

XXI. International RESER Conference: Service4Health – Increasing productivity in German hospitals: Which role do diversity aspects play?

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Focusing on medical core processes, the project considers the grade of orientation on processes and costs of an action in dependence on human factor and its diversity. The challenge for German hospitals is to increase productivity and simultaneously arrange the effects of the various forms of diversity: ethnic, demographic and relational diversity. This arrangement needs on the one hand specific knowledge about the practical problems and on the other hand data about dependency of productivity and diversity.

1. Challenges for german hospitals

Due to increasing costs in health care and the implementation of a case based compensation (G-DRG; diagnosis related groups) hospitals in Germany have to manage growing financial challenges. Increasing competitive pressure, better informed patients, the demographic change and not least political guidelines are demanding a higher quality of the hospitals.

For a successful management the answer to these challenges is in the one hand the consequent identification of the processes and quality and in the other hand the gain of the productivity.

An attempt to persecute this, is the development of a productivity index. The special challenge exists therein, to observe in this model not only the hard parameters (for example cost per process step, cost of material, revenue per patient, etc.)but also the soft parameters (for example satisfaction of the patient). Considering these both parameters a holistic productivity index can be developed. An approach will be built in this article.

The topmost intention in this paper is the practicability in the clinical daily routine; therefore for the development of the index many pragmatists from all areas of the hospital were involved in the project. The goal is to calculate the productivity easily and evident, in order to develop benchmark approaches with other hospitals in Germany.

In this paper the focus is on the emergency room. In this section of the hospital the main part of the patients begins their course of their treatment. The success of the treatment is up to the first decisions made in the emergency room.

2. Question

2.1. Productivity in hospitals

Production in a hospital can't be reproduced by the classical sight output/input, because in the center there is a strong influence of the patient in the whole healing process. The quality of the hospital can't be evaluated only in the strict medical meaning. In fact there are many more perceptions necessary to reproduce the complex treatment process. These views will be developed in this article.

The challenge exists specially for the patients to evaluate the outcome of health services. If anything the patient can estimate the quality after a certain period. Therefore it is necessary to develop auxiliary quantities; with them it is possible to estimate the outcome of the process. This specialty has to be kept in mind for developing a productivity index.

2.2. Diversity in hospitals

Diversities can be found in different divisions of a hospital. Not only the clientele of the patients differ in their ethnic and demographic attributes. Also the employees were influenced by different components. In the actual scientific discussion there are only few notes, how the demographic and ethnic diversity influences the productivity in a hospital. A first step in this direction is this article.

3. Methodology

3.1. Productivity in hospitals

In order to develop a process model, it is necessary to identify and to consider the core processes. These core processes identified the team of the emergency room of the Sana Kliniken Lübeck GmbH.

But what is productivity meaning in an emergency room? The emergency room is only one part of the whole treatment process. Hence it can't be calculated with fees of the diagnosis related groups (DRG) as an output factor, because other divisions of the hospitals influence this factor. Additive in the mind of a holistic productivity index

this factor is not enough. In fact other factors like the soft ones have to be given influence in this model.

3.2. Identification of the output parameters

At this time in the scientific knowledge there is no agreement about the output factors in an emergency room. The last attempts to quantify the output of an emergency room were limited on the sight of the patients. Therefore the output of an emergency was reduced of a pure measurement of the patient satisfaction.

Another approach is the observation of an emergency room in consideration of the core function. The main task in this division is to diagnose the patients and allocate for them the right unit in the hospital. Therefor there is the possibility to identify the false classifications in the emergency room, because the diagnosis will be checked again and again in the treatment process.

In this project the capture of the relevant output parameters has to consider all stakeholders of an emergency room and has to cover the most important parameters in their sight. Therefor all experts who are influence these process were embedded (physicians, nurses, administration). In discussions inside and between different hospitals the relevant factors have been found.

3.3. Identification of the diversity factors

Since the last few years diversity plays a bigger role in the economic considerations. Based on the social change there are many challenges not only especially for hospitals but also for the whole economy.

In this project the focus is on these parts of diversity:

- Relational diversity: Influences of the different affiliation to the permanent staff of the hospital
- Ethnic diversity: Influences of the different nationality/culture of the patients or the employees
- Demographic change: consequences of the changed age distribution on the treatment and therefore on the productivity

In this observation only diversities of the patients will be included. The identification of the relevant indicators is based according to prior agreements with the experts of the emergency room.

