Internal Controlling of a Radiology Department

Internes Controlling einer radiologischen Abteilung

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Abstract

Caused by legal reform initiatives there is a continuous need to increase effectiveness and efficiency in hospitals and surgeries, and thus to improve processes.
Consequently the successful management of radiological departments and surgeries requires suitable structures and optimization processes to make optimization in the fields of medical quality, service quality and efficiency possible.
In future in the DRG System it is necessary that the organisation of processes must focus on the whole clinical treatment of the patients (Clinical Pathways). Therefore the functions of controlling must be more established and adjusted. On the basis of select Controlling instruments like budgeting, performance indicators, process optimization, staff controlling and benchmarking the target-based and efficient control of radiological surgeries and departments is shown.

Key Points:
- Successful management of hospital departments and practices requires suitable structures and processes for the optimization of medical quality, service quality, and economic efficiency.
- In future in the DRG system it will be necessary for process organization to focus on the whole clinical treatment of patients (clinical pathways).
- Increasing complexity and continuously intensifying competition make the development and implementation of management and controlling systems necessary.Professionalized coordination of interfaces in particular via controlling and provision of relevant information is becoming increasingly important. Greater differentiation of controlling functions is inevitable for implementation.

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Zusammenfassung

Aufgrund der teilweise dynamischen Entwicklung der gesetzlichen Rahmenbedingungen besteht in der Organisation von Krankenhäusern und Praxen ein kontinuierlicher Zwang zur Steigerung der Effektivität und Effizienz und somit zur Prozessoptimierung.
In der Konsequenz sind für das erfolgreiche Management von radiologischen Praxen und Abteilungen geeignete Strukturen und Prozesse erforderlich, um die Optimierung in den Dimensionen Medizinische Qualität, Servicequalität und Wirtschaftlichkeit zu ermöglichen. Zukünftig ist es im System der Fallpauschalen unumgänglich, dass sich die Prozessorganisation intensiver an dem Gesamtbehandlungsablauf der Patienten ausrichten muss (Klinische Behandlungspfade). Für die Umsetzung ist eine stärkere Etablierung und Differenzierung der Controllingfunktionen unumgänglich. Anhand des Einsatzes von geeigneten Controllinginstrumenten wie Budgetierung, Kennzahlenmanagement, Prozessoptimierung, Personalcontrolling und Benchmarking wird die zielorientierte und effiziente Steuerung von radiologischen Praxen und Abteilungen dargestellt.

Introduction

A partially dynamic change of framework conditions in the healthcare market has greatly altered the requirements regarding the managing and controlling of hospitals. The competition on the healthcare market is

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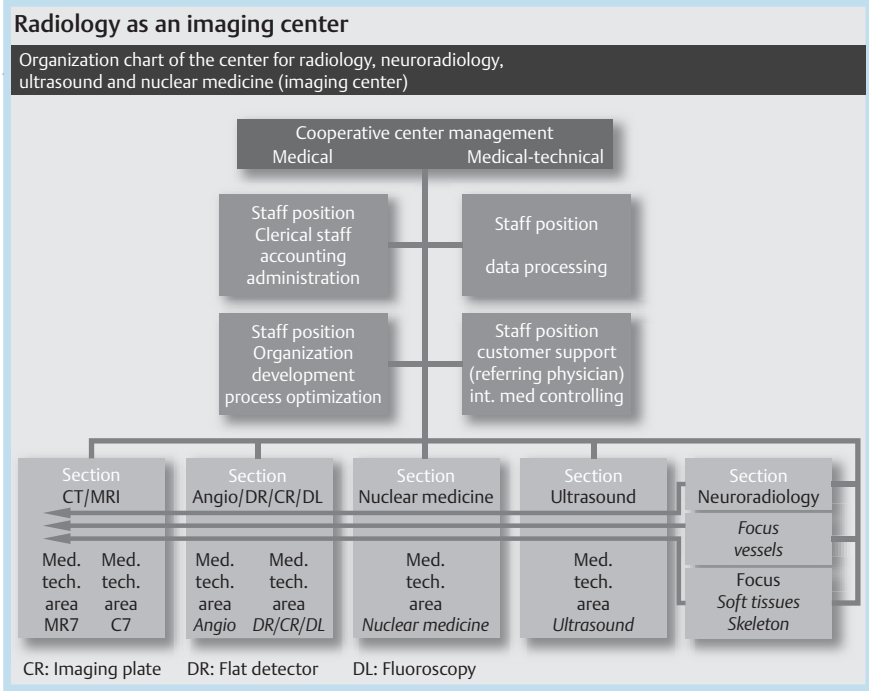

Fig. 1 Imaging Center Organization chart "Center for Radiology, Ultrasound and Nuclear Medicine at the Krankenhaus der Barmherzigen Brüder Trier".

performance and cost- based with defined (ideally high) quality. Increasing complexity and continuously intensifying competition make the development and implementation of management and controlling systems necessary. Professionalized coordination of interfaces in particular via controlling and provision of relevant information is becoming increasingly important. Greater differentiation of the controlling functions is inevitable for implementation.

