



G-DRG-Impact evaluation according to sec. 17b para. 8 Hospital Finance Act

Executive summary of the final report of the second
research cycle (2006 to 2008)

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Analysis by order of the German Institute for the Hospital Remu-
neration System (InEK)

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Introduction

In 2004, a new diagnosis and procedure related flat-rate remuneration system was introduced for almost all inpatient services in somatic hospitals in Germany. The [G-]DRG system ([German-] Diagnosis-Related Groups) has led to a uniform “product-definition” of inpatient services. Based on this, hospital budgets are ascertained prospectively, performance-based and individual case reimbursement levels are set. The introduction of a DRG system aims at enhancing economic efficiency, competition, developing demand-based service structures, ensuring the quality of inpatient care and increasing transparency within the hospital sector. To further support quality assurance of inpatient services, external measures have been implemented and expanded.

Such fundamental changes of incentive structures in the inpatient care sector may also lead to unintended effects and possibly even unwanted, unforeseen adjustment responses by the protagonists.

On introduction of the new reimbursement system, the legislator therefore commissioned the self-governing bodies (as per sec. 17b para. 8 Hospital Finance Act) to conduct subsidiary research on its effects. This impact evaluation is to focus on changes in (infra) structures and quality of care, as well as the effects on other care-sectors including types and extent of service shifts from one care sector to another.

The self-governing bodies for the inpatient hospital care sector (German Hospital Federation, National Association of Statutory Health Insurance Funds and the Association of German Private Health Care Insurers) thus designed and tendered a research project as per sec. 17b para. 8 Hospital Finance Act for impact evaluation based on two, or optionally three, research cycles. The IGES Institute was awarded the tender and commissioned with its implementation in December 2008.

The results of the first G-DRG impact evaluation research cycle, published in April 2010, exclusively referred to the G-DRG system implementation phase from 2004 to 2006. The current report on the second research cycle examines the core convergence phase from 2006 to 2008. An optional third research cycle would examine the years 2008 to 2010, the end of the convergence phase. This subdivision into three research cycles allows for potentially necessary readjustment of the research concept, as well as the consideration of new developments in research and latest findings. The second research cycle therefore does not readdress all questions of the first research cycle and integrates new questions, e.g. regarding service shifts in the ambulatory (SHI-physician) care sector and impacts on post-discharge mortality into the research.

The impact evaluation draws from a broad empirical data base. This includes questionnaire surveys of all hospitals accredited under sec. 108 Social Security Code No. 5 and of all Medical Review Boards of the Statutory Health Insurance Funds. Furthermore, highly aggregated G-DRG data evaluations as per sec. 21 KHEntgG, hospital data collected by the Federal Office of Statistics, and data from the National Institute for Quality in Health Care (BQS) were provided. These datasets are part of the impact evaluation and can be downloaded as a user-friendly database from the InEK website.

Additionally, substantial amounts of routine inpatient and ambulatory data from statutory health insurances, made available by health insurances and health insurance associations, was integrated into the impact evaluation. For reasons of data protection this data has not been included in the data publication of the impact evaluation.

Due to the simultaneous and nationwide implementation, the impact evaluation can only be based on data provided by hospitals that participated in the G-DRG system introduction phase. Therefore, changes over time can be described, but reliable conclusions about their causes cannot always be drawn due to lacking reference ranges. Furthermore, numerous developments occurring contemporaneously with the G-DRG system implementation might have influenced the parameters analysed in the impact evaluation. A clear distinction between effects resulting solely from the G-DRG implementation and any other plausible influencing factor is also not possible for many cases in the second research cycle. For methodological reasons, the impact evaluation can therefore often only describe actual changes, but cannot conclusively identify causal relationships between the implementation of the G-DRG system and specific changes within the inpatient care sector.

However, the impact evaluation does give a comprehensive picture of the inpatient care sector and its changes since G-DRG system implementation in 2004. It also broadly depicts the adjustments induced by the G-DRG system both in inpatient and bordering care sectors up to 2008.

