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Patient Risks and Avoidable Costs:Six Sigma Reduces Variation in Medicine

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In all health service systems that have introduced a DRG system for billing in-patient medical services (e.g. Italy, Germany, Australia, USA) a few target costing situations have occurred. Hospitals get a specific amount for a defined treatment, yet this amount needs to support operational costs as well as income to be invested further.

Since, at the same time, competition between hospitals is intensifying, more private hospital chains are entering the market through M & A, and financial institutions have discovered healthcare to be worth investing in, hospitals find themselves in an unusual situation. They must increase medical quality step-by-step, improve patient care (service, comfort and fear management), while reducing avoidable costs, optimising the use of resources and shortening patient stays.

Such goals can only be realised by following an efficient performance process, the outcome of which fulfills patient expectations and uses resources in an optimised way, which means that no amount of time, capital or materials can be wasted.

The Phenomenon of Variation

Disruptions in quality and efficiency of the medical treatment process can usually be traced to the phenomenon of variation, which can be found in all parts of living and working processes.

For example, after a long flight, the amount of time it takes to claim your luggage could be anywhere between five and 50 minutes. By the same token, a hip replacement operation can take 85 or 130 minutes, depending on a number of variables.

The phenomenon of variation of the service process has been named the most important cause for errors, unnecessary costs, and client satisfaction.

Variation is a sign of not properly controlling services. Once time pressure is added to this lack of service control, the risk of error rises exponentially. Variation needs to be in balance with the quality demand of the client who is paying for the service (e.g. an airline traveler) or the ethical demand of a qualified result (e.g. an operated patient).

• In air travel, a delay of 15 minutes is “on time according to flight schedule”

• In emergency care, for a heart attack patient, the “First-Contact-To-Balloon-Time” of 90 min. max. is considered the benchmark standard.

The knowledge of variation is a much more meaningful indicator for productivity in terms of client orientation, fair prices and quality than the use of averages such as average waiting time of a patient for an x-ray diagnosis, average costs of a surgical procedure, etc. An average recovery time of 20 days for a patient until s/he can go back to work following a certain procedure (e.g. hemorrhoidecotomy) does not say very much about the quality of the entire care process. This value can only be achieved by adding some patients’ 28-day recovery times and others’ 12-day recovery time. According to ethical and economic reasons, it is best to keep variance as low as possible and declare a cumulative goal of 14 days instead of the average 20 days.

Six Sigma Makes Variation Transparent

To make the phenomenon of variation transparent, the Six Sigma concept has proven itself in the industry as well as in American and Singaporean hospitals.

99 % perfection = 2.8 Sigma	99.9997% perfection = 6 Sigma
5.000 not correctly performed surgical procedures per week	1.7 not correctly performed surgical procedures per week
200.000 wrong prescriptions a year	68 wrong prescriptions a year
48.000 to 98.000 avoidable deaths in hospitals a year	17 to 34 avoidable deaths in hospitals a year

Figure 1: 99 % perfection is not enough for the health care system. Source: Creative Healthcare (2004)

Six Sigma defines quality as a measure of variance from a given performance standard or promise of quality.

Six Sigma was derived from a measuring index that is used in quality management: defects per million opportunities (DPMO) = actually occurred defects in 1 million error possibilities.

Every DPMO value corresponds to a Sigma value. A DPMO shows the frequency in which the error will possibly occur.

An error possibility (opportunity) is every chance that a given request (promise of quality) or not correctly exercised.

Especially in healthcare, even a 99 % degree of perfection is ethically and economically unacceptable: patients and hospital workers are highly endangered in this scenario, and the misuse of resources also leads to prevention of future investments.

Every process, every error phenomenon and every variance of a determined quality standard in a hospital could generally be improved with the help of Six Sigma. Examples include: Reduction of patient falls/injuries, less medication errors, shorter circulation time for pharmaceutical goods, shortening of billing cycles for private patients as well as those with health insurance, shorter waiting periods for heart attack patients at the heart catheter lab, etc.

Detecting the Six Sigma Value of a Performance Process

For the first step in detecting the Six Sigma value, following definitions need to be established:

• “Unit” of performance (object/product/service) to be delivered to the patient

• “Requirements” or the main parts that make up the performance that will satisfy or anger the patient.

• Number of “requirements” for every performance category (“unit”) in which the number of “requirements” equals the number of error possibilities.