4. Results

4.1. Value chain in hospitals

To improve the productivity in hospitals the identification of core processes and subsequent supporting processes is needed. The value chain of a hospital is described in table 1. During the medical admittance process the course for the further medical treatment has to be set. In this phase has the decision to be made by which medical department a patient is treated and which form of therapy (e.g. surgical, conservative) is used.

Due to this fact the processes in an emergency unit have a fundamental impact on the value chain. Especially in acute hospitals the most patients were admitted via the emergency unit. So we focused our discussion in this paper on outcome and productivity of a central emergency unit.



Figure 1: value chain in hospital

4.2. Classical perception on productivity

Productivity is classically defined as a ratio of output and input. The challenge for hospitals is now to define how to measure and evaluate both factors.

In the service sector and in particular in hospitals some distinctive features have to be taken into account. Due to the comprehension of the patient in the treatment process production and consumption go together. Further on the desired behavior of the patient, called compliance, has a significant influence on the outcome of medical treatment. In addition German hospitals have to adjust their capacities on peak demands. They have to provide all capacities of treatment even if actual demand is low.

4.3. Output-parameters

Following output parameters will be observed in the project:

patient perspective		
output parameter	description	calculation
Waiting period to medical contact	compromise between expectation of the patient and the real achievement of th time until the first medical contact	$\frac{\text{expected time to medical contact}}{\text{real time to medical contact}}$
pain	compromise between the expected decrease of pain and the real decrease	$\frac{\text{expected decrease of pain}}{\text{real decrease of pain}}$
accuracy of the first diagnosis	match of the admission diagnosis and the end diagnosis	$\frac{\text{corresponding diagnoses}}{\sum \text{number of diagnoses}}$
human perspective		
human resources	are the human resources sufficient to the workload?	a score value will be built
management perspective		
ambulant potential	inpatient cases of the emergency room adjusted to the cases, wich will not be paid by the insurance	$\frac{\sum \text{number of cases} - \text{ambulant pote}}{\sum \text{number of cases}}$
amount of coverage	approximated compromise of the revenues and the costs (limitation on the personnel costs)	$\frac{\text{revenues} - \text{costs}}{\text{revenues}}$

Figure 2: output parameter and their calculation

4.3.1. Patients perspective

A modern hospital has to take a position as a service provider, thus the patients perspective plays an important role in the emergency unit. The main request of a patient is the solving of his acute problem. Therefore a quality feature of the emergency unit is the time period until the first contact to a physician. Here starts the solving of the problem regarding the patients' perspective.

For the calculation of the parameter „waiting period to medical contact“ patients expectations concerning the first physician contact are evaluated when patients arrive in the emergency unit. Afterwards the real waiting time documented in the hospital information system is set in relation to the expectation of the patient.

Another relevant aspect for patients is the reduction of their pain. An evaluation of pain can be made using a standardised pain scale. The patient has to rate his pain on scale from 0 to 10 (NRS – numeric rating scale). At the admittance in the emergency unit the patient has to assess his pain. The questioning is done a second time after finishing treatment in the emergency unit. Comparing both results the variation and development of pain out of the patients' point of view can be documented. One has to consider, that the pain assessment is only subjective rating. Again the measured pain decrease is set in quotient to the expectation of the patient.

A third challenge of the emergency unit is to do the right diagnostics at a very early time in the process of medical treatment and choose the right clinical pathway. To control this process, one can compare the admission diagnose with the discharge diagnose. The admission diagnose is determined by the examinations and diagnostic procedures in the emergency unit. The discharge diagnose represents the complete development of patients treatment. If there is a high correlation within both diagno-

ses, a high diagnostic quality in the emergency department can be assumed. In our context of the productivity index the correlation between admission diagnose and discharge diagnose is indicated in percentage.

4.3.2. Employees' perspective

In a holistic consideration the employees' point of view plays an outstanding role. Highly staff satisfaction leads nearly automatically to a higher customer's satisfaction. Beside technical equipment, team spirit and monetary aspects especially employees' workload is an important of a satisfactory job. High workload results from undervaluing staff for a defined performance.

By grouping emergency patients in several priorities (called Manchester Triage) an estimated time for nursing activities can be calculated. Time needed for nursing activities is added up during a shift and compared with the according duty roster. Subsequently a set-actual comparison of personnel situation is conducted. One has to consider, that also low workload is not designated. To account for this aspect a score model is used. If the score shows 0.2, a clearly low or clearly high workload is indicated. The value 0.5 is assembled if slightly low or high workload is detected. The value 1 points out an optimal proportion of workload.