Effects on structure and medical services of the inpatient care sector

In the core convergence phase (2006 to 2008), a weakening of the long-standing trend of decreasing hospital numbers and hospital beds can be observed. No stronger reductions in service capacities can be established, also for the entire period from G-DRG implementation up to 2008. The number of hospitals decreased by a slightly larger margin between 2003 and 2008 compared to between 1991 and 2003, whereas the decrease in the number of hospital beds was not as strong as between 1991 and 2003.

There has been an increased reduction of the number of hospital departments since G-DRG system implementation. This development is substantially founded by a decline in the numbers of obstetrics and gynaecology, ENT, ophthalmology and surgery departments. Within individual specialties (e.g. cardiac surgery, paediatric surgery, neurosurgery, neurology, plastic surgery), there has been a further increase in the number of hospital departments (also) in 2003 to 2008. Particularly in view of the numerous influencing factors, these changes cannot exclusively be ascribed to the G-DRG system implementation. Nevertheless, it has been ascertained that capacity adjustments have continued seamlessly between 2003 and 2008.

According to the hospital survey results, various reorganisation measures were undertaken for organisational structure during the core convergence phase, as was also the case in the implementation phase. These activities are connected to the G-DRG system implementation and aim at enabling more economic provision of services. Changes in organisational structure had their emphasis e. g. in the setup and expansion of medical centres and intermediate care units, as well as the reorganisation of admission processes and purchasing departments. The developments were often part of institutionalised cooperative relationships that were formed with other hospitals between 2006 and 2008. Besides creating specialised offers for provision of care and providing coverage for non-represented specialties, they also affected co-operations in pharmacy and laboratory services as well as purchasing departments and kitchen services. Hospitals also extensively changed internal operational structures, for instance with the use of IT (implementation of HIS systems or electronic patient files) or increased use of controlling instruments, which by own account were seen as closely connected to incentives arising from the G-DRG system.

Between 2003 and 2008, the number of full-time employees as well as the employee workload, derived from the number of cases and inpatient days of care, developed heterogeneously throughout the professions. For nursing care, the number of full-time staff slightly increased from 2003 to 2008, contrary to the longstanding trend, but the workload expressed in the number of cases per full-time employee continually increased. The number of inpatient days per full-time nurse has nevertheless remained stable since 2003. For physicians, however, a slight decline in the increase of the number of full-time physicians to an annual average of 1.8% could be observed in the core convergence phase. The workload, expressed in the number of cases per full-time employee, virtually remained stable from 2006 to 2008, after having shown a considerable decrease during G-DRG system implementation.

The limitations of the indicators and the manifold factors influencing the hospital workforce (e. g. changes in inpatient treatment needs, outsourcing)

do not allow for conclusive identification of effects resulting solely from the G-DRG system.

As there was a lack of primary data, changes in employee satisfaction resulting from the G-DRG system were analysed by means of a systematic literature research. The only identified study WAMP (Wandel von Medizin und Pflege im DRG System [Changes in Medicine and Nursing in the DRG system]) showed that workload predominantly increased from 2004 to 2007. For example, high staff fluctuation, which was also observed in the G-DRG impact evaluation hospital surveys, is increasingly being perceived as strain by physicians. According to this study, positively perceived work conditions are widespread amongst physicians. Nursing staff show a decrease in workload in relation to patient clientele and an increase in relation to factors associated with structure. It is not possible to determine whether these changes in staff satisfaction are effects of the G-DRG system, not least because of the current state of research on this issue.

One of the main objectives of G-DRG implementation was to reduce the length of inpatient stays. The G-DRG system gives clear incentive to do this in contrast to per diem remuneration systems. At the same time, a fee per case reimbursement system will also give misdirected incentive to increase the number of cases that were reduced by accompanying invoicing regulations in the G-DRG system.

After almost stable numbers of inpatient cases in the G-DRG implementation phase, the number of inpatient cases increased considerably between 2006 and 2008 with an annual average of 2.1% or approx. 348,000 cases. However, similarly high increases in case numbers have also been observed in other time periods, e.g. in the second half of the 90ties.

