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Preamble

This dissertation originates from a joint project of the Alfried Krupp von Bohlen und Halbach Institute for Health Care Management and Research of the University of Duisburg-Essen and Verisk Health Inc. From the side of Verisk Health Inc., Maria Trottmann and Ralph Leonhardt contributed the care burden splitting model, an estimating model based on the data accessible to Verisk Health Inc. For the Institute for Health Care Management under the direction of Professor Jürgen Wasem, the author of this dissertation provided the methodological embedding of the model into the economic background concerning remuneration systems for providers of medical care and the use of competitive elements in health systems through selective contracting. Based on her in-depth analysis of the current collective remuneration system in outpatient medical care in Germany, the author´s share lay also in the development of potential implementation scenarios of the care burden splitting model into the German system of collective and selective remunerations within the statutory health insurance system.

Introduction: Risk Adjustment in Outpatient Medical Care Remuneration – Perspectives in Germany

In Germany as in most countries, risk adjustment up to now has mainly been used between health funds. The aim is to avoid risk selection in order to use competition of health funds to improve efficiency and effectiveness in health care. As a recent development, in 2009 - together with the introduction of the German Health Fund - a morbidity based risk adjustment scheme to distribute resources between the about 180 competing social health funds has been installed.

But in the same year, the reform of the remuneration system of physicians in outpatient care depicted a second field of implementation of risk adjustment in the German social health care system introducing some forms of risk adjustment in this context as well. Changes in morbidity of the patient population have to be measured since then and, fulfilling a long-term claim of physicians, morbidity risk was transferred from physicians to statutory health funds. As legal regulations of the reform left space for interpretation, discussions about purposes and potential implementation fields of risk adjustment in the remuneration system for outpatient medical care have been triggered. An important question from an economic point of view is "Can the remuneration system for outpatient medical care in Germany be improved by including risk adjustment?"

This dissertation tries to enrich the discussion about the role of risk adjustment in the German outpatient remuneration system by providing new methodological solutions in the use of a diagnoses-based classification system as well as an analysis of the conditions for their use under the specific German conditions.

As collective remuneration for outpatient care in Germany is budgeted and its distribution is at least to a considerable degree planned, morbidity orientated risk adjustment could be used to optimize the planning process on all distribution levels and to avoid risk selection by providers. The introduction of selective contracting of funds with provider groups in Germany was aimed at raising efficiency and effectiveness in medical care by using mechanisms of competition (Cassel et al., 2008). In this context risk adjustment can be used to optimize the adjustment of the budgets of collective remuneration. Within selective contracts it can be used to tailor remuneration according to patient and service groups and avoid risk selection strategies by providers, as well. Hence in chapter I an elementary analysis of these possible functions of risk adjustment will be done. Based on a short introduction into remuneration systems for medical care in general, the role of risk adjustment in the

construction of payment blends will be analyzed. Additionally, the function of the use of selective contracts on medical markets as well as the conditions for its economic success will be outlined.

In order to provide a foundation for the development of reform options, in chapter 2 the actual collective remuneration system for outpatient medical care in Germany will be analyzed with a special focus on the degree of risk adjustment used in it.

Morbidity based risk adjustment has been used in the past to calculate the expected total costs for a defined patient population. To this end, a patient's health care expenditure is commonly related to personal characteristics like age, sex and observable information about health status. However, a risk adjustment system that is used for the distribution of remuneration between groups of providers, groups of services or (eventually) singular physician practices needs to be more differentiated. Specifically, it needs to identify how much of a person's health risk is attributable to a specific group of providers, a group of services or a singular physician, respectively. Depending on the model's application, it might be useful that the risk measures of one individual patient sum up to his or her total risk measure with respect to total health care expenditure. In chapter 3, a model will be developed that is qualified for these additional tasks, the care burden splitting model.

Building up on the analysis of the German outpatient remuneration system in chapter 2 and on the model developed in chapter 3, in chapter 4 central potential fields of implementation of risk adjustment into this system will be discussed focusing on implementations of the care burden splitting model. In a first step it will be analyzed, in how far the implementation of risk adjustment could make sense for purposes of selective contracting leaving the collective remuneration system unattached. This will include the analysis of potential inconsistencies and problems to be solved for consistent solutions. In a second step the introduction of additional elements of risk adjustment into the collective remuneration system itself will be discussed in order to reach efficient and effective medical care appropriate to the needs of patients. Basing on this a set of recommendations will be developed how to implement a remuneration system using risk adjustment as a tool for a competition avoiding risk selection on the provider market and for a need-related distribution of remuneration.

1 Organizing Markets of Medical Care – Why Risk Adjustment is Necessary

Markets for medical care have special characteristics which in most countries have led to the decision to apply strong regulations in order to reach the goals of their health policy. Information asymmetries on the markets for health insurance as well as medical care itself are one main aspect of difference in comparison to the neoclassical market model and do not allow to reach optimal allocation of resources by unregulated market mechanisms (Rice, 2004). At the same time these information asymmetries have an important impact on the outcome of remuneration systems used on these markets. In the first section of this chapter main types of remuneration systems will be outlined, analyzing their function in the special markets for outpatient medical care and the role of risk adjustment in the construction of remuneration systems. In a second section a focus will be set on attempts nevertheless to use competitive mechanisms in regulated health care markets by adding possibilities of selective contracting to traditional collective systems of organization and remuneration of outpatient medical care. Analyzing the conditions for successful use of collective contracting, the dual function of risk adjustment for selective contracting will be worked out.

1.1 Remuneration Systems on Markets of (Outpatient) Medical Care: The Function of Risk Adjustment in the Construction of Payment Blends

Remuneration systems for outpatient medical care have to be customized to the special conditions of medical markets. Therefore important market characteristics will be described in section 1. After analyzing the potential and the mode of functioning of the main theoretical forms of remuneration on these markets in section 2, in section 3 the role of risk adjustment in the construction of appropriate payment blends will be discussed.

1.1.1 Markets for (Outpatient) Medical Care and the Role of Physicians

As already mentioned above in relation to neoclassical economic models, one main difference between medical care and other services is the large degree of asymmetric information between the buyer (the patient) and the seller (the physician). Patients as buyers do not know how they will benefit from medical care and therefore delegate the decision making authority to physicians (Arrow 1963). Whereas patients know best the additional benefit they achieve by reaching a better personal health status, physicians are far better informed about the function of health production, in other words about the effect of different methods and quantities of medical care on patient´s health status (Hurley, 2000). In consequence, physicians as sellers have a strong degree of control over the types and quantities of medical services exchanged.

One appropriate model for the analysis of this kind of situation is the principal-agent-theory. It tries to explain the relationship between a principal (mandating the agent to act in his interest) and an agent executing this task but being driven by own interests (Picot, Dietl, & Franck, 2002). From this point of view, the patient can be seen as a principal authorizing the physician as his agent to choose an optimal treatment to achieve a better health status.

In economic theory, there have been various attempts to explain physician behaviour on markets for medical care. In these models, the maximization of income as motivation for medical supply is supplemented with other motives of physicians like e.g. special ethical aims, the need for leisure time, reputation, need of patients in different ways and combinations (Scott, 2000). But with the income maximization motive playing a major role in most models[1], as sellers, the personal interests of physicians naturally lie in exchanging large quantities of highly profitable services. If the most profitable set of services does not equal the one that serves the patient best, a conflict of interest arises between the interests of principal and agent that has possible adverse consequences both on the effectiveness of and the expenditures for medical care. It may be expressed in the phenomenon of physician-induced demand, defined as a situation that "the physician influences a patient´s demand for care against the physician´s interpretation of the best interest of the patient" (McGuire, 2000).

1.1.2 Remuneration Models: Ingredients for Payment Blends

Broadly speaking, physician remuneration systems should follow two main goals: to promote efficient levels and types of health care services and to be fair to providers (Ellis and McGuire 1993). Hence a remuneration system should set incentives to generate services according to the needs of patients and doing this accounting for regional aspects and aspects of necessity of special provider groups. Acknowledged needs of patients should be satisfied in the most effective and efficient way. In contrast, the aim of fairness to providers cannot be operationalized so easily. As a minimum condition providers should be treated equally within the same remuneration system under equal conditions concerning costs and effectiveness.

Regarding the specific features of markets for medical care, the choice of elements for a remuneration system must take into account the possible phenomenon of supply- or physician-induced demand, whatever form it may take depending on the incentives set by the respective form of remuneration. In this way it should avoid over- or underprovision of medical services related to the need of patients.

[1] One exception to this is the so called „target-income" theory, a behavioral theory relating supply decisions of physicians to the aim of accessing a defined level of income rather than of its maximization (McGuire 2000).

Relating to the assessment base for the calculation of payments there are the following main types of remuneration (see e.g. (Amelung & Zahn 2009)):

1. Fee-for-service payments

   Each medical service unit is paid for separately. Taking into account mechanisms of supplier-induced demand, this form of remuneration can lead to inappropriately high quantities of services and hence reduce efficiency and effectiveness. In Germany fee-for-service payments are used in the GOÄ (Gebührenordnung für Ärzte) for services rendered to patients outside the social health insurance system. A considerable amount of fees of the EBM (Einheitlicher Bewertungsmaßstab or Uniform Value Scale, see subsection 2.1.2 for more information) are related to singular physician services as well.

2. Lump-sum payment

   Lump-sum payments are designed to cover all services rendered in a singular case within a defined period. The case can be defined by a special diagnosis (like diagnosis-related groups in inpatient remuneration in Germany) or may relate to the whole patient population of a medical provider group. The extent of included services can be different. It may cover most services for a patient (like e.g. lump-sum payments for general practitioners for a three month period in the EBM[2]), or it can refer only to a treatment complex (like e.g. lump sum payment in the EBM for the treatment complex of coloscopy in cancer prevention[3]). The sum paid for each case is set prospectively (Janus, Amelung, & Voss 2007). Assessing this payment system for potential effects of supplier-induced demand, it can lead to an unnecessary increase of cases and on the other hand to under-provision of medical care within the case definition (e.g. reducing the treatment effort for a diagnosis within the basis period of the lump-sum payment). Additionally, risk selection strategies can be attractive for medical providers when remunerated by lump-sum payment: patients needing less care within a case group could be preferred by physicians as they will cause them less effort.

3. Capitation

   Capitation payments relate remuneration to the enrollment of a patient in a practice independent of the amount of services he or she may receive in the enrollment period. They are fixed in advance and not dependent on the quantity provided. By this they mitigate the problem of incentives to produce additional cases and/or singular services. Hence they have enjoyed rapid growth notably in the US but also in other countries around the globe (Rice & Smith, 1999). Rather than earning more for each additional service, physicians gain surpluses if their care is less expensive than predicted – so incentives are set towards more efficiency

[2] EBM No. 03110-03112.

[3] EBM No. 01741.

and effectiveness of care. But costs can also be avoided by rendering less services or services of lower quality than needed by the patient (Rosenbrock & Gerlinger, 2006). Even more pronounced than in case of lump-sum payment, the downside of such a system is that it can be profitable for the physician to avoid severely ill patients or to attract more healthy ones (risk selection). Furthermore, if the same capitation is paid for healthy patients and the severely ill, physicians are held responsible for variation in health care expenditure that is beyond their control.

4. Fixum by time

   This form of payment (for instance a monthly salary) avoids incentives towards an increase of patients, cases or singular services based on the aim of income maximization. On the other hand it may set incentives towards underprovision of medical services or quality-reduction, if the physician has a strong preference e.g. for leisure time. In so far the appropriateness of medical services is strongly related to the internal motivation of the physician and to the control mechanisms installed by a potential employer/salary payer.

5. Pay-for-performance (P4P)

   In the last years, pay-for-performance has been discussed as an element enhancing the quality of medical care instead of focussing on quantity aspects. Hence its aim is to relate "payment to one or several measures which are based on individual or group performance" (Amelung & Zahn 2009). When using P4P, decisions about what to measure and how to measure have to be taken. Performance goals can be defined as aspects of medical success, patient satisfaction or economic efficiency. According to the widely acknowledged systematic of Donabedian, quality of medical care can be measured by parameters of outcome, of the process of care or of by structural parameters mainly characterizing the input of medical care like e.g. medical qualification (Donabedian 1966). Measurement can take place on the level of an individual or of a group of medical care givers. Performance can be measured related to an absolute quantitative goal, a relative quantitative goal (best achievers in a time period, relatively to another time period, in relation to a control group) or as a combination of these methods (Amelung & Zahn 2009). Especially when using parameters of performance closely related to medical or even economic outcome, the question of other influences than medical provider activity like e.g. patient compliance arises. That is why P4P is mostly applied in combination with other remuneration forms. Incentives for physician-induced demand or risk-selection seem to depend on the form of P4P-payments and how they are linked to other remuneration forms. Quality-related medical outcome-parameters for example could set incentives for the most appropriate provision of services to patient groups with high compliance but for risk selection excluding patients with low compliance. Incentives of structural quality parameters as another example depend on their link to a main

remuneration form – when e.g. combined with fee-for-service, they may well work towards overprovision of medical services.

As incentives of all types of remuneration, as already explained above, may lead to undesirable effects concerning over- or underprovision of medical care, most remuneration systems combine several elements. This can be done on the same system level (e.g. as a remuneration system for individual providers combining lump-sum payments and fee-for-service), or on different system levels (e.g. combining capitations on the region level with fee-for-service payments on the level of the individual provider).

1.1.3 Constructing Payment Blends: the Role of Risk Adjustment

As addressed in subsection 1.1.2, individual forms of remuneration may have undesirable effects concerning the quantity and quality of medical care provision. Most remuneration systems solve this problem by combining different traditional forms and, when inclined to innovation, enriching the system with elements of P4P. As a pure fee-for-service system is known to tend to overprovision of medical services and a fixum per time may have the opposite effect, elements of either lump-sum payments or capitation are mostly part of complex remuneration systems in medical care.

But – as already outlined in subsection 1.1.2. - most variants of lump-sum-payments and capitation systems are confronted with a problem already known from regulated health insurance markets without risk-related premia: risk-selection. Rather than earning more for each additional service as in fee-for-service systems, physicians gain surpluses if their care is less expensive than predicted. So it may be more profitable for them to treat less severely ill patients needing less medical care. In P4P – systems, especially those linked to outcome, risk selection can be profitable, too, in order to get patients with higher probabilities to reach given performance criteria in their group.

The answer to risk selection strategies, similar to competitive health insurance systems (Van de Wen & Ellis, 2000), is an effective system of risk adjustment, making it more profitable for physicians to invest into effective care for different patient groups than into risk selection strategies (Shen & Ellis, 2002).

Risk selection of providers in prospective remuneration systems using lump-sum payments or capitation stems from differences in expected costs across patients. So, for example, when receiving

a capitation for each patient enrolled in his practice for a period, the physician is interested in patients for which he expects a relatively low demand for medical services during this time. Because of that, risk adjustment tries to differentiate capitations according to the morbidity risk of the patients. As an effect, the physician will receive a higher capitation for a patient with a high risk of need for medical care than for a patient with a lower risk. Risk estimation can be done based on different criteria: demographic characteristics like age and gender, past utilization of services as medical care itself or e.g. pharmaceutical consumption, medical diagnoses, socio-economic features. Though prior year expenditures of a person seem to be the best single predictor of her future cost of medical care (Van de Wen & Ellis, 2000), there are arguments concerning undesirable incentives of using it for risk adjustment.[4] This induced the development of prediction models for costs of medical care based on demography and the classification of medical diagnoses, sometimes supplemented by parameters of pharmaceutical consumption. These models relate the costs of a period to risk groups of the classification system. Cost weights calculated in this way using past data can be used to predict future costs of medical care basing predictions on actual patient diagnoses.[5]

Thus, using morbidity based risk adjustment to calculate capitations as well as different types of lump-sum payments based on predicted future costs will help to reduce risk selection strategies that stem from morbidity risks, because a considerable part of the predictable risk of need for medical care can be included into the calculation of prospective remuneration systems. The use of additional socio-economic criteria might further reduce risk selection possibilities, but at least in Germany there are considerable problems to obtain appropriate data. Outcome-oriented P4P-payments could as well be systematically adjusted to the morbidity risks of patients by predicting treatment success using a morbidity based classification system.

In conclusion, it seems to make sense to use remuneration systems composed of different elements. Lump-sum payments and/or capitations could be suitable elements of those systems to reach the aims described above. Nevertheless in order to avoid risk selection, morbidity-based classification systems should be used to calculate those payments typically fixed ex ante. Remuneration systems could be enriched by elements of P4P to reach quality goals. Here as well risk adjustment is advisable to avoid risk selection strategies of care providers.

[4] Cost weights calculated on prior medical cost would not reflect the appropriateness of care for patients and would set incentives to go on providing less care for patients already undertreated in the past. Additionally, costs caused by chronic and acute illness would have the same effect on risk adjustment, but would differ in their expected effects on future need for medical care (Van de Wen & Ellis, 2000).

[5] The choice of risk factors, classification systems and estimation models for risk adjustment will be further explained in subsection 3.1.1.

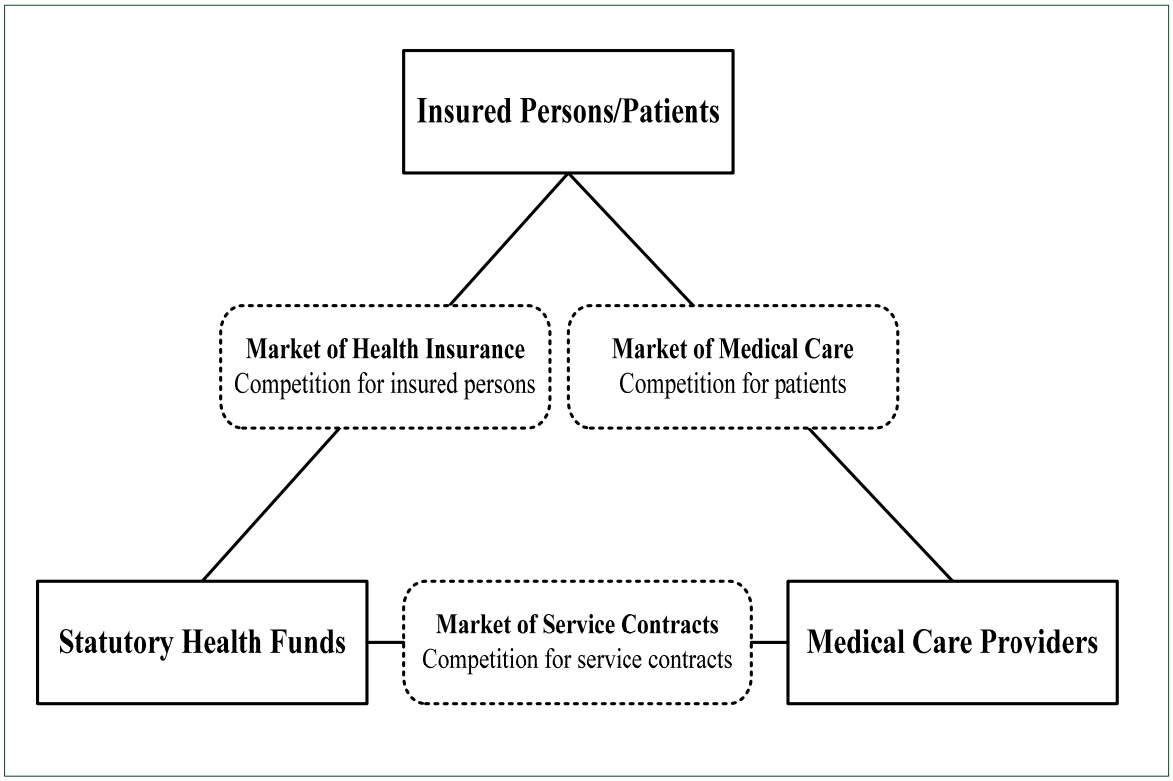
1.2 Implementation of Selective Contracting and the Role of Risk-Adjustment

Selective contracting can be a promising strategy to enhance efficiency and effectiveness in health care systems by using regulated competitive mechanisms. Subsection 1.2.1 will have a short look on the aims of selective contracting on German social health care markets, whereas in subsection 1.2.2 the necessary conditions to reach these aims will be analyzed. As a conclusion the two functions of risk adjustment in selective contracting will be described in subsection 1.2.3.

1.2.1 Selective Contracting as an Element of Competition in Health Care Systems

As already mentioned above, different forms of market failure have lead to political decisions towards regulation of health care markets. Nevertheless the use of competitive mechanisms in a carefully regulated environment can be a promising strategy to improve efficiency and effectiveness on those markets.

Figure 1: Markets and Competition in Health Care



Origin: (Cassel et al. 2008)

An important element of a so-called program of managed competition is the existence of collective agents who are able to contract with competing economic units of providers (Enthoven, 1988). In the case of Germany, health funds can act as collective agents on markets for service contracts with providers (as visualization of the different markets of social health care see Figure 1).

However, selective contracts affect markets for health insurance as well. By offering different types of medical care provision (by selective and collective contracts) health funds compete for insured persons. Selective contracts can affect price competition for insured persons as well. This can take place by special monetary benefits for insured persons entering into a program of a selective contract. Eventually, when selective contracts are successful in a more efficient and effective provision of care, they can even affect the health care contribution of all fund members because of cost reduction effects. Markets of medical care can be concerned as well. Here selective contracting can lead to a reduction of the free choice of patients regarding providers. Selective contracts can be organized in two ways. In one form the patient has to enroll herself to a program with selected providers for a fixed period. In Germany this is the case e.g. in primary physician models (see subsection 2.4.1). In this kind of contracts with ex-ante enrollment and obligation of patients to demand care at contract physicians[6], free choice of providers by patients is reduced. Other selective contracts mainly concerning special medical procedures (e.g. the implantation of a hip joint endoprosthesis) do not include ex-ante enrollment.

Selective contracts can be used as the main form of contracting in a health system or as an additional element meant to develop more efficient and effective methods of provision of medical care in a system dominated by collective contracting like in Germany[7]. In any case its aim is to activate competitive searching processes in order to realize reserves of productivity in the medical system as well as to enhance quality of care (Ebsen et al., 2003).

