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Article

Effectiveness and impact of management accounting in hospitals: Evaluation of the effectiveness of cost accounting and revenue budgeting

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Abstract: The goal of this research is to determine whether hospital financial performance is impacted by particular management accounting techniques, such as departmental revenue budgeting, specific costing, and departmental costing. We analyzed several sets of performance indicators for 146 hospitals whose management accounting adoption status is available. An outlier test was used to determine which data were outliers at the 0.1% significance level, and the results were then eliminated in order to see if any extremely outlier values (hospitals) were present for each indicator. To determine whether there were any noteworthy variations in the average values of the several performance measures, we employed a t-test (two-tailed probability). The results suggest that departmental revenue budgeting and departmental and specific costing improve hospital financial performance.

Keywords: management accounting; costing; financial performance

1. Introduction

Against the backdrop of the increasing demand for high-quality and efficient medical care, the importance of full-fledged business management in which the front line takes the initiative has become extremely high. With the accompanying transfer of authority to the front line, top management is increasingly required to grasp and evaluate the performance of the front line and to encourage management autonomy in the front line. Therefore, the appropriate use of management accounting is currently a major issue for hospitals. However, it has not been sufficiently clarified quantitatively whether the management accounting methods that are currently being introduced and utilized in the medical industry have an effect on the financial performance of hospitals, or whether they have an impact on non-financial performance.

Therefore, this study analyzes, based on objective performance data (not subjective performance perception data), whether specific management accounting methods, such as departmental costing, specific costing, and departmental revenue budgeting, affect the financial performance of the hospital as a whole (not specific departments within the hospital), and if so, on nonfinancial performance.

In the past, it was not sufficiently clear whether management accounting had an effect on objective financial performance in hospitals as well as in for-profit companies. However, this study revealed that departmental and specific costing and departmental revenue budgeting have a positive effect on objective financial performance in hospitals. In addition, the influence of management accounting on discharge outcomes, which had not been evaluated at all in previous studies, was also examined, and it was found that management accounting is not considered to have a

negative impact on medical outcomes.

However, it should be noted that this study focuses only on the existence or absence of a specific management accounting method, and the degree of impact on financial performance may differ depending on the method of use. It should also be noted that the use of management accounting methods does not have any effect on medical outcomes, as there are many aspects of medical outcomes, and the indicators selected in this study do not cover all aspects of medical outcomes.

2. Literature review

Studies on the effects of management accounting on financial performance have been accumulated for for-profit firms (Alamri, 2019; Dahal et al., 2020; Onodi et al., 2021). For example, Alamri (2019) found that the introduction of activity based costing alone does not improve return on investment, but only in firms that perform more complex operations and use activity based costing in conjunction with other management systems. In a study of Jordanian firms, Abu Afifa and Saleh (2022), for example, found that meticulous cost accounting and cost control based on high-cost awareness were associated with high financial performance in listed service firms.

However, the relationship between management accounting and financial performance in for-profit companies is not necessarily true for hospitals, which are not-for-profit organizations. The main objective of management accounting is to improve financial performance, which is not the main objective of non-profit organizations, and the awareness and behavior of employees working in such organizations are often different from those of employees in for-profit companies. Moreover, in the case of hospitals, the sense of belonging to the organization is not necessarily high, and they are also characterized as a group of professionals with a high degree of autonomy. Therefore, research on the relationship between management accounting and financial performance in hospitals is desirable, but previous studies are extremely limited. For example, Lachmann et al. (2013) showed that financial performance improves when budget control, task uncertainty, and managers' awareness of organizational goals in a hospital are compatible in an Australian hospital. Krupička (2020) analyzed the effect of a performance evaluation system on the financial performance of Czech hospitals. However, both studies used the subjective financial performance of the questionnaire respondents as the dependent variable, and the relationship with objective financial performance, such as medical profit margin calculated from actual financial data, is unclear. The only studies that have examined whether management accounting methods affect the objective financial performance of hospitals are those by Jovanović et al. (2019), Kludacz-Alessandri (2020), Krupička (2021), Fahlevi et al. (2022), Sedevich-Fons (2023) and others.

Based on objective performance data for Slovenian and Croatian hospitals, Jovanović et al. (2019) found that hospital groups with cost planning for major services had higher quality of care in terms of readmission rates, while there were no significant differences in efficiency or profitability. Fahlevi et al. (2022) also analyzed the impact of a hospital-wide Balanced Scorecard (BSC) on hospital financial performance using objective financial data. However, Jovanović et al. (2019) and

Fahlevi et al. (2022) are studies on the management accounting methods of cost planning and BSC, and not on the management accounting methods of departmental costing, specific costing, and departmental revenue budgeting, which are the subject of this paper.