The achievement of objectives and tasks is characterized by intransparency with the increasing size of hospitals. Additional function controlling on the department/center level that supports and supplements central controlling is critical. This partially decentralized form of structural organization makes it possible to realize strategic objectives on the department/center level as well as to apply and implement the necessary measures. In addition, coordination of management activities on the operational level is possible. This compels responsible persons to change from administrators to managers.

Successful management of radiological hospitals and practices requires suitable structures and processes for the optimization of medical quality, service quality, and economic efficiency (**Fig. 1**).

Radiology as a service center

Radiology as a service department with diagnostic imaging methods and a growing number of interventional treatment options plays a major role in the hospital. It provides services both for a number of internal hospital departments as well as external referring physicians (e. g. private practices and external hospitals) [1]. To be able to handle these different stakeholders and to successfully render increasingly complex services, comprehensive controlling on the department/center level is indispensable.

Common practices such as focusing on prior experiences (ex post scenarios: "we've always done it this way") are not viable in the described framework conditions. From an economic standpoint, the third amendment of the Hospital Accounting Regulations adapts the requirements regarding cost and activity accounting in hospitals to the industrial standard. In addition to the legally stipulated instrument of full cost accounting, "new" methods such as direct costing and breakeven analysis must be in the foreground (**Fig. 2**). The latter are able to provide controlling options on an operational level and incentives for responsible persons. This thus requires an adjustment with respect to operational and internal controlling.

As part of internal controlling with respect to

- Performance, cost, revenue management
- Quality management
- Date management
- Utilization management
- Personnel utilization management and demand management
- Information management
- Communication management
- Process management

digital management tools such as RIS (radiology information system), PACS (picture archiving and communication system), RAD analyzer (a special analysis tool for performance and process information) are absolutely required. Information and communication technologies are a measure of success in process-oriented organization controlling. This additionally requires ongoing development of the digital infrastructure, in particular to allow continuous monitoring of result quality.

In the future in the DRG system it will be necessary for process organization to focus on the whole clinical treatment of patients (clinical pathways). This is true for the importance of neuroradiology in the whole clinical treatment process, for example in the case of stroke or brain tumor. In addition

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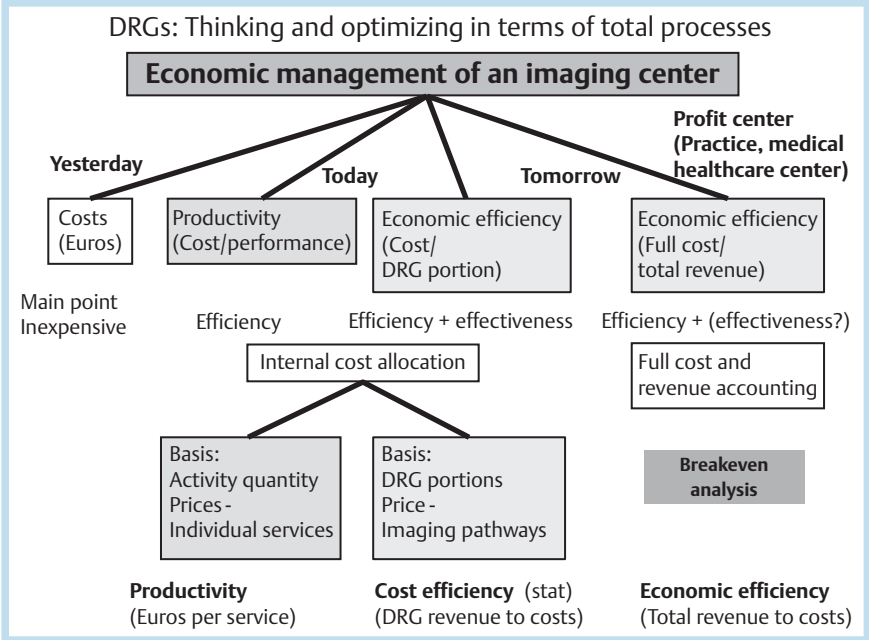

Fig. 2 Parameters for the economical leadership of an imaging center.

to the provision of individual services, interdisciplinary consultation prior to the diagnosis and treatment of clinical pictures (e.g. vascular diseases) must be in the foreground, particularly in the context of medically and economically efficient diagnosis and clinical pathways. A CT examination that is able to be avoided as a result of defined clinical pathways or interdisciplinary consultations represents an advantage for the patient (lower or no radiation exposure) and for the value added chain of the hospital. In the system of DRG reimbursement (revenue is a datum), examinations that are not performed for qualitative reasons or the selection of a medically equivalent but more cost-effective examination with a consistent level of medical quality is remunerated additionally (!) [3].