1.2.2 Selective Contracting – Conditions for its Success

When analyzing the conditions that have to be fulfilled to reach the aims of selective contracting, we will concentrate on a scenario with an existing collective contracting system which up to now dominates the health care system in Germany. In a situation like that the first question to be answered is: which legal and institutional preconditions have to be fulfilled to give selective contracts a chance on medical care markets, to make competitive mechanisms unfold on these markets?

[6] In case of the primary care model, insured persons are obliged to first contact the general practitioner where they are enrolled to get a prescription to use a specialist.

[7] The German system of collective contracting is outlined in Chapter .2.1.

According to Cassel et al. and Ebsen et al. there are several conditions for that (Cassel et al., 2008; Ebsen et al., 2003):

- Some scope in contract design concerning the choice of contract partners and of contract contents in regard to types and quantities of care and their remuneration (Cassel et al., 2008).

  The "selectivity" of a contract expresses itself in the condition that there should be no obligatory contract partners.[8] In particular the possibility of contracting across sector boundaries as in integrated care contracts increases the potential benefits from productivity reserves through a better combination of services of health care sectors (like e.g. inpatient and outpatient care). Here the collective contracts within sector boundaries do not produce the appropriate incentives. For insured persons choosing to be treated within a selective contract there should be the possibility of granting them financial incentives by their health fund.

- A sufficient degree of transparency for patients choosing between several options of medical care provision (Ebsen et al., 2003).

  This could be supported by systems of public reporting of quality like in elaborated P4P-systems (Emmert, 2008).

- Legal possibilities to bind the insured persons by obligating them to stay in a chosen selective contract for an appointed period – this is especially relevant in case of contracts with in-advance enrollment. By this legal obligation providers gain more certainty for necessary investment decisions related to the selective contract (Ossege, 2009).
- Regulations to avoid a market dominating position for a selective contract partner (Ebsen et al., 2003).
- Regulations for the coordination between the selective and the collective contract system, especially concerning collective remuneration systems.

  The collective remuneration has to be reduced by the costs of medical care for patients now served within selective contracts. Otherwise no health fund (collective agent) would be interested in agreeing on selective contracts from an economic point of view (Schulze, 2007). The need for procedural adaptations in these systems depends on their structure. When collective remuneration is paid based on a strict fee-for-service system or even as lump-sum-payments for the treatment of a special diagnosis (within a prespecified period) as in case of German hospitals, the adjustment of collective remuneration in case

[8] In this sense, the primary physician model of § 73b SGB V is no selective contract, as from 2009 on it obliges health funds to contract with communities of general practitioners representing at least 50% of all GPs in a KV region.

of selective contracting is quasi automatic.[9] The fee-for-service payments or the lump-sum-payments for cases within selective contracts just do not show up any more in the collective remunerations. In case of remuneration systems with ex-ante budgets like in the German remuneration system of outpatient medical care (described in detail in chapter 2), ex-ante adjustment procedures have to be implemented. Without adjustment of the ex-ante budgeted parts of remuneration, the incentives to contract outside the collective system would be significantly reduced.

Given the legal and institutional preconditions, selective contracting will only be successful in raising efficiency and effectiveness if incentives within selective contracts are set in a way that counteracts risk selection as a provider strategy. Here the remuneration system used internally is of great importance. Incentives of different forms of remuneration were already discussed in the chapters 1.1.2 and 1.1.3, and the conclusions drawn there on the general level can be applied correspondingly.

1.2.3 Two Functions of Risk Adjustment for Selective Contracting

When adjusting collective remuneration budgets in advance for costs of medical care for patients in selective contracts, at first glance it seems possible to assume the (expected) average costs per insured person as a starting point for the adjustment. But patient populations of selective contracts will only by chance exhibit the same health risk structure as those staying within the collective contract. So when adjusting only the average costs per insured person, there are two possibilities: First, let us assume that the patient population of the selective contract has a higher average morbidity risk than that of the collective contract. This may be the case in contracts for the treatment of severe diseases or in the beginning of a new contract with in-advance-enrollment, when patients who meet their doctor often are more likely to enroll themselves. Without risk adjustment the adjustment of the collective remuneration would be too low. As a consequence this would lead to lower incentives to close contracts for those groups of insured persons – selective contracts that could otherwise be economically profitable for suppliers as well as health funds would not take place.

Second, let us assume that the morbidity risk of the patient population in selective contracts is lower than average. Without risk adjustment and just using the average expected costs of the former collective contract population, the adjustment of the collective remuneration would be too high. Health funds could take advantage of selective contracts without being successful in terms of

[9] There is one restriction to this statement in German collective hospital remuneration: according to § 4 KHEntgG, para 3 a hospital serving less than the contracted cases in the collective system, nevertheless receives 20 % of payment for this difference of non-implemented cases.

efficiency and/or providers could gain only by risk selection. Providers within collective contracts would have a diminished income and means for health care for the collective contract population would be reduced related to their morbidity risk.

So in both cases, selective contracting could not optimally unfold its potential to reach its aims. Risk adjustment in the adjustment of the collective remuneration in case of selective contracting aims at correcting the problematic incentives described above and should lead to more effective and efficient solutions in the organization of medical care by health funds.

As already discussed in subsection 1.1.3 for all remunerations systems (in the collective as well as in the selective "landscape"), payment blends seem to be most successful in combining incentives. But the use of capitation, lump-sum-payment and P4P-elements without risk adjustment could lead to risk selection as a main strategy of the provider collectives and individual provider units. So risk adjustment of remuneration becomes a crucial element also within a strategy of managed competition to be able to use competition mechanisms for better efficiency and effectiveness.

Analyzing the conditions for success of selective contracting in raising efficiency in medical care, we can deduce that risk adjustment plays a crucial role in two ways:

- By the adjustment of collective remuneration
- By the construction of internal remuneration systems for selective contracts

In conclusion, risk adjustment can be useful in constructing appropriate remuneration systems in collective as well as in selective contracts. Additionally, risk adjustment is necessary for an adequate adjustment of the collective remuneration in case of selective contracting. By this it contributes to one major precondition for the economic success of selective contracting.

2 Risk Adjustment in the Existing Regulatory Framework of the Collective Remuneration System

In this chapter, the present German collective remuneration system for outpatient medical care will be analyzed thoroughly especially concerning the actual role of risk-adjustment. In section 2.1 an outline of the organization and the institutions as well as a draft of the official basic fee schedule for outpatient medical care in the statutory health insurance system is given. In the following sections 2.2

and 2.3 the collective remuneration system on its different levels is analyzed concentrating on the aspect of risk adjustment already realized.

2.1 Basic Outline of the German Collective Remuneration System

Germany is the only European country with a dual insurance system in basic medical care. About 90% of the population is health insured in health funds under the regime of statutory health insurance, including income dependent but risk independent premia[10], an obligation to contract with all possible members for the funds and a system of risk adjustment between the health funds. About 10 % of the population defined by social status and income is insured in private insurance companies working under the conditions of risk-adjusted premia without obligation to contract; premia are calculated using a capital-funded method (Rosenbrock & Gerlinger, 2006). Remuneration schemes for health care providers in both insurance systems, especially in outpatient care, are different. Privately insured patients pay their doctors according to a traditional fee-for-service regime (with the fee-schedule set by the government) and are reimbursed by their health insurance company. Patients insured in social health funds normally get their medical benefits free at point of delivery (there is also a co-payment of 10 Euros per three-month period) while the funds pay to the physicians respectively their organizations according to elaborated collective contracts combining several different remuneration principles. Additionally in the last ten years, in order to raise effectiveness and efficiency of medical care, besides the collective contracting system of health funds and semi-public organizations of outpatient physicians some variants of selective contracts between groups of medical care givers and singular statutory health funds have been established. In this chapter we will work out the main structure of the collective contracting system (based on the regulations valid in January, 2010)[11] and the landscape of selective contracting in German social health insurance concerning medical out-patient care.

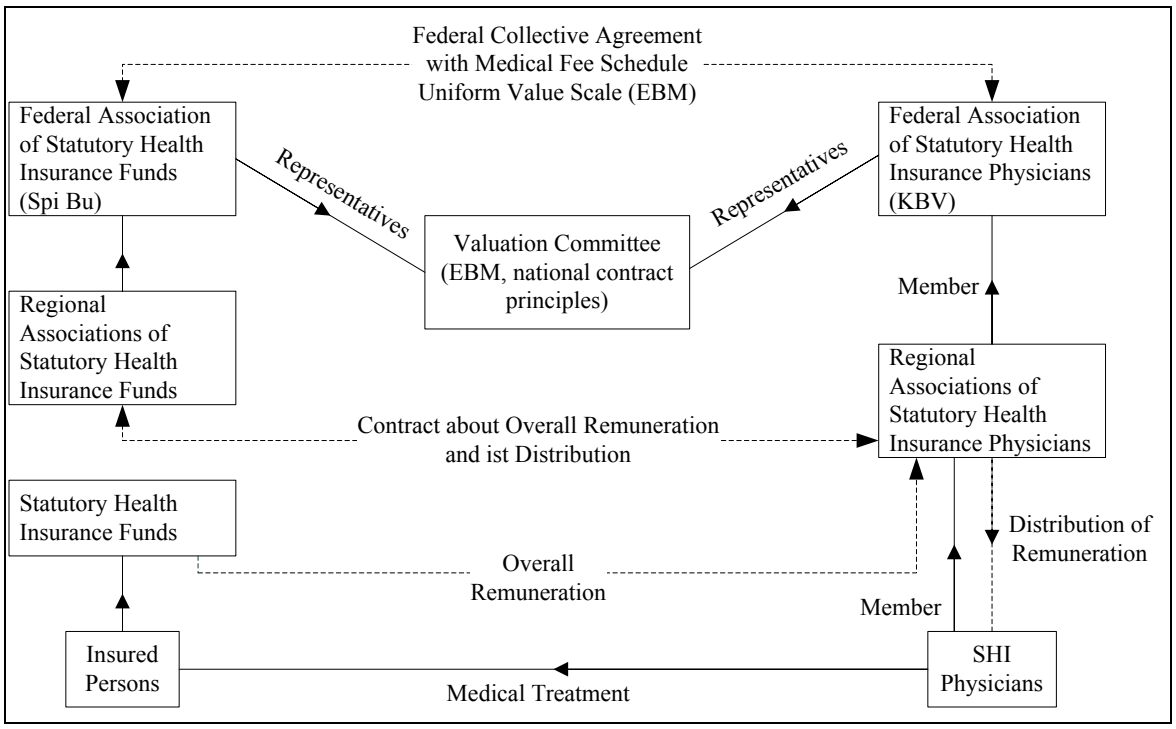
[10] Premia are split between employers and employees. Up to 2010 additional premia calculated as fixum play a reduced role in financial measures.

[11] On March 26, 2010, the Valuation Committee adapted the regulation for the distribution of overall remuneration (Bewertungsausschuss, 2010). The adaptions do not touch the topic of this study, i.e. the implementation of risk adjustment in the remuneration system. Nevertheless we will indicate the direction of these changes in footnotes in the respective chapters.

2.1.1 Organization and Institutions

Collective contracting and remuneration of outpatient medical care in the system of statutory health insurance is organized in a system of institutions on several organizational levels.

Figure 2: The System of Collective Contracting in German Medical Outpatient Care



Origin: own figure

As already mentioned above, socially health insured persons do not pay directly to their physicians for their medical treatment. Instead of this there are two main institutions involved intermediately creating a remuneration system which is divided into two layers. The first layer involves both the singular statutory health insurance fund and the Regional[12] Association of Statutory Health Insurance Physicians (Kassenärztliche Vereinigung, in short KV), an institution with a dual function: On the one hand the representative of all statutory health insurance physicians providing outpatient care in a region (usually: state level), on the other hand the responsible body for the public task of guaranteeing provision of services (Berner, 2008). Based on a contract between all regional associations of statutory health insurance funds (which have to act jointly and concerted with regard

[12] The regions are nearly identical to the German states ("Laender"), the only exception is Northrhine-Westfalia, which is divided in two regional associations of statutory health insurance physicians.

to this contract) and the Regional Association of Statutory Health Insurance Physicians, the KV mainly gets an overall remuneration for the medical treatment of all insured persons of this fund. On the next layer, bound by joint and concerted contracts on the regional level, the KV transfers the remuneration to the singular physicians. It is thus possible to define the remuneration based on different principles on each of the two layers. But as shown above in Figure No. 2, the partners of the contract about the overall remuneration and its distribution are not totally free in their decisions. They are bound by a collective agreement on the federal level between their respective representatives. The KVs are represented by the Federal Association of Statutory Health Insurance Physicians (Kassenärztliche Bundesvereinigung, in short KBV). From 2008 on, the health insurance funds on the federal level do no longer act as different confederations but in a united organization called Federal Association of Statutory Health Insurance Funds (Spitzenverband Bund der Krankenkassen, in short SpiBu). These two associations work in two common boards in order to fulfill their task of contracting about the principles of remuneration for outpatient medical care. While the Federal Joint Committee e.g. decides on new medical methods to include into outpatient medical care[13], the Valuation Committee is responsible for most questions regarding remuneration on the federal level. It rules on the Uniform Value Scale, the fee schedule for statutory health insurance physicians, and it decides on main principles of the remuneration system within the limitations of the actual legal regulations.

2.1.2 The Uniform Value Scale in the Collective Remuneration System

As explained above, the Uniform Value Scale (Einheitlicher Bewertungsmaßstab, in short EBM) as fee schedule for outpatient medical care is regulated per contract by KBV and SpiBu in the Valuation Committee. Basically it was constructed as a fee-for-service remuneration system. It fixes the relative value of most of the singular services and complexes of services by relating them to value points.

While undergoing frequent reforms during its history, the EBM has been enriched with elements of lump-sum payments, which have been mainly introduced and broadened during the last 10 years (Walendzik, 2008).

Following the legal regulations of the Statutory Health Insurance Modernization Act 2004, in 2005 a new version of Uniform Value Scale has been introduced, containing some modest elements of morbidity adjustment of complex fees. So the ordination complex, a basic complex fee for most types of physicians, was differentiated according to three age groups, and the first diagnoses-related fee complexes were introduced (Rosenbrock & Gerlinger, 2006).

[13] In fact the Federal Joint Committee is an organ of KBV, SpiBu and the German Hospital Association and fulfils many additional tasks of self –administration not mentioned here concerning statutory health insurance.

On this base, remuneration is distributed to the singular physicians by the KVs. But as the overall remuneration on the first layer of the remuneration system is budgeted, the price of the value points paid to the singular physician is determined by that budget and by the method of implementing the budget into the distribution of remuneration on the second layer of the system.

In sections 2.2 to 2.4 we will explain further how the actual remuneration system works on its different layers and which elements of risk adjustment are already implemented.

2.2 "Overall Remuneration" - Remuneration by Statutory Health Insurance Fund to Association of Statutory Health Insurance Physicians

On the first layer of the remuneration system payments flow from statutory health insurance funds to associations of statutory health insurance physicians. They are based on contracts between the regional associations of health insurance funds – jointly and concerted – and the regional associations of statutory health insurance physicians. The main part of the remuneration – called overall remuneration – is paid as a fixed amount (budget) releasing the health insurance funds from all further remuneration payments for most medical services in this period. Nevertheless besides the overall remuneration, there are some special medical services which are paid for "extra-budgetarily" as fee for service. This can be regulated by law like for substitution treatment in case of drug addiction or fixed by the contracting partners, e.g. in cases of newly introduced medical services or in cases of special services like, for example outpatient surgery, when both contract partners wish to encourage their delivery by excepting them from budgeting. Hence this part of the remuneration is not budgeted.

2.2.1 History

Generally, German Statutory Health insurance law allows different remuneration forms for the calculation of the overall remuneration paid by the statutory health insurance funds to associations of statutory health insurance physicians[14], which historically led to mixed calculation modes. In the beginning of the 1990s, overall remuneration mainly was calculated according to the number and value of services provided by the physicians in a given KV with prices per service differing between funds. However in 1993, by budgeting the expenditures of statutory health insurance funds, the Health Care Structure Act capitated the overall remuneration. The capitation was calculated on base of the overall remuneration a social health fund had paid to a KV in a basic period. For the West German states of Germany this period was the full year of 1991. For East Germany in order to take into account the incomplete structure of outpatient medical care in 1991, the doubled volume of the first half year of 1992 was used (Zalewski, 2008).

[14] § 85 para. 2 phrase 1 SGB V.

So from 1993 on, overall remuneration for the different funds has been calculated according to the following scheme:

Formula 1: Calculation of Overall Remuneration Based on Capitations

$$Capitation\ basic\ period = \frac{overall\ remuneration\ basic\ period}{number\ of\ members\ of\ a\ statutory\ health\ insurance\ fund\ basic\ period}$$

$$\text{Capitation new period} = \text{capitation basic period} \times (1 + \text{rate of change of base rate salary})$$

$$Overall\ remuneration\ new\ period = capitation\ new\ period \times number\ of\ members\ of\ a\ statutory\ health\ fund\ new\ period$$

By this method of calculation differences between overall remunerations were fixed on two levels:

- Regional level: As the supply structure of outpatient medical care in the basic period was different in the different KVs, the system started with very differently elaborated volumes of services between the regions and therefore rather different regional capitations. Especially in the new German states the transformation of medical care to new organizational forms was still in process, which resulted in lower capitations even though the basic period was slightly shifted in time (Wasem & Walendzik, 2008). Additionally the number of services paid as extra-budgetary remuneration and the prices of their fee points differed from KV to KV, so that the share of extra-budgetary remuneration in all payments to the KV was regionally very different.
- Health insurance fund level: As the overall remuneration paid by a sickness fund reflected historical volume, level and prices of services used by its insured persons before the introduction of budgeting, capitation levels differed significantly between sickness funds from the beginning. In the first years, these differences at least partly reflected the demand of the insured persons of the funds. But especially after the introduction of free choice of statutory health insurance fund by their members in 1996 the capitation system showed its structural problems. Switching funds by – mostly young and healthy - members led to the situation, that the historical capitations no longer reflected demand or morbidity (Wasem & Walendzik, 2009a). Additionally, resulting in more members in funds with lower capitations and because

of this with lower premia, this led to systematically lower payments for physicians in outpatient care in comparison to a situation without competition between funds.

On this situation the remuneration reform from 2008 to 2010 had to build up. In the following chapter we will describe the actual system of remuneration on the first layer, which is partly a new construction and partly still shows the historically grown structures.

2.2.2 Present Regulations and the Influence of Risk Adjustment

On the level of overall remuneration, the remuneration reform of 2009 mainly had two intentions:

- The transfer of the morbidity risk from the statutory health fund physicians to the health funds
- Equal prices for equal services within the morbidity related remuneration in all regions and for all funds

Anticipating a raising morbidity because of demographic development, the transfer of the morbidity risk to the health funds was a claim of the KBV since many years (Stüwe, 2006). It was realized in two steps. From 2009 on, a morbidity related overall remuneration should be paid by the funds to the KVs.[15] In order to measure changes in morbidity, a diagnosis-based patient classification system had to be installed and is used beginning with the overall remuneration of 2010 as a second step.[16] Moreover, a procedure to calculate a potential additionally necessary quantity of services due to unforeseeable increases in morbidity had to be consented.

From 2009 on, an orientation point price for all services within the morbidity related remuneration has to be fixed on the federal level by the Valuation Committee. Only differences in prices related to regional differences in costs or the structure of medical care have to be accepted in different regions, otherwise the orientation point price centrally defined has to be used for overall remuneration, for extra-budgetary services and remuneration of services because of ex ante unforeseeable morbidity.[17] So, understanding the overall remuneration as a product of two components – quantity of services (fee points) and price of services (point price), the price component was equalized for all contract participants.

According to the legal regulations, the reform took place in two steps. We will look at those steps separately to analyze the introduction of elements of risk adjustment on the level of the overall remuneration.

[15] § 87a para. 3 SGB V.

[16] § 87a para. 5 phrase 1 Nr. 2 und phrase 2 SGB V.

[17] § 87a para. 2.

For the year 2009, the Extended Valuation Committee[18] fixed the rate of morbidity growth at 5,1 % of the overall remuneration as an act of deliberate estimation. The orientation point price was determined as 3,5001 Cent and no regional differences in costs or structure of medical care were stated relating to whole KV regions. In addition, some fees for services were excluded and paid for extra-budgetarily. Additional demand due to unforeseeable growth of morbidity was defined in two ways: on the one hand, the Extended Valuation Committee determined some acute HCC-groups of the classification system. In case of a rate of growth of the relative weights per insured person for these HCC-groups lying above 25%, the additional utilization is defined as induced by unforeseeable morbidity growth and therefore will trigger additional payments by the sickness funds. On the other hand exceptional events like e.g. epidemics can cause additional demand because of unforeseeable morbidity growth as well (Erweiterter Bewertungsausschuss, 2008).

For the statutory health insurance funds, 2009 meant a big change of the systematic of the remuneration. The overall remuneration they have to pay to the KV´s is now calculated based on the services delivered to their members at the regional point price, which is mostly identical with the central orientation point price. The price component in remuneration now is equalized, the quantity component depends on the past utilization of medical services by the members of the funds. So from 2009 on, differences in overall remuneration mainly result from different demand behavior based on morbidity and/or on other factors like social or regional demand patterns, from regional supply structures and for 2009 also from supply reactions on different capitations in 2007, as this was the basic calculation year for overall remuneration in 2009. From 2011 on, this third factor will completely vanish.

For the KVs, the only systematic change was the fixed orientation price: in general services are now paid for at the same prices within the overall remuneration. The quantity component of the overall remuneration has not been touched by the legal regulations for 2009. Nevertheless the Extended Valuation Committee decided to do a normative step here, too, by discretionarily moving towards more equal quantities of fee points per insured person in the KV regions. Table 1 shows the effects of the decisions in 2008 resulting as well from price as from quantity effects on the overall remuneration per insured person in the different regions comparing a projection of 2009 to the values of 2007.