On the other hand, Kludacz-Alessandri (2020) found that the hospital group implementing departmental profit/loss target management had better profitability while there was no significant difference in quality (readmission rate) or efficiency and that the hospital group implementing departmental cost accounting was more likely to have better profitability, although this was not statistically significant. Krupička (2021) classified medical corporations into four groups with different levels of performance management accounting practice, based on the status of profit/loss monitoring for facilities (hospitals) and departments (medical departments, etc.) within facilities and the status of performance evaluation by facility directors and department heads based on the profit/loss. In addition, Sedevich-Fons (2023) analyzed the financial performance of the entire medical corporation as the explained variable and each item of the hospital functionality assessment as the explanatory variable, and found that an improvement in the assessment item "budget management is being done appropriately" leads to an improvement in business profits, while it also leads to a decrease in business profitability.

Although these three studies are partially consistent with the three specific management accounting methods studied in this paper, Kludacz-Alessandri (2020) was a study of hospitals, including both national and public hospitals and medical corporation hospitals. However, there was a limitation that the study included a large group of hospitals (718 hospitals) with rather high business management capacity. Another limitation was the small sample size (77 hospitals) for statistical validation. Krupička (2021) was able to secure a certain number of sample corporations (151 corporations), but it covered hospital-operated medical corporations and did not cover hospitals established by entities other than medical corporations, such as national and public hospitals. Since this study targets hospital-operated medical corporations as a whole, performance management accounting for each facility (hospitals, aged care facilities, etc.) and the two-level responsibility center for each department within the facility are the subjects of verification, which is slightly different from the subjects (departments) of verification in this study. Furthermore, although Sedevich-Fons (2023) uses budget management as one explanatory variable, it is not clear what the budget is for (e.g., the entire hospital, department, or service) and lacks the specificity of the management accounting method as the subject of the study. In addition, the explanatory variable was the adequacy of budgetary control, which is extremely abstract and ambiguous. In addition, while the explanatory variable is hospital-based, the financial performance of the explained variable is the performance of the medical corporation as a whole, which operates a wide variety of facilities and businesses. In addition, the study is limited to medical corporations and does not include medical institutions established by other entities, such as national and public corporations.

All of the above studies, except Jovanović et al. (2019), basically examined the effects of management accounting of responsibility centers on financial performance and did not examine the effects of management accounting by service unit, such as cost accounting, on profitability. In this regard, Jovanović et al. (2019) evaluated the

effect of service-based management accounting on financial performance, but it was limited to cost planning, and cost accounting was not the subject of the study. In addition, the study did not examine the effects of various management accounting methods on various aspects of hospital performance, such as the utilization of hospital beds, the number of patients undergoing surgery and other important treatment procedures, and discharge outcomes, which are strongly related to the quality of medical care.

3. Research methods

Therefore, in this paper, we evaluate the effectiveness of management accounting methods by combining data from a questionnaire survey on the current status of management accounting conducted in 2022, with financial data obtained separately from hospitals responding to the survey. Specifically, of the 221 hospitals (13.7% recovery rate[1]) that responded to the 2022 survey of hospitals (1619 hospitals), 146 hospitals for which financial and other performance data were available and could be used for analysis were selected to be evaluated for the status of implementation of cost accounting and revenue budgeting by the department. We examine whether differences in the implementation status of departmental costing and revenue budgeting and specific costing (Nurkholis et al., 2023) lead to differences in profitability. We will also examine how differences in the implementation of management accounting methods affect medical outcomes, such as ward utilization, implementation of key therapeutic actions, and discharge outcomes and readmission status. The following is a more specific description of the research methodology.

3.1. Performance data collection methods

First of all, as a basic premise, the hospitals that responded to the questionnaire survey conducted in 2022 for hospitals were selected as the target hospitals for performance data collection in this study. This is because this study cannot be conducted unless the implementation status of various management accounting methods is known.

The financial performance data, which are indispensable for verifying the effectiveness of management accounting methods, were obtained through requests for additional responses and disclosure requests, as well as from the local public corporation yearbooks and hospital websites. In addition, we tested whether any outliers would have a significant impact on the analysis of the medical profit margin and medical profit per hospital bed (calculated using the total number of beds in each hospital in the Impact Assessment Report) calculated from the medical revenue and medical expenses obtained through the above procedures. The authors conducted a test to see if any outliers would have a significant impact on the analysis. Specifically, an outlier test (Smirnoff-Grubbs test) was conducted to identify the data (hospitals) that were determined to be outliers at the 0.1% significance level. As a result, one public hospital was found to be a large outlier in both the medical profit margin and medical profit per hospital bed and was therefore excluded from the analysis. As for the other hospital, whose medical profit per sickbed was also considered an outlier, only this indicator data was treated as an outlier, and the hospital itself was included

in the analysis, as in the case of the outlier data for the other indicators described below[2].

For the 146 hospitals for which we were able to obtain analyzable financial performance data through the process described above, we obtained performance data on discharge outcomes, readmission status, ward utilization, and implementation of key therapeutic actions from the Impact Assessment Report. In evaluating the effectiveness of management accounting methods, it is primarily important to examine the effect on financial performance, such as profitability, which is the target of the method, but it is also important to examine the effect on other performance that can be affected by the method. In the evaluation of the effectiveness of management accounting methods in non-profit organizations such as hospitals, where financial performance is not the main objective, it is particularly important to evaluate the effects of the methods on performance other than financial performance.

