

Postprint Version	1.0
Journal website	http://www.healthpolicyjrnل.com/article/S0168-8510(10)00163-6/abstract
Pubmed link	http://www.ncbi.nlm.nih.gov/pubmed/20605051
DOI	10.1016/j.healthpol.2010.06.005

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Does case-mix based reimbursement stimulate the development of process-oriented care delivery?

LETI VOS^{A, B, *}, MICHEL L.A. DÜCKERS^C, CORDULA WAGNER^{A, D}, GODEFRIDUS G. VAN MERODE^E

a NIVEL, Netherlands Institute for Health Services Research, P.O. Box 1568, 3500 BN Utrecht, The Netherlands b Department of Medical Decision Making, Leiden University Medical Center, P.O. Box 9600, 2300 RC Leiden, The Netherlands c Impact, Dutch Knowledge and Advice Center for Post-disaster Psychosocial Care, P.O. Box 78, 1110 AB Diemen, The Netherlands d The EMGO Institute for Health and Care Research (EMGO+), VU University Medical Centre Amsterdam, P.O. Box 7057, 1007 MB Amsterdam, The Netherlands e Care and Public Health Research Institute (CAPHRI), Maastricht University Medical Centre+, P.O. Box 5800, 6202 AZ Maastricht, The Netherlands

ABSTRACT

Objectives: Reimbursement based on the total care of a patient during an acute episode of illness is believed to stimulate management and clinicians to reduce quality problems like waiting times and poor coordination of care delivery. Although many studies already show that this kind of case-mix based reimbursement leads to more efficiency, it remains unclear whether care coordination improved as well. This study aims to explore whether case-mix based reimbursement stimulates development of care coordination by the use of care programmes, and a process-oriented way of working .

Methods: Data for this study were gathered during the winter of 2007/2008 in a survey involving all Dutch hospitals. Descriptive and structural equation modelling (SEM) analyses were conducted .

Results: SEM reveals that adoption of the case-mix reimbursement within hospitals' budgeting processes stimulates hospitals to establish care programmes by the use of process-oriented performance measures. However, the implementation of care programmes is not (yet) accompanied by a change in focus from function (the delivery of independent care activities) to process (the delivery of care activities as being connected to a chain of interdependent care activities) .

Conclusion: This study demonstrates that hospital management can stimulate the development of care programmes by the adoption of case-mix reimbursement within hospitals' budgeting processes. Future research is recommended to confirm this finding and to determine whether the

establishment of care programmes will in time indeed lead to a more process-oriented view of professionals .

1. INTRODUCTION

During the last decade, it is believed that fundamental shortcomings in the organisation of hospital care can cause quality problems like long waiting times, waste of resources, poor coordination of care delivery ^[1]. Traditionally, hospitals are functionally organised into medical (e.g.

internal medicine) and facilitating departments (e.g. laboratory), which operate as separate 'silos' with their own goals ^[2,3]. Each silo is concerned with maximising its own efficiency rather than that of care processes ^[4]. As a consequence, each care activity within a care process of a patient will be planned on basis of availability of resources, after the previous care activity is completed. This means that activities belonging to a patient's care process are treated as being independent instead of as being connected to a chain of interdependent care activities .

[FIGURE 1]

This poor coordination of care delivery is partially due to the use of fee-for-service systems of provider payment ^[4].

A fee-for-service system rewards the delivery of individual procedures (i.e. hospital admissions, number of in-patient days) and stimulates the overuse of services, duplication of services and use of costly specialised services. One way to stimulate coordination and efficiency of care delivery, is to base reimbursement, in whole or in part, on the total care of a patient during an acute episode of illness ^[5] .