[18] The extended valuation committee is composed of the members of the valuation committee, two neutral members and one neutral chairman. When the regular valuation committee does not reach a decision, the extended valuation committee decides by majority.

Table 1: Change of Overall Remuneration per Insured Person from 2007 to 2009

KV	Overall Remuneration per Insured Person in Euro 2007	Overall Remuneration per Insured Person in Euro (Simulation)	Change from 2007 to 2009 (in %)
Schleswig-Holstein	383	407	6,3
Hamburg	430	468	8,8
Bremen	438	471	7,5
Niedersachsen	382	445	16,5
Westfalen-Lippe	345	382	10,7
Nordrhein	386	411	6,5
Hessen	396	437	10,4
Rheinland-Pfalz	382	415	8,6
BaWü	413	424	2,7
Bayern	450	478	6,2
Berlin	427	479	12,2
Saarland	396	449	13,4
Meck-Pomm	384	457	19,0
Brandenburg	351	407	16,0
Sachsen-Anhalt	339	404	19,2
Thüringen	318	396	24,5
Sachsen	350	419	19,7
German Average	391	430	10,0
Average West	400	433	8,3
Average East	347	415	19,6

Origin: (Wasem and Walendzik 2009a), based on calculations of the Institute of the Valuation Committee

So in 2009 the only element of risk adjustment in the calculation of overall remuneration was the application of a – deliberately fixed – rate of growth of morbidity and one element of the procedure to measure unforeseeable morbidity growth and the demand triggered by it. Overall remuneration

paid by the health insurance funds is now determined by past utilization ratios in the region, whereas the sum of overall remunerations received by the KVs is fixed based on historical patterns changed only by an equalized price component. The normative correction of the regional quantity component by the Extended Valuation Committee is mainly directed towards equality of remuneration per insured person without applying any risk adjustment.

In 2009, the diagnosis-based patient classification system was introduced – a system designed by DxCG (later Verisk Health Inc.) and adapted by the Institute of the Valuation Committee. Its aim is the calculation of relative weights by multivariate regression analysis for diagnosis-related risk groups in order to be able to determine changes in morbidity.

The legal regulation of the second step of the remuneration reform concerning the calculation of overall remuneration was open for alternative implementations concerning the use of risk or better morbidity adjustment. This led to a general discussion about so called "incremental models" versus "partition models" (Wasem & Walendzik, 2009b). They differ in the question whether the calculation of overall remuneration should be adapted to morbidity only by risk-adjusting the growth of remuneration or by risk-adjusting the whole remuneration.

In an "incremental model", the calculation of quantities of fee points in overall remuneration on both levels (region and fund) stays unchanged. No systematic corrections concerning the historical proportions especially of the regional overall remunerations are included. Changes in morbidity are only applied in the form of morbidity change rates. Although it is possible to implement a model with morbidity change rates calculated especially for KVs and for singular health insurance funds, this would be of no systematic use to correct disproportions of morbidity and remuneration, as change rates of morbidity of regions or funds can show totally different relations to each other than morbidity indices of regions or funds (Wasem & Walendzik, 2009b).

The basic idea of a "partition model" is that overall remunerations should generally follow morbidity, not only in the component of quantity growth. On the regional level this would mean, that overall remunerations of all regions would have to be recalculated or adjusted according to the risk scores of the insured persons living in those regions measured by the patient classification system. Implemented on the level of singular health insurance funds, each fund would have to pay an overall remuneration according to the morbidity of its members and their families: If a given health insurance fund in a specific KV region accounts for instance for 5 % of total morbidity in outpatient care in Germany, it should pay 5 % of total overall remunerations in Germany. Implementing the "partition model" even in several convergence steps would have meant a new round of redistribution after the redistribution of 2009 which had induced costs more than three billion Euros and nevertheless

caused a lot of protests by the "losers". In subsections 4.2.1.1 and 4.2.1.2 we will systematically discuss pro´s and con´s of the implementation of a "partition model" on the regional and the health fund level.

For 2010, the Extended Valuation Committee decided to implement an "incremental model" with one national change rate of morbidity. For the calculation of the morbidity change rate from 2009 to 2010, a special hierarchical model, developed from a HCC version and based on the complete ICD-10 GM diagnoses (compressed basing on 30 condition categories) was used in a two-year prospective version (Erweiterter Bewertungsausschuss, 2009a).[19] In order to avoid overestimation of morbidity changes due to typical right coding processes in the introduction stage of classification systems (Wasem, Rotter, Focke, & Igl, 2007) the morbidity change rate was calculated by this classification system and by a merely demographic classification system. The growth rate implemented into overall remuneration for 2010 was composed of 61% of the change rate calculated by the diagnoses-related classification system and of 39% of the change rate of the demographic grouper. The result was a value of 1,6616 (Erweiterter Bewertungsausschuss, 2009a). Additional demand due to unforeseeable growth of morbidity was defined in the same way as for 2009.

Resuming the development of the remuneration system in 2009, the degree of risk adjustment in the determination of overall remunerations did not change significantly. Further on the main element of morbidity adjustment is manifested in the morbidity change rate, which at least is calculated by the help of a diagnoses-related classification system. The ratios of the overall regional remunerations are still determined by historical decisions, ratios of the overall remunerations of statutory health funds within a region are regulated by applying the past utilization of their members.

2.3 The Distribution of Remuneration by Associations of Statutory Health Insurance to Individual Physicians

As described before, on the second layer of the remuneration system, the remuneration is distributed to individual physicians by their regional KV. Principally, each physician bills his services to the KV according to the Uniform Value Scale. In 2007, the Uniform Value Scale was reformed another time, moving further in direction of more lump-sum fees, especially concerning the services of general practitioners. But it is only in the case of extra-budgetary remuneration that the physician just gets fees for services for every unit at the determined regional price. In all cases within the overall remuneration, the KV is limited by the budget within the distribution of the remuneration.

[19] Up to now there is no decision which model is going to be used in the next years.

The way to realize the budget within the distribution of remuneration is contracted between the regional associations of statutory health insurance physicians and funds according to legal regulations as well as rules contracted on the national level. Historically the distribution of the remuneration has been regulated in different ways which will be explained in subsection 2.3.1. In subsection 2.3.2 we will describe the present system of distribution of the overall remuneration and the role of risk adjustment.

2.3.1 History

Generally, if the potential quantity of billed services or points of the Uniform Value Scale is not limited, the only possibility to match the sum of payments to all physicians by KV with overall remuneration is a variability of prices. As a result of the introduction of budgeting into the calculation of overall remuneration in the Health Care Structure Act of 1993, a system of floating prices of fee points was introduced (Simon, 2008) effecting that the price of services was known by physicians only ex post (Sydow & Bollmann, 2008). As a part of the statutory health insurance physicians increased their delivery of services, consequently prices went down. As a result a physician who wanted to keep the same income had to expand quantity as well. This process showed a systematic effect of a perpetuating "rat race".

This lead to another version of implementing budgetary constraints, manifested in "individual budgets" of physicians, constructed upon delivered quantities of medical care in the past. Only services delivered within this quantity had to be remunerated with an ex ante fixed price, leading to a system with limited variability, as services above the individual budget were not paid for.

It was the Statutory Health Insurance Modernization Act 2004 which scheduled a new system of distribution of remuneration from KV to individual physicians trying to generally introduce so called "standard service volumes" for physician practices.[20] Within those volumes, services were to be remunerated with a fixed price, for volumes above those standard service volumes only reduced prices should be paid. But it was not before 2009, as a system constructed in a similar way was implemented.

Before distributing the overall remuneration to singular practices a decision has to be taken concerning the share of different physician groups. Although this problem has to be solved relating to all groups of physicians on the second layer of the remuneration system, the separation of

[20] The Statutory Health Insurance Reform Act of 1999 had already defined standard service volumes as a possible option in organizing the distribution of remuneration between singular physicians.

remuneration between general practitioners and specialists has drawn special attention for different reasons. Generally, long-term-trends show a growing share of specialists in all statutory health insurance physicians (Rosenbrock & Gerlinger, 2006). Only from 1996 to 2008, the share of general practitioners went down from 54,9 % to 48,2 %. (Kassenärztliche Bundesvereinigung, 2009)[21] On the other hand, there is a growing awareness that general practitioners may have an important function in medical care for the problem of aging patient populations with multiple chronic diseases and as gatekeepers of the medical system (Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen, 2009). But income of general practitioners in comparison to most specialists is still relatively low.[22] From the political point of view, beginning from 2002, the German General Practitioner Organization gained influence and has become an important contract partner in selective contracting, in this way imposing pressure on the discussion about the separation factor in the distribution of overall remuneration.

In 2000, the formal distribution of the overall remuneration by a separation factor became a legal obligation and in this way was no longer a quasi-autonomous decision of the organizations of statutory health insurance physicians but one of the topics of the Valuation Committee (Rosenbrock & Gerlinger, 2006). In this way, the legislator tried to react on the problem, that especially technical specialist services showed a stronger growth in quantity than traditional general practitioner services.

The Uniform Value Scale reform in 2008 even aggravated the problem, as it introduced a stronger component of lump-sum fees especially into the remuneration of general practitioners while projecting case lump-sum payments for specialists for a later period. Although the reform momentarily improved the relation of fee points between the two main groups of physicians for the general practitioners, a classical fee-for-service remuneration scheme systematically provides more incentives to enlarge quantity of services than a lump-sum-payment in a long-term perspective. Nevertheless the legislator no longer codified an obligation to fix a separation factor for the distribution of overall remuneration between general practitioners and specialists (Sydow & Bollmann, 2008).

[21] In Germany, aside from specially qualified general practitioners, specialist physicians for internal medicine can decide to practice as generalist as well.

[22] In 2007, for example, the average net income before tax of a one-person practice of a general practitioner was about 110.000 €, while the average net income of all one-person practices was about 130.000 € (Statistisches Bundesamt, 2009).

2.3.2 Present Regulations and the Implementation of Risk Adjustment

From 2009 on, standard service volumes for individual statutory health insurance physicians and medical practices have to be installed. Within those volumes, medical services have to be remunerated using the regional prices which are based on the orientation price. Services above that volume are to be paid a scaled-down price.[23] Standard service volumes have to be morbidity-adjusted and differentiated for different specialist groups of physicians.[24] But morbidity adjustment for standard service volumes is legally restricted to the use of age and gender.[25] Before calculating the standard service volumes, the problem of shares of physician groups and especially of a separation factor between general practitioners and specialists has to be solved.

In this chapter, we will first explain the procedure of distribution of overall remuneration identifying its different steps (subsection 2.3.2.1). Then we will analyze the present distribution of remuneration between general practitioners and specialists (subsection 2.3.2.2) and the calculation of standard service volumes (subsection 2.3.2.3) especially studying the role of risk adjustment.

2.3.2.1 The Procedure of Distribution of Overall Remuneration

For 2009 [26], the Extended Valuation Committee decided to use the proceeding depicted in a simplifying way in the following figures.

As shown in Figure 3, the calculation base for the standard service volumes is the overall remuneration. Besides, the singular physician may get some remuneration out of the extra-budgetary remuneration in case he delivers services of this category. If after the remuneration period it has been determined that he was engaged in additional services caused by an unforeseeable increase in morbidity, he may receive additional remuneration because of this.

First, an estimated remuneration for services of psychotherapy with obligatory approval is subtracted from overall remuneration. Those services have to be paid out of the overall remuneration but are not included in the system of standard service volumes. The remaining volume is divided between the two domains of care: outpatient care of general practitioners and outpatient care of medical

[23] § 87b para. 2 phrases 1 and 2 SGB V.

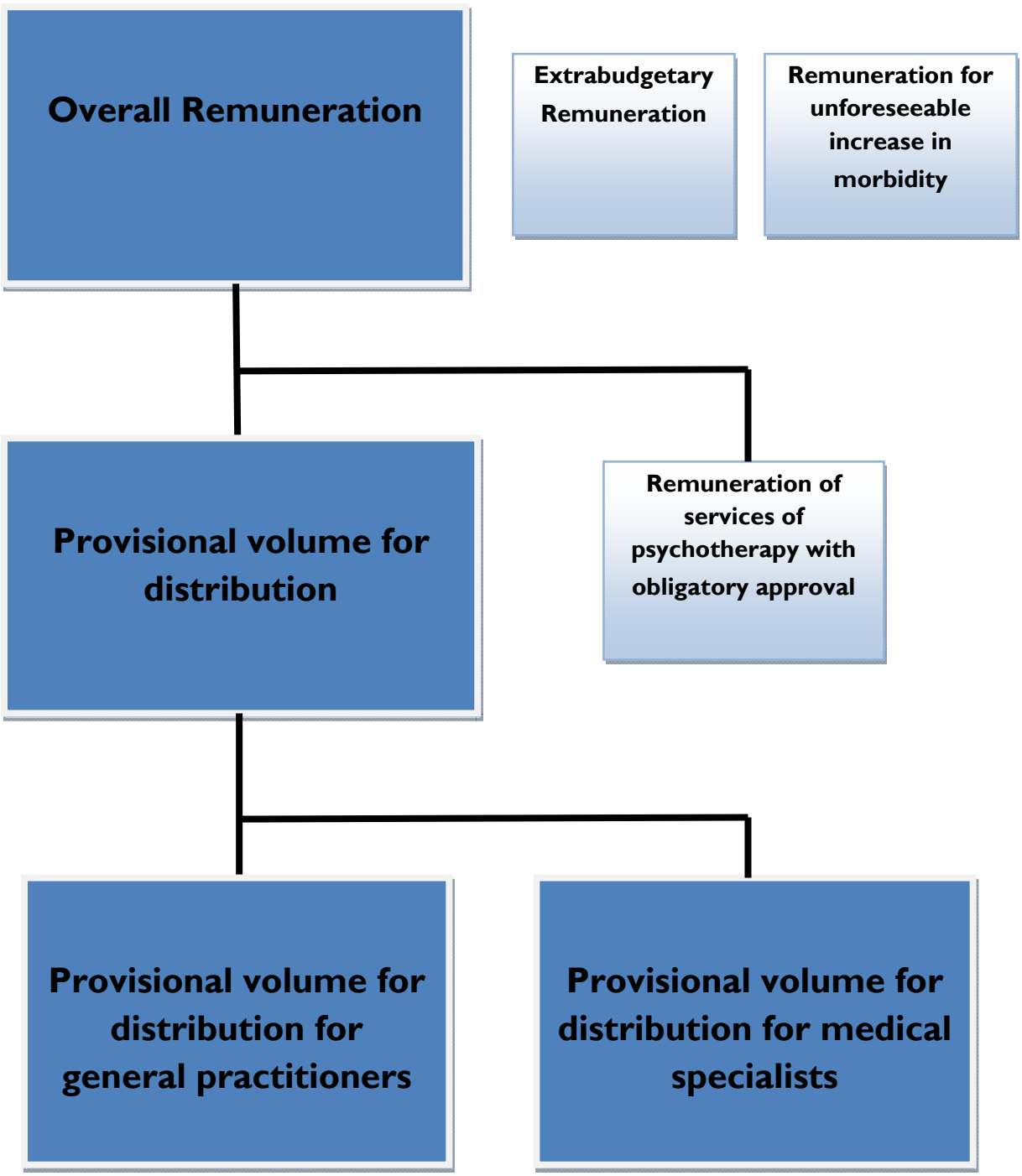
[24] § 87b para 3 phrase 1.

[25] § 87b para 3 phrase 6.

[26] The decision of the Valuation Committee for 2010 taken in 2009 (Bewertungsausschuss, 2009b) had a very similar structure. As already mentioned above, in March 2010 the Valuation Committee decided some major adaptions to this concept to be implemented from July 2010 on.

specialists. In subsection 2.3.2.2 we will have a closer look at the division of remuneration between these two groups. After the division there are two provisional volumes for distribution: one for general practitioners and one for medical specialists.

Figure 3: Calculation of Standard Service Volumes in 2009, Part I



Source: Own presentation based on a figure of the KBV

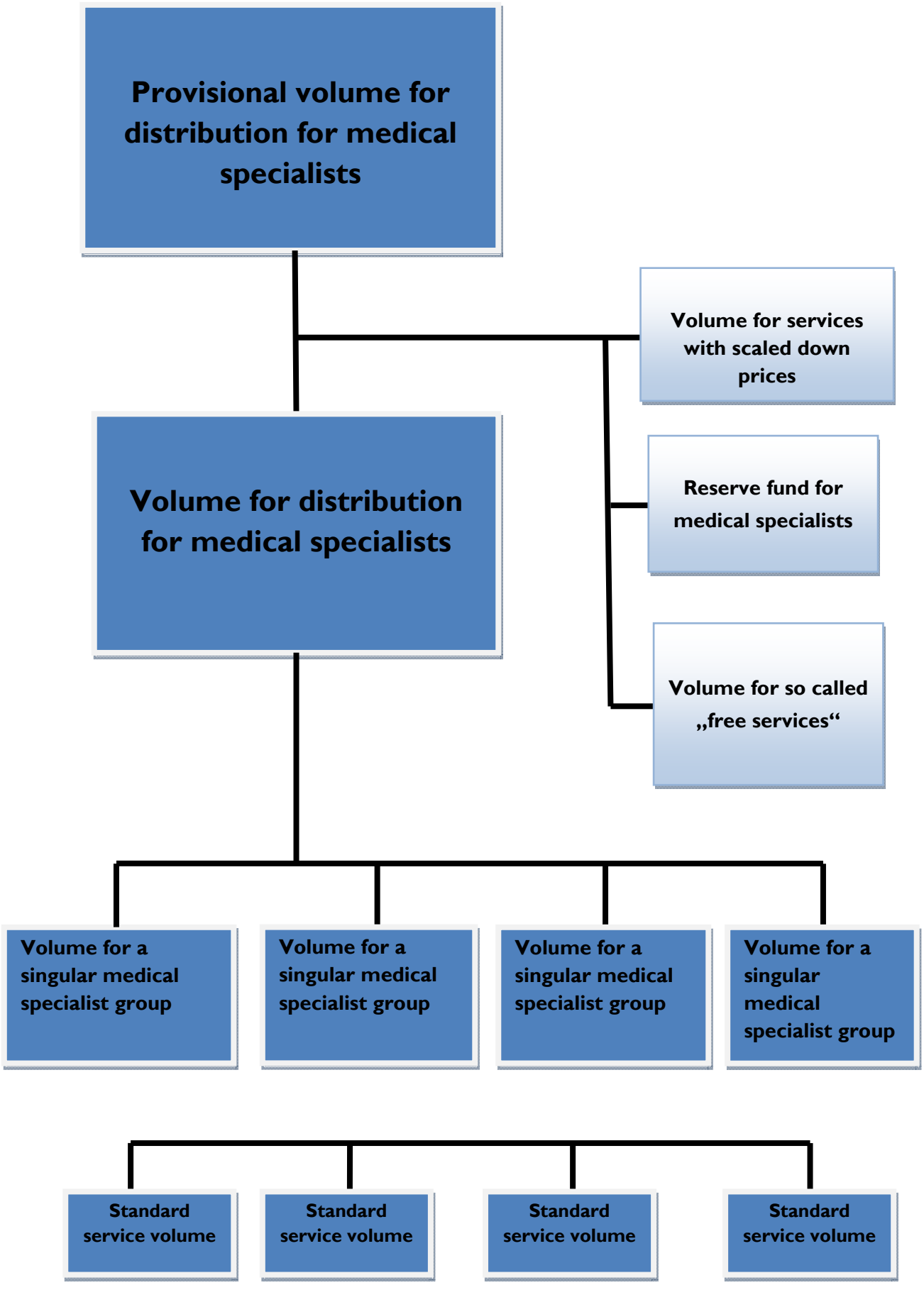
Figure 4 shows in an exemplary way how a standard service volume is developed for the medical specialists.

Before distributing the provisional volume for all medical specialists, three funds with special functions are subtracted. The volume for services for scaled down prices are used to remunerate the services of the specialist physicians above the standard service volumes. The reserve fund is used for miscellaneous aims, e.g. to remunerate physicians with new practices. The last volume contains an estimated sum for so-called "free services", services that according to the collective contracts have to be remunerated without quantity limit although they are not paid extra-budgetarily by the sickness funds but are within the overall remuneration. In case of the general practitioners, a fourth fund would be installed to remunerate special services bound on fixed quality preconditions.[27] The result of the subtraction of the funds is the volume for distribution for medical specialists.

This volume is divided between the specialist groups (e.g. neurologists, cardiologists etc.) according to their past share in quantities measured in fee points. The volumes of the medical specialist groups finally are the base for calculation of standard service volumes for a singular statutory health insurance physician.

[27] From July 2010 on, the decision of the Valuation Committee from March 2010 will change this procedure. Basing on the experience that the expansion of free services reduced volumes for distribution usable for standard service volumes, most of them will now be budgeted in so called quality-bound additional volumes, fixing their share in overall remuneration on the relations of 2008. Their distribution between singular physicians can be implemented in several variants on the regional level (Bewertungsausschuss 2010).

Figure 4: Calculation of Standard Service Volumes 2009, Part 2



Source: Own presentation based on a figure of the KBV

2.3.2.2 The Separation Factor: Distribution of Remuneration between General Practitioners and Specialists

Even without legal obligation, the Extended Valuation Committee, as already visible in Figure 3, decided to centrally fix a method of calculation of the separation factor. (Bewertungsausschuss, 2009a; Erweiterter Bewertungsausschuss, 2008, 2009a) Before applying the separation factor, the remuneration for services of psychotherapy sessions with obligatory approval[28] provided by the main groups of psychotherapists is subtracted from the overall remuneration to get the provisional volume for distribution. Then the separation factor is applied. While the volumes for distribution for the two domains of care are principally distributed between the singular medical groups by their shares in historical quantities in fee points, the separation factor is based on the historic share of both main groups of physicians in 2007[29] in the provisional volume for distribution. In this way, the separation factor takes into account the higher average point values of general practitioners in 2007 and conserves the relative remuneration situation of the group. Additionally, the historical shares are corrected by a factor representing the different upgrades of remuneration in points by the reform of the Uniform Value Scale in 2008. So the improvement of the relative remuneration situation of general practitioners was transferred to 2009 and 2010.[30]

So the calculation of the separation factor between the two remuneration domains at the moment is based on historical utilization supplemented with historical price relations. No elements of risk adjustment are implemented.