3.2. Selection of performance indicators and basic statistics for analysis

In this study, to evaluate the effectiveness of management accounting methods, performance related to profitability was naturally included in the analysis. As for performance aspects other than profitability, the analysis covered performance related to medical outcomes, such as discharge outcomes and readmission status[3], and performance related to efficiency and productivity of inpatient operations, such as ward utilization and implementation of important therapeutic procedures, which were available from the Impact Assessment Report. The following indicators were selected as specific measures of each performance aspect.

As indicators of financial performance (profitability), we first selected the medical profit margin and medical profit per hospital bed. Although it does not indicate the "degree" of each hospital's financial performance, whether each hospital is profitable or loss-making is an extremely important concern regarding financial performance, especially for hospitals that are non-profit organizations whose main purpose is not financial performance (and therefore the "degree" of profitability is not a major focus), and it is also a symbolic performance indicator. Therefore, we decided to use surplus or deficit as an indicator of financial performance in the form of a comparison of the percentage of profitable hospitals among the analyzed hospital groups.

The outcome measures analyzed were the rate of improvement in outcome at discharge, the rate of mortality due to injury or disease with maximum resource input, and the rate of worsening of outcome at discharge[4]. The improvement rate at discharge is the percentage of patients whose outcome at discharge was either "cured", "mildly improved", or "in remission" (i.e., the injury or disease had improved). The opposite is the rate of worsening outcome at discharge, which is the proportion of patients with either "worsening", "death from the most resource-intensive injury or disease", or "death from an injury or disease other than the most resource-intensive injury or disease". The mortality rate from the most resource-intensive injury or disease is the proportion of patients whose outcome was "death from the most resource-intensive injury or disease". Since this is a highly symbolic measure of discharge outcome and has been used in previous studies, it was included in this analysis as well.

The readmission rate within 6 weeks for the same disease as the previous hospitalization (hereafter, 6-week readmission rate for the same disease) and the unexpected readmission rate within 6 weeks for the same disease as the previous hospitalization (hereafter, 6-week unexpected readmission rate for the same disease) were also analyzed as indicators of readmission status.

As indicators of ward utilization, the bed utilization rate and the average length of hospital stay were used in the analysis. The bed utilization rate is a performance indicator that indicates high or low utilization of hospital wards, and the average length of hospital stay is a performance indicator that indicates efficient use of hospital beds (efficiency of the medical care delivery process). The bed utilization rate was calculated based on the total number of inpatients and the average length of stay for beds and patients for each hospital obtained from the Impact Assessment Report and the number of beds (total number of inpatients × average length of stay/number of beds × 365). On the other hand, the uncorrected average length of stay, which is based on the actual disease composition of the hospital and the actual length of stay for each disease, was first used as a reference index for analysis. The "average length of stay after correction for disease composition", which is calculated by changing the actual disease composition of each hospital to the national average disease composition and applying the actual length of stay for each disease to each hospital, is analyzed as the main indicator of the performance of efficient use of hospital beds, an indicator that better reflects process efficiency.

The number of patients undergoing surgery per hospital bed per year and the number of patients undergoing surgery/chemotherapy/radiotherapy per hospital bed per year (the number of patients undergoing important treatments) were analyzed as indicators of the status of implementation of important treatment procedures. The existence of a management accounting method may increase the awareness of the need to increase reimbursement (sales), and this may increase the implementation of important therapeutic procedures, which generally have high reimbursement amounts. However, to see the implementation of important therapeutic actions about the increase in reimbursement, it is better to use the "number" of applicable patients as an indicator than the "percentage" of applicable patients, which is affected by the increase or decrease in the total number of patients. To control for differences in the number of patients by hospital size, we used the number of beds, which is the most basic measure of the size of each hospital.

In this study, various performance indicator sets for 146 hospitals for which management accounting implementation status is known were subject to analysis. To examine whether there were any extremely outlier values (hospitals) for each indicator, an outlier test was conducted and data that were determined to be outliers at the 0.1% significance level were removed. As a result, basic statistics such as the amount of data for each indicator subject to analysis are shown in **Table 1**.

Table 1. Basic statistics of performance indicators.

Performance Aspects	**profitability**			**Ward Usage**			**Critical Care Practice Status**	
Variables	Medical profit ratio	Medical profit per sickbed (thousand yen)	Deficit surplus	Bed utilization rate	Average number of days in hospital	Average number of days in hospital after correction of disease composition	Number of operated patients per hospital bed per year	Number of patients with surgery/ chemotherapy/ radiotherapy per hospital bed per year
n	146	145	146	146	146	145	146	146
Average	−2.5%	−569	-	64.6%	13.55	13.34	7.36	8.88
median	−1.5%	−351	-	67.4%	13.33	13.33	7.64	8.76
standard deviation	9.5%	2053	-	11.7%	1.87	1.53	2.76	3.43