Example: Cardiologic outpatient clinic

The most important demands to the outpatient clinic from the patient’s point of view are:

• Maximum amount of time spent waiting is 15 minutes

• Satisfaction with the kind of care provided by the treating physician or nurse (friendliness, communication)

• Clean toilets

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These 3 demands are equal to 3 error possibilities for every outpatient visit. If data of 500 patients' data have been collected, you will get the following picture (as an example): 83 patients had to wait more than 15 minutes, 25 patients felt they were not treated in a friendly manner and 54 thought the toilets were not clean. Thus, the Six Sigma value computes: With a (generally assumed) base of 1 million error possibilities, this means 108.000 mistakes in a million (=DPMO). This corresponds to a Sigma value of about 2.75—hardly a satisfactory situation.

The Six Sigma Method

In accordance to the kind of project, Six Sigma provides two approaches to solve a problem:

a) The DMAIC-Cycle method is used if an existing service process with regards to client orientation, higher quality and lower costs (elimination of existing wastefulness in the "hidden factory") need to be optimised or reorganised.

b) The DFSS-Method (Design for Six Sigma) is used if a completely new concept is to be established and realized. For instance, the construction of a new hospital, functionally designed, will comply with the demands of patient care and patient triage with regard to innovative care methods and financial restrictions of the DRG system (i.e. shorter stays, tendency towards outpatient or pre-inpatient care).

Six Sigma is process oriented, thus four categories of measurements are generally taken:

•Output (= direct process results)

•Outcome (= the process results as felt by the patient with long-term effect)

• Process variables (process efficiency, use of resources, complications)

• Input (factors or pieces that are needed to create output and outcome in order to meet process goals and patient expectations) Typical input for medical service processes are, e.g. quality of pre-diagnosis, quality of pre-treatment, health status of the patient (multi-morbidity) etc.

Summary and Evaluation

The phenomenon of variation is the pivotal cause of patient risks, quality deficiencies and avoidable costs of medical service processes. Variation is the typical feature of an improperly controlled care process. Six Sigma supports the detection of the variation phenomenon and offers tools to overcome it.

Six Sigma is an attuned system of thoughts, methods and techniques for the achievement and advancement of superior business success. Six Sigma is characterized by:

• An understanding of true client needs,

• a disciplined use of data and facts on the basis of statistically secured methods, and

• a focus on business process as well as its permanent improvement and client-oriented reorganization.

The consistent use of the Six Sigma tools is implied, whether it concerns the expertise of all taking part in the project, or the design of the

product. In these times of flexible and/or closed budgets, the necessary capital for all this is fairly easy to mobilise.

In many cases, the easier method (e.g. the PDCAcycle) is appropriate and leads to quick results.

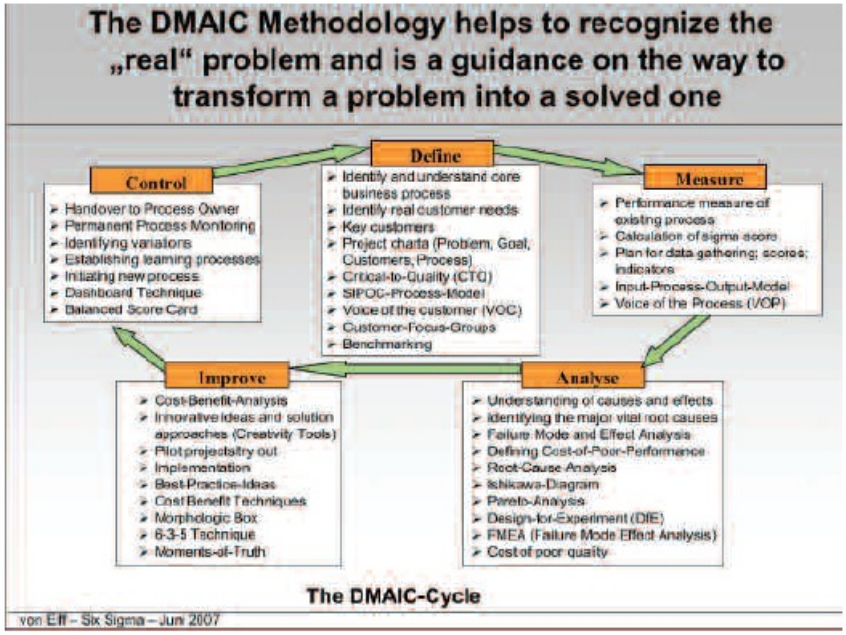

Figure 2: Six Sigma types of measuring

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