This is in line with the theory of target engineering, which states that external pressures related to reimbursement systems can be used to bridge internal conflicts of interests hampering efficiency and quality ^[6,7]. Based on this premise, many Western countries introduced Diagnosis Related Groups (DRGs) or similar case-mix based grouping systems for hospital reimbursement. Also in the Netherlands a new reimbursement system was developed and initiated in 2005 that will gradually replace the fee-for-service payment of hospital care ^[8]. In this new system, hospital budgets are based on the number of delivered Diagnosis Treatment Combinations (DTCs). A DTC consists of all diagnosis- and treatment-related costs incurred by the hospital and the clinician. Thus, it covers the pathway from an initial consultation or examination to the final check-up ^[9]. Consequently, hospital budgets become dependent upon the efficient and effective delivery of DTCs instead of on individual procedures. However, within this new system hospital budgets are not open-ended. Hospitals negotiate with health care insurers regarding the maximum number of DTCs they may deliver within 1 year .

To actually achieve a better coordinated and more efficient care delivery across hospital department boundaries, hospitals may introduce a more process-oriented way of working by the implementation of coordinating structures, called care pathways or care programmes (see Fig. 1) ^[3,10]. Coordinating structures establish the sequence of activities (diagnostics, consultations, treatment) and the professionals' responsibilities in the diagnosis and treatment of homogeneous patient groups .

This potentially improves the coordination of care delivery and reduces waiting times and delays within care processes for patients. Hereafter, we refer to these coordinating structures as care programmes .

Although the implementation of care programmes is considered a major step, it does not automatically imply that healthcare professionals have adopted a processoriented way of working ^[11]. To actually change work processes, the implementation of care programmes must be accompanied by: (1) a less hierarchical organisation, in which people have more

responsibility, increased decision making capabilities, and act more autonomously and flexible^[12]; (2) less fragmentation of responsibilities by appointing process owners^[10,13]; (3) protocols, that ensure smooth coordination, continuity, and less variation between care processes per patient^[1,14]; and (4) a process-oriented view held by all employees^[13].

[FIGURE 2]

Davis^[5] argues that, given the dispersion of care across clinicians and practices, the fragmentation of care delivery and lack of continuity in clinician–patient relationships, extensive evaluations of new reimbursement methods are needed. A number of studies already evaluated the effect of case-mix based reimbursement on output measures, like the length of stay, for example^[15–17]. From those studies, it appears that admissions, the average length of stay and intensity of care, and thus health care costs have, at least initially, decreased as intended^[18]. In addition to these intended effects, several dysfunctional effects, such as DRG-creeping (‘a deliberate and systematic shift in a hospital’s reported casemix in order to improve reimbursement’) and DRG-dumping (‘an attempt to avoid treating difficult cases’), have been reported^[18]. These studies did not examine the effects on the organisation of care delivery, e.g. the coordination between care activities. It is, however, very important to get insight into the effect on care coordination because it is believed that hospital administrators adopt case-mix reimbursement in hospital budgeting systems as a means of showing conformity with institutionalised rules and expectations^[19], but decouple their budgeting systems from the internal operations of the organisation. If that is the case, a better care coordination, which is very important from the patient’s point of view, will not be achieved and improvements in efficiency may be only the result of DRG-creeping and dumping.

Therefore, we explore in this study whether case-mix based reimbursement stimulates activities to develop care programmes, and eventually a process-oriented way of working.

1.1. Hypothetical model

On the basis of literature, we constructed a hypothetical model (see Fig. 2) to demonstrate how case-mix reimbursement should contribute to the establishment of care programmes, with the ultimate goal to become process-oriented.

To meet the new requirements of case-mix reimbursement, Dutch hospitals have to base the allocation of budgets on processes (the number of delivered DTCs) rather than on individual procedures. In this way hospitals can align the different departmental interests with the organisational goal of maximizing the total hospital budget according to the theory of target engineering.

Thus, the model starts with the adoption of the new reimbursement system within the hospitals’ budgeting process (process-based budgeting) and consists of four hypothesised relations.

Hypothesis 1. A more process-based budgeting system stimulates activities to establish care programmes.

When financial resources are allocated on basis of care process performance, optimisation of care processes in keeping with certain targets – all of which involve a time factor (e.g. short throughput time) – is more important than high utilisation of departmental resources^[20]. Hence, it is assumed that different departments working for the same patient group will undertake more actions to implement care programmes and meet process targets.

Hypothesis 2. A more process-based budgeting system coincides with the use of more process-oriented indicators by clinicians.