Before G-DRG implementation, the length of stay had already been in a steadily decreasing trend over the last years. After G-DRG implementation, this trend continued in slightly weaker form. Between 2004 and 2008 the length of inpatient stay decreased from 7.77 to 7.12 days with an annual decrease of 2.2%. This reduction of average length of stay between 2006 and 2008, as also between 2004 and 2006, is a largely homogenous development which extends to nearly all G-DRGs and main diagnoses. Also taking into account the long-term trend of decreasing length of stay and the continuous reduction after G-DRG implementation, these homogenous changes do not speak for a high specific effect on length of inpatient stay through the G-DRG system.

In the core convergence phase, both the number of cases and the case-mix showed considerable shifts in services, particularly towards the G-DRGs of MDC 08 (Diseases and disorders of the musculoskeletal system and connective tissue), 05 (Diseases and disorders of the circulatory system), and the pre-MDC. Similar developments were seen between 2004 and 2006.

The most distinct case-mix increases were recorded for long-term ventilation, knee and hip endoprosthetic surgery, intervertebral disc surgery as well as defibrillator implantation. These are services that entail high non-personnel costs. Such changes in service structures also influence the hospital cost structures in that the proportion of non-personnel costs increases and personnel costs decrease.

A component analysis of the case-mix development showed that a large proportion of the case-mix growth, all in all 1.1 million case-mix points from 2006 to 2008, results from the marked increase in number of cases (719,000 case-mix points). A similarly high case-mix growth stems from structural changes, particularly between adjacent DRGs within one partition. In contrast, the reduction of length of inpatient stay had a negative impact on the case-mix development. The case-mix increase of 701,000 case-mix points during G-DRG system implementation is still nearly exclusively based on structural changes.

Despite the relatively short investigational period, it can be assumed that the above outlined developments in hospital services are also instigated by increasing prevalences of circulatory and musculoskeletal diseases due to changes in demographic development amongst other things. All in all, direct effects of the G-DRG system on the range of described changes in hospital services cannot be proven.

For new examination and treatment methods (NUB) between 2006 and 2008, the hospital survey for G-DRG impact evaluation shows both an increasing number of hospitals participating in the NUB process and hospitals that have contractual agreements for at least one NUB reimbursement. The most frequent NUBs with regard to case numbers and number of hospitals providing the service are usually rapidly incorporated into the G-DRG system as supplementary remuneration.

Hospital transferral patterns only changed marginally between 2006 and 2008, as was also the case in the G-DRG system implementation phase. The proportion of patients transferred to other hospitals out of all patients decreased slightly. However, it cannot be concluded that less collaboration took place between the hospitals compared to the G-DRG system implementation phase, as the number of newly formed cooperations between hospitals also included further increases in core medical services during the core convergence phase.

A general specialisation of hospital services has not been observed in the entire period since G-DRG system implementation. However, an increase in the number of cases, particularly from 2005, is counteracting distinct specialisation. As a rule, expansion of service portfolios are accompanied by corresponding increases in case numbers, so that the average number of cases per hospital increased accordingly for the majority of G-DRGs. Dis-

tinct increases in the number of service providing hospitals can be seen between 2006 und 2008, as was also the case during the G-DRG system implementation phase. This applies e.g. to G-DRGs from invasive therapeutic and diagnostic cardiac procedures and orthopaedic-surgical care for intervertebral disc damages. This is also related to the observed expansion in infrastructure for large medical devices in hospitals (such as heart catheterisation stations, magnetic resonance imaging machines amongst others). A systematic influence of G-DRG system implementation on the specialisation and diversification of hospital services could not be determined.

Both the average measured shortest (street) distance between the patient's residence and hospital (22.6 km in 2008) and the average shortest journey time (22.3 min) showed only a slight overall change for inpatients between 2006 and 2008. These had remained stable between 2004 and 2006. Regional variations in service provision structures and their developments could also not be examined in the second research cycle. Changes in the number of specialised departments (e.g. reductions in the number of obstetrics and gynaecology and ENT departments), existing care services and the marked change in case numbers (e.g. due to changes in population morbidity) to a large extent determine changes in access to specific inpatient services. A direct influence of the remuneration system cannot be deduced from this.