Performance Aspects	**Outcome at discharge**			**Readmission Status**	
Variables	Improvement (cure, lightening, remission) rate	Mortality due to maximum resource input	Exacerbation (exacerbation /death) rate	Re-admission rate for the same disease within 6 weeks	6-week same-illness unexpected readmission rate
n	143	145	145	145	146
Average	82.0%	2.6%	3.8%	7.9%	1.1%
median	82.6%	2.4%	3.7%	7.1%	1.1%
standard deviation	7.2%	1.4%	1.7%	4.3%	S0.7%

3.3. Analysis contents

In this study, we used a t-test (two-tailed probability) to examine whether there were significant differences in the mean values of the various performance indicators described above by department[5] and by whether or not specific cost (profit-and-loss) accounting and departmental revenue budgeting were implemented (only the percentage of profitable hospitals was tested for differences in ratio). In principle, this study analyzed differences in hospital performance due to differences in their management accounting practices when there were at least 20 samples in each of the two groups being compared. However, since it is difficult to secure a sufficient sample size for the analysis of each group of public and private hospitals, we treated the sample size of 15 or more hospitals as a reference. Due to these sample size limitations, this study was able to analyze revenue budgets by department, but not cost budgets by department. In addition, although the questionnaire survey on which this study relies also ascertained whether or not target management of departmental profits and losses is implemented and whether or not performance evaluation is conducted based on departmental profits and losses, analysis by the existence of these practices cannot also be conducted due to the limitation of the sample size.

First, we will examine whether there is a difference in profit and loss between the two groups of hospitals that implement divisional cost accounting and those that do not and whether profitability, which is the objective of divisional cost accounting, has been improved. In this case, a simple comparative analysis of profitability by whether or not a hospital implements sectoral costing is not sufficient and appropriate to evaluate the effect of sectoral costing. This is because it is known from previous interview surveys that many hospitals decided to introduce departmental costing because they were in the red and their profitability was not good, therefore, hospitals

immediately after the start of departmental costing are often considered to be in the red[6]. Even if divisional costing is effective in improving profitability, the nature of this management accounting method makes it unlikely that profitability will improve as soon as it is introduced. In most cases, the business management first grasps the status of profit and loss by department, then considers countermeasures based on the information, asks the front line to change their behavior, and only after the front line medical staff is convinced and changes their behavior, does it lead to improved profitability. Therefore, even if it is effective, there is a certain time lag between the start of the cost accounting and the financial results.

Therefore, in this study, since the questionnaire survey asked about the starting year of departmental cost accounting, and most of the hospitals answered the starting year, we attempted to analyze the results by considering the starting year. In doing so, it is necessary to make a difficult judgment as there is no clear evidence on how long the time lag should be considered before the financial effects of sector-specific cost accounting in hospitals are realized, as there have been no studies to date. Based on our experience in interviewing hospitals, we believe that it will take more time than in a general corporation for the front-line medical staff, who are not necessarily active in improving financial performance in a non-profit organization, to be convinced and change their behavior. It also seems to take longer for the management level to consider measures based on the departmental profit-and-loss information and to ask the front-line medical professionals to change their behavior than in general companies, due to the hesitation of the management level to make financial requests to the medical professionals. In addition, the profitability data available for this study are annual, and annual profitability differs from monthly profitability in that even if profitability improves from the middle of the year, the annual average does not change significantly, resulting in a particularly long time lag before clear improvements are seen.

Considering these points, this study decided to analyze the hospitals that introduced departmental costing in the year when the questionnaire survey was conducted (2022) and the year before (2021), removing the hospitals that implemented it immediately after its start[7]. As a result, we decided to examine the differences in financial performance in 2022 between the two groups of hospitals: those that started departmental cost accounting from the 2000s until 2020 (start-year-only hospitals) and those that did not implement departmental cost accounting. Note that Kludacz-Alessandri (2020) and Krupička (2021), who similarly studied the effect of sector-specific cost accounting on performance improvement, did not examine the start year, so they were unable to conduct an analysis that took such a time lag into account.

Furthermore, we will examine the effect of such sector-specific cost accounting on performance for both public and private hospital groups. This is because public hospitals and private hospitals have different management awareness and degrees of managerial freedom, and the effects of management accounting methods may differ. In addition, since the number of hospitals that implement sectoral cost accounting is not small, we can manage to obtain a large enough sample to compare the differences in performance between the public and private hospital groups. However, it should be noted that the sample size for the private hospital group is less than 20, which is not sufficient for the verification of the private hospital group.

Next, we examine whether there are differences in financial performance between the two groups of hospitals that implement specific cost accounting (profit/loss) and those that do not. However, the sample size is too small to focus on the group of hospitals that implement specific cost accounting and exclude the hospitals that started most recently, since there are only a few hospitals that implement specific cost accounting in the first place. In addition, unlike departmental costing, specific costing is not necessarily implemented because hospitals are in the red, but rather because they want to ensure profitability for each service unit. Therefore, it cannot be said that hospitals immediately after the start of costing are particularly unprofitable, and analysis considering the year of start is not necessarily necessary. Therefore, we did not limit the starting year of specific costing when examining its effectiveness. Furthermore, it was not possible to examine the difference in performance between the groups of hospitals that implemented specific costing and those that did not, because the sample size of the group of hospitals that implemented specific costing was too small.