For clinicians to assume responsibility for the establishment of ‘their’ care process, balanced steering information is a prerequisite^[21]. Therefore, we hypothesise that process-based budgeting coincides with the use of more process-oriented performance indicators by clinicians.

Hypothesis 3. The use of more process-oriented indicators by clinicians is related to a higher number of activities geared to establishing care programmes .

The information gathered using measurement of process-oriented performance indicators helps to identify areas for improvement^[22,23]. Output indicators (e.g. throughput times) tell hospital management and clinicians whether they are reaching targets^[24]. Additionally, process measures, like the number of patient handovers between clinicians and physical transfers of patients between departments, gauge the delivered care^[25]. The number of physical transfers, for example, informs about the (non)integration of various operations in a care process. An optimal integration of various operations means a better adjustment to patients' needs and minimal delays and waiting times^[26]. We therefore assume that use of process-oriented indicators stimulates clinicians to undertake actions to develop and improve care programmes .

Hypothesis 4. More activities to establish care programmes lead to a higher proportion of care delivery that is organised in care programmes .

Finally, it seems plausible that hospitals conducting more activities to establish care programmes have higher proportions of care delivery organised in such programmes than hospitals that undertake fewer or no activities. However, when hospitals are at the end of their transition towards a process-oriented way of working, it is likely that they carry out fewer or no activities to establish care programmes but can have a high proportion of care delivery organised in care programmes .

2. Materials and methods

2.1. Data collection

To assess the effect of case-mix reimbursement on the development towards process-oriented organisations, we conducted a survey during the winter of 2007/2008 .

A questionnaire was sent to all Dutch hospitals (N= 96), including university (N= 8), tertiary teaching (N= 26), general (N= 59), and specialised hospitals (N= 3), followed by a reminder after approximately 3 weeks. Recipients were hospitals' chief executive officers, who in most instances completed the questionnaire together with quality managers .

Questions included: the extent to which process-based budgeting is applied (interval: completely disagree, 0.0; completely agree, 5.0); the use of four different process-oriented performance indicators (dichotomously scaled: yes/no); activities to establish care programmes (ordinally scaled: none, for a single patient group, for several patient groups, hospital wide); the percentage of care delivery that is/can be organised in care programmes (interval: 0–100%); indicators for process-orientation decision making [interval: completely centralised, 0.0; completely decentralised, 5.0]; the establishment of process owners [interval: completely disagree, 0.0; completely agree, 5.0]; the employees' view of care delivery as a process [interval: completely disagree, 0.0; completely agree, 5.0]; (clinical) protocols for specific diseases [dichotomously scaled: yes/no]; (organisational) protocols for routing of patients [dichotomously scaled: yes/no]; and hospital characteristics (type of hospital, the number of fulltime equivalents (FTEs) employed personnel, and the number of people living in the area the hospitals serve) .

This questionnaire is in fact part of a larger survey carried out on a regular basis (at least every 5 years) and aims to assess the developmental stage of a hospital's quality management system^[27]. However, following developments in the hospital sector, the questions involving the application of process-based budgeting and the percentage of care delivery that is/can be organised in care programmes are only introduced/new in the survey of 2007 .

Although several process-oriented indicators exist, we limited ourselves in this questionnaire to: 'length of in-hospital stay', 'throughput times', 'number of physical transfers between departments', and 'number of patient handovers between clinicians'. These indicators are closest related to one of the principles of the establishment of care

programmes, which is to simplify the process by reducing the number of interactions and handovers^[28].

Besides, these indicators are the known indicators among hospitals and are frequently used within projects that aim to establish care programmes, for example^[24].

2.2. Data analysis

Descriptive statistics were used to assess the extent to which process-based budgeting is applied, the use of four different process-oriented performance indicators, the number of activities geared to establish care programmes, the percentage of care delivery that is/can be organised in care programmes, and the indicators of process-orientation in hospitals. Next, structural equation modelling (SEM), a statistical technique for testing and estimating relationships using a combination of statistical data and qualitative causal assumptions, was used to assess the hypothesised relations as visualised in Fig. 2. To apply SEM, all observed variables in the model need to have a normal distribution.