Effects on economic efficiency

In the core convergence phase (2006 to 2008), the increase in adjusted (total) hospital costs, at 3.5% annually, was considerably stronger than during the implementation phase of the G-DRG remuneration system. However, the increase in average adjusted costs per case between 2006 and 2008 of 1.5% annually was substantially below that seen between 2003 and 2006 (+2.3% annually). Overall, the entire time period from G-DRG system implementation to 2008 shows an increase of the average adjusted costs per case of 2.0% annually, which corresponds to development levels between 1991 and 2003 (1.9% annually).

In the core convergence phase of the G-DRG remuneration system, the increase in non-personnel costs was again markedly higher than the increase in personnel costs compared to the G-DRG implementation phase and further rose to 6.8% annually. In this time period, the non-personnel costs per inpatient case increased accordingly with 4.7% annually. The increases in medical supply costs can be partly ascribed to higher case numbers for DRGs with above-average non-personnel costs (e.g. defibrillator implantation, knee and hip endoprosthetic surgery). The proportion of non-personnel costs in total gross hospital costs increased considerably between 2003 and 2008 from 33.5% to 38.1%, whereby this development was fur-

ther accelerated during the core convergence phase of the G-DRG system. Parallel to this, the proportion of personnel costs out of total gross hospital costs decreased in this time period from 65.3% to 60.5%. These considerable changes in cost structure can partially be explained by changes in structure of medical services. The increase in hospital personnel costs at 2.6% annually was also accelerated between 2006 and 2008 compared to the G-DRG system implementation phase. Similar to 2004 to 2006, the personnel per case costs increased here by 0.5% annually.

Per case costs for physicians, however, increased considerably by 4.3% annually, whereas per case costs for nursing staff slightly declined (-0.8%) as also between 2004 and 2006. The hospital survey results also show that the trend towards centralising administrative functions and areas (e.g. purchasing) towards outsourcing and the founding of service subsidiaries continued between 2006 and 2008. This can to a great extent be attributed to the DRG system. Through this, personnel costs in the affected professions might generally have reduced.

The hospital revenue structure differentiated according to central account groups only changed slightly between 2004 and 2008. A slight reduction of the share of hospital revenue stands against a similarly high increase in the share of ambulatory services revenue out of all revenue from the account groups 40 to 43 between 2004 and 2008. A stronger G-DRG driven diversification of the revenue sources cannot be deduced from this finding.

The hospital survey shows slightly lower overall investment ratios on comparing 2006 and 2008. However, a higher proportion of hospitals are specifically investing in personnel resources and IT-infrastructure as a result of the G-DRG system, as was also seen in the G-DRG implementation phase. Thus there also seems to be a direct link between hospital investment activities and the G-DRG system in the core convergence phase.

Hospitals and Medical Review Boards of the Statutory Health Insurance Funds report a further increase of Medical Review Board case audits between 2006 and 2008. The proportion of reviewed cases out of all cases remained almost stable at approx. 11% compared to the first research cycle. The proportion of reviewed cases with revision of claims increased considerably to 38% between 2006 and 2008. According to the hospitals, the average revised claim amount increased from 830 € to 920 €. This increase of Medical Review Board case audits has led to rising personnel expenses in both Medical Review Boards and hospitals. Hospital survey results show an increase in hospital staff employed to prepare, accompany and follow-up Medical Review Board case audits.

Shift of services

Case-based flat-rate remuneration systems set strong incentives for economic service provision which may also lead to intended or unintended shifts of services to bordering sectors.

Thanks to the extensive amount of data made available by health insurances and health insurance associations, ambulatory (SHI-physician) doctor-patient contacts after inpatient stay and their subsequent development between 2005 and 2007 could be analysed in the second research cycle of impact evaluation.

A comparison of the number of doctor-patient contacts from insurees without inpatient stay and the number of doctor-patient contacts from insurees after inpatient stay (within 10 days post discharge) shows an identical relative increase of 2.5% annually between 2005 and 2007. Insurees with inpatient stays showed almost identical increase rates for the number of post-discharge doctor-patient contacts for the observed time periods after discharge (0 to 10 days, 10 to 30 days, and 30 to 90 days).