In the following, the internal controlling of a radiological department/imaging center on the basis of select effective controlling tools is shown based on the example of the center for radiology, neuroradiology, ultrasound, and nuclear medicine at the Krankenhaus der Barmherzigen Brüder Trier (Brothers of Charity Hospital Trier) with respect to:

- Medical quality
- Service quality
- Economic efficiency

Revenue

The center's revenue comes from the following:

- Ambulatory services
- Private patients
- Internal cost allocation
- External referring physicians (hospitals, practices)
- Other (radiology courses, management courses)
- Additional revenue from new services (cardio CT; screening (e.g. whole-body MRI, brachytherapy, oncology, integrated care, leasing of equipment and personnel by other healthcare providers, increase in the number of private patients))
- Revenue for teleradiological services
- Expansion by improving medical quality, imaging and service
- Third-party funds

The increase in economic efficiency is additionally increased by establishing two ambulatory medical healthcare centers. These allow higher system utilization, optimal personnel deployment, additional profit margins, and the integration of ambulatory and inpatient spheres (expansion of the value added chain).

Budgeting

In annual budget meetings, the administration and center management determine the framework for economic controlling of the imaging center in the form of budget planning. The same applies to the medical healthcare centers.

From strategic planning exceeding the retrospective analysis of the implementation of planning data and comprising a multi-year forecast, budgets in the operational area define expectations on the basis of assumptions for the coming year (**Fig. 3**). They are typically based on the data of the previous year with inclusion of efficiency improvements. Budgets target the financial field and are comprised of a value-based cost portion (input, economic planning), quantity-based services (output, medical planning) as well as the expected revenue. This includes the three areas, service planning, cost planning, and revenue planning. Success parameters are activity quantity (evaluated by achievement points), personnel and material costs and planned revenue. Economic efficiency results from the ratio of total costs to total revenue and internal pricing. A positive difference between revenue and costs allows an increase of the budget under variable conditions (flexible budgeting) in the areas of personnel, materials, and investments.

The magnitude of the activity quantity (medical fee schedule points) is largely determined by the internal cost allocation of the referring physicians. They take responsibility

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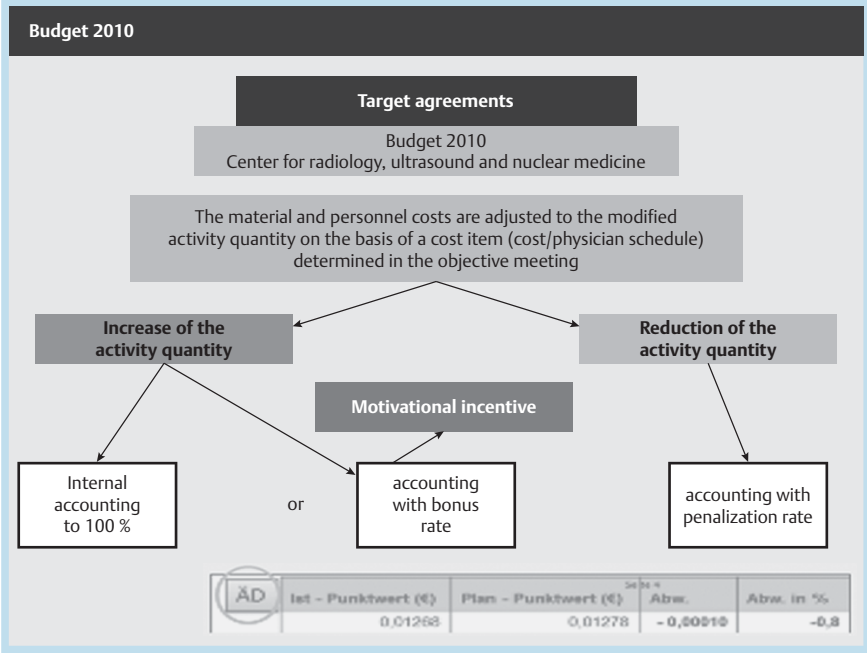

Fig. 3 Budget 2010, „target agreement", cost efficiency and performance measurement.

