assistant nurse cost per admin (SEK)	Total personnel cost per admin (SEK)	Material cost (SEK)	Capital cost (SEK)	Venue cost (SEK)	Drug cost (SEK)	Total cost per admin (SEK)	Total annual admin costs (SEK)
a	b	c	d	e	f	g	h	i	j = *d* × *g*	k = *e* × *h*	l = *f* × *i*	m = *j* + *k* + *l*	n	o	p	q	r = *m* + *n* + *o* + *p* + *q*	s = *(1 × cost of first IV) + (12 × cost of subseq. IVs)*
Unadjusted SSPL tariff approach	All	First IV	30	90	10	32.09	25.37	25.17	963	2,284	252	3,499	106	15	445	4,535	8,599	**111,783**
	All	Subseq. IV	30	90	10	32.09	25.37	25.17	963	2,284	252	3,499	106	15	445	4,535	8,599	
Adjusted SSPL tariff approach	All	First IV	30	90	10	32.09	25.37	25.17	963	2,284	252	3,499	106	15	445	–	4,064	**52,833**
	All	Subseq. IV	30	90	10	32.09	25.37	25.17	963	2,284	252	3,499	106	15	445	–	4,064	
Marginal cost approach	Simple	First IV	20	45	5	12.08	6.34	4.50	242	285	23	549	89	–	–	–	638	**5,397**
	Simple	Subseq. IV	–	45	5	12.08	6.34	4.50	0	285	23	308	89	–	–	–	397	
	Complex	First IV	20	65	5	12.08	6.34	4.50	242	412	23	676	89	–	–	–	765	**7,046**
	Complex	Subseq. IV	0	65	5	12.08	6.34	4.50	0	412	23	435	89	–	–	–	523	

Notes: This table supports the illustrative comparison of costing approaches presented in Section 4.3, based on a standardized treatment scenario in which a patient receives intravenous (IV) drug administration every four weeks for 12 months — that is, one first administration followed by twelve subsequent administrations. Admin = administration; SSPL = Southern Healthcare Region's Price List (Södra sjukvårdsregionens prislista). The unadjusted tariff approach applies the 2024 SSPL tariff for IV drug administration (KVÅ code DT016) at the hematology department without modification, including all cost components — personnel, material, capital, venue and drug — and does not differentiate between simple and complex administrations or between first and subsequent treatment occasions (administrations). The adjusted tariff approach modifies the SSPL tariff by excluding drug costs, which are typically modeled separately in health economic evaluations, while retaining all other cost components. The marginal cost approach is independent of the SSPL and does not rely on any of its cost components. It applies a micro-costing methodology focused exclusively on variable costs that increase with each administration, specifically personnel and material costs. Personnel costs were calculated by multiplying time estimates per staff category (physicians, nurses, assistant nurses) — obtained through interviews with healthcare personnel at the hematology department of Malmö University Hospital (Figure A2) — by wage-based unit costs derived from Statistics Sweden (Table 2). Time estimates reflect real-world variation between simple and complex administrations, and between first and subsequent administrations. Material costs include consumables used before, during, and after administration (e.g., IV sets, gloves, syringes, alcohol wipes), identified from clinical input and costed using regional procurement prices (Table 2). Total annual administration costs were calculated using the formula: (1 × cost of first IV administration) + (12 × cost of subsequent IV administrations). Figures shown here are rounded, whereas exact figures were used in the calculations.

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