Service shifts from inpatient to SHI-physician care, measured through the development of doctor-patient contacts per insuree with inpatient stay can therefore not be shown between 2005 and 2007. However, upon differentiated analysis of individual service levels and service areas, different developments can be observed.

A comparison of the number of doctor-patient contacts per insuree before and after G-DRG system implementation is not possible. All issues investigated in the G-DRG impact evaluation however indicate that hospitals did not change conduct directly after G-DRG system implementation. Therefore, even in the event of possible service shifts it may be assumed that incentives were not effectuated exclusively in the first year of G-DRG implementation. Hence, service shifts to contract physician service areas should still be identifiable between 2005 and 2007. This, however, is not the case and it can thus be concluded that G-DRG implementation did not lead to an increase in post-discharge doctor-patient contacts with consequently determinable shifts in services. Solely a general increase of the number of doctor-patient contacts, independent of inpatient stay, can be shown between 2005 and 2007.

For inpatient rehabilitation, the longer standing trend of declining case numbers and inpatient days of care reversed between 2006 and 2008. The marked increase in case numbers in inpatient rehabilitation of 4.6% annually is however not predominantly due to an increase in direct transfers from hospitals to rehabilitation establishments; In 2008, the number of direct transferrals slightly declined for the first time over a longer period of observation, but altogether the numbers considerably increased between

2003 and 2008. A further decline in average length of stay of cases treated in rehabilitation, particularly those in specialties with a high number of direct referrals, does also not indicate a shift of services from hospitals to rehabilitative care.

The proportion of patients transferred from rehabilitation to hospitals out of all patients discharged from rehabilitation has continually increased from 1.8% in 2003 to 2.2% in 2008. The individual departments showed a heterogeneous picture. In 2008, the proportions of patients from clinical geriatrics and neurology were lower, and those of orthopaedics and internal medicine were higher than the figures observed in 2003.

The data also made available for the second cycle of impact evaluation do not allow for reliable conclusions for shifts or transfers of services from acute inpatient to rehabilitation sectors resulting from G-DRG implementation. In addition, there are also indications that the morbidity of inpatients in rehabilitation, which always represents a central confounder for time-related comparisons, has increased substantially over the last years.

The slower growth in the outpatient surgery segment (as per sec. 115b Social Security Code No. 5) during the core convergence phase of the G-DRG system compared to that of 2003 to 2006 may be put down to corresponding legal adjustments in 2004. This effect has been decreasing over time. According to the current findings, implementation and establishment of the G-DRG system have to a large extent given impulses for hospitals to increase their activities in this service area e.g. expansion of sustainable ambulatory services and profile development in a more competition-oriented environment

The hospital survey for the first time investigated hospital participation in further ambulatory service areas between 2006 and 2008. According to this, pre-inpatient treatment as per sec. 115b Social Security Code No. 5 without subsequent admission was the most widespread. Here, case numbers increased by 12.5% annually between 2006 and 2008, and 43% of the surveyed hospitals reported that this development was induced by the G-DRG system.

In the second research cycle, the G-DRG impact evaluation also included the number of cases in hospital emergency units and their developments for the first time. Between 2006 and 2008, the number of cases in almost all hospitals increased by 6.2% annually. Solely 3 % of the surveyed hospitals reported the G-DRG system as responsible for the increase in case numbers in emergency units. The hospitals primarily ascribed the increase in case numbers to existing shortfalls in emergency care by statutory health insurance accredited physicians and that the hospitals themselves had undertaken structural changes of their emergency units, e.g. for marketing purposes. Nevertheless, although the surveyed hospitals do not observe a

connection between G-DRG implementation and an increase in case numbers in emergency units, the importance of emergency units both as instruments for patient recruitment and binding and also as organisational units that prepare patients for admission and direct them onto the best course of care within the hospital is likely to have (further) increased with the introduction of the case-based remuneration system.

Despite a slight increase in service expenditure in home health care according to sec. 37 para. 1 Social Security Code No. 5 (to avoid or shorten a hospital stay) between 2006 and 2008, a systematic shift of services in home health care cannot be concluded, even in view of the overall very low case numbers and low expenditure. Possible shifts of services that do not lead to service expenditure could not be determined in the G-DRG impact evaluation.