Finally, we examine whether there is a difference in profitability between the two groups of hospitals with and without departmental revenue budgeting, or, to put it another way, whether financial performance differs depending on the presence or absence of departmental revenue target management. Profit budget (target) management is a management method that directly aims to increase revenue, but in the hospital industry, where the proportion of fixed costs such as personnel and equipment costs is large, it is in effect a method to manage profit and loss at the same time, and its ultimate goal is to secure profit. Therefore, this study examines the effect of implementing departmental profit budgeting on profit and loss. The year of the start of implementation is also investigated for sectoral profit budgeting, but the sample size is too small to analyze the hospitals that started most recently since the number of hospitals that started implementation is small and the number of hospitals that responded in the year of start is also small. Similarly, due to the limitation of the sample size, we were not able to conduct a separate analysis for each group of public and private hospitals.

In addition, this study will simultaneously examine the effects of the implementation of these various management accounting methods on performance aspects other than profitability. **Table 2** shows the relationship between departmental costing and hospital performance, **Table 3** shows the relationship between cost accounting and hospital performance and finally **Table 4** shows the relationship between departmental revenue budgets and hospital performance.

Table 2. Relationship between departmental costing and hospital performance.

Departmental Costing and Hospital Performance			**Profit and loss calculation (understanding) by department**			**Profit and loss calculation (understanding) by department**		
Performance indicator			**nil**	**Yes**	**significant probability**	**nil**	**Yes (limited to the beginning of the year)**	**significant probability**
profitability	medical profit ratio	n	83	62	0.1109	83	46	0.0279
		Average	−3.7%	−1.4%		−3.7%	−0.3%	

Table 2. (*Continued*).

Departmental Costing and Hospital Performance			**Profit and loss calculation (understanding) by department**			**Profit and loss calculation (understanding) by department**		
Performance indicator			**nil**	**Yes**	**significant probability**	**nil**	**Yes (limited to the beginning of the year)**	**significant probability**
profitability	Medical profit per sickbed (thousand yen)	N	83	61	0.3896	83	45	0.1010
		Average	−717	−429		−717	−142	
	Percentage of hospitals in the black	n	83	62	0.4285	83	46	0.2318
		Average	43.4%	50.0%		43.4%	54.3%	
Ward Usage	Bed utilization rate	n	83	62	0.8320	83	46	0.6687
		Average	64.8%	64.4%		64.8%	63.9%	
	Average number of days in hospital (reference)	n	83	62	0.1736	83	46	0.1883
		Average	13.73	13.30		13.73	13.25	
	Average number of days in hospital after correction of disease composition	n	83	61	0.0750	83	45	0.0738
		Average	13.54	13.08		13.54	13.04	
Critical Care Practice Status	Number of operated patients per hospital bed per year	n	83	62	0.5667	83	46	0.6106
		Average	7.27	7.53		7.27	7.54	
	Number of patients with surgery/chemotherapy/radiotherapy per hospital bed per year	n	83	62	0.4647	83	46	0.5254
		Average	8.73	9.15		8.73	9.16	
Outcome at discharge	Improvement (cure, lightening, remission) rate	n	81	61	0.5898	81	45	0.6476
		Average	82.3%	81.6%		82.3%	81.7%	
	Mortality from injuries and illnesses with maximum input of medical resources	n	82	62	0.4223	82	46	0.2084
		Average	2.7%	2.5%		2.7%	2.4%	
	Exacerbation (exacerbation/death) rate	n	82	62	0.5095	82	46	0.3273
		Average	3.8%	3.6%		3.8%	3.5%	
Readmission Status	Re-admission rate for the same disease within 6 weeks	n	82	62	0.2056	82	46	0.3776
		Average	7.5%	8.5%		7.5%	8.2%	
	6-week same-illness unexpected readmission rate	n	83	62	0.1915	83	46	0.6072
		Average	1.2%	1.0%		1.2%	1.1%	

Table 3. Relationship between cost accounting and hospital performance.

Cost Accounting and Hospital Performance			**Profit and loss calculation (understanding)**		
Performance indicator			**nil**	**yes**	**significant probability**
profitability	medical profit ratio	n	115	29	0.0171
		Average	−3.4%	1.1%	
	Medical profit per sickbed (thousand yen)	n	114	29	0.0484
		Average	−748	141	
	Percentage of hospitals in the black	n	115	29	0.0604
		Average	42.6%	62.1%	

Table 3. (*Continued*).