Therefore, variables were first assessed for univariate and multivariate normality. Univariate normality was assessed using skewness statistic b_1 , kurtosis statistic b_2 , and the D'Agostino & Pearson K2 omnibus test for normality^[29,30]. In addition, Srivastava's and Small's test of multivariate kurtosis and skew, and an omnibus test of multivariate normality based on Small's statistics, were used to check multivariate normality^[30,31]. A significant value of one of these statistics ($p < 0.05$) indicates a deviation from normality.

Subsequently, the hypothesised relationships were assessed in two steps: one that tested the hypothetical model and a second test without non-significant relations.

Model fit depends on a number of features that need to be examined in addition to the significance of parameter estimates. We limited ourselves to common fit statistics like Chi-square, the Tucker–Lewis Index (TLI), the Confirmative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). A significant Chi-square represents 'badness of fit'. This test is suitable for models with a sample size up to 100. TLI and CFI values below .90 indicate that the model can be improved. Values between .90 and .95 are acceptable, and values above .95 are good^[32].

Good models, moreover, have an RMSEA value of equal to or lower than .05, values between .05 and .08 are considered acceptable, values higher than .10 indicate a poor fit^[33,34]. SEM analyses in this study were conducted using AMOS 16.0.

Finally, we assessed whether implementation of care programmes contributed to the transition towards process-orientation. Therefore, Spearman correlation coefficients were computed between the percentage of care in care programmes and the indicators of process-orientation that were measured on an interval scale. Independent sample T-tests were performed for the indicators measured on a dichotomous scale.

[TABLE 1]

3. RESULTS

Sixty-two hospitals completed and returned the questionnaire (a response rate of 65%), including 5 university, 14 tertiary teaching, 40 general, and 3 specialised hospitals.

On average, university hospitals have the most personnel (in fulltime equivalents) and the highest number of people to serve, followed by tertiary teaching, general, and specialised hospitals.

Table 1 gives an overview of the data gathered in the hospital survey.

These data show that:

- 33.3% ($n = 19$) of the hospitals allocate financial resources on the basis of care processes to some extent (score > 2.5).

- Clinicians in hospitals generally use two processoriented performance indicators, namely 'length of in-hospital stay' and 'throughput times', to monitor and adjust the organisation of

care processes. The indicators for the number of transfers between departments and patient handovers between clinicians are used by approximately 10% of the hospitals .

- Most hospitals (n = 50, 81%) undertake several projects to establish care programmes. Only one hospital is not actively involved in establishing care programmes .
- On average, 33% (sd 20.1) of care delivery was organised in care programmes in the winter of 2007/2008 and 71% (sd 14.2) of care delivery can be organised in care programmes according to the respondents .
- On average, decision making is more centralised than decentralised, as was indicated by one-third of the hospitals (33.9%, n = 21) .
- 75.4% (n = 46) of the hospitals appoint process owners to care processes (score > 2.5) .
- Care delivery in the minority of the hospitals (39.3%, n = 24) is regarded as a series of linked care activities (score > 2.5) .
- 93.5% of the hospitals has (clinical) protocols for specific diseases and almost 75% has (organisational) protocols for routing of patients .

Before testing the hypothesised relationships, we first assessed the univariate and multivariate normality of the variables of the hypothetical model (Fig. 2). Tests for univariate normality indicate that the variables can be regarded as normally distributed except for the variable ‘% patients in care programme’ (see Table 1). To normalise this positively skewed variable, we applied a square root transformation. After this transformation, normality statistics were good ($\chi^2_1 = 0.52$ [p = 0.12], $\chi^2_2 = 0.15$ [p = 0.88], D’Agostino & Pearson K2 = 2.50 [p = 0.29]). The transformed variable was used in further analysis. In addition, statistics indicate that multivariate normality of the data can be assumed (multivariate kurtosis [Srivistava’s test: $\chi^2_4 = 3.85$, df = 4, p = 0.43; Small’s test: Q1 = 4.69, df = 4, p = 0.43]; multivariate skewness [Srivistava’s test: $\chi^2_4 = 2.51$, df = 4, p = 0.16; a variant of Small’s test: VQ2 = 4.04, df = 4, p = 0.40]; omnibus test of multivariate normality based on Small’s statistics [VQ3 = 8.74, df = 8, p = 0.37]) .