2.3.2.3 "Standard Service Volume" - Distribution of Remuneration to Individual Physicians

From 2009 on, the standard service volume for the singular physician practice is calculated principally as a product of the number of quarterly cases[31] served last year and a monetary value per case for the specialist group. This value per case is determined by dividing the volume for the singular medical specialist group through the number of cases served by that group.

[28] Sessions of psychotherapy after a fixed number of probatory sessions have to be individually approved by the Statutory Health Funds in advance.

[29] In August 2008, these are the last available empirical data, which could be used for the calculation of remuneration in 2009. In September 2009, the same relation was adopted for 2010.

[30] In March 2010, the calculation method of the separation factor was changed, which will be implemented beginning with July 2010 (Bewertungsausschuss, 2009b). Nevertheless it is based on historical utilization data like before and does not include any elements of diagnoses-based or even demographic risk adjustment.

[31] Cases are only fully counted within quantitative limitations for one practice.

As an element of morbidity adjustment the number of cases for the singular standard service volumes is weighted by the share of quantities of points in 2007 of three age groups[32] corresponding to the age groups for the basic lump-sum charges of the Uniform Value Scale (Erweiterter Bewertungsausschuss, 2008).

Although the remuneration reform means a general increase of remuneration of more than 10% for the German statutory health insurance physicians, growth was not distributed equally over regions, as already described above. This caused a special sensitivity to additional redistribution processes caused by changed procedures on the second layer of the remuneration system, as especially in the regions with lower remuneration growth rates redistribution processes could result in individual remuneration losses. The following aspects of the new distribution system were seen critically:

- A relatively high amount of services remunerated extra-budgetarily and especially as "free services" reduces the financial scope for the standard service volumes and results in benefits for physicians supplying with special services in comparison to those providing basic general services.
- Calculating the standard service volumes using the average value per case in a specialists group disadvantages physicians specialized in providing expensive services for patient groups with special morbidity (Wasem & Walendzik, 2009a).

In the original resolution of the Extended Valuation Committee, the possibility of compensation for practices with remuneration losses per regional contract were only open for practices with losses of more than 15 % in comparison to the last year`s quarter and for those, whose case value is more than 30 % higher than the average (Erweiterter Bewertungsausschuss, 2008). Nevertheless in January 2009, because of protests of physicians, the Extended Valuation Committee gave room to the regional partners to compensate smaller remuneration losses as well by redistributing on the second layer of the remuneration system (Erweiterter Bewertungsausschuss, 2009d). Thus, on the regional level the calculation of the standard service volumes was realized in different ways.[33]

Looking at the construction of the standard service volumes focusing on the question of risk adjustment, we can summarize, that the distribution of remuneration to individual physicians contains only one relatively faint element of morbidity adjustment. It is manifested in the rough demographic weights used in the calculation of the standard service volumes. But legal regulations do only allow risk adjustment by age and sex, additional characteristics must not be applied in the moment.

[32] First age group: <6 years, second age group 6-59 years, third age group >59.

[33] As already mentioned in 2.3.2.1, in March 2010 the Valuation Committee decided to budget most of free services in quality-bound additional volumes beginning with July 2010 to counteract the reduction of standard service volumes.

2.4 Adjustment of Collective Remuneration by Social Health Fund to KV in case of Selective Contracting

As explained in subsection 1.2.2, one condition for the success of selective contracting is the adjustment of remuneration in the collective contract system. After a short outline depicting the history of the adjustment problem in subsection 2.4.1, subsection 2.4.2 will present the present solutions for the adjustment of the collective remuneration on the level of social health fund and KV (2.4.2.1) and of the singular physician practice (2.4.2.2).

2.4.1 History

While the collective remuneration system is still dominating the landscape of outpatient medical care remuneration, since the end of the 1990s, opportunities for selective contracting have been introduced to enrich the system of competing statutory health insurance funds with more elements of competition. As illustrated in subsection 1.2.2, one important condition for the potential success of selective contracting is an appropriate adjustment of the collective remuneration in order not to pay twice for medical services (Cassel et al., 2008). Although selective contracting is already looking back on a changeful development based on quickly altering legal regulations (Wiegand, Jung, & Heuzeroth, 2009)[34], it was not before the Statutory Health Insurance Reform Act in 2007 that the legislator prescribed to install a regular adjustment procedure for the collective remuneration for the three main forms of selective contracts. These are contracts concerning primary physician models[35], of integrated care[36] and of special outpatient care[37]. The details had to be contracted by the partners of the collective contracts which were driven by very different interests. The funds involved in selective contracting were interested in regulations that would allow a clear adjustment of overall remuneration and would not discriminate physicians taking part in selective contracts by inappropriately diminishing their standard service volumes in order not to provide disincentives for joining those contracts. The Associations of Statutory Health Insurance Physicians mainly claimed that standard service volumes of physicians not involved in selective contracting should not be influenced by selective contracts (Köhler, 2009).

2.4.2 Present Adjustment Regulations and the Influence of Risk Adjustment

In 2008, the first general rules for the adjustment of collective remuneration for selective contracts on both steps of the collective remuneration system have been introduced by the (Extended) Valuation Committee and have been developed forth in 2009. In the following chapters we will

[34] Selective contracts for integrated care e.g. were financed by a general 1% initial funding taken from the overall remuneration from 2004 to 2008.

[35] § 73b SGB V.

[36] § 140a ff SGB V.

[37] § 73c SGB V.

outline the regulations contracted for 2009 and 2010 on both steps of the remuneration system and the role of risk adjustment.

2.4.2.1 Adjustment of Collective Remuneration by Social Health Fund to KV

The adjustment of the overall remuneration on the first step of the remuneration system has proved to be the less controversial topic, although coordination of both adjustment problems showed to be important in order to avoid liquidity problems on one or the other side of the collective contract partners (Köhler, 2009). For 2009 as well as 2010, the adjustment principles are similar and the adjustment is calculated based on historical utilization of services 2007 respectively 2008 within the concept of actual overall remuneration (Bewertungsausschuss, 2008; Erweiterter Bewertungsausschuss, 2009c). For selective contracts with ex ante enrollment the utilized services of the enrollees are developed further in analogy to the development of the overall remuneration. In case of contracts without enrollment for special services, the average number of these services historically demanded is taken as calculation base.

The only methodical change in adjustment method from 2009 to 2010 refers to the estimated cost calculation for enrollees in selective contracts whose historical utilization is not known.[38] While for 2009, the average utilization of all persons enrolled was taken as base of estimation (Bewertungsausschuss, 2008), for 2010, a small element of risk adjustment has been introduced. The base was no more a general average of all enrollees, but the averages in three age groups corresponding again to the groups used in lump-sum charges and in the construction of standard service volumes (Erweiterter Bewertungsausschuss, 2009c).

Resuming, adjustment of collective remuneration in case of selective contracts is generally based on historical utilization. A small element of a reduced age-related risk adjustment is added in form of the estimation of utilization by persons, whose historical utilization is not known.

2.4.2.2 Adjustment of Standard Service Volumes

Agreements on the adjustment of the standard service volumes in case of selective contracts were much harder to achieve than on the adjustment of overall remuneration. The most controversial issue was the potential adjustment of standard service volumes (SSV) of physicians who are not involved directly in selective contracting. Potential effects that could influence their SSV were:

[38] Reasons of that can be different, e.g. there may have been a change in the health fund or even the insurance system.

- Different utilization particularly due to differences in morbidity of insured persons involved in selective contracting in comparison to those resting within the system of collective remuneration[39]
- Potential patient migration to selectively contracted care from physicians without to physicians with selective contract
- Reduction of services by multiple physicians especially in primary care models

Additionally, there may be effects on the utilization of other groups of physicians.[40]

For 2009 a solution was found which put a relatively small burden regarding the above topics onto the physicians without selective contracts. Only migration effects in a very narrow sense are incorporated into the selective contract. The adapted historical utilization of services of patients, who have not seen a physician engaged in the selective contract in the last whole year, is subtracted from the volume of the medical group affected by the contract when calculating the case value for all physicians of that group. All other effects are only imposed on the SSV of those physicians engaged in selective contracts by proportionally changing their number of cases (Erweiterter Bewertungsausschuss, 2009b).

Summing up, for 2009 adjusting the SSV for effects of selective contracting criteria of historical utilization are used, and effects difficult to relate are mostly attached to the physicians engaged in selective contracts.

The resolution of the Extended Valuation Committee for 2010 is more favorable for those physicians. It changes the calculation method by leaving the number of cases unaffected. The number of cases for SSV of a physician engaged in a selective contract is just reduced by the number of patients enrolled in the contract who have been his/her patient in the same quarter of last year as well. For the determination of a SSV for a group of physicians, as a first step an unadjusted case value for a hypothetical situation without selective contracts is calculated. Additionally a new case value accounting for selective contracts is determined by dividing the remaining volume for the group of physicians (without the part already served by selective contracts) by the remaining cases (without cases subtracted in the SSV of physicians with selective contracts). Following the elements of risk adjustment in the general construction of the SSV, this new case value is adapted to the age group

[39] Especially at the initial stages of primary care models there is a strong probability that persons with higher morbidity are enrolled because they tend to have had more frequent physician contacts.

[40] There might be incentives in both directions. E.g. from primary care models there might result less consultations of specialists because of the intended gate keeping role of general practitioners. On the other hand, the lump-sum payment of general practitioners in those contracts may set incentives to transfer services from general practitioners to specialists.

structure[41] of the "unadjusted" case value. In this way the difference of the adapted adjusted case value and the unadjusted case value expresses all changes in case value, which do not result from changes in age group structure.[42] But in order to divide the risk of adjustment between physicians with and without participation in selective contracting, the full difference is only accepted for the calculation of the SSV of all physicians, when it represents no more than +/- 2,5% of the unadjusted case value. All amounts above this limit are transferred into a calculation for a special case value for physicians engaged in selective contracting (Erweiterter Bewertungsausschuss, 2009c).

So, while the general principle of adjustment of the overall remuneration is still historical utilization, in analogy to the construction of the SSV from 2010 itself an element of rough risk adjustment by age groups is realized at least in the adjustment of the SSV of the physicians engaged in selective contracting.[43]

3 Splitting the Care Burden - A Risk Adjustment Model for Outpatient Medical Care

Based on the analysis of chapter 1 regarding the general use of diagnoses-based risk adjustment and of the existing German collective remuneration system, in this chapter a risk adjustment model will be developed applicable for risk adjustment within overall remuneration and for a more exact adjustment of it in case of selective contracts. Section 3.1 will outline the aims of the model and discuss the criteria for successful risk adjustment that are found in the literature. Based on that, in the following sections, a risk adjustment model for outpatient care apt to split the care burden is developed with German data. In section 3.2 the data used are described and the variables of the model are explained. Section 3.3 simulates the calculation of risk scores for general practitioners versus specialist physician, whereas in section 3.4 a basic simulation of constructing standard service volumes is done.

3.1 . Splitting the Predicted Outpatient Care Burden– Why and how?

The risk adjustment model developed in this chapter adds new possibilities of use in comparison to those already implemented in the collective outpatient remuneration system. This section discusses the main idea of the following simulations. In subsection 3.1.1 basic elements of risk adjustment models are explained. Additionally, principles for successful risk adjustment especially for purposes of

[41] Again this refers to the three age groups in complex fees of Uniform Value Scale.

[42] Those changes will only affect physicians with selective contracts.

[43] The introduction of quality-bound additional volumes in July 2010 leads to the necessity to adjust those volumes as well in case of selective contracting. Because oft the expected lower adjustment amount than in standard service volumes, here only volumes of physicians engaged in selective contracting will be adjusted (Bewertungsausschuss, 2009b).

medical remuneration systems are described in subsection 3.1.2, whereas in subsection 3.1.3 the intention for the development of the special model generated in this study, the care burden splitting model, is derived. Subsection 3.1.4 outlines main limitations for the use of the care burden splitting model in practice.

3.1.1 Risk Adjustment: Risk Factors, Classification Systems and Estimation Models

In chapter 1, functions of risk adjustment for the use in medical remuneration systems were analyzed. In order to fulfill these purposes, risk adjustment models have to be constructed to allow predictions of medical costs to a satisfying degree. Principally, risk adjustment models are constructed in two steps:

- Choice of risk factors
- Choice of classification systems and estimation model

In subsection 3.1.1.1 a short overview will be given about the choice of risk factors for risk adjustment systems. Subsection 3.1.1.2 concerns main decisions about the methods of estimation, including the choice of classification systems and estimation model.

3.1.1.1 Choice of risk factors

In morbidity-based risk adjustment systems, risk factors have to be apt to predict medical costs related to morbidity. Some other relevant criteria may be able to predict medical costs as well, e.g. characteristics of supply. Patients living in a region with a high physician density may regularly cause more medical costs than patients living in a region with few physician practices. So it is possible that using regional physician density as a risk factor would lead to a better prediction of future medical costs. Nevertheless it depends on the aims of risk adjustment which factors should be used (Schokkaert & Van de Voorde, 2004). Related to the implementation of risk adjustment between health funds, Van de Ven and Ellis state, that the aim of fairness has to be defined through principles and judgements of the society concerned by it (Van de Wen & Ellis, 2000). So, translated into the implementation of risk adjustment in a collective medical remuneration system, this means: If is politically meant to set incentives for an equal provision of medical care for all citizens only related to morbidity, it is not advisable to use physician density as a risk factor. If, on the other hand, a special regional supply structure should be maintained, this could take place through the use of supply-related risk factors.

Up to now, morbidity is the only criterion taken into account for risk adjustment in the German collective remuneration system for outpatient care by the legislator (§§ 87a and b SGB V). Hence appropriate risk factors to operationalize the criterion have to be found. These risk factors may be direct or indirect characteristics of morbidity. Direct characteristics are related to the causes of

medical costs whereas indirect characteristics like e.g. socio-economic factors are not directly related to causes of medical costs, but only correlated to those costs. In Table 2 possible risk factors are presented:

Table 2: Risk Factors Indicating Morbidity

Risk Factors Indicating Morbidity	
Direct indicators of morbidity (examples)	**Indirect indicators of morbidity (examples)**
encoded diagnoses	employment status
encoded medication	socio-demographic characteristics like eg. household size
medical procedures	inclination to change health fund
use of diagnostics	Prior utilization of medical services

Origin: Own table

To decide about their use in a risk adjustment model in the context of physician remuneration, these factors should be analyzed. Important aspects for this are the following questions:

- Does the risk factor correlate only to morbidity or to other causes for differences in individual medical costs as well?
- Will the use of the risk factor for risk adjustment cause undesirable incentives for physician behavior?
- Is the information needed obtainable within a reasonable cost range?[44]

As an example, the use of prior utilization of medical services as risk factor will be discussed here along these criteria. Prior medical costs are known to have a high correlation to morbidity and to be the best individual risk factor for the estimation of future medical costs (Beck et al., 2006; Newhouse, Manning, Keeler, & Sloss, 1989; Spycher, 2002). But prior utilization does not only represent morbidity but as well utilization behavior of individual patients caused by other reasons. An even more important argument against the use of this risk factor is related to the second criterion. As in case of higher utilization of services physician remuneration would be positively affected in

[44] These criteria were developed in analogy to (Van de Wen and Ellis 2000).

future, the use of this risk factor would lead to additional incentives for physician-induced demand as well.

As this section is only giving a short overview, not all possible risk factors will be discussed. The present realizations of risk adjustment within remuneration systems concentrate on direct indicators of morbidity like diagnoses combined with age and sex. Information about other indirect indicators is often difficult to obtain (e.g. socio-economic status of insured persons) and there may be relatively strong correlations to other causes of medical utilization.

While this subsection has presented a short overview on the issue of choice of risk factors for risk adjustment systems used in outpatient physician remuneration, subsection 3.1.2. will add some considerations concerning the care burden splitting model developed in this chapter.

3.1.1.2 Choice of Classification systems and estimation model

For an estimation of medical costs using information about one or more chosen risk factors, two further methodological decisions have to be taken:

- Choice of appropriate classification systems systematically grouping the information concerning the chosen risk factors
- Choice of an estimation system including as well decisions about mathematical methods as well as those about possible time horizons

For the use in an estimation model the information available about a chosen risk factor is grouped into classes that can be linked to medical costs. This is systematically done using a classification system. In practice a so called "grouper" is applied, an IT solution automatically matching diagnoses or pharmaceutical information to the classes of the classification system. Especially in the case of diagnoses and of medication several alternatives are available. The output of the classification system, the adjustment factor, can then be used for the estimation model.

Figure 5: Classification Systems

Origin: Own figure

Up to now several classification systems for medical diagnoses as well as for the use of pharmaceuticals have been developed. Main differences between classification systems for medical diagnoses can be found for example in the degree of hierarchization of diagnoses, the way of inclusion of comorbidities[45] or in the question whether only medically comparable diagnoses should be grouped together or whether similar medical costs should be the only criterion. For an in-depth-analysis of available classification systems the reader is referred to further literature.[46] Again, the question of choice of a classification system is additionally considerated in subsection 3.1.2 for the development of the care burden splitting model.

The first decision when chosing an estimation model concerns its basic mathematical construction. In the so called "cell-model" each patient is represented only in one risk group. For each of these risk groups average costs of medical care are calculated (Reschke et al., 2004).[47] The so called "regression model" on the other hand is already used in the German remuneration system for outpatient care.[48] Here estimated costs for a patient consist of a basic amount of costs for each person increased or decreased by additional amounts basing on age, sex and other risk factors indicating morbidity calculated on the base of cost weights. As a regression model is used in this study to estimate the care burden for physician groups and singular physician practices, more concrete mathematical proceedings are explained in subsection 3.2.5.

Further on a decision has to be taken about the time horizon of the model. Cost weights can be calculated using adjustment factors and costs stemming from the same period (concurrent or retrospective estimation models) or from different periods. In the latter case of prospective estimation models, costs are estimated with the help of morbidity indicators of former periods (Reschke et al., 2004). While in prospective estimation models mainly information about chronic diseases takes effect, in concurrent models information about acute diseases will additionally influence the cost weights calculated by regression.

3.1.2 Principles for Successful Risk Adjustment

According to Van de Ven and Ellis (Van de Wen & Ellis, 2000), three general criteria are crucial for successful risk adjustment models: feasibility, fairness and appropriateness of incentives (see also

[45] The decision about the classification of comorbidities is closely linked to the choice of the estimation model.

[46] See e.g. (Reschke et al., 2004).

[47] The „cell-model" was used in the German risk adjustment system between health funds until 2008 (Bundesversicherungsamt, 2008b) and is still used in the Swiss risk adjustment between health funds (Spycher, 2002).

[48] A regression model is used as well in the German morbidity orientated risk adjustment system between health funds from 2009 (Bundesversicherungsamt, 2008a).

subsection 3.1.1.1 concerning the choice of risk factors). Feasibility is fulfilled if the data for model calibration is available in appropriate quality and sufficiently well trusted by all parties affected. In the context of remuneration of medical providers, the fairness principle implies that providers are only held responsible for variations in costs that they are able to influence by optimal treatment decisions. They should not suffer financially from caring for very sickly patients or be rewarded for selecting the most profitable patients. Appropriateness of incentives means that the remuneration system incites efficient and effective levels and types of care. Moreover, the incentives to report false information should be limited.

Additional criteria are developed by Pope et al. (Pope, Kautter, Ellis, Ash, & al., 2004). They seem to be especially important if the risk classification model is implemented in the field of physician remuneration. The first principle states that the disease categories should be clinically meaningful in order to be acceptable and interpretable by physicians (see differences in classification systems pointed out in subsection 3.1.1.2). Clinical meaningfulness also opens possibilities of applying the model for care management purposes. The second principle states that diseases should be grouped together only if they are sufficiently homogenous in costs. Third, each risk group must have enough members to allow stable calculation of payments. Taking into account the extreme skewness of medical expenditure, the costs of rare diagnostic categories might be so unpredictable that they should not affect the remuneration of physicians. Fourth, when creating an individual's risk profile, hierarchies should be used to ensure that more severe manifestations overwrite less severe manifestations of the same disease. More concretely, if an individual was diagnosed a minor form and a more severe form of the same disease, only the more severe form adds to her risk profile. The presence of the minor form is not likely to increase her predicted expenditure. In contrast to that, the manifestation of a different disease should of course add to her risk profile and increase her expected costs. Last but not least, the estimated impact of a disease group can come out negative in a statistical model. However, risk adjustment should not lead to disincentives to report correctly so physicians should not be punished for reporting additional information. -According to that, the influence of an additional disease should not be negative. Therefore, these disease groups are set to zero when calculating the risk scores. This also increases the acceptance of the model among clinicians because the notion that an individual's risk score is low when she has a specific disease and higher if she is healthy contradicts medical experience.

3.1.3 Why Split the Outpatient Care Burden?

As developed in chapter 1, diagnoses based risk adjustment can help to construct payment blends successful in promoting efficient levels and types of health care services and being fair to providers. Collective remuneration as well as remuneration systems for selective contracts can be better adapted to the needs of patients. Incentives for the supply of medical care can be set to meet these needs, to do this in an efficient and effective way and to avoid risk selection. Additionally risk

adjustment can be used for a more exact adjustment of the collective remuneration in case of selective contracting as a condition for unfolding the economic power of a competitive contract system.

Chapter 2 showed that the implementation of diagnoses based risk adjustment into the German collective remuneration system is still limited. The existing model adapted by the Institute of the Evaluation Committee (InBA) is apt to calculate a growth rate of morbidity for overall remuneration. It could be used as well to redistribute overall remunerations between KV-regions according to expected costs of morbidity in outpatient medical care, although, as described above, up to now this has not taken place.

But diagnoses-based risk adjustment could be implemented as well by calculating the morbidity burden in outpatient care for different groups of physicians or for singular practices. In this way, incentives for an appropriate allocation of resources concerning medical specialties could be set. On the level of the singular practice risk selection could be avoided. A more exact adjustment of the collective remuneration in case of selective contracts with specialty groups of physicians could be reached.