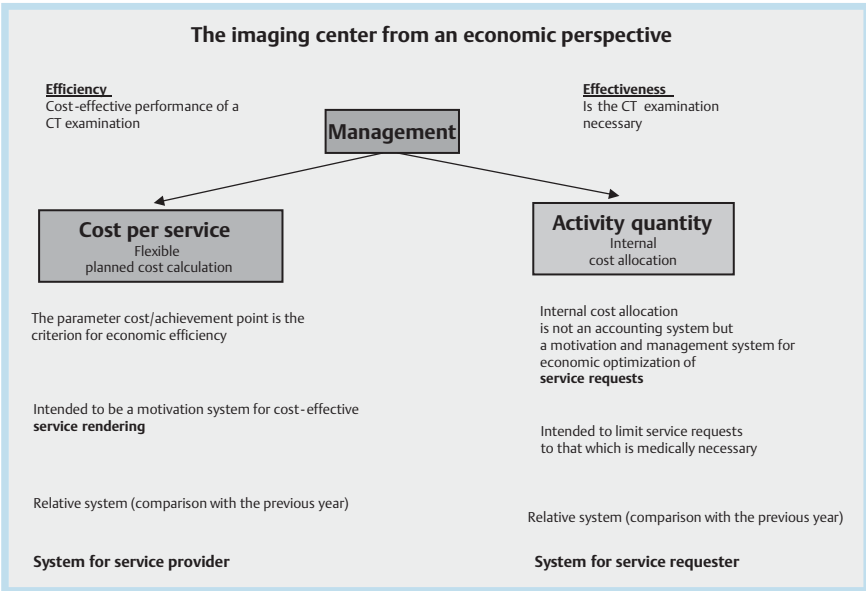

Fig. 4 Controlling of the imaging center from an economic perspective.

for the cost-effectiveness of requests (economy of service request) and thus the effectiveness of the service request (indication). Production efficiency and cost effectiveness (efficiency: cost/medical fee schedule point corresponds to internal pricing) of the rendered service are the responsibility of the management of the imaging center (▶ **Fig. 4**). Therefore, deviations between planning and reality in transactions can be understood, possible reasons can be detected, and systematic controlling measures can be determined.

Key figures

Key figures assume a prominent role for successful controlling and optimization. This is particularly true for the preparation of a department's annual budget meeting with hospital management. Prepared objective meetings as forecast planning with analysis of performance development and costs are required for the further development of the center.

They provide real-time information about the current state of development of planning and implementation of requirements so that any necessary correction measures can be implemented in the case of deviations from the plan.

In this connection, key figures play a particular role in the successful controlling of an imaging center. This includes for example weekly evaluations of data quality, cost development and performance development.

Performance-related key figures are:

- Number of patients/cases
- Number of examinations/interventions

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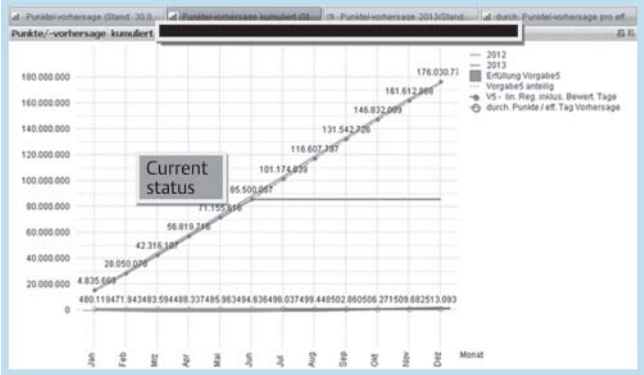

Fig. 5 Plan/actual comparison: Current state and projection of the achievement points (Y-axis) on the basis of a linear regression estimate (estimate exactness>; 99 %).

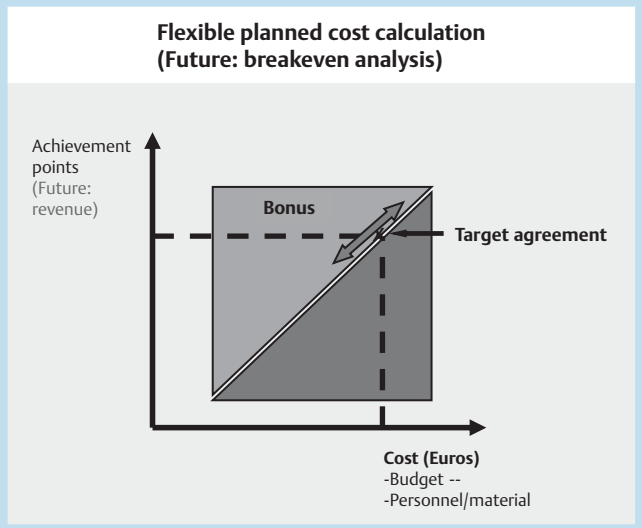

Fig. 6 Flexible planned cost calculation (in future breakeven analysis).