Cost Accounting and Hospital Performance			**Profit and loss calculation (understanding)**		
Performance indicator			**nil**	**yes**	**significant probability**
Ward Usage	Bed utilization rate	N	115	29	0.8647
		Average	64.7%	64.3%	
	Average number of days in hospital (reference)	n	115	29	0.0084
		Average	13.72	12.77	
	Average number of days in hospital after correction of disease composition	n	114	29	0.0291
		Average	13.47	12.76	
Critical Care Practice Status	Number of operated patients per hospital bed per year	n	115	29	0.3432
		Average	7.29	7.83	
	Number of patients with surgery/chemotherapy/radiotherapy per hospital bed per year	n	115	29	0.1839
		Average	8.73	9.73	
Outcome at discharge	Improvement (cure, lightening, remission) rate	n	113	28	0.7852
		Average	82.2%	81.8%	
	Mortality from injuries and illnesses with maximum input of medical resources	n	114	29	0.0587
		Average	2.7%	2.3%	
	Exacerbation (exacerbation/death) rate	n	114	29	0.0351
		Average	3.9%	3.2%	
Readmission Status	Re-admission rate for the same disease within 6 weeks	n	114	29	0.1359
		Average	7.6%	9.2%	
	6-week same-illness unexpected readmission rate	n	115	29	0.5885
		Average	1.1%	1.0%	

Table 4. Relationship between departmental revenue budgets and hospital performance.

Departmental Revenue Budgeting and Hospital Performance			**Establishment of departmental revenue budgets (targets)**		
Performance indicator			**nil**	**yes**	**significant probability**
profitability	medical profit ratio	n	112	26	0.1357
		Average	−3.0%	−0.1%	
	Medical profit per sickbed (thousand yen)	n	111	26	0.1232
		Average	−710	−89	
	Percentage of hospitals in the black	n	112	26	0.0249
		Average	41.1%	65.4%	
Ward Usage	Bed utilization rate	n	112	26	0.5795
		Average	65.2%	63.8%	
	Average number of days in hospital (reference)	n	112	26	0.6497
		Average	13.55	13.35	
	Average number of days in hospital after correction of disease composition	n	112	25	0.7982
		Average	13.30	13.38	
Critical Care Practice Status	Number of operated patients per hospital bed per year	n	112	26	0.8814
		Average	7.46	7.56	

Table 4. (*Continued*).

Departmental Revenue Budgeting and Hospital Performance			**Establishment of departmental revenue budgets (targets)**		
Performance indicator			**nil**	**yes**	**significant probability**
	Number of patients with surgery/chemotherapy/radiotherapy per hospital bed per year	N	112	26	0.9052
		Average	9.02	8.93	
Outcome at discharge	Improvement (cure, lightening, remission) rate	n	110	26	0.1604
		Average	82.5%	79.9%	
	Mortality from injuries and illnesses with maximum input of medical resources	n	112	26	0.6244
		Average	2.6%	2.8%	
	Exacerbation (exacerbation/death) rate	n	112	26	0.5257
		Average	3.7%	4.0%	
Readmission Status	Re-admission rate for the same disease within 6 weeks	n	112	26	0.2897
		Average	7.8%	8.9%	
	6-week same-illness unexpected readmission rate	n	112	26	0.7212
		Average	1.1%	1.0%	

4. Analysis results

First, we compared the profitability of hospitals that implemented cost accounting by the department without considering the starting year of implementation and found no significant difference in any of the profitability indices. However, there was some difference in the medical business profit margin, suggesting that the profitability of the implemented hospital group is likely to be better than that of the non-implementing hospital group. Next, as mentioned in the previous section, when we examined the difference in financial performance between the groups of hospitals that implemented the program and those that did not, we found a significant difference in the medical profit margin, and although not significant in the medical profit per hospital bed, the results suggest that the group of hospitals that implemented the program is more likely to be more profitable. The results also indicated that the profit per bed ratio was not significant, but the profit per bed group was likely to be better.

We also analyzed whether there were any differences in the use of hospital wards and the implementation of important therapeutic procedures depending on whether or not departmental cost accounting was implemented. Regardless of whether or not the year of implementation was limited, there were no significant differences in the number of patients undergoing surgery or other important therapeutic procedures, nor in bed utilization, which indicates the utilization status of hospital wards. On the other hand, there was a significant difference, albeit at the 10% level, in the adjusted average length of stay, which indicates efficient use of hospital beds, suggesting that the group of hospitals that implemented cost accounting by the department had a shorter and more efficient average length of stay.

In addition, we also looked for differences in discharge outcomes and readmission status depending on whether or not departmental cost accounting was implemented.

We examined the impact of such sector-specific cost accounting on financial performance separately for public and private hospital groups and found that the situation was the same for all hospital groups. Although the significance of the difference in financial performance was certainly reduced due to the drastically reduced sample size in comparing the public and private hospital groups, there was some difference in medical profit margin (significance probability: 0.1080 for public and 0.0987 for private), suggesting that the implementation of sector-specific cost accounting is likely to be effective in improving profitability. The results suggest that the implementation of departmental cost accounting is likely to be effective in improving profitability. However, the effect of shortening the adjusted average length of stay was likely observed mainly in the private hospital group (significance probability: 0.3767 for public and 0.1068 for private).

Next, we examined the difference in profitability between the groups of hospitals that implement specific cost accounting and those that do not, and found significant differences in all profitability indices, although the percentage of profitable hospitals was significant at 10%. The average length of hospital stay, which indicates the efficient use of hospital beds, was significantly different between the two groups, both in the disease-composition-corrected index and the uncorrected reference index. The average length of stay was significantly shorter in hospitals with specific costing, suggesting that the hospital beds are used more efficiently.