3.1.4 Limitations

Before describing further technical details of the model in section 3.2, at least three limitations of our approach deserve special attention. First, as long as risk scores are calculated using real-life data, they necessarily reflect outcomes of the current regulation, which is important keeping in mind when interpreting the results of the model. For example, primary care physicians according to the EBM fees receive the same amount of basic lump-sum payment whether they see a patient either once or multiple times in a quarter. Therefore, the risk score of an individual needing frequent visits may not be markedly higher than the risk score for an individual needing rare visits – although the burden on the physician is higher in the first case.

Second, if risk adjusted payments are used to achieve specific normative goals – for example a movement towards more primary care services and less specialty care – corrections of the risk scores are needed. Risk scores calculated by the model without corrections will only reflect the given empirical situation. Correcting incentives can also be implemented into a remuneration system by combining additional elements in the payment blend used.

An example of such an addition to reach normative goals is sketched by Goroll et al. (Goroll, Berenson, Schoenbaum, & Gardner, 2007). Their proposal, which is currently implemented during a

pilot study with different networks of physicians, includes supplementing the risk adjusted base payments by P4P elements in the form of performance based bonuses rewarding high quality, efficiency and patient-centered care.

Third, the risk scores are calculated using the billed services stemming from a fee schedule with a high percentage of fees for service (the EBM) as a proxy for need. If these risk scores would be applied creating new remuneration systems e.g. for risk-adjusted capitations in case of selective contracts serving a considerable part of the population, the database to adapt them to future developments might not be available any longer.

3.2 Data and Model Characteristics

After describing the dataset used for model development in subsection 3.2.1, this section explains the main characteristics of the model concerning the choice of risk factors and classification system (subsection 3.2.2) and of target variables (subsection 3.2.4), Though the model can be used for splitting the care burden between different physician groups, here it is exemplarily worked out to separate the care burden of general practitioners and specialists. In order to implement this basing on the German collective remuneration system, subsection 3.2.3 shows how to identify this burden using billed services. The following subsections deal with the choice of the estimation model in general (subsection 3.2.5), methods for the evaluation of estimation models (subsection 3.2.6) and present model results concerning total physician expenditure per quarter (subsection 3.2.7) as well as primary care (subsection 3.2.8) and specialist care (subsection 3.2.9) expenditure per quarter.

3.2.1 Data

Data is used from the Verisk Health Inc. modelling database, which combines data from different social health insurance funds. Individual level information is available for about

500.100 insured individuals during the years 2006 and 2007. The 2006 data is used in order to describe the individuals' risk profiles. In addition to age and sex, detailed diagnostic information and detailed information on pharmaceutical spending is available to serve as indicators of health status (see details in section 0). The 2007 data is used to define the target variables. Throughout the paper, results are displayed for the last quarter of 2007. The reason for choosing the last quarter is that it takes some time before all data from a specific period are processed and available. Therefore, the diagnostic and pharmaceutical information of the whole year 2006 is only available from about mid 2007 on. If the model is used in practice, it could only be based on information that is at least some months old. Not including this gap in our analysis would give a false indication of the accuracy of our models. Of course, different time horizons could be chosen for the implementation of the model in practice. Individuals who were not fully insured in both years were excluded, except for those who were newly born in 2006 or died in 2007.

3.2.2 Choice of Risk Factors

The core challenge for successful risk adjustment is the choice of appropriate risk factors. On the base of US data, Ellis, Ash and al. (Ellis et al., 2009) have shown that primary care spending can be predicted with remarkable accuracy using the well known Hierarchical Condition Category (HCC) Classification developed by DxCG (which is now part of Verisk Health Inc.). The HCC algorithm maps diagnostic information (ICD-10 codes) into risk groups for cost prediction. Pope et al. (Pope et al., 2004) show that this classification system fulfils most of the criteria they list for successful risk adjustment. The HCC classification is applied for risk adjustment between the sickness funds in Germany. In the German outpatient remuneration system, the DxCG classification system is used in an adapted form to calculate the change rate in morbidity. Therefore, it is well established in the German market and the necessary data is available at all the sickness funds. Adaptions in the calculation of collective remuneration using the care burden splitting model would not imply a total change of classification system actually used. However, with considerable differences between the two countries, the result of Ellis, Ash et al. concerning the prediction of expenditures by physician groups (in this case primary care spending) needs to be verified with German data.

As described in subsection 3.2.1, in addition to diagnostic information (ICD-10 codes), the dataset used also contains information about the patients' previous health care consumption. Resulting from well known studies (Lamers, 1999), the use of specific pharmaceuticals can be seen as being highly predictive for future health care spending. For drug classification, the ATC (Anatomical - Therapeutical - Chemical) system maintained by the WHO is widely established. As ATC codes describe the active agent, rather than the specific product, generic and brand-name drugs are summarized under the same ATC code. For cost prediction, the ATC codes are grouped into Rx-Groups using an algorithm which was also developed by DxCG (Zhao, Ellis, Ash, & al., 2001).

3.2.3 Separating Primary Care from Specialty Care

In order to apply the model in the German outpatient remuneration system, the burden carried by different groups of physicians has to be identified. To this end, billed services have to be split by physician groups. In our dataset, the specialty of physicians can be derived from her or his identification number. In contrast notably to the US, primary care services may not be billed by specialists in Germany. It is therefore not necessary to dive deep into accounting data in order to separate primary care from specialty care. However, an exception concerns specialists for internal medicine, who may either decide to work in primary care or gain a license for the work as a specialist in fields such as cardiology or pneumology. To be able to distinguish those providing primary care from the other group offering specialist care, the kind of services billed by each physician for internal medicine is used as an indicator (see Table 3). In the cases when physicians billed services from different specialty groups, the most frequently used class served as an indicator. Services that are not restricted to a specific group were not considered.

Tabelle 3: Identification of Physicians According to Billed Services

Specialty	EBM numbers used for identification
Primary Care	03000 - 03999
Internal Medicine without specialisation	13250 - 13260
Internal Medicine - Angiology	13300 - 13311
Internal Medicine - Endocrinology	13350 - 13431
Internal Medicine – Hematology /Oncology	13500 - 13502
Internal Medicine - Cardiology	13550 - 13561
Internal Medicine - Nephrology and Dialysis	13600 - 13621
Internal Medicine - Pneumology	13650 - 13670
Internal Medicine - Rheumatology	13700 - 13705

Origin: own table

3.2.4 The Target Variables – How to Proxy the „Care Burden"?

The aim of risk adjustment is to predict the patient's need for care by using personal characteristics such as age or health status. In practice, "weights" (or "coefficients") are calculated reflecting the amount by which an indicator (a HCC, for example) increases the patients' need for care. However, a major challenge is to find suitable indicators for "the patients' need for care". The best available indicators are the utilization of health care services. However, this measure is strongly dependent on the current remuneration system.

As already outlined in chapter 2, the current collective remuneration system for German physicians in outpatient care is highly complex. Most services are reimbursed according to the so-called "Uniform Value Schedule", a fee schedule that attributes each service a point value reflecting the effort of provision. The amount that was paid for a "point" until 2009 depended on the region where a physician was situated as well as on whether or not he had spent more than his "Standard Service Volume" already. This analysis aims at the identification of the amount that is needed to care for one particular patient. Differences in prices are unrelated to patient´s need of medical care and a possible cause of dilution. This is why we multiply the number of points by a constant, uniform amount instead of using the historic point values. The amount chosen as point value is 3,5 Cent. This is close to the 3,5001 Cent that was fixed as "orientation value" for 2009 by the Extended Valuation

Committee (Erweiterter Bewertungsausschuss, 2008). In order to get a complete picture of the care that is needed by a patient, the amount (in Euros) that has been reimbursed to the physician outside the point system is added. The costs of the materials necessary for dialysis, which are also reimbursed separately from the point system, are not considered because we focus on physician services.

Formula 2: Definition of Physician Costs in Outpatient Care

$Cost_i$ (in €) = 0,035 * $Points_i$ + Other $reimbursement_i$ (in €)

Table 4 : Descriptive Statistics of the Target Variable (Final Quarter of 2007) in Euro

	All Physicians	Specialists (Summed)	Primary Care
Observations	509.269	509.269	509.269
Mean	106,50	66,40	40,10
Standard Error	274,36	259,05	61,70
1. Quartile	0,00	0,00	0,00
Median	48,45	0,00	26,33
3. Quartile	122,65	59,99	56,76
Percentile 90	253,26	168,88	95,63
Percentile 95	377,63	282,93	130,46
Percentile 99	809,51	699,01	250,32
Minimum	0,00	0,00	0,00
Maximum	14.920,21	14.902,89	7.727,18

Origin: own table

Descriptive statistics of different target variables are shown in Table 4. The average costs for physician services to one patient are about 100 Euros in the dataset. Almost two thirds of this amount is spent on specialty care while the rest goes to primary care. A typical characteristic of health data is that the distribution is extremely skewed to the right. The median is much below the

mean for all types of care. For specialty care, even the third quantile is below the mean, which implies that over 75 percent of the population has below average cost. For all types of care, the maximum is markedly higher than the 99 percentile pointing at a long-tailed distribution.

3.2.5 Predicting Individual Expenditure for Different Types of Care

For each individual patient, spending for ambulatory care is predicted by a comprehensive set of risk factors as described in section 0. Linear multivariate models estimated by OLS have been proven to be powerful for prediction of health care expenditure in many occasions. This is why it is the method that is most frequently applied in practice (Ellis, 2008). Because it is very well known and more easily to understand by intuition than other methods, it is generally well accepted by clinicians.

In general, the regression equation takes the form

$$\mathbf{y = X\beta + u}$$

where X is a N x K matrix of individual characteristics, with N denoting the number of observations and K the number of coefficients to be estimated. β is a K x 1 vector of coefficients to be estimated and u is a N x 1 vector of random error terms, which have zero mean and are uncorrelated with X.

In our case, the estimation includes an intercept (β_0). The matrix of explanatory variables X therefore starts with a variable that equals one for all individuals. In addition, the matrix consists of dummy variables[49] indicating whether an individual belongs to a specific age and sex group (AGG), has a hierarchical condition category (HCC), has an interaction of HCC (or in a few cases additionally with age groups) (IHCC), is member in a pharmaceutical group (HRxG) or an interacted pharmaceutical group (RxGI). Letting AGG denote an N x 40 matrix of age and gender group dummies, and β_{AGG} a 40X 1 vector of coefficients pertaining to age and gender groups (and the same for the HCC etc.). The model can be written as:

Formula 3: Regression Equation for the Prediction of Outpatient Medical Costs

$$\mathbf{y = \beta_0 + AGG_i\,\beta_{AGG} + HCC_i\,\beta_{HCC} + IHCC_i\,\beta_{IHCC} + HRxG_i\,\beta_{HRxG} + RxGI_i\,\beta_{HRxG} + u_i}$$

$$\mathbf{with\ i = 1, ..., N.}$$

The estimated coefficients are used to predict costs on the individual level. For example, a female aged 53 having suffered from a minor infection (HCC 127) has predicted total physician expenditure of (restricted model 2):

[49] A dummy variable is 1 if the characteristic under consideration is observed for the individual and zero otherwise.

Formula 4: Prediction Example

$$Y_i = \text{Intercept} + \beta_{AGG} + \beta_{HCC127} = 36{,}23 - 7{,}39 + 7{,}29 = 36{,}13$$

In order to calculate the individual risk score (see chapter 3.3), the individual's prediction is divided by the average prediction in the population. For example, the average prediction from the restricted model 2 amounts to 106,50. Therefore, this specific individual has a risk score of 36,13 / 106,5 = 0,339 (see also Table 8).

3.2.6 Assessing the Goodness-of-fit of the Regressions

The best way to assess the predictive power of our models would be an out-of-sample test, i.e. using the estimated coefficients from one dataset ("training dataset") to predict values in another dataset ("testing dataset"). In this way, one would control for potential overfitting. Overfitting means that the estimated model describes random noise occurring in this particular dataset rather than a general relationship between the covariates and the target variable. As we estimate a prospective model, the ideal "testing dataset" would be another year of data. Unfortunately, this data is not available to us. However, we think that it is appropriate to work with only one dataset because the overfitting problem is not likely to be substantial. It occurs if the number of observations is small compared to the number of estimated parameters. Ellis and Mookim show that, in datasets of the size of ours, the problem is negligible (Ellis & Mookim, 2009). To be specific, they model health care expenditure using age, sex and about 180 HCCs and find that the out-sample measures of fit are almost as high as the in-sample measures.

There are several criteria available to assess the in-sample goodness-of-fit of a regression. The most commonly used measure is the R^2. It describes the share of the total variation that is explained by the model. The total variation is described by the sum of squared deviations from the mean. The explained variation is the squared deviation from the mean of the predicted values.

Formula 5: Definition of R^2

$$R^2 = \frac{\sum_i^n \left(\hat{C}_i - \overline{C}\right)^2}{\sum_i^n \left(C_i - \overline{C}\right)^2}$$

Where i = 1….n denotes the n individual patients. C_i are the observed and $\hat{C}_i$ the predicted costs. The population average is denoted $\overline{C}$.

The Standard Error of Regression or RMSE (= Root Mean Squared Error) is defined as the square root of the sum of squared prediction errors. The prediction errors are equal to the realisation for patient i minus the prediction for this patient. It is a measure of the goodness of prediction.

Formula 6: Definition of the Root Mean Squared Error (RSME)

$$RMSE = \sqrt{\frac{\sum_i^N \left(\hat{C}_i - C_i\right)^2}{n}}$$

The Mean Absolute Deviation (MAD) considers the absolute value of the deviations instead of the squared deviations. It is less sensitive than the RMSE to very large values of the deviations ("outliers").

Formula 7: Definition of the Mean Absolute Deviation (MAD)

$$MAD = \frac{\sum_i^I \left|\hat{C}_i - C_i\right|}{n}$$

3.2.7 Total Physician Expenditure per Quarter

The columns of Table 5 show selected quality criterions for regression models. The first column refers to the so-called kitchen sink regression. This full model uses all available predictors, regardless of the significance level of their coefficients. As some diseases affect patients differently at different ages, the disease groups are interacted with dummies indicating that an individual is under 18 (kid*HCC) or over 60 (old*HCC) years old. Moreover, some diseases have different cost structures in the presence of co-morbidities, so interactions between disease groups are included. This results in 40 age and gender groups and 777 disease groups.

The model attains an R^2 of 40 percent and considerable accuracy of prediction thereby confirming the finding of Ash, Ellis et al. mentioned in subsection 3.2.2 (Ellis et al., 2009) that the HCC risk groups are generally well suited to predict ambulatory care. However,

the RMSE exhibits relatively large values compared to the average predicted costs. Thus, the prediction accuracy on the individual level seems to be not very good at a first glance. Nevertheless these high RMSE values are typical for predictions of medical costs on the individual level (see e.g. (Diehr, Yanez, Ash, Hornbrook, & Lin, 1999) or (Hsu, Lin, & Yang, 2008)).

In contrast, the MAD (= Mean Absolute Deviation) is much lower. It is also a measure of predictive accuracy, but here the average absolute prediction error is calculated, instead of the average squared prediction error as in the RMSE. The smaller value of MAD compared to RMSE indicates that there

are some very large prediction errors which drive the RMSE upwards. As in the MAD measure these "outliers" are included in the formula by their absolute value and not their squared value, MAD is less strongly affected by them.

To ensure that estimated coefficients are stable over time, a second estimation is run containing only the disease groups with more than 200 observations. Furthermore, disease groups that are statistically indifferent from zero on the five percent level are excluded in the final regression. The age and sex groups are included in every estimation. The results of the restricted models are shown in the second and third columns. The quality according to the chosen criterions stays roughly the same so the restrictions imposed do not markedly reduce the predictions made by the model. The same is true for the results shown in the third column. In this model, we excluded disease categories with negative coefficients. The practical advantages thereof are discussed in 0.

Table 5 : OLS Regressions on Total Physician Expenditures (Last Quarter of 2007)

	Full Model	Restricted Model 1	Restricted Model 2
		- Only groups having more than 200 observations - significant on the 0,05 level	- Only groups having more than 200 observations - significant on the 0,05 level - Only non-negative coefficients
Risk Factors	40 AGGs, 184 HCCs, 184 Kid*HCCs, 184 Old*HCCs , 23 Interact. HCCs 162 RxGroups 40 Intera. RxGroups	40 AGGs, 104 HCCs, 13 Kid*HCCs, 52 Old*HCCs , 12 Interact. HCCs 72 RxGroups 13 Intera. RxGroups	40 AGGs, 96 HCCs, 2 Kid*HCCs, 21 Old*HCCs , 3 Interact. HCCs 67 RxGroups 4 Intera. RxGroups
Observations	509.269	509.269	509.269
Average Costs	106,50	106,50	106,50
Average Predicted Costs	106,53	106,52	106,52
R^2	0,409	0,406	0,406
RMSE	210,75	211,47	221,47
MAD	85,240	85,36	85,36

Origin: own table

3.2.8 Primary Care Expenditures per Quarter

Table 6 shows the goodness-of-fit measures for spending on primary care providers (see definition in section 3.2.3). The predictive power of the Verisk Health Inc. risk factors is reduced compared to the model for all physicians. The R-squared, for example, only attains about 20 percent. The likeliest explanation for this drop is the lump-sum remuneration of primary care physicians. As mentioned previously, already according to the EBM-version of 2005, the primary care physicians receive a lump sum every time they see a patient the first time in a quarter. For repeated visits in the same quarter, they do not receive much additional remuneration. Therefore, the correlation between patient morbidity and the payment for this particular patient is limited for general practitioners. Presumably a calculation based on actual data and the actual EBM-version could show even a more reduced predictive power.

Again, results are also shown for two restricted models. The goodness-of-fit measures do not drop much in comparison to the full model. However, in the case of primary care it is questionable whether the restriction to non-negative coefficients is sensible. Patients with certain chronic conditions might need specialist care so often that the burden on their primary care physicians is indeed reduced. For example, people with heart disease might receive frequent care from their internist cardiologist so they need less care of their primary care provider. These issues must be discussed in detail when the model is implemented for a specific purpose. From an empirical point of view, the models' performance is roughly the same, so the influence of this assumption remains limited.

Table 6: OLS Regressions on Expenditures for all Primary Care Providers (Final Quarter of 2007)

	Full Model	Restricted Model 1	Restricted Model 2
		- Only groups having more than 200 observations - significant on the 0,05 level	- Only groups having more than 200 observations - significant on the 0,05 level - Only non-negative coefficients
Risk Factors	40 AGGs, 184 HCCs, 184 Kid HCCs, 184 Old HCCs , 23 Interact. HCCs 162 RxGroups 40 Interact. RxGroups	40 AGGs, 113 HCCs, 14 Kid HCCs, 51 Old HCCs , 12 Interact. HCCs 77 RxGroups 13 Interact. RxGroups	40 AGGs, 107 HCCs, 10 Kid HCCs, 18 Old HCCs , 75 RxGroups 3 Interact. HCCs 6 Interact. RxGroups
Observations	509.269	509.269	509.269
Average Costs	40,10	40,10	40,10
Average Predicted Costs	40,10	40,10	40,10
R^2	0,246	0,244	0,242
RMSE	53,56	53,66	53,72
MAD	28,17	28,20	28,20

Origin: own table

Compared to the model for all physicians, the RMSE is much smaller in this model, not exceeding the average predicted costs by much. This is likely due to the fact that the distribution of expenditures for primary care is less skewed to the right. In order words, there is a smaller tail of very high expenditures. This can also be seen in table 4 where the maximum spending on primary care is much lower than the maximum spending for specialists. In general this may be caused by the equalizing effect of lump-sum-payments.

3.2.9 Specialist Expenditures per Quarter

The same regressions are applied also to specialist care (see table 7). In the first step, expenditures for all specialists are summed up. Amounting to about 40 percent, the R^2 is higher than for primary care. As specialists are often consulted for chronic rather than acute health problems, it is not surprising that specialist care is more predictable by the HCC disease categories. Moreover, payments to specialists are only bundled to a limited extent. Therefore, many services are billed separately. A patient who received a large amount of care is shown as expensive in the data. The RMSE and the MAD show almost the same patterns as they had for the costs of all physicians. The RMSE is high, pointing at the influence of a limited number of individuals having very high costs that cannot be well explained by the model.

Here again, the restricted models perform only slightly worse than the unrestricted one.

Regressions were also run for frequently used specialty groups such as gynaecologists. These results are not shown for brevity. Because of our limited database, for other specialists groups we did not have enough sufficient data which were suitable for an analysis in this setting.

Table 7: OLS Regressions on Expenditures for All Specialists (Last Quarter of 2007)

	Full Model	Restricted Model 1	Restricted Model 2
		- Only groups having more than 200 observations - significant on the 0,05 level	- Only groups having more than 200 observations - significant on the 0,05 level - Only non-negative coefficients
Risk Factors	40 AGGs, 184 HCCs, 184 Kid HCCs, 184 Old HCCs , 23 Interact. HCCs 162 RxGroups 40 Intera. RxGroups	40 AGGs, 89 HCCs, 16 Kid HCCs, 52 Old HCCs , 68 RxGroups 12 Interact. HCCs 13 Interact. RxGroups	40 AGGs, 94 HCCs, 4 Kid HCCs, 22 Old HCCs , 3 Interact. HCCs 26 RxGroups
Observations	509.269	509.269	509.269
Average Costs	66,40	66,40	66,40
Average Predicted Costs	66,53	66,51	66,49
R^2	0,397	0,393	0,391
RMSE	200,97	201,66	202,15
Mean Absolute Deviation	71,28	71,36	71,25

Origin: own table

3.3 Individual Risk Scores (RS)

After describing the main characteristics of the prediction model and defining its variables, in this chapter the additional preconditions for using the model to split the care burden are developed. As already mentioned above, this is done exemplarily for the case of splitting the burden between primary and specialist outpatient care. The model of course can be implemented analogically between different kinds of specialist care. In subsection 3.3.1 the calculation of risk scores under the condition of a burden splitting model is explained. Subsection 3.3.2 shows some typical examples for additive risk scores in order to display a picture of possible results of the model.