Next, the hypothetical model was tested using SEM. It was shown that process-based budgeting does not have a significant effect on activities to establish care programmes (hypothesis 1: b = 0.02; p = 0.80), but does coincide significantly with the use of process-oriented performance indicators by clinicians (hypothesis 2: b = 0.30; p = 0.02) .

The use of a higher number of performance measures has in turn a positive relation with activities to establish care programmes (hypothesis 3: b = 0.21; p = 0.01). Further, an increase in activities to establish care programmes is positively related to the percentage of patients being treated in care programmes (hypothesis 4: b = 0.40; p = 0.00). Fit measures for this model are good: Chi-square ‘badness of fit’ is not significant (0.96; p = 0.62), the CFI and TLI are almost 1.00 and the RMSEA is close to zero .

In a second test, the non-significant relation between process-based budgeting and activities to establish care programmes was removed (Hypothesis 1). Test results demonstrate that relations 2, 3, and 4 are still significant and estimates are unchanged. Chi-square is not significant (1.02; p = 0.80). The TLI and CFI are almost 1.00; the RMSEA is close to zero. This means that the model fits of the first and second model are similar. However, because the second model is more restrictive, it is more informative and should thus be preferred .

Statistics show that the presence of more care programmes is not associated with higher scores on indicators for process-orientation: decentralised decision making ($\beta = -0.11$; p = 0.44), agreements about process ownerships ($\beta = -0.02$; p = 0.92), hospital employees having a processoriented view ($\beta = 0.06$; p = 0.67), availability of protocols for specific patient groups (t = -0.22; p = 0.83) or for routing of patients (t = -1.82; p = 0.08) .

4. DISCUSSION

The purpose of this study was to test whether casemix based reimbursement stimulates activities to develop care programmes, and eventually a process-oriented way of working. SEM analysis reveals that the adoption of the case-mix reimbursement system within the

hospitals' budgeting process, via a positive effect on the number of process-oriented performance measures used by clinicians, leads to a higher frequency of activities to establish care programmes. Internal process-based budgeting was not confirmed to stimulate these activities directly. It is possible that clinicians need process-oriented performance data before they feel compelled to optimise care processes, to work together, and to establish care programmes. This view is supported by previous research of Lehtonen that showed that the implementation of case-mix reimbursement in the hospitals' budgeting process is strongly dependent on the involvement of clinicians ^[18].

Results on indicators for process-orientation show, however, that implementation of care programmes in the surveyed hospitals has not yet been accompanied by process-orientation. It seems that hospitals do implement protocols for the diagnosis, treatment, and routing of patients, but that employees frequently do not acquire a process-oriented view. The change of focus from function to process, and all additional arrangements (e.g. decentralisation of responsibilities), may require more time.

It could be difficult for clinicians, as well as for nurses, to find the appropriate balance between (1) their traditionally strong orientation to professional values and their commitment to develop the power and prestige of their profession ^[3] and (2) a more collaborative processorientation that is needed to effectuate care programmes.

The lagging process-orientation can also be related to the low percentage (10%) of hospitals in which clinicians use process-related performance measures to monitor and adjust the organisation of care delivery (i.e. the number of patient handovers). The use of these kinds of performance indicators by clinicians is important for the development of a process-oriented view, because they provide insight into the process of care (i.e. steps to be taken to diagnose and treat patients) and information about waste (i.e. waiting times, unnecessary consultations).

At the time of this research, only one-third of the hospitals applied internal process-based budgeting to any extent. Because the case-mix-based reimbursement system gradually replaces the fee-for-service system in the Netherlands, it can be expected that more hospitals will apply process-based budgeting and to a greater extent in the future, which in turn will contribute to the development of more care programmes. This expectation is strengthened by the results of a recent longitudinal analysis on the development of Dutch hospital quality management systems. This analysis revealed that financial and nonfinancial policy measures increased the development levels of Dutch hospital quality management systems since 1995, which includes an increase in the use of protocols for specific patient or diagnosis groups, protocols for the routing of patients from admission to discharge, and management information systems providing periodic overviews of care provision and outcomes ^[27]. Assuming that this trend continues, we expect that policy measures (like the introduction of case-mix reimbursement) contributes to the further development of process-oriented care delivery via the increased use of process-oriented performance indicators and development of care programmes. This may help to shift the focus from function to process in hospitals, because it stimulates healthcare professionals in different departments to collaborate and to achieve common goals.