In addition, when we looked at the differences in medical care outcomes depending on whether or not specific costing was implemented, we found no significant differences in readmission status and improvement in discharge outcomes, but significant differences in worsening discharge outcomes[8]. Specifically, the rate of worsening outcomes at discharge was significantly lower in the group of hospitals that implemented cost accounting, and the mortality rate due to injury or illness with the maximum input of medical resources was also significantly lower, albeit at the 10% level. In other words, it can be inferred that the hospital group with specific costing has relatively better medical care outcomes because the hospital group with specific costing does not have worse outcomes at discharge.

Finally, we examined the difference in profitability between the group of hospitals that implement divisional profit budgeting and the group of hospitals that do not and found that the percentage of profitable hospitals was significantly higher in the group of hospitals that implement divisional profit budgeting. Hospitals that have implemented departmental profit target management have likely succeeded in at least ensuring profitability (becoming profitable). The results for medical business profit margin and medical business profit per hospital bed are also not significant, but the results suggest that the implemented hospital group is likely to be better, which may have some effect on improving the degree of financial performance.

On the other hand, there are no significant differences in the status of ward utilization and the status of important therapeutic actions for any of the indicators. There are also no significant differences in discharge outcomes or readmission status for any of the indicators.

5. Conclusion

Similar to previous studies (Kludacz-Alessandri, 2020; Krupička, 2021), the presence or absence of departmental cost accounting[9] alone does not lead to a significant difference in profitability even at the 10% significance level when the starting year is not considered. However, as far as the medical business profit margin is concerned, it does not seem to be completely ineffective in improving profitability. When the year of the start of departmental cost accounting is taken into account, the medical profit margin is significantly higher in hospitals with departmental profit and loss accounting, and although not significant, the medical profit per hospital bed is also likely to be higher[10]. Incidentally, Kludacz-Alessandri (2020) and Krupička (2021) for hospital-operated medical corporations not only conducted cost calculation by the department but also conducted profit/loss target management by the department (Kludacz-Alessandri, 2020) and profit/loss performance management by department (Krupička, 2021) based on the results of the calculations. The difference between the two groups was significant in the medical profit margin and the percentage of profitable hospitals. Kludacz-Alessandri (2020) also tested for differences in adjusted average length of stay and readmission status but found no significant differences in either.

There were no significant differences in the implementation of important therapeutic actions or the utilization of hospital beds between the two cases of no limitation and after the limitation of the year in which departmental costing was started. However, there was a significant difference at the 10% level in the average length of hospital stay after adjusting for disease mix, which better suggests efficient use of hospital beds. It can be inferred that hospitals that implement departmental cost accounting are trying to improve profitability by increasing the number of patients and total revenue while improving the unit cost of medical care by reducing the average length of hospital stay[11]. While the adjusted average length of stay, which indicates efficient use of hospital beds, was significantly shorter, there was no significant difference in the bed utilization rate, which indicates the utilization of hospital wards, and it seems that the hospitals succeeded in increasing the number of patients enough to maintain the bed utilization rate while shortening the length of stay.

In addition, we also tested for differences in discharge outcomes and readmission status, and found no differences in any of these indicators, suggesting that the implementation of sector-specific cost accounting does not appear to have a negative impact on medical outcomes. This situation was the same for the public and private hospital groups as it was for all hospital groups.

The implementation rate of specific costing by departmental costing implementation rate shows that the group of hospitals that implemented departmental costing (43.0%) implemented specific costing more significantly (probability of significance 0.0000) than the group of hospitals that did not (6.1%), indicating that departmental costing is likely to induce specific costing. Of course, it is not possible to directly clarify the causal relationship between the two calculations. However, in a group of hospitals that are active in business management, where both calculations are implemented, departmental costing was practiced by the mid-2010s in many cases, while specific costing was basically implemented after the late 2010s, and

departmental costing has been done relatively early in most hospitals (Nurkholis et al., 2023)[12]. Therefore, it is reasonable to infer that the practice of departmental costing has increased the need to understand profitability to manage profitability more fully and concretely in the department, and has induced specific costing[13]. It may be necessary to evaluate the effectiveness of sector-specific costing by taking into account the effect of inducing specific costing.

The ratio of profitable hospitals was also significantly higher in the group of hospitals that implemented specific cost accounting than in the group of hospitals that did not implement specific cost accounting, although only by 10%. The average length of hospital stay after adjusting for disease composition, which suggests efficient use of hospital beds, was also significantly different, indicating that the process of providing medical care was shorter and more efficient in hospitals that implemented specific cost accounting[14], and the average length of hospital stay is shortened to increase the unit cost of medical care while increasing the efficiency of ward utilization by increasing the number of newly admitted patients.