3.3.1 Calculating Risk Scores under the Condition of Additive Separability

The regressions described in the previous sections are used to predict expenditures per physician group on the individual level. These predictions are then used to derive an individual risk score. The

aim of the risk scores is to describe the risk of this particular individual *in comparison* to the average risk in the population. Ideally, this risk score should be additively separable into a component specialist and a primary care component, hence:

Formula 8: Condition for Additive Separability of Risk Scores for Physician Groups

$$\text{Risk Score}_{i,\text{All Physicians}} = \text{Risk Score}_{i,\text{Primary Care}} + \text{Risk Score}_{i,\text{Specialists}}$$

The subscript i denotes an individual. An individual's risk score for all physicians is calculated as prediction for this individual over the mean prediction. For example, if an individual has predicted cost of 200 € while the overall average cost amounts to 100 €, his or her risk score is 2. The average risk score in the population amounts to 1.

Formula 9: Definition of Risk Score for All Physicians

$$\text{Risk Score}_{i,\text{All Physicians}} = \frac{\text{Prediction}_{i,\text{All Physicians}}}{\text{Average Prediction}_{\text{All Physicians}}}$$

The subscript i again denotes an individual. If the estimation model yields unbiased predictions, the condition $\text{Pred}_{\text{All Physicians}} = \text{Pred}_{\text{Primary Care}} + \text{Pred}_{\text{Specialist}}$ holds on average if risk scores are calculated by the first term of the equation in Formula 10. However, on the individual level, the sum of predictions per specialty will not necessarily equal the prediction for all specialties. Therefore, a correction term is needed to make sure that risk scores for specialties add up to the risk score for all physicians (second term of the equation in Formula 10). The calculation can be done in an analogous way for primary care, specialty care (see Formula 11) or different specialties separately.

Formula 10: Definition or Risk Score for Primary Care

$$\text{Risk Score}_{i,\text{Primary Care}} = \frac{\text{Pred}_{i,\text{Primary Care}}}{\text{Avg Pred}_{\text{All Physicians}}} \times \frac{\text{Pred}_{i,\text{All Physicians}}}{(\text{Pred}_{i,\text{Primary Care}} + \text{Pred}_{i,\text{Specialists}})}$$

Formula 11: Definition of Risk Score for Specialist Care

$$\textit{Risk Score i ,Specialists} = \frac{\text{Pred}_{\text{i, Specialists}}}{\text{Avg Pred}_{\text{All Physicians}}} \times \frac{\text{Pred}_{\text{i, All Physicians}}}{(\text{Pred}_{\text{i, Primary Care}} + \text{Pred}_{\text{i, Specialists}})}$$

3.3.2 Examples for Risk Scores

A consequence of the calculation in Formulae 9-11 is that the mean risk scores per physician group are markedly below one, as the average risk score for *all* physicians equals one. Therefore, a risk score below one within a group of medical services does not imply that the individual is a below average risk. For interpretation, it is important to keep in mind that all risk scores are calculated only for the burden on physicians. Diseases that require expensive drugs or frequent use of inpatient care do not necessarily show up with a high risk score.

Table 8: Risk Scores for Selected Individuals

All	Primary Care	Specialists	
1,000	0,376	0,624	**Mean Risk Score**
Examples, all patients female and 53 years old			
0,339	0,131	0,208	**1 Healthy person. One HCC for minor infections (cold).** Other ear, nose, throat, and mouth disorders
0,865	0,597	0,268	**2. Type 2 diabetic with minor signs of any organ failure** Diabetes with neurologic or peripheral circulatory manifestation Hypertension Diabetic and other vascular retinopathies Insuline Antihypertensives
1,233	0,554	0,752	**3. Type 1 serious diabetic with serious problems.** Diabetes with renal manifestation Type I diabetes mellitus Depression Unstable angina and other acute ischemic heart disease Nephritis Urinary tract infection Statines Beta blocker Insulin
1,076	0,560	0,516	**4. Long term HIV patient, on drugs, no AIDS yet.** HIV/AIDS Diabetes with no or unspecified complications Other endocrine/metabolic/nutritional disorders Angina pectoris/old myocardial infarction Statines Non-nucleoside reverse transcriptase inhibitors (NNRTI) Nucleoside reverse transcriptase inhibitors (NRTI) Protease inhibitors

Origin: own table

Table 8 shows examples of risk scores for selected individuals calculated using the restricted model 2. They are all female and 53 years old. When healthy, this individual has a risk score of 0,307. The share of specialists is higher than that of primary care physicians, which is likely driven by gynaecologists. The second person, a diabetic with minor signs of any organ failure has a risk score for all physicians of about average. This sounds surprisingly low for a person with her diagnosis, but is in fact higher than the score of a large majority of people. The reason is the extreme skewness of health care expenditure data. Remember from Table 5 that the mean costs are markedly higher than the median costs, implying that most people have costs below average. Risk scores follow the pattern of predicted costs. Hence, most individuals have a risk score below one for all physicians. As for physician groups, the diabetes type 2 is largely treated by primary care physicians. By way of contrast, person 3 with diabetes type 1 and severe problems needs more specialist than primary care. Her score for all physicians is almost equal to two, indicating a high need for physician care. The fourth patient, who is HIV positive and on drugs, has a score for specialists roughly the average, but needs much more primary care than the average.

3.4 A Simulation of the Use of Risk Scores to Calculate Standard Service Volumes

For illustration purposes, simulations were run that use the risk scores for the calculation of the standard service volumes. These calculations offer interesting insights into the workings of risk adjustment and its possible use for outpatient care remuneration in Germany. However, it is important to keep in mind that we are using a limited dataset. Moreover, the simulation is based on some assumptions that are not reflected in the current remuneration system such as the inclusion of all services by primary care doctors and the assignment of each patient to exactly one doctor. For these reasons, it is not possible to depict possible winner or losers of reforming the system from the calculations. Chapter 3.4.1 will explain the assignment of a patient to one particular physician. Thereafter, the calculation of the standard service volumes will be explained in chapter 3.4.2. The results of the simulation will be discussed in section 3.4.3.

3.4.1 Assigning Patients to Physicians

Currently, patients in Germany have free choice of physician and may visit as many different primary care physicians as they like.[50] However, it is useful to assign patients to doctors for our simulation. Following Ellis, Ash et al. (Ellis et al., 2009), we use a two-step procedure for the assignement. First, each patient is assigned to the primary care physician (PCP) who has billed the largest amount for this patient in 2007. This physician is denoted his or her "Assigned PCP". Here we use a different procedure than in the ordinary distribution process of remuneration, as standard service volumes

[50] The only incentive to cling to one primary physician per quarter ist the obligation to pay an additional practice fee of 10 Euro for visiting another physician without referral (§28, para 4 SGB V).

are normally calculated on the base of patient numbers of the same quarter of the previous year. As a result, the prediction of service quantities may be better than in "real life" as there are no effects of changes of physician and non-users. Nevertheless this will not distort our comparison of risk adjustment methods as the same procedure is implemented in both calculations. Because of the limited number of people in our dataset, many practises are assigned only a few patients. In order to analyze the model for "normally sized" practices, we cluster physicians that are practising in the same geographical region. To this end, physicians are sorted according to their zip codes. Thereafter, practices are clustered together until a minimum of 800 patients is reached[51]. These clustered practices are denoted pseudo PCPs. The mechanism assures that every two patients that share the same assigned PCP also end up with the same pseudo PCP.

While not part of the current regulation, the random assignment of patients to physicians would not distort the comparision between two modes of calculation if there were no systematic differences in the risk structure of existing practises. However, if some doctors systematically attract certain risk groups – for example because they have aquired a reputation for curing a specific disease – then the risk mix of real physicians is more spread than in our simulation. Our simulation, then, underestimates the beneficial effect of risk adjustment in predicting cost on the practice level.

Table 9: Assignment of Patients to Physicians

	Assigned PCP	Pseudo PCP
Number of different phycisicans	31.016	356
Number of patients, average	10	836
Number of patients, min	1	801
Number of patients, max	615	1.274

Origin: own table

[51]This number is not unrealistic and is also used in examples by the GKV Spitzenverband. (GKV-Spitzenverband, 2010) However, some KVs, for example the KV Sachsen-Anhalt, report higher number of cases (Kassenärztliche Vereinigung Sachsen-Anhalt, 2010) per physician. This is not astonishing, as in general the lower concentration of physicians in the eastern KVs leads to above average numbers of cases.

3.4.2 Calculating a Risk Adjusted Correction for the "Standard Service Volumes"

As mentioned in section 2.3.2.3, there is an element of risk adjustment in the current calculation of the "Standard Service Volumes". In principle, the Standard Service Volume is is multiplied by a correction factor reflecting the physician´s risk burden, hence:

Formula 12: Calculation of Standard Service Volumes

Standard Service Volume = Number of Cases * Case Value * Correction

The number of cases is assumed to equal the number of patients assigned. As this simulation is done for general practitioners only, this is a reasonable assumption. For most of their services, general practitioners bill only once per patient and quarter. However, we ignore the fact that the patient could have visited other physicians and counted as a case in their budget as well.[52] This proceeding seems to be justifiable, as this simulation serves to compare two ways to calculate the correction factor. To this end, it is mainly important that the two analyses are calculated in the same way.

First, the correction factor is calculated according to the current regulation. It is a weigthed average of the number of patients in an age group and the ratio of average cost for core services by this group over the total average of core services.

Formula 13: Calculation of the Correction Reflecting Current Regulation

$$\text{Correction} = \frac{\sum_{a=1}^{3} \frac{C_a}{C} N_a}{N}$$

The age groups are:

a = 1 : 0-5

a = 2: 6 – 59

a = 3: 60+

C_a = Age specific burden for core services, per region and physician group C = Average burden for core services, per region and physician group

N_a= number of patients in an age group

[52] There are also special cases in which the GP bills more additional fees-for-service, for example if laboratory tests were ordered.

N = total number of patients per physician

It is well known that age is only a very crude indicator of the different health need of patients. Recall that our model uses a set of risk factors such as age, sex, diagnostic groups (HCCs) and pharmaceutical groups in order to predict individual costs in a specific period. The individual prediction is then compared to the population average in order to calculate an individual's risk score. The risk score therefore indicates "how much greater the burden for a physician is to care for this individual in comparison to an average individual". Using these risk scores, there is a straightforward way to adjust the correction factor to differences in morbidity risk. The correction factor is the average risk score of patients cared for by the physician.

Formula 14: Calculation of the Correction Reflecting Morbidity Risk

$$\text{Correction} = \frac{\left(\sum_{i=1}^{I} \frac{\text{Prediction}_{\text{i, Group}}}{\text{Average Prediction}_{\text{Group}}} \right)}{N}$$

i …I = All patients per physician

Prediction $_{\text{i, Group}}$ = Individual prediction of costs for a physician group

Average Prediction $_{\text{Group}}$ = Average prediction for this physician group

Please note that the risk scores in the enumerator are calculated only within a physician group (this is the same calculation as suggested for total physician cost above). The reason is that the Standard Service Volumes serve to distribute resources *within* a physician group. The amount of remuneration that the group receives in total is determined in an earlier step.

3.4.3 Results of the Simulation

As shown in Table 10 below, both simulations explain the total cost very well, reaching a predictive ratio of one. The mean error, being the sum of negative and positive errors, is very close to zero. However, the absolute errors are rather sizeable, showing that some individual doctors had larger or smaller costs than predicted. These results do not assess the performance of the current budgeted system, because the cost variables include many services that are currently not part of the budgeted system.

The purpose of the simulation is the comparison of the two modes of calculation, which yields very interesting results. In fact, the risk adjusted simulation does not provide a more accurate prediction

of the expenditures on the physician level than the current age-related calculation does. The explanation for this surprising observation lays in the current remuneration system even in the version of the EBM 2005, that is before its changes in 2008, when lump-sum-payment was again extended for general practitioners. The lion's share of the remuneration for primary care physicians in Germany is a quarterly lump-sum that is independent from patient need or frequency of use. Therefore, the morbidity based risk scores are not doing particularly well in predicting billed expenditures for primary care. Moreover, the quarterly lump sums are differentiated across the same three age groups that are used for the correction of the standard service volumes. For this reason, the age-related standard services volumes are well suited to predict the billed cost per patient in primary care.

Table 10 : Results of the Simulation of Standard Service Volumes

	Simulation Age Adjusted	Simulation Morbidity Adjusted
Mean	53.866,84	53.899,40
Predictive Ratio	1	1
Mean Error	-32,55	-0,01
Correlation Predicted – Real	0,62	0,61
Mean Absolute Error	5.739,33	6.069,68
1. Quartile Absolute Error	2.334,34	2.766,56
Median Absolute Error	4.522,45	4.942,71
3. Quartile Absolute Error	8.107,90	8.348,62
Share of physicians with negative deviations > 15% of their volume	0,12	0,11

Origin: own table

As lump-sum payments play a much smaller role in specialty care, it would be interesting to see how the risk adjusted calculation of the standard service volume would perform for specialists. However, because of the limited dataset it is not possible to build sufficiently large specialist practices without merging together specialists from very different regions, which could be a major source of distortion. Therefore, these calculations have to be postponed to further research.

4 Using Risk Adjustment in the German Outpatient Remuneration System

As shown above the care burden splitting model can be used to predict costs for different groups of physicians. These may be the main groups of general practitioners versus specialists or different specialist groups. Additionally it is possible to use morbidity-orientated risk adjustment to calculate standard service volumes. However, it seems to depend on the remuneration forms basically used for a physician groups whether this method is more advisable than simple forms of risk adjustment using age-groups.

In the German outpatient remuneration system there are two principal fields for the implementation of a greater degree of risk adjustment in order to improve efficiency and effectiveness of care.

Basing on the argument that introducing selective contracting in a properly regulated environment is a successful instrument to raise efficiency and effectiveness in medical care, section 4.1 will concentrate on the use of the model to pursue this aim in selective contracting. Regulations of collective contracting in this context are only discussed as far as they are relevant for this question.

Additionally, risk adjustment can be understood as a method to create a collective remuneration system which is more successful in the allocation of financial means related to patient needs and in the construction of incentives for effective and efficient medical care. Understanding our topic like this, section 4.2 will reflect the use of the care burden splitting model within a broader perspective of how and where to use risk adjustment in the collective remuneration system to reach our aims.

Whenever discussing risk adjustment relating to the collective remuneration, a simplified scheme of the collective system will be added in order to indicate the level of distribution of remuneration we are relating to.

4.1 Using the Care Burden Splitting Model in Implementing Selective Contracting

As outlined in subsection 1.2.1 selective contracting can be seen as a way to use the mechanisms of competition for a more effective and efficient organization of medical care. In subsections 1.2.2 and 1.2.3 the dual role of risk adjustment for these approaches was elaborated. According to that, in the following subsection 4.1.1, we will study the use of our model in the construction of the remuneration system of selective contracts, whereas subsection 4.1.2 concerns the role of risk adjustment in the adjustment of collective remuneration in case of selective contracts.

4.1.1 Using Risk Adjustment in the Construction of Selective Contracts

In this chapter we will discuss the possibilities of use of the care burden splitting model and diagnoses-orientated risk adjustment in general only in the subsystem of selective contracts in Germany under the condition of an unchanged collective remuneration system. How can risk adjustment help in the construction of remuneration systems in selective contracts in order to reach effective and efficient care, reduce incentives for risk selection and insure high quality of care?

In Germany, different forms of selective contracts are possible and practiced. The three most important legal forms are primary physician care[53], special out-patient care[54] and integrated care[55]. Whereas primary physician care involves only general practitioners, the two other forms may well involve several physician groups as providers. In contracts of integrated care, providers of other sectors like hospitals offering in-patient care may be contract partners, too.

Selective contracts may involve all outpatient medical care for a group of patients or only services concerning special diseases or treatments. Additionally, as explained in chapter 1.2.1, in one group of selective contracts patients have to enroll themselves[56] in order to take part in the medical care provided by the participants of the contract. In these cases the patient population is defined in advance (e.g. medical care for a regional population, medical care for specific chronic diseases). In another group of selective contracts there is no possibility of enrollment in advance because they concentrate on short-term medical procedures for special conditions. Here the population supplied by these contracts in a period cannot exactly be identified in advance.

Risk adjustment could be applied by health funds in order to calculate the predicted utilization costs of the group of insured served by selective contracts and use this information in the negotiations about the remuneration budget. The care burden splitting model here would be especially helpful for contracts with only one or a few physician groups cutting out only a part of inpatient medical services. Although in the present world of collective remuneration and adjustment for selective contracts these costs of predicted utilization will not be identical with the adjustment sum in the collective contract (see subsection 4.1.2.2), this calculation can be a starting point. It informs about the potential costs of a predicted utilization in the collective system.[57] In order to avoid the

[53] § 73b SGB V.

[54] § 73c SGB V.

[55] §§ 140a ff SGB V.

[56] In the cases of primary physician care and of special outpatient care patients even have to enroll themselves for one year without the possibility to leave the contract before when not leaving the health fund.

[57] Of course, if the adjustment of the collective remuneration because of past utilization shares of the members of a special health fund is lower than the expected utilization of the patient group in selective contracting, this will c. p., reduce the remuneration sum this fund is willing to pay.

interference of regional factors like differences in demand patterns or supply structure, the health funds could use regionalized fund-specific relative weights in their prediction model.

The data used for different forms of contracts may be different. In case of contracts with in-advance enrollment it is possible to use the diagnoses-data of the enrollees to predict their future utilization costs when accessible. For selective contracts without in-advance enrollment the use of risk adjustment does not seem to be helpful in cases of acute conditions with low predictability. So average past costs may be a better calculation basis. In case of acute procedures resulting from chronic conditions, a calculation using risk adjustment is more complicated. It should be possible to use an adapted version of the care burden splitting model to predict the total number of services possibly included in the selective contract for all insured persons of the fund, but it is not clear how many and which persons will take part in the contract. So the remuneration for one participant has to be calculated on base of the risk structure of all insured persons. Especially when the services included do not differ much in dependence of the concrete patient diagnosis, this should be not a problem.

The remuneration sum the fund is willing to offer may differ from the predicted costs for the collective system (and as well from the adjustment sum in collective remuneration) because of several factors: on one hand the health fund could expect that the provider group will provide care in a more efficient and effective way and because of this reduce production costs. On the other hand it could expect cost reduction in other sectors not included in these selective contracts like e.g. use of pharmaceuticals or hospital care. In this case health funds could be willing to pay more than the expected costs of the contracted medical services in the collective system.

One possible health fund strategy in this last case could be the additional use of a risk adjustment model to predict costs in external sectors to the selective contract like hospital care or use of pharmaceuticals for the group of patients enrolled and to link a part of remuneration to the aim of lower real costs in these sectors. Pharmaceutical or hospital costs that are lower than predicted for the patient group would result then in remuneration premia, higher costs even may cause the reduction of remuneration. In this way, an element of pay-for-performance would be introduced into the remuneration within the selective contract.

Given a total remuneration for a selective contract with several groups of providers, the care burden splitting model could be used to distribute the remuneration between the specialist groups using the risk scores of the enrolled population. In case of contracts without in-advance enrollment the shares of the specialist groups could be calculated basing on the risk scores of all insured persons of the funds related to the included services. By extending the model to the in-patient sector in case of

integrated care, risk adjusted shares for in- and outpatient sector could be estimated. In this case the estimation model would of course have to be methodologically adapted.[58]

Using the care burden splitting model in this way would mean to fix the cost relations of the provider groups on a historical base represented by the relative weights. Different from the use described above this implementation of the model would cause no incentives to reduce total costs by triggering less costs in other provider groups, at least as long as they are internal contract partners. Additionally the remuneration system serving as a base for calculating the relative weights should be monitored in its results for the development of the relative weights over time. At the present moment, general practitioners in the collective remuneration system receive lump-sum payments to a larger degree than specialists. If this situation persists and remuneration data for the relative weights are taken from this system, the share of general practitioners in the relative weights could well go down. Reacting on these problems, there could be normative corrections to the share of special groups. But of course those changes would reduce the incentives for those provider groups which are negatively affected by this action to take part in this kind of contract.

Risk adjustment on the level of the provider community would result in reduced incentives for risk selection for this community contracting with a health fund, as many morbidity risks would induce a higher remuneration in the affected sectors or specialist groups. Nevertheless risk selection could be an option for the individual provider unit participating in the selective contract if risk adjustment is not transferred to the individual practice level. So when using a capitation remuneration on the individual provider level, too, it should be risk-adjusted by the risk score of the individual patient. But a precondition for this is the development of a risk adjustment model which is able to appropriately predict costs on the level of an individual provider unit as e.g. an individual physician practice. As shown in subsection 3.4.3, for GP practices this cannot be done in a very differentiated way based on remuneration data stemming from the collective remuneration system because of the large degree of lump-sum-payment received by GPs. However for specialist physicians this precondition could be fulfilled. As an additional aspect, when using risk adjustment on the level of the individual provider unit, it should be especially avoided that additional incentives for risk selection are created which negatively affect socially disadvantaged groups.[59]

[58] Because of the high share of non-users of inpatient care within the insured persons the estimation model should eventually be constructed in two steps.