5. LIMITATIONS

Although this study gives a valuable inside in the effect of case-mix reimbursement on the development of a process-oriented way of working, three key limitations in the study should be mentioned. First, we made use of self-reported data gathered using a questionnaire. As a consequence, social desirability bias could have influenced our study results. It is a general limitation of questionnaires that respondents have the tendency to reply in a manner that will be viewed favourably by others. Therefore, some of the results could give a too optimistic picture. Second, the answers chief executives give to questions about issues related to characteristics of decentralised members of the organisation (such as the process-oriented

view of employees) reflect their personal, potentially biased, interpretation. Therefore, future research needs to extend the number of questionnaire addressees to decentralised organisational members. The third limitation, which is inherent in SEM, is that a good fit by a model consistent with one causal hypothesis does not rule out an equally good fit by another model consistent with a different causal hypothesis. Care should always be taken when making claims of causality, especially since we did not collect data at multiple time points .

6. CONCLUSIONS

This study demonstrates that hospital management can stimulate the development of care programmes by the adoption of the case-mix reimbursement system within hospitals' budgeting processes. This means that case-mix reimbursement does potentially improve care coordination and that decoupling between hospitals' budgeting systems and internal operations does not take place. Future research is recommended to confirm this finding and to determine whether the establishment of care programmes will in time indeed lead to amore process-oriented view of professionals .

Acknowledgement

This research is funded by ZonMw, the Netherlands Organisation of Health Research and Development .

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FIGURES AND TABLES

Figure 1

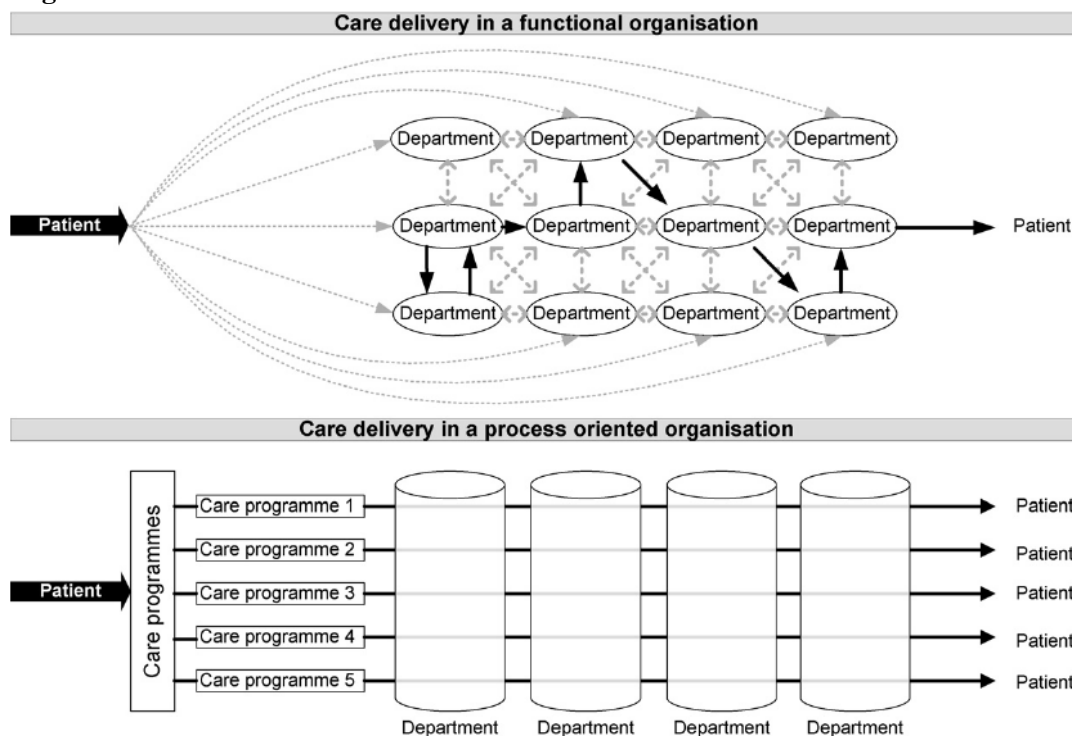


Fig. 1. Care delivery in a functional organisation or process-oriented organisation.