Furthermore, the proportion of cases with worse outcomes at discharge was significantly lower in the group of hospitals that implemented specific cost accounting, and the mortality rate due to injury or illness with the maximum input of medical resources was also significantly lower at the 10% level. In other words, the hospital group with specific cost accounting does not have relatively worse medical outcomes despite better profitability; rather, medical outcomes are also relatively better as far as the published indices are concerned. Perhaps, hospital groups that conduct thorough analysis, such as those that track profit and loss, have superior analytical capabilities (including information for analysis) for medical services and can search for room to improve profitability without worsening medical outcomes, or even to reduce costs by improving medical outcomes (i.e., improving efficiency).

Finally, the proportion of profitable hospitals was significantly higher in the group of hospitals that implemented divisional profit budgeting than in the group of hospitals that did not implement such budgeting, suggesting that divisional profit target management contributed to ensuring profitability. In addition, the results for medical business profit margin and medical business profit per hospital bed also suggest that profitability is better in the group of hospitals that implement divisional profit budgeting, although the results are not statistically significant. On the other hand, there were no significant differences in the use of hospital wards or the implementation of important therapeutic procedures, indicating no effect of departmental revenue budgeting. There were also no significant differences in discharge outcomes or readmission status, suggesting that departmental revenue budgeting does not have a negative effect on medical outcomes.

Incidentally, a similar study (Kludacz-Alessandri, 2020) examined the difference in performance between hospitals with and without departmental “profit/loss” target management, although not departmental “revenue” target management, and found that while the medical profit margin and percentage of profitable hospitals were significantly higher in the group of hospitals that implemented it, there were no significant differences in the adjusted and uncorrected average length of stay, 6-week same disease readmission rate and unexpected readmission rate[15], which were similar results to those in this study.

It has not been sufficiently clear whether management accounting has the same effect on objective financial performance in hospitals, which are not-for-profit organizations, as it does in for-profit companies. However, this study reveals that departmental and specific costing and departmental revenue budgeting have a positive effect on objective financial performance in hospitals. Furthermore, the impact of management accounting on discharge outcomes, which had not been evaluated in previous studies, was also verified, and it became clear that management accounting does not seem to have a negative impact on medical outcomes.

It should be noted, however, that this study focuses only on the presence or absence of specific management accounting methods, and the degree of impact on financial performance, etc. may differ depending on the method of utilization of such methods. It is also important to note that the use of management accounting methods cannot be said to have no effect on the results of medical care since the results of medical care have various aspects and the indicators selected in this study do not cover all aspects of the results of medical care.

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Notes

1. It is known that hospital size is related to the implementation status of management accounting such as cost accounting (Nurkholis et al., 2023), but the distribution of bed size among the respondent hospitals in this survey was 29.1% with less than 200 beds, 14.1% with 200 beds, and 56.8% with 300 or more beds. The overall distribution of hospital bed size is not significantly different from that of the hospital group as a population (30.0% with less than 200 beds, 19.2% with 200 beds, and 50.8% with 300 or more beds). Therefore, the respondent hospital groups in this survey are considered to be representative of the population to some extent.
2. If a hospital is excluded from the analysis if any one of the indicators related to medical outcomes, productivity, or efficiency is an outlier, the sample size will decrease significantly, and this is not desirable for statistical validation.
3. Although there are other aspects related to the outcome of medical care, such as the incidence of complications, data on such aspects for hospitals, the subject of this study, are not publicly available, and therefore cannot be included in the analysis.
4. In the "Impact Assessment Report", each patient is classified into one of the following outcomes at the time of discharge: "cured", "mild recovery", "remission", "unchanged", "worsening", "death due to the injury or disease for which the greatest amount of medical resources were invested", "death due to an injury or disease other than that for which the greatest amount of medical resources were invested", or other.
5. Department here is defined in the questionnaire as "each department, each ward, the laboratory department, the pharmaceutical department, the surgical department, etc.".
6. Conversely, hospitals that are continuously profitable and do not perform departmental costing because there is no need to do so are also included in the group of non-performing hospitals.

7. In addition, while all the other hospitals started in the 2000s or later, only one hospital introduced cost accounting more than 30 years ago, in 1991. This is unusually early and heterogeneous in the hospital industry and the extremely long time that has passed since its introduction suggests that there are many factors other than departmental cost accounting that may have influenced the introduction of cost accounting. In addition, although we have interviewed this hospital twice, it is not necessarily proactive in utilizing departmental costing (it practices business management to motivate medical professionals and increase their utilization status through its organizational culture, and is rather reluctant to use profitability information to encourage them to do so). Therefore, this hospital was also excluded from the analysis.
8. It is not possible to make a blanket judgment about the outcome of medical care since it should be evaluated from multiple perspectives and the impact assessment of the introduction of specific costing did not take into account differences in risk among hospitalized patients. However, readmission status and discharge outcomes are at least one aspect of medical outcomes.
9. Interviews have revealed that the actual situation is often that only departmental profit-and-loss is understood and is not sufficiently managed. In the questionnaire survey on which this study relies, the degree of profit-and-loss management is quite weak, with only 10.5 and 20% of the hospitals implementing departmental cost accounting managing departmental profit-and-loss goals and departmental