[59] Incentives for selection induced by differences in demand for medical care by different social groups may in some cases even have desirable effects. So if there is under-consumption of medical services by a socially disadvantaged group, the provision of a relatively high capitation in comparison to their utilization may raise the interest in rendering them medical services and therefore reduce their under-consumption (van de Ven & Ellis,

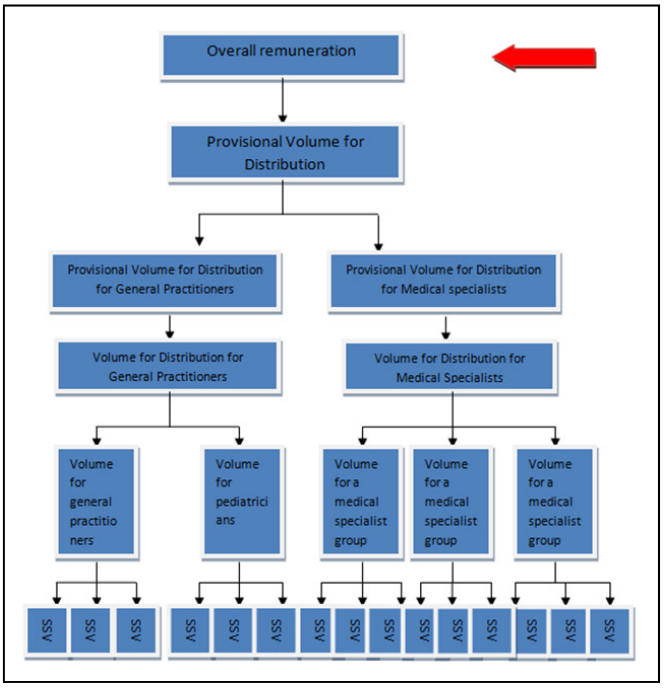
Risk adjusted capitations indicators. To do this, models should be constructed for a risk-adjusted prediction of typical indicators for outcome.

4.1.2 Using Risk Adjustment Models for Adjustment Processes in the Collective Remuneration System in Case of Selective Contracting

As already stated in subsections 1.2.2 and 1.2.3, the accurate adjustment of collective remuneration in case of selective contracting is an important precondition for activating the full potential of competition of selective contracting (Cassel et al., 2008). Because of this, in this chapter we do not only want to use the prediction of the costs of utilization of services by the patients served by selective contracts to construct appropriate selective contracts like in subsection 4.1.2. In addition, we want to adapt the adjustment of and within collective remuneration to this estimation. We will examine in how far this is possible without changing further elements of the collective remuneration system. The problem will be studied on three levels: the level of the overall remuneration, the level of different physician groups (i.e. general practitioners, different specialist groups) and the level of the standard service volume of a single physician practice. In our analysis, we will exemplarily study the adjustment for contracts with in-advance enrollment.

4.1.2.1 Using Risk Adjustment Models for the Adjustment of the Overall Remuneration in Case of Selective Contracting

Using a risk adjustment model, the utilization in selective contracts could be predicted more accurately than by just using historical utilization data. Additionally, for the health fund, the adjustment sum would better reflect the collective price of the services now delivered by selective contract partners. Up to now, the adjustment of overall remuneration was, as described in subsection 2.4.2.1, calculated based on historical utilization. Is it possible to harmonize an adjustment model using risk adjustment with the actual process of



2000). But in Germany empirical results about the influence of socioeconomic criteria on the consumption of medical services are inconsistent (Lampert & Kroll, 2005; Zok, 2007).

calculating overall remuneration like described in subsection 2.2.2?

Overall remuneration for a KV-region is determined by historical development; at present risk adjustment is only used to calculate a yearly growth rate. Overall remuneration to be paid by a singular health fund is calculated based on the share (in points) of its members in the historical utilization of services in the KV-region.

In order to calculate a risk adjusted adjustment sum we could use fund-specific regional or across-funds regional relative weights using the already existing model of the InBA.

When using fund specific regional weights[60], the basic formula for calculating the adjustment sum ASF for contracts with in-advance enrollment and full outpatient medical service could be made up quite simple as

Formula 15: Adjustment Sum of Overall Remuneration for Selective Contracts of a Health Fund Using Fund Specific Regional Relative Weights

$$ASF = \sum_{h=1}^{k} RSFsel_h \times \frac{ORF}{n}$$

with

ASF = Adjustment sum of a health fund F

$RSFsel_h$ = fund-specific regional risk score of the insured person h in the health fund F taking part in a selective contract

ORF = Overall Remuneration to be paid by the health fund F before adjustment for selective contracting

n = number of insured persons in health fund F

k = number of insured persons in the selective contract of health fund F

In the case of selective contracts with in-advance enrollment and specialized services the formula has to be adapted to the part of overall remuneration which is concerned.

In case of across-funds regional relative weights calculated on the base of all health funds of the region, an adjustment sum calculated in the way shown above and collective remuneration sum would not fit together.

[60] In this case, the patient causing average estimated cost for outpatient care should have a risk score of 1.

Let us assume that all insured persons of a fund F are enrolled in selective contracts. If

Formula 16: Condition for Use of an Adapted Formula in Case of Across-funds Regional Relative Weights

$$\frac{\sum_{i=1}^{n} RSF_i}{\sum_{j=1}^{m} RSR_j} \neq \frac{\sum_{i=1}^{n} HPF_i}{\sum_{j=1}^{m} HPR_j}$$

with

RSF_i =Risk score of the insured person i in health fund F in the region R

RSR_j=Risk score of the insured person j in any health fund in the region R

HPF_i=historical[61] points of the insured person in health fund F in the region R

HPF_j=historical[62] points of the insured person j in any health fund in the region R

m = number of all insured persons in all health funds in the region R

n = number of insured persons in health fund F

then the adjustment sum can easily be higher than the overall remuneration or in the opposite case leave an overall remuneration for the fund to pay into the collective contract system without any patient to supply.

By changing the basic formula for the adjustment sum ASF with regional relative weights into

Formula 17: Adjustment Sum of Overall Remuneration for Selective Contracts of a Health Fund using Across-funds Regional Relative Weights

$$ASF = \frac{\sum_{h=1}^{k} RSRsel}{\sum_{i=1}^{n} RSRall} \times ORF$$

with

[61] In the reference period for calculation of overall remuneration.

[62] In the reference period for calculation of overall remuneration.

ASF = Adjustment sum of a health fund F

$RSRsel_h$ = regional risk score of the insured person h enrolled in a selective contract of health fund F

$RSRall_i$ = regional risk score of the insured person i in health fund F

ORF = Overall Remuneration to be paid by the health fund F before adjustment for selective contracting

k = number of insured persons in a selective contract of health fund F

n = number of insured persons in health fund F

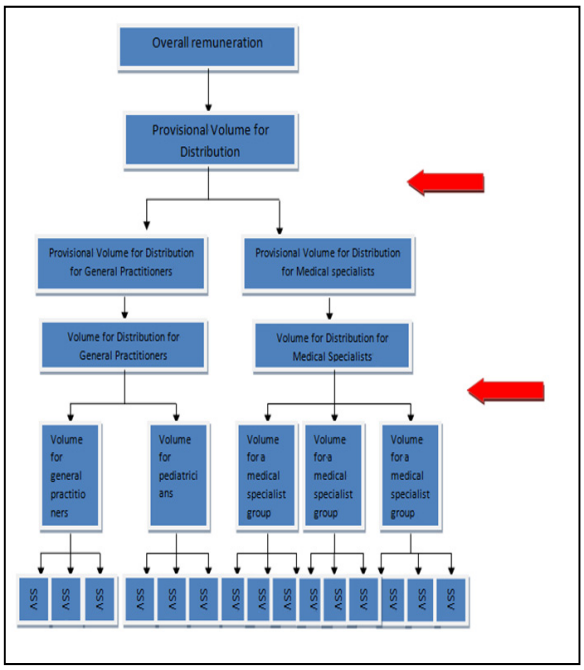
this problem could be solved.

Nevertheless fund-specific relative weights would be able to reflect demand patterns of the members of a specific health fund in addition to their morbidity risk. This could be patterns caused by socio-economic factors, but as well by a special health care management strategy of the fund in the collective system. So the use of fund specific relative weight seems preferable.

We can resume that a risk-adjusted method of adjusting the overall remuneration paid by health funds is as well desirable in order to establish adequate conditions of competition for selective contracting as feasible under the condition of the present collective remuneration system.

4.1.2.2 Using Risk Adjustment Models for the Adjustment of Budgets for Physician Groups within the Overall Remuneration in Case of Selective Contracting

In addition to the calculation of the adjustment sum in overall remuneration the care burden splitting model would allow to calculate the adjustment sum for general practitioners and specialists and for different specialist groups. So at first we will discuss in how far this is a desirable option. Then we will ask whether it is possible to implement this option within the present collective remuneration system.



Aim of a risk-adjusted adjustment of the budgets for physician groups is a fair reduction of the collective budgets of these groups in the collective system in order to guarantee appropriate medical services for patients in this system. For health funds, it is important that their insured persons resting in the collective system are supplied by different groups of medical providers in the right proportion. The Care Burden Splitting model could be helpful in reaching this aim because it is able to predict demand for services of groups of physicians better than simple past utilization data. Nevertheless, as already discussed shortly in subsection 4.1.1 there are some week points concerning the preservation of historical utilization patterns and possible effects of differences in types of remuneration between physician groups. We will have a more systematic look at these problems in subsection 4.2.2 when discussing the implementation of the model in the collective remuneration system.

When trying to implement the care burden splitting model into the present collective remuneration system in order to adjust for selective contracts, we find different conditions than in case of the adjustment of overall remuneration. Here it is only possible to operate on the level of the whole region, as, like explained in chapter 2.3.2, the distribution of overall remuneration is not carried out fund-specifically. Hence here we have to use regional relative weights. Additionally the remuneration sum to be adjusted is not the regional overall remuneration, but in case of the budgets of general practitioner and specialists, it is the provisional volume for distribution[63]. Because of that, the sum of

[63] The provisional volume for distribution corresponds to the overall remuneration reduced by the predicted remuneration of services of psychotherapy with obligatory approval. In case of the distribution between specialist groups the budgets have to be calculated on base of the volume for distribution for medical specialists.

adjustments on this level will not equal the sum of adjustment sums eventually paid by health funds in the region, even if we would decide to use regional relative weights on the level of adjustment of overall remuneration, too.

The calculation of the adjustment sum for a group of physicians would be done in a similar way as the calculation of the total adjustment sum in subsection 4.1.1 using the relative weights from the care burden splitting model[64]. Here we will show the calculation of the adjustment sums for general practitioners versus specialists in case of selective contracts with in-advance enrollment and full inpatient medical services. So the adjustment sum for one of these groups is

Formula 18: Potential Adjustment Sum for a Physician Group in Case of Selective Contracting Calculated Using the Care Burden Splitting Model

$$ASPG = \sum_{l=1}^{z} RSRPGselPCB \times \frac{PVD}{m}$$

with

ASPG = Adjustment sum for a physician group

$RSPGselPCB_l$ = region-specific risk score from the care burden splitting model for a physician group of the insured person l in the region R taking part in a selective contract

PVD = Provisional volume for distribution of region R

z = number of insured persons in region R taking part in a selective contract

m = number of all insured persons in all health funds in the region R.

Within the collective remuneration system, the shares of the groups in the provisional volume for distribution are:

Formula 19: Calculation of a Provisional Volume for Distribution for a Physician Group Using the Separation Factor

$$PVDPG = SFPG \times PVD$$

[64] Eventually normatively corrected as discussed in chapters 3.1.4 and 4.1.1.

with

PVDPG = Provisional volume for distribution for a physician group[65]

SFPG = separation factor for this physician group

PVD = Provisional volume for distribution of region R.

So if not

Formula 20: Condition for the Applicability of the Care Burden Splitting Model for the Adjustment of the Provisional Volumes for Distribution

$$\sum_{l=1}^{z} RSPGselBCB = z \times SFP$$

an adjustment sum calculated in the way shown above and the provisional volume for distribution would not fit together. In the case that all insured persons in a region are served by selective contracts e.g. concerning general practitioners, the adjustment sum can easily be higher than the provisional volume for distribution for that group of physicians or in the opposite case leave a provisional volume for distribution without any patient to supply.

This problem could not be solved as above. But it would be possible to take the provisional volume for distribution for a physician group - calculated using the separation factor of the collective system - as a starting point and use risk adjustment in an analogical way as in overall remuneration. But then we would not use the care burden splitting model splitting up relative weights for different physician groups but just a general morbidity-based risk adjustment model calculating regional relative weights to predict utilization within one physician group like e.g. general practitioners. The risk score of the average insured person is again equal to 1. So here the formula would be

Formula 21: Adjustment Sum for a Physician Group in Case of Selective Contracting Calculated Using a General Diagnoses-related Risk Adjustment Model

$$ASPG = \sum_{l=1}^{z} RSRPGsel \times \frac{PVD}{m}$$

[65] Here: general practitioners versus specialists.

with

ASPG = Adjustment sum for a physician group

$RSRPGsel_I$ = region-specific risk score for a physician group of the insured person I in the region taking part in a selective contract

PVD = Provisional volume for distribution of region R

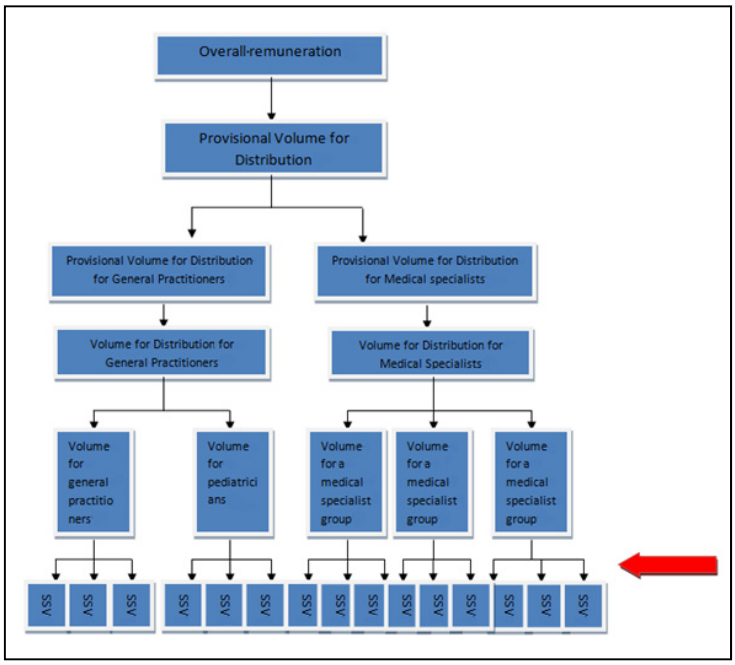
m = number of all insured persons in all health funds in the region R

z = number of insured persons in region R taking part in a selective contract

Summing up, it would be possible to use risk adjustment in adjusting the provisional volumes for distribution of specific physician groups. Nevertheless the care burden splitting model cannot be used within the regulations of the present collective remuneration system as long as separation factors are calculated in a different way.

4.1.2.3 Using Risk Adjustment Models for the Adjustment of Standard Service Volumes in Case of Selective Contracting

In subsection 2.4.2.2 we found some problems for the calculation of a fair adjustment of standard service volumes in the collective remuneration system in case of selective contracting. Could a more elaborated method of risk adjustment in calculating the adjustment volume for the singular physician practice help to solve these problems?



In 2.4.2.2, three special problem areas when distributing the adjustment sum of a group of physician to the singular standard service volumes are identified:

- Migrations into a selective contract by former patients of physicians who do not decide to enter the selective contract
- Reduction of multiple utilization within one group of physicians in the collective contract through selective contracting
- Differences in morbidity between patients entering a selective contract and those staying in the collective contract

One reason for this problem is the different calculation horizon in the adjustment procedure for the number of patients in standard service volumes and the number of patients in selective contracts with in-advance enrollment. Whereas standard service volumes are calculated on base of data of patient numbers from the same quarter of the year before, adjustments are made on base of patients actually enrolled in the contract. This problem is not solved by including more elaborated methods of risk adjustment. Migration effects and effects of reduced multiple utilization stay difficult to locate and distribute to singular standard service volumes.

Could risk adjustment at least help to take into account in a more appropriate way the morbidity differences described above when calculating the adjusted standard service volumes of physicians taking part in selective contracts? As a first and general precondition for this it should be possible to predict future utilization costs within the collective remuneration system of relatively small groups of patients using the classification system for risk adjustment on a higher level than already done at

present. As demonstrated in subsection 3.4.3, in case of general practitioners who receive age-group-related lump-sum-payments to a large degree, this could not be confirmed – risk adjustment using only the three EBM age groups showed even higher predictive power. In case of specialists mostly remunerated by fees-for-service the result is expected to be different.

But even if these general preconditions are fulfilled, the effects of using morbidity risk adjustment models only in the calculation of the adjustment of standard service volumes can be different depending on the special situation of the physician: Let us assume that before adjustment for selective contracting morbidity risks are more or less uniformly distributed[66], and that in the initial stage of a selective contract mainly patients with higher morbidity (and therefore visiting their physician more often than other patients) enroll themselves. In this case, risk adjusting for morbidity could help to reduce the standard service volumes of the physicians engaged in selective contracting in an adequate proportion without changing the collective remuneration system. Nevertheless this assumption may not be realistic. Probably there are practices having a relatively higher or lower proportion of high risks in the three age groups of patients used in calculating the standard service volumes. By risk adjusting only the adjustment for selective contracts, the standard service volumes in effect can be even more inappropriate low or high for the patients to supply within the collective system. So there are limitations for the use of the risk adjustment model when implemented only to calculate the adjustment sum for selective contracting. A more appropriate adjustment method could only be implemented when changing the calculation of standard service volumes itself, that is the collective remuneration system.

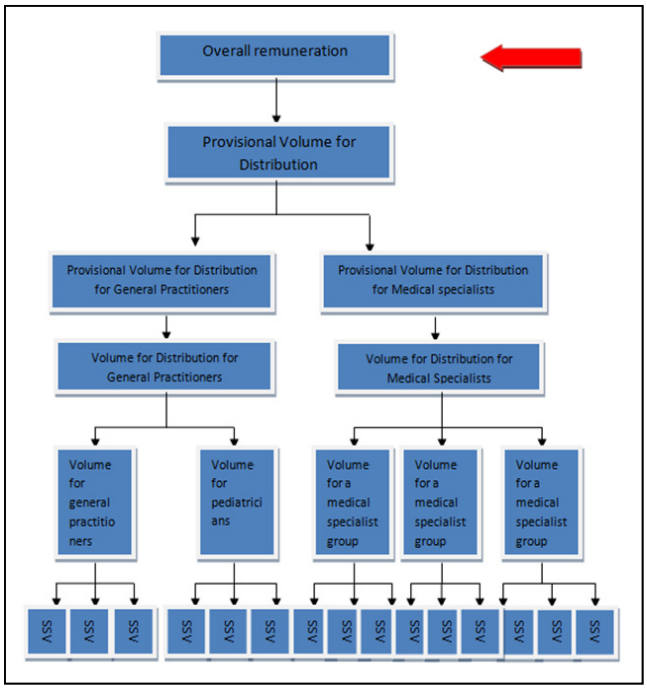
4.2 Using the Care Burden Splitting Model in Implementing a Risk Adjusted Collective Remuneration System

While in section 4.1, we discussed the use of diagnoses-based risk adjustment for the purpose of selective contracting leaving the collective remuneration system basically unchanged, here we change our focus. In the collective remuneration system, could risk adjustment be a method towards an allocation of financial means meeting better the needs of patients? Could it set incentives for providers towards a more effective and efficient medical care in outpatient care? We will investigate this question on the levels of overall remuneration, physician groups and standard service volumes.

[66] Or, more exactly, differences in morbidity are already appropriately expressed by risk adjustment by applying the three age groups in calculating the standard service volumes.

4.2.1 Diagnoses-orientated Risk Adjustment in Calculating the Overall Remuneration

As already mentioned in subsection 2.2.2, during the implementation of the reform of remuneration in outpatient care in 2009, there was a discussion about a so-called "partition model". The basic idea behind a "partition model" is that overall remunerations should generally follow morbidity not only in the component of growth rate of service quantity. On the regional level that would mean that overall remunerations of all regions would have to be recalculated or adjusted according to the risk scores of the insured persons living in those regions measured by the patient classification system.



Should overall remunerations be calculated by distributing their sum (adding up overall remunerations countrywide) between the regions and between the health funds in the regions using diagnoses-related risk adjustment? In how far is it systematically desirable to use risk adjustment on the level of overall remunerations, abandoning potential political costs of potential "loser" reactions?

4.2.1.1 Risk Adjustment between KV-regions in Calculating the Overall Remuneration

Striving after equality of living conditions, it may be a political aim to be able to deliver the same medical services to patients with the same morbidity all over Germany. But regional supply structures within Germany differ considerably. So adjusting the regional supply structures to morbidity could be a contribution to equal living conditions for all citizens (Klose, Rehbein, & Uhlemann, 2007). Paying a remuneration calculated using supra-regional relative weights for morbidity to the regional providers may be seen as an adequate incentive to reach that aim. Providers in a region with weak supply structures relatively to the morbidity of the regional population will get higher budgets and raising income possibilities. In this way incentives are created for new providers to strengthen supply structures. In regions with strong supply structures, the effect is opposite.

However, regional supply structures and diagnoses confirmed by physicians for use in the classification system may not be independent factors. A supply situation characterized by low utilization possibilities will probably lead to a smaller number of diagnoses than a supply situation with high utilization possibilities.

Risk adjustment bases upon the average utilization structure of a population. So when, in order to redistribute overall remunerations between KV-regions, supra-regional relative weights are calculated, they show average utilization in Germany. But which utilization patterns or even which scale of utilization should be a political aim? Which level and structure of outpatient medical care is desirable?

In terms of capacity planning by the Federal Joint Committee (Gemeinsamer Bundesausschuss, 2007) in Germany, there are more planning areas with over- than under-supply (Klose et al., 2007). But the procedures of capacity planning are based on historical provider-patient ratios, too and do not answer the question of demand and need in a systematical way.

The Advisory Council on the Assessment of Development in the Health Care Systems defines over-, under- and misuse as follows:

"The partial or full refusal of health care despite the presence of individually, professionally,

scientifically or socially acknowledged need, although services are available that can be expected to provide a sufficiently proven net benefit and, compared to the medical alternatives, can be provided efficiently, is called "underuse". The supply of service beyond the level needed is termed "overuse". It is the provision of services for which there is no indication or insufficient evidence of their clinical benefit (medical overuse), services that provide too few benefits to justify their costs of services that are provided inefficiently ("economic overuse"). Misuse is health care that causes an avoidable damage" (Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen, 2001).