Figure 2

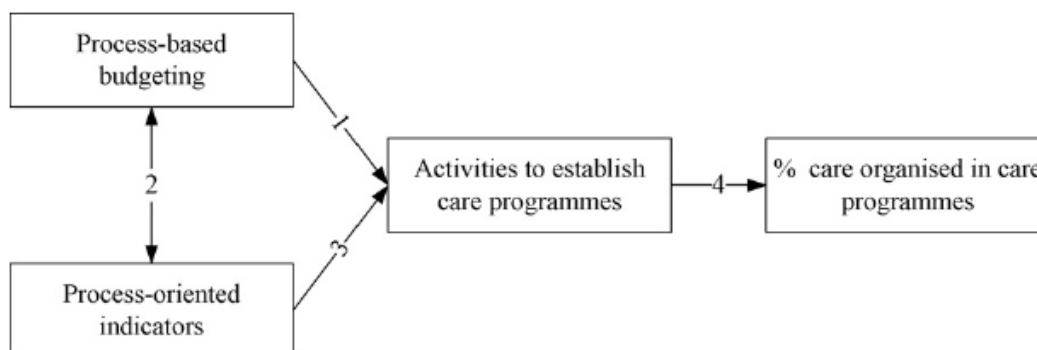


Fig. 2. Hypothesised relations.

Table 1

Table 1
Overview survey data.

	Mean (sd)	Range (min-max)	$\sqrt{b_1^a}$ (p)	b_2^b (p)	D'Agostino & Pearson K^2^c (p)
Process-based budgeting within the hospital					
Process-based financial allocation	2.1 (1.0)	0-4	-0.22 (0.49)	-1.39 (0.16)	2.41 (0.30)
Process-oriented performance indicators					
Use of process-oriented performance indicators	1.7 (0.8)	0-3	0.38 (0.24)	-0.16 (0.88)	1.39 (0.50)
Indicator for throughput times (% [n])	(47.5 [29])				
Indicator for length of in-hospital stay (% [n])	(63.9 [39])				
Indicator for number of handovers (% [n])	(11.5 [7])				
Indicator for number of transfers (% [n])	(9.8 [6])				
Activities to establish care programmes					
Activities to establish care programmes	2.2 (0.7)	0-3	-0.10 (0.75)	-1.42 (0.16)	2.12 (0.35)
None (% [n])	(1.6 [1])				
A single project (% [n])	(17.7 [11])				
Several projects (% [n])	(58.1 [36])				
Hospital wide (% [n])	(22.6 [14])				
Percentage of care delivery that is or can be organised in care programmes					
% of care delivery in care programmes	33.1 (20.1)	10-100	1.23 (0.00)	1.89 (0.06)	13.70 (0.00)
% of care delivery potentially in care programmes	71.0 (14.2)	30-100	-0.37 (0.25)	0.77 (0.44)	1.92 (0.38)
Indicators of process-orientation					
Decentralised decision making	2.3 (1.0)	0-5	-0.04 (0.90)	-0.05 (0.96)	0.02 (0.99)
Process view employees	2.5 (1.0)	1-5	0.07 (0.83)	-0.46 (0.65)	0.26 (0.88)
Process ownership	3.1 (1.0)	1-5	-0.64 (0.06)	0.09 (0.93)	3.63 (0.16)
Protocols for routing of patients (% [n])	(74.2 [46])				
Protocols for specific patient groups (% [n])	(93.5 [58])				

^a Skewness statistic $\sqrt{b_1}$.

^b Kurtosis statistic b_2 .

^c D'Agostino & Pearson K^2 omnibus test for normality.