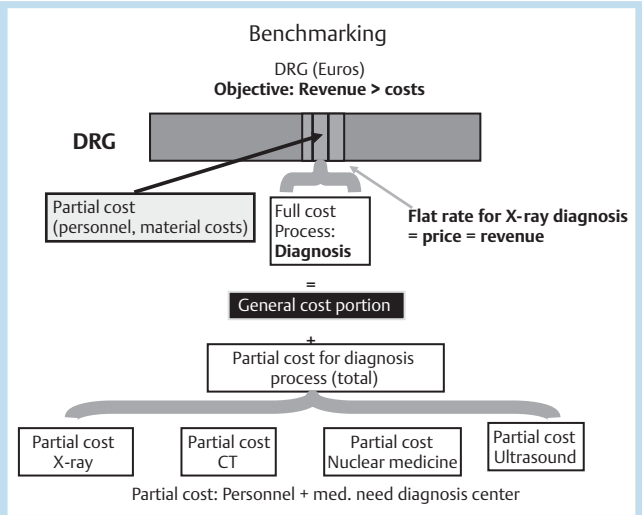

Fig. 7 Calculation of the costs of a DRG.

- Number of achievement points on the basis of the medical fee schedule
- Radiological DRG portions
- Comparisons to previous year
- Comparisons of planned vs. actual

Cost-related key figures are:

- Cost per achievement point (medical fee schedule, uniform value scale)
- Cost per examination
- Cost per case
- Comparison of the costs of the previous year
- Planned – actual comparisons
- Cost per imaging pathway

The monthly key figure-based report allows ongoing monitoring of performance and cost development and a reliable prognosis regarding the achieving of the targets defined in the budget at the earliest time possible.

In monthly reporting of the internal controlling in close coordination with the business controlling department, the data are provided to the responsible managers of the cost centers in the imaging center and are jointly discussed. Cost and performance are controlled and thus productivity (cost per achievement point) is evaluated via target-actual cost/performance comparisons (**Fig. 5**).

Personnel and material costs are adjusted via flexible budgeting in the form of a profit and loss calculation. While ensuring medical quality, an increase in productivity based on more services (than planned) with lower costs is rewarded with a bonus for the employees of the imaging center. In the case of a productivity increase, this is then negotiated as a planned/target variable for the coming year. The criterion for economic efficiency is then increased (**Fig. 6**).

Moreover, any necessary deviation analyses are performed and show possible reasons for the deviations and initiate necessary correction measures in relation to plan implementation.

Service rendering under consideration of the efficiency principle is necessary for the survival of the imaging center given the continuously changing/intensifying framework conditions. Economic efficiency as the ratio of revenue to cost relates to the sum of the individual services (e. g. ambulatory services, emergency cases) and to the realization of diagnosis related groups.

Approximately 70 – 80 % of hospital revenue comes from DRGs. The DRG system represents a service-based compensation system. The annual material and personnel costs must be compared to the sum of the corresponding DRG portions as the "set price" to check profitability. This applies in particular to personnel costs as the largest cost pool.

Alternatively, at most the DRG revenue of the radiology cost center can be made available as a controlling parameter during budgeting.

As a consequence, the imaging center must concentrate not only on the cost-effective rendering of individual services but also on the whole clinical treatment process as the sum of individual services (**Fig. 7**). A center is not comparable with a practice.

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Cost and performance benchmarking

To be able to evaluate the economic efficiency result, in particular the productivity result, external hospitals are used as comparison partners (external benchmarking) [4]. Therefore, personnel and material costs can be compared and analyzed on the same day with the cost data of the DRG calculation hospitals (approx. 220) to the level of the individual DRGs.

If the costs for a treatment case are significantly above the average DRG revenue, the process workflow and the type and number of procedures used must be compared and a need for optimization must be determined [5]. Without knowing the costs for a DRG, optimization in the context of economic efficiency cannot be realized.

Comparison of performance data with the procedures of the Institute for the Hospital Remuneration System makes it possible to derive effectiveness evaluations: In a retrospective comparison to other hospitals what is the clinical pathway in the case of a complex DRG, e.g. F59B, complex or multiple vascular procedures without complicated constellation, without revision, without complicated diagnosis, age 2 years, without certain two-sided vascular interventions or moderately complicated vascular interventions with complicated diagnosis without extremely severe CC, without rotation thrombectomy (**Fig. 8**).

Benchmarking with the procedures commonly used in the calculation of the Institute for the Hospital Remuneration System shows the possible need for optimization of the clinical pathway.

F59B (e.g. stent in pelvis + PTA)

DRG	OPS	OPS-Text	BKT rel. Anteil OPS/Fall	DRGBrowser rel. Anteil OPS/Fall	Abweichung BKT/DRGBrowser
F59B	3-607	Arteriographie der Gefäße der unteren Extremitäten	73,23%	57,63%	15,60%
F59B	8-836.0b	Perkutan-transluminale Gefäßintervention: Angioplastie (Ballon): Gefäße Oberschenkel	54,33%	54,21%	0,12%
F59B	3-605	Arteriographie der Gefäße des Beckens	32,28%	45,38%	-13,10%
F59B	8-83b.c3	Zusatzinformationen zu Materialien: Verwendung eines Gefäßverschlusssystems: Clipsystem	24,41%	0,00%	-
F59B	8-836.09	Perkutan-transluminale Gefäßintervention: Angioplastie (Ballon): Andere Gefäße abdominal	22,05%	22,33%	-0,28%
F59B	8-840.09	Perkutan-transluminale Implantation von nicht medikamentenfreisetzenden Stents: Ein Stent: Andere Gefäße abdominal	22,05%	0,00%	-
F59B	8-840.0b	Perkutan-transluminale Implantation von nicht medikamentenfreisetzenden Stents: Ein Stent: Gefäße Oberschenkel	14,96%	0,00%	-
F59B	8-836.0c	Perkutan-transluminale Gefäßintervention: Angioplastie (Ballon): Gefäße Unterschenkel	11,81%	[illegible]	-0,11%
F59B	3-828	Magnetresonanztomographie der peripheren Gefäße mit Kontrastmittel	11,81%	3,84%	7,97%

Clinical pathway

Fig. 8 From the DRG-Portion to the analysis of the clinical pathways.

Personnel controlling

The personnel requirement assessment increasingly used in DRG calculation is used in particular for the controlling of personnel costs on the basis of revenue [6]. The lowest cost personnel requirement is determined as part of personnel planning, and the financial feasibility is checked, determined and checked for plausibility on a monthly basis. The refinancing of personnel categorized according to the individual types of personnel, i.e., medical service, medical-technical service, functional service, is the focus of the calculation of the personnel requirement ("more money cannot be spent than earned"). The actual financed personnel requirement is determined on the basis of the personnel cost matrix from the calculation data of the Institute for the Hospital Remuneration System based on average values (**Fig. 9**). The goal is to align the personnel requirement/number of employees and personnel utilization with the revenue from paid services.

Exclusive relation to inpatient service is problematic since exact delimitation and exclusion with respect to the remaining direct and indirect services (ambulatory services, additional fees, research and teaching, etc.) must be performed.

Process controlling

Optimization of the process organization had a direct effect on the value added chain of patient treatment. An up-to-date organization structure seeking to achieve uniform achievement of objectives and avoiding friction can only

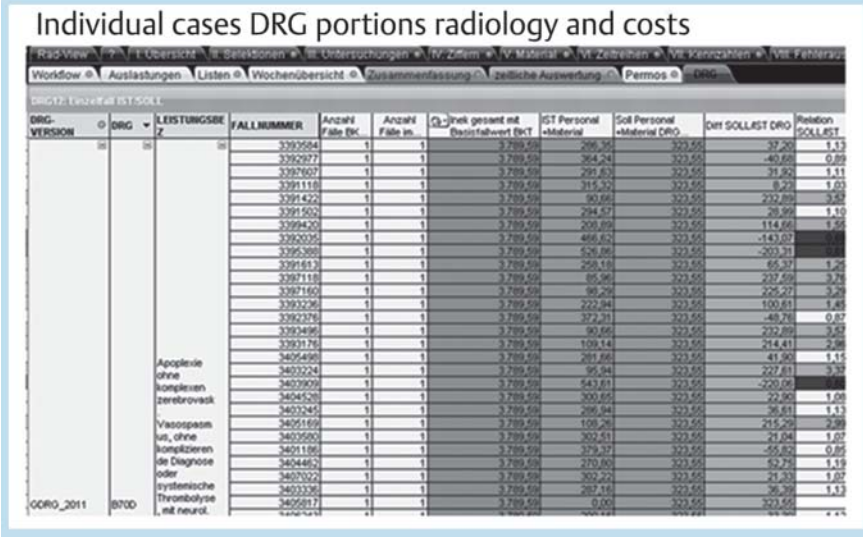

Fig. 9 Patient-related comparison of the "Imaging flat rate" in the DRG system with the personell and material costs of a radiology department.

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last if a change from function-based work to process-oriented thinking becomes established [7]. The focus must be on processes and not structures and activities. In the context of DRG, the entire clinical pathway in the hospital is compensated so that ongoing process optimization of medical quality, service quality and economic efficiency is required to ensure revenue. The following applies: First define the required processes, then adapt the structures, and finally find/develop and deploy the necessary personnel [8].

The center must be successfully managed according to the rules of a commercial enterprise with respect to the three indicated pillars. In the future the path of the patient along the entire clinical pathway, i. e., along the entire qualitative and quantitative value added chain, must be planned and organized (**Fig. 10**). The organization and calculation of the rectal carcinoma imaging pathway practiced for 3 years at the Brüderkrankenhaus in Trier results in continuous optimization of quality, economic efficiency, and patient orientation.

This requires structures and IT tools that record organizational medical processes and costs (activitypath–based costing). From the perspective of radiology, PACS, RIS, HIS (hospital information system) and the RAD analyzer are important components (see **Fig. 9**). An ongoing real-time exchange between the systems in connection with imaging and patient information as well as across the spectrum of examinations and the process workflow (in real time if possible) is an absolute requirement.

However, this new way of thinking also requires other methods of retrospective analysis than the previously often used interpretation of frequency distributions [9]. Due to the high diversification of clinical pathways, both the individual examinations and the maintenance of their planned order play a role (**Fig. 11**). This allows interpretation of the details of clinical pathways or deviations of clinical pathways from a medical (effectiveness) and economic (efficiency) standpoint.

DRGs require optimization in the areas of effectiveness (was the indication or the MR examination necessary) and efficiency (how was the examination performed). The complex task under the necessary consideration of key quality management figures is: How can non-medically necessary services be avoided and necessary services be rendered efficiently with high quality standards.

In this connection, productivity (cost per examination) must be used as an efficiency criterion for assessing success. Moreover, it is necessary in personnel deployment planning to implement resources where they are most needed according to the rationality principle.

Prior to process optimization, the current situation should be made transparent and assessable with the support of utilization measurements, for example (**Fig. 12**).

Detailed workflow analyses as well as the recognition and prioritization of improvement potential must be determined on the basis of quantitative measurements ("you cannot manage what you do not measure", P. Drucker, American Economy). Operational excellence and continuous improvement management are key factors here.

Moreover, utilization management as part of external benchmarking with 500 hospitals in Europe (Philips Utilization Services) allows evaluation of the quality of the process workflow based on the criteria patient flow management,

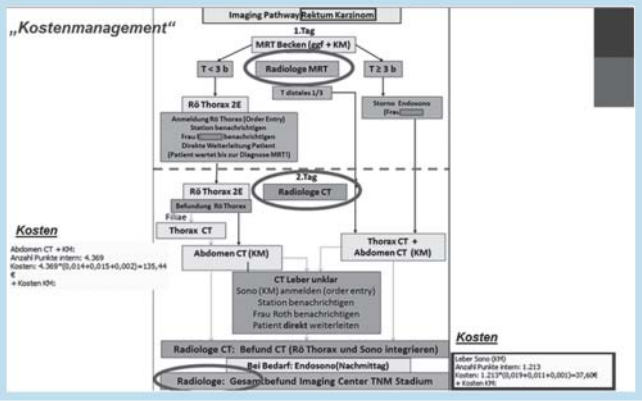

Fig. 10 "Rectal carcinoma" imaging pathway at Krankenhaus der Barmherzgen Brüder Trier.

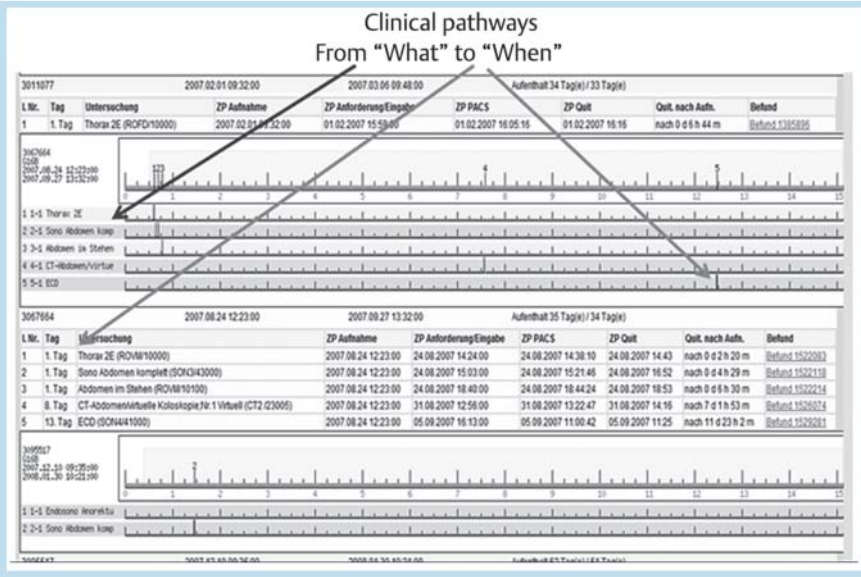

Fig. 11 Monitoring of an imaging pathway with regard to indication, resources, cost efficiency.

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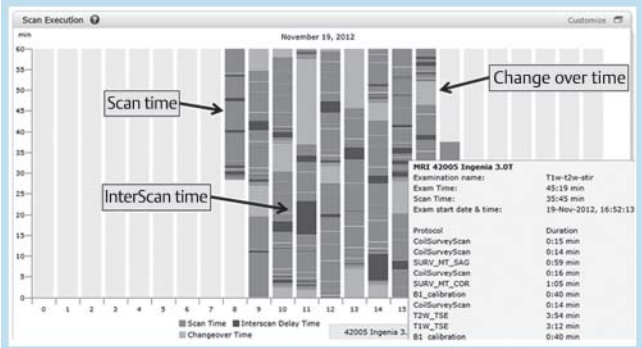

Fig. 12 Utilization management (Key Performance management Indicators KPIs) Philips Utilization Management.

examination flow management, schedule logistics management, and procedure optimization.

Improvement of efficiency in the form of reduced wait times and shorter examination times (increase of service quality) increases satisfaction regarding the experienced and practiced process quality for all process participants (patients, employees). An efficient process organization also means increased patient throughput. Consequently, this allows a cost reduction and optimization of system utilization.

The necessary number of completed examinations and the minimization of patient wait times should be realized at the end of digital appointment and patient workflow management. The difference between the revenues and costs determined by the DRG reimbursement system can be enhanced by an increase in productivity as well as the prevention of unnecessary services/examinations. New equipment (e.g. MRI units, flat detectors) offer the option of increasing patient throughput and thus increasing economic efficiency.

The main point is:

The economic success of an imaging center requires continuous efforts as well as the use of suitable controlling instruments and intensive monitor of implementation to be able to be successful with regard to medical quality, service quality, and economic efficiency.

References

1 *Busch HP.* Das Zentrum für Radiologie, Sonographie und Nuklearmedizin („Imaging Center") im Krankenhaus der Barmherzigen Brüder Trier. das Krankenhaus 2011: 583 – 591

2 *Hentze J, Kehres E.* (Hrsg) Krankenhauscontrolling; Konzepte, Methoden und Erfahrungen aus der Krankenhauspraxis, 4. Vollständig überarbeitete und erweiterte Auflage. Verlag W. Kohlhammer 1998/2010

3 *Busch HP.* In Prozessen denken und optimieren – eine Herausforderung für Krankenhäuser. das Krankenhaus 2011: 459 – 464

4 *Busch HP.* Benchmarking radiologischer Abteilungen, Startpunkt einer erfolgreichen Prozessoptimierung. das Krankenhaus 2010: 207 – 2014

5 *Busch HP.* Kennzahlen zur Steuerung und Optimierung radiologischer Abteilungen (Imaging-Center). Radiologie up2date 20111208 – 1210

6 *Busch HP, Frewer W.* Personalbedarfsanalyse: Vom isolierten Kostenreduktionsprogramm zum Baustein einer erfolgreichen Prozessoptimierung. das Krankenhaus 2013: 605 – 612

7 *Frewer W, Schuh H, Busch HP.* Schnittstellenmanagement im Rahmen kontinuierlicher Prozessoptimierung von klinischen Behandlungspfaden. das Krankenhaus 2012: 1003 – 1009

8 *Zapp W, Dorenkamp A.* Anwendungsorientierte Prozessgestaltung im Krankenhaus – Bericht über ein Forschungsprojekt. In: Zapp W (Hrsg) Prozessgestaltung im Krankenhaus. Heidelberg: Economica; 2002: 1

9 *Hopf M.* Mustererkennung im Krankenhaus, Praktikumsarbeit im Zentrum für Radiologie, Neuroradiologie, Sonographie und Nuklearmedizin im Krankenhaus der Barmherzigen Brüder Trier; 2013

10 *Berens W et al.* Der Einsatz von Controllinginstrumenten in Krankenhäusern – Erfolgspotentiale und Status quo. Gesundheitswesen 2010; 73: e51 – e60

11 *Bienert ML.* Betriebswirtschaft für leitende Ärzte. In: Hellmann W et al. (Hrsg) Gesundheitswesen in der Praxis. Heidelberg: Economica; 2009: 112

12 *Busch HP.* Managementhandbuch für Radiologen. Thieme Verlag; 2008

13 *Frewer W, Busch HP.* A Multidisciplinary Approach to financial planning. Imaging Management 2012; 12: 20 – 23

14 *Frewer W.* Personalanalyse – wie funktioniert das? Jahrbuch Gesundheitswirtschaft 2014,, Hrsg. Oliver Lorenz, Prof. Dr. Wilfried von Eiff

15 *Gocke P et al.* Prozessmanagement und Controlling in der Diagnostischen Radiologie im Krankenhaus. Der Radiologe 2002; 42: 332 – 343

16 *Huch B.* Operatives Controlling im Krankenhaus. In: Henze J, Huch B, Kehres E (Hrsg) Krankenhaus-Controlling. 2. Aufl.. Stuttgart: Kohlhammer; 2001: 45 – 66

17 *Schmelzer HJ, Sesselmann W.* Geschäftsprozessmanagement in der Praxis. Wien: Carl Hanser Verlag München; 2001

18 *Schmiegel W et al.* S3-Leitlinien „Kolorektales Karzinom – Aktualisierung 2008". Z Gastroenteral 46: 799 – 840

19 *Schmidt-Rettig B, Eichhorn S.* Hrsg Krankenhausmanagementlehre, Theorie und Praxis eines integrierten Konzepts. Kohlhammer 2008

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