In this sense, up to now, there is no appropriate official standard for measuring patient need for outpatient medical care. So it may be justifiable to relate to a morbidity-weighted average. Nevertheless it is necessary to keep in mind, that by relating to an average, useful supply structures with over-average costs could be cut off within the collective system, even if they are cost-effective because of their influence on the costs of other sectors (e.g. in avoiding inpatient costs). Anyway, by relating to average current costs, it is theoretically possible to calculate a remuneration reform without the need of additional financial means.

Even accepting current average morbidity-related utilization as a standard, there are still more questions. How do physicians react on financial incentives concerning their settlement behavior, and

in which time horizon do they react? Changes in prices of medical services in situations of under- or overutilization are already initiated by the extended valuation committee (Erweiterter Bewertungsausschuss, 2009a). Are changes in possible supply quantities in the standard service volumes (triggered by changes in overall remuneration) appropriate additional incentives?

Anyway, physician reactions in settlement behavior will show time-lags (Wasem & Walendzik, 2009b). And even if price incentives alone are efficient, on the long run an adaption of quantities in overall remuneration will be necessary. So a convergence phase in introducing overall remunerations calculated using supra-regionally diagnoses-based risk adjustment seems to be appropriate.

4.2.1.2 Risk Adjustment between Health Funds in a Region in Calculating the Overall Remuneration

Diagnoses-based risk adjustment could be used to calculate the overall remuneration to pay by singular health funds in a region as well. According to this, a health fund would pay the average costs of utilization calculated on base of the morbidity of its members. The partition model could be implemented on the level of the KV-regional overall remuneration independently of the use of risk adjustment between KV-regions discussed in subsection 4.2.1.1.

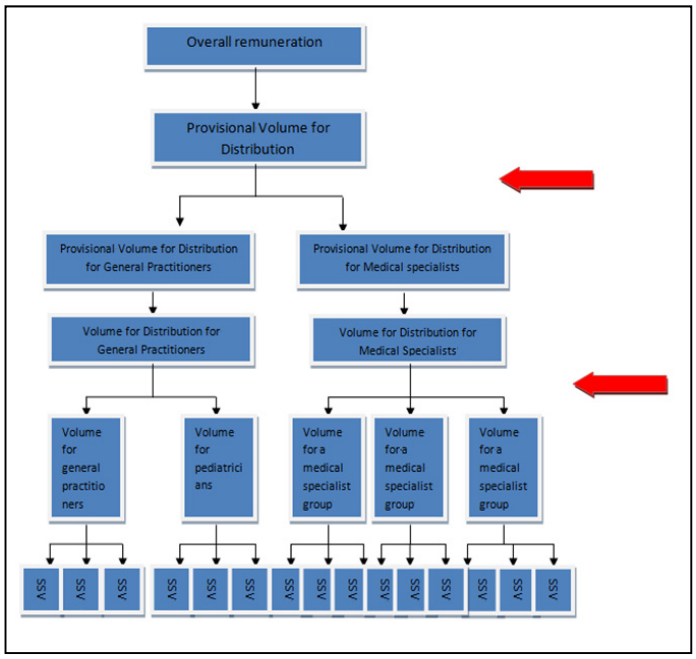
Assuming that most singular health funds are not concentrated in one subregion with a very special supply structure, differences based on supply structures not comprised in the risk adjustment system would here weigh less. But social strata might be represented to a different degree in health funds. As like already mentioned in subsection 4.1.1, effects of social strata for the utilization of medical services are subject to controversy, potential incentives for risk selection can vary. Some studies suggest lower utilization in outpatient care of insured persons from lower social strata, (Lampert, 2005). Assuming a higher utilization of hospital care by these persons, a "partition model" in the remuneration of outpatient care could set incentives for risk-selection against this group of persons, because hospital care in the German system is remunerated by (diagnoses adjusted) fee per case.

But there is a much more serious argument against the calculation of overall remuneration paid by the singular health fund using morbidity risk. Health funds are or at least should be active players using care management to model medical care not only through selective contracting, but in the collective system as well. In a world of a partition model on the level of health funds, the singular fund would have no incentives to use care management in order to look for the most efficient care for its members. Anyway it would pay for the average care for a person with the given morbidity. So in order to maintain incentives for effective and efficient care, overall remuneration paid by singular

funds in a region should rather be calculated like in the current remuneration system using the ratios of past utilization.[67]

Summing up, on the level of different KV-regions a partition model causing the redistribution of overall remunerations following morbidity of patient populations could be implemented in convergence steps carefully monitoring changes in supply level and structure of the regions. On the level of singular health funds within a region, the regulations of the current system for the calculation of overall remuneration using past utilization ratios should be maintained.

4.2.2 Using the Care Burden Splitting Model on the Level of Physician Groups to Calculate the Separation Factor and Distribute the Overall Remuneration between Physician Groups



In the past subsections we have discussed the use of the care burden splitting model within selective contracts (subsection 4.1.1) and studied the possibility of implementing it in the adjustment of overall remuneration (subsection 4.1.2.2). As a result we saw that without changing the calculation of the separation factor and the methods to distribute remuneration between specialist groups in the collective system it is not advisable to use the model for adjustment within overall remuneration in case of selective contracting. In this chapter we will ask whether it could be desirable to use it when calculating the shares of physician groups in overall remuneration in the collective system, independently from selective contracts. In this case, the care burden splitting model would be implemented in two places within the distribution scheme of overall remuneration to physician practices (see subsection 2.3.2):

- For the partition of the provisional volume for distribution into the provisional volumes for distribution for general practitioners and for medical specialists
- For the distribution of the volumes for distribution for general practitioners or specialists between volumes for singular physician specialist groups.

[67] If funds are successful in increasing cost effectiveness of care, this should be taken into account in the calculation of the growth rate of overall remuneration as claimed in § 87a, para 4. Up to now, no procedure to measure changes in cost effectiveness has been agreed upon in the valuation committee.

Implementing the care burden splitting model in the collective system would allow its use in adjustment for selective contracting, too. For this purpose, Formula 18 in subsection 4.1.2.2 could be used.

Introducing the care burden splitting model to distribute the collective remuneration between physician groups would mean a more exact reproduction of utilization patterns than just using past utilization as in the present. Additionally, changes in morbidity causing changes in the relative utilization of different physician groups would be represented in the remuneration system. E.g. if the relative growth of elderly patient groups increases orthopedic diseases and dementia (Kruse, Gaber, Heuft, Oster, & Schulz-Nieswandt, 2002; Weyerer, 2005), the share of orthopedists and neurologists in the overall remuneration would automatically grow.[68] By regular adaption of the relative weights, changes in utilization patterns could be represented in the remuneration system with a relatively small time-lag.

Nevertheless there are three main discussion points to consider:

- Within a KV-region, there may be subregions with different supply structures. Especially the share of specialists may be significantly lower in rural regions.
- Present utilization patterns in the outpatient medical system reproduced by the relative weights of the model could be criticized as suboptimal in the care of patient population. So the Advisory Council on the Assessment of Developments in the Health Care System points out the growing importance of primary care in a society of elder people characterized by multiple morbidities (Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen, 2009).
- Differences in the remuneration system between different groups of physician (different shares of lump-sum-payment and fee-for-service-payment) could distort the relative weights of these groups within the care burden splitting model. In 2007, a higher ratio of lump-sum-payment was introduced into EBM mainly concerning general practitioners (Bewertungsausschuss;, 2007). In subsections 3.2.8 and 3.2.9 we found that the predictive power of the care burden splitting model is higher for costs of specialist care than for those of primary care. This is likely due to the fact that the burden of morbidity is not exactly reflected by EBM lump-sum payments to general practitioners. So rising morbidity of patients resulting e.g. in more frequent visits in a period and a higher burden of the physician will not necessarily result in higher cost weights.

[68] In order to adapt the numbers of specialist physician practices to changing need structures of the population, the planning system for physicians regulated through the Federal Joint Committee could be reformed introducing elements of risk-adjustment as well.

When implementing the care burden splitting model on the KV-regional level, there should be some empirical research in advance, whether the intra-regional structures concerning the share of specialists differ significantly. If so, it could be considered to disaggregate the collective remuneration and implement regionally differentiated relative weights. In that case, the adjustment for special regional selective contracts could be done using these regional relative weights as well. Yet the introduction of such solutions accounting for regional differences within a KV-region would be a novelty in the collective remuneration system. Additionally, when establishing a partition model for overall remuneration on the country-wide level, introducing subregional relative weights within a KV-region for the calculation of shares of physician groups could be seen as contradictory. On the other hand, different structures of medical supply could be considered as desirable for regions with different population density.

Concerning the aim of an optimal combination of services of different physician groups, there could be applied normative corrections to the shares of physician groups calculated using the care burden splitting model. These normative corrections should be based on empirical findings as far as possible. These could be derived from experiences obtained in selective contracting. Taking an example suggested in subsection 4.1.1 selective contracts with general practitioners could be constructed using incentives to reduce services of specialists for a defined population, following the hypothesis, that in this way the same outcome could be obtained on a lower cost level (or alternatively a better outcome at the same cost level). The results could be evaluated empirically and, if positive, used to estimate appropriate corrections within the collective remuneration system.

The results of the use of different remuneration forms for different physician groups within the collective remunerations system should be monitored carefully. If empirical research indicates differences in the increase of service quantities of physician groups triggered by differences in their mix of remuneration forms, EBM changes should be considered in order to harmonize these mixes.[69]

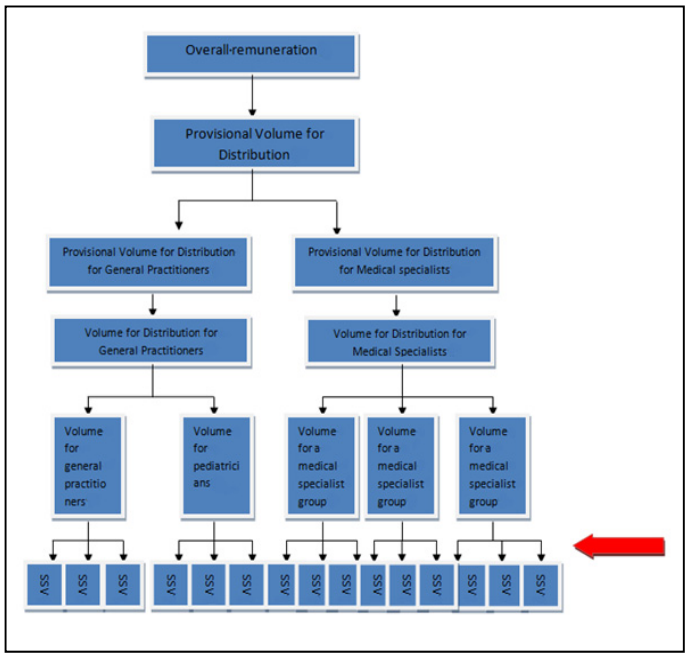
Summing up, the care burden splitting model could be useful as a base for a more appropriate distribution of the collective remuneration between physician groups predicting the utilization of services of these groups by the patients more precisely than the procedures used in the present. When implemented in collective remuneration, it could be used as well for the adjustment in case of selective contracting. Nevertheless it may be desirable to add some normative corrections in order

[69] The collective remuneration system on the level of singular physicians could generally develop towards more lump-sum payments or towards more fees-for-service. If the first way is chosen, in order to be able to calculate morbidity-adjusted relative weights, it should be guaranteed that single services or procedures are documented by the physicians.

to obtain higher efficiency and effectivity of care. These corrections should be based on empirical research which could be done using the economic and medical results of selective contracts.

4.2.3 Using Risk Adjustment in Calculating the Standard Service Volumes

In subsection 4.1.2.3, we discussed the possible use of risk adjustment in the adjustment of standard service volumes in case of selective contracting. As a result, we found, that in some situations it could help to find a more appropriate adjustment of standard service volumes of the physicians engaged in selective contracts. But the different risk adjustment methods of the present calculation of standard service volumes and the modeled adjustment method imposed some limitations.



Using a diagnoses-oriented system of risk adjustment in the calculation of standard service volumes would avoid those limitations. Calculation of standard service volume and calculation of adjustment would be harmonized.

In this chapter we will discuss advantages and possible limitations of diagnoses-based risk-adjusted standard service volumes. However, precondition for a change would be an amendment of § 87b, paragraph 3, phrase 5 SGB V, which up to now restricts the use of risk-adjustment to the factors of age and gender.

Standard service volumes could be calculated then on the base of diagnoses of the patient population of a given practice in the past instead of just using the number of patients in three roughly age-related risk groups as presently. Given a diagnoses-based model with sufficient predictive power for such relatively small patient groups and a relatively stable attachment of patients to singular physician practices[70], quantities of services to deliver by singular practices could be better adapted to the prospective needs of their patient population.

But results of subsection 3.4.3 showed that in the case of German general practitioners a diagnoses-based model does not prove to be successful in comparison to a prediction model just based on age groups. As EBM remuneration of general practitioners is mainly based on lump-sum-payments related to age groups, morbidity-driven differences in the care burden of physicians are not necessarily

[70] According to a survey in 2006 only 11% of all insured persons changed their physician (general practitioner or specialist) because of dissatisfaction (Cornelius 2006).

reflected in remuneration or utilization costs of patients and a diagnoses-based model cannot unfold its advantages. This result awakens to the understanding that the success of morbidity-based risk adjustment is dependent of the types of remuneration used in a system. If, like in case of standard service volumes of general practitioners, physicians are mainly paid by lump-sum-payments not related to the difference of burden in case of different patient morbidity, construction of their budgets relating to morbidity differences does not improve the situation. Hence - as already mentioned in 4.2.2 when discussing the use of risk adjustment to separate remuneration between physician groups - changes of payment mixes in EBM could be considered. Adjusting the lump-sum-payments to patient morbidity or combining them with more fee-for-service elements could lead to a better base for the calculation of risk adjusted standard service volumes and, triggered by that, an allocation of resources according to the need of patients. In the case of German specialist physician, diagnoses-based risk adjustment might be already much more successful in calculating appropriate standard service volumes, as the EBM contains less general lump-sum-payments. Further research should be done here using a larger database.

Assuming, that the diagnoses-based risk-adjustment model is apt to predict costs for patients of singular practices in a sufficient way, questions about incentives of risk factors not included into the model may come up. There may be physician practices mainly serving patients characterized by systematically different utilization patterns than those represented in the diagnoses-orientated risk adjustment model. For example the location of a practice may lead to a higher ratio of patients with specific socio-economic characteristics correlated to specific utilization patterns. Here it is important to bear in mind that standard service volumes are no capitations, but budgets that have to be filled with fees for service and lump-sum-payments in order to generate income. Because of that they rather create incentives for the physician to counterbalance differences in utilization patterns. In cases of relatively low utilization of his patients related to morbidity he will at least try to exhaust the standard service volume, in cases of relatively high utilization he will have no interest to exceed it more than necessary.

Summing up, diagnoses-based risk adjustment could be an appropriate instrument to distribute overall remuneration to singular physician practices, given a remuneration system that uses types of remuneration reflecting differences in care burden in a sufficient way.

Conclusion

In the outpatient medical care sector of German social health-care system, diagnoses-based risk adjustment could have an important function for reaching aims of efficient and effective care adapted to the need of the patient population and of fair distribution of remuneration to the providers. Payment blends of collective and selective remuneration systems could be adapted to avoid risk adjustment by providers of medical care and to customize remuneration to the relative needs of patients. The adjustment of collective remuneration in case of selective contracting could be adapted to the risk structure of patient populations in selective contracts in order to set incentives to provider collectives to compete for more efficiency and effectiveness instead of investing into the most profitable selection of patients.

Nevertheless the current degree of risk adjustment in the collective remuneration system and in the adjustment procedures in case of selective contracting is still low. According to that the estimation models used in the collective remuneration system concentrate on the prediction of total outpatient care costs of patient collectives of KV-regions.

One objective of this project was the development of an estimation model, the care burden splitting model, that is able to distribute the remuneration for outpatient medical care for a patient population between different medical provider groups and possibly even to individual provider practices relating to need and morbidity of patients. Achieving that, a precondition for a more precise use of diagnoses-based risk adjustment within collective and selective remuneration systems was fulfilled.

A more appropriate degree of risk adjustment could be implemented on two levels: On the first level, leaving the structure of the collective remuneration system basically unchanged, it could be used for remuneration systems within selective contracts and for the adjustment of collective remuneration in case of selective contracts.

For the purpose of selective contracting health funds could estimate the potential costs of a patient population, when served in the collective system (eventually only for the part of medical services rendered by a physician group) and use it as a starting point for negotiating. Within a contract the care burden splitting model could be implemented to distribute the remuneration between physician groups or even practices. Additionally it could be used for measuring changes in the quantity of medical services outside the selective contract in comparison with predictions as an outcome-parameter for P4P.

Diagnoses-based risk adjustment could be used for a more precise adjustment of the collective remuneration in case of selective contracting. Nevertheless leaving the collective remuneration system mainly unchanged would set limits to that. Especially the care burden splitting model could not be used for the adjustment within different physician groups or for standard service volumes. To do this, the collective remuneration system itself would have to undergo deeper structural changes.

On a second level, the collective remuneration system could be reformed using diagnoses-based risk adjustment on all levels. That would automatically allow a more exact adjustment in case of selective contracting using the care burden splitting model.

The model would allow the distribution of overall remuneration between physician groups, automatically adapting their remuneration shares in time to the need of an aging population. Additionally and dependent of the remuneration forms used within the collective system, standard service volumes could be constructed reflecting the need of the patients of individual practices reducing incentives for risk adjustment.

Concluding, from the economic point of view, the use of the care burden splitting model makes sense in selective as well as collective contracts. As socio-economic variables may have an additional considerable impact on cost risks in medical care, on the long term, diagnoses-based models may be refined by additional predictors.

Politically, the highest probability for an implementation of the care burden splitting model seems to exist within selective contracts. Here health funds and provider communities can experiment with remuneration blends using risk adjustment. Health funds will be strongly interested in measuring the efficiency and effectiveness of medical care bought by selective contracts in comparison to the collective remuneration system.

Reforms of the collective remuneration systems will be, even in the presence of strong economic arguments, more difficult to implement. As discussed in chapter 2.2.2, in 2009 a partition model of overall remuneration between KVs using national morbidity risk weights was not realized and even small convergence steps caused some protest though the remuneration reform came along with a considerable growth of overall remunerations in total. Using the care burden splitting model to redistribute remuneration shares between physician groups would again create winners and losers with the latter prone to protest. This would take place in an economic situation of health funds not allowing another record growth of physician remuneration. The calculation of standard service

volumes using diagnoses-based risk adjustment would even require legal changes. So precondition for a reform moving towards a consequently risk-adjusted collective remuneration system would be a strong legislator placing economic arguments over clientele interests of physician groups.

Executive Summary

Background and aims of the dissertation

Designing optimal payment systems for outpatient care is one of the main challenges posed to health care decision makers today. While it is widely acknowledged that pure fee-for-service payments are ill-suited to incite efficient levels and types of health care services, bundled payments bear the danger of rewarding under-provision and risk selection. To counteract these effects, careful risk adjustment is crucial. This dissertation analyzes the use of risk adjustment in the current collective remuneration system for outpatient care in the German statutory health insurance scheme. Building up on this analysis, the study has two main objectives:

- To develop of a risk adjustment model apt to split the outpatient care burden between different groups of physicians
- To propose a more efficient implementation of risk adjustment within the German remuneration system for outpatient medical care

Methods

The analysis of the current collective remuneration system for outpatient care is mainly based on the evaluation of documents released by regulatory boards. For the purpose of model development, appropriate risk factors, classification systems, and estimation models used for the purpose of risk adjustment are discussed and selected. The resulting care burden splitting model is tested using statutory health insurance data of about half a million insured individuals in 2006 and 2007. As a third step, propositions to use this model as well in the collective remuneration systems for outpatient medical care as for the purpose of selective contracts of health funds with individual medical provider groups are developed.

Results

As a result, the care burden splitting model is shown to be apt to predict individual expenditures for outpatient care for different provider groups. Using this model it is possible to additively split the individual care burden into several parts attributed to different physician groups such as primary care physicians and specialists.

Conclusion

Recommendations for the implementation show how this model could be used to increase both the incentives for efficiency and the fairness towards physicians in the German collective and selective remuneration systems for outpatient medical care.

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Appendix 1: Directory of Abbreviations

Abs	Absatz
AGG	Alters- und Geschlechtsgruppen
AIDS	Acquired Immune Deficiency Syndrome
AOK	Allgemeine Ortskrankenkasse
ATC	Anatomical - Therapeutical - Chemical
BaWü	Baden-Württemberg
DRG	Diagnosis Related Groups
e.g.	example given
EBM	Einheitlicher Bewertungsmaßstab
Ex.	example
GKV	Gesetzliche Krankenversicherung
GM	German Modification
GmbH	Gesellschaft mit begrenzter Haftung
GOÄ	Gebührenordnung für Ärzte
GP	General Practitioner
HCC	Hierarchical Condition Category
HIV	Human immunodeficiency virus
HRxG	Hierarchical Pharmaceutical Group
i.e.	it est: this means
ICD	International Statistical Classification of Diseases and Related Health Problems
IHCC	Interacted Groups Age and Hierarchical Condition Category
InBA	Institut des Bewertungsausschusses
Inc.	Incorporated

Intera.	Interactions
IT	information technology
KBV	Kassenärztliche Bundesvereinigung
KHEntgG	Krankenhausentgeltgesetz
KV	Kassenärztliche Vereinigung
MAD	mean absolute deviation
Meck-Pomm	Mecklenburg-Vorpommern
NNRTI	Non Nucleoside Reverse Transcriptase Inhibitor
NRTI	Nucleoside Reverse Transcriptase Inhibitor
OLS	Ordinary least squares
P4P	Pay-for-Performance
PCP	Primary Care Physician
Pred.	Prediction
RMSE	root mean squared error
RS	Risk Score
RxGI	interacted Pharmaceutical Group
Rx-Groups	Arzneimittelgruppen
SGB	Sozialgesetzbuch
SHI	Statutory Health Insurance
SpiBu	GKV-Spitzenverband, Spitzenverband Bund der Krankenkassen
SSV	Standard Service Volume
US	United States (of America)
WHO	World Health Organization

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