Effects on quality of care

Changes in post-discharge mortality after G-DRG implementation as an indicator for performance quality were investigated with the very extensive routine SHI health data (over 35 million inpatient cases between 2004 and 2008) provided by health insurances and health insurance associations. Periods of inpatient stay at 30, 90 and 365 days post-discharge were investigated.

Overall, there has been a continuous and marked decline in post-discharge mortality since G-DRG system implementation (2004 to 2008). Both the period of pre-admission to 30 days post-discharge as well as 90 and 365 days showed significant reductions in mortality of 3.4% to 4.5%. Specific service areas (MDCs) or adjacent DRGs and individual G-DRGs also portray the same picture. Between 2006 and 2008, mortality significantly dropped in 14 out of 26 MDCs in the period up to 30 days post-discharge and did not increase significantly in any MDC. For some cases an increase in mortality can be explained by different patient collectives. We recommend further research on the reasons for mortality in the individual service areas.

Whether and possibly to what extent the drop in post-discharge mortality is influenced by the G-DRG system cannot be quantified. It can however be ascertained that G-DRG system implementation has not led to a systematic deterioration of quality of care in form of increasing post-discharge mortality rates. Although the comprehensive introduction of a G-DRG system that finances almost all hospital costs and nearly all hospital cases as has been done in Germany is worldwide unique, these findings do correspond with other international experiences in case-based remuneration system implementation as e.g. in the USA.

Besides using data from health insurances and health insurance associations, the development of process and performance quality after G-DRG implementation in some service areas was investigated with data from the quality assurance process according to sec. 137 Social Security Code No. 5. All in all, the overall findings from comparable performance and process quality indicators between 2004 and 2008 or between 2006 and 2008 predominantly show distinctly positive developments. Almost all indicators included in the investigation showed stable or positive developments in the overall results. Also, the majority of performance quality indicators that had dropped slightly between 2004 and 2008 (again) showed stable or positive performance developments between 2006 and 2008. Thus, both the implementation and convergence phase of the G-DRG system show that there was no deterioration of process and performance indicators in the hospitals after implementation of the new remuneration system with regard to the observed indicators. It must be taken into consideration that the comparable indicators taken from the quality assurance process according to sec. 137 Social Security Code No. 5 solely depict some service areas and only those aspects of care that were investigated with the set of indicators are represented.

A systematic literature review investigated whether the G-DRG system led to changes in patient satisfaction. Only one study, “International Health Policy Survey of Sicker Adults” by the Commonwealth Fund, was identified and shows no consistent developments. However, this study did not explicitly investigate changes in patient satisfaction with regard to the DRG system. As is also the case for the question of how the DRG system impacts employee satisfaction, further studies investigating this question would be desirable.

The surveyed hospitals reported that structures and instruments for quality management continued to be of growing importance between 2006 and 2008. This however was not considered to be in connection with incentives set by the DRG system but rather with hospitals’ quality policies, political requirements as per Social Security Code No. 5 or increasing hospital attractiveness. The hospitals also do not ascribe the increasing number of certifications to the G-DRG system. Furthermore, a progressive spreading of clinical pathways can be observed in the hospitals. This is due to an increase in the proportion of hospitals using clinical pathways as well as an increase in the total number of implemented clinical pathways.

Prospects

The findings of the G-DRG impact evaluation as per sec. 17b para. 8 Hospital Finance Act indicate that the G-DRG system initiated several devel-

opments towards its aspired objectives in the implementation phase. These developments were furthered in the core convergence phase.

At the same time, the results show that many of the feared negative effects of case-based remuneration systems, particularly with regard to a deterioration of quality of care, also did not take effect in the core convergence phase.

The inpatient care sector continues to develop dynamically, shaped by the incentive structure of the case-based remuneration system; changes have in part only been visible between 2006 and 2008. Adjustments made to the G-DRG system by hospitals and also the other stakeholders have surely not been completed, not least because of the continuous development of the system.