4.3.3. Management's perspective

Considering the discussed topics the focus of the hospital management lies on the financial success of the hospital. The financial success of an emergency department has to be discussed in two different aspects. One has to distinguish between the two patient categories of in- and outpatient treatment. If a patient is medicated in an outpatient treatment, he leaves the emergency unit after treatment homeward. On the other hand there are many patients who were admitted to hospital after there first treatment in the emergency unit.

From a financial perspective it is very important that if a doctor wants to hospitalize a patient the admittance has to conform to the administration criteria of the German health insurance companies (D-AEP criteria). If there are frictions and an external audit is executed through the insurance companies, the hospital loses a huge part of its revenues for this case. To save costs trough unpaid inpatient treatment, the doctors of the emergency unit have to check the criteria and to avoid admitting patients to the hospital insurance companies will not pay for. In this paper we call these case out-patient potential. To measure the out-patient potential after admittance through the emergency department all cases are automatically reviewed using a medical-coding and diagnose-based computer program. Thus the fraction of admitted patients is identified which is not inpatient-treatable regarding to the AEP-criteria.

The financial outcome of outpatient treatment in emergency is not easy to predict because detailed comparison of costs and revenues base only on little data. In a first view we focus on personnel costs, which represent the major cost pool. The personnel costs were compared with the average revenue of outpatient treatments. This approach leads to a first contribution margin within the emergency unit.

4.4. Selected diversities

The interdisciplinary workgroup of emergency department experts assumed following diversity aspects of patients with a high influence on productivity. So these aspects are examined in a first step. The influence of the diversities of the staff will be the issue of a second analysis.



Figure 3: observed diversities

A special interest for Sana Kliniken Lübeck is the influence of the place of residence regarding to the demands of the patients in the emergency unit. The clustering of postal codes and related driving time to the E.U. will allow us to analyse if the population of Lübeck's city center has another expectation of waiting period to medical contact than e.g. tourists.

The research on diversity aspects of patients will influence the review of the patients perspective on productivity. We assume that several differences will occur and have to be topic of further analysis.

4.5. Modelling of a productivity index

Many industry branches use productivity indices to measure the input factors in relation to the output. In the hospital sector it is not very common yet to think in terms of productivity. Especially in the emergency unit output and input melt with other divisions of the hospital because resources are used in different areas at the same time.

Nevertheless this paper tries to give a basis for further discussions on productivity measurement in emergency units taking the three most important perspectives into account. All components are condensed within an index to one business ratio, which allows to compare different emergency units with another.

In several workgroups with internal and external experts the weightage of patient-, employee- and management-perspective were defined. The service orientation for patients leads to a 0.4 weight. The other components obtain a weight of 0.3.

This leads to the following productivity index of an emergency department

productivity =

$$0,4 * \left[\frac{\text{expected time to medical contact}}{\text{real time to medical contact}} * \frac{\text{expected decrease of pain}}{\text{real decrease of pain}} * \frac{\text{corresponding diagnoses}}{\sum \text{number of diagnoses}} \right]$$

*+0,3 * Score value human resources*

$$+0,3 * \left[\frac{\sum \text{number of cases} - \text{ambulant potential}}{\sum \text{number of cases}} * \frac{\text{revenues} - \text{costs}}{\text{revenues}} \right]$$

The higher a single parameter in the index turns, the higher the total productivity is. The more the productivity approaches the value 1, the more productive the emergency unit is.

5. Discussion

We could show that the classical approach of measuring productivity is not suitable for an implementation in healthcare system without further ado. Nevertheless we developed a practical proposal how emergency units can be compared taking their productivity into account.

The model has now to show its fitness in some business cases. Did we treat all factors in a suitable way? In the following month the theoretical approach will be tested in the practical conditions of two German hospitals of the Sana Kliniken AG. Afterwards the results will be reviewed critically and improvements realized.

The further research has also to show how different diversities work on the output factors. We assume a high impact of demographic factors on the productivity. The hypothesis, that multimorbidity of elder patients has a negative effect a contribution margin through expensive and complex technical examinations has to be verified. We will also monitor if this effect is maybe neutralized by a lower expectation for the time period of first medical contact. Another exciting topic could be regional differences between the expectations of patients and the consequences for their satisfaction.

A third topic will be the influence the employees diversities. Skills shortage and the resulting insertion of foreign personnel lighten up the influence of relational and ethnical diversities. Also agency staff and part-time work play an increasing role against this background.

The productivity of an emergency unit is definitely not only influenced by the discussed factors. Many framework requirements like competitors, political decisions

and financial resources in a health system play a significant role. But the measurable and controllable topics of the productivity index discussed above will help managers and physicians to look at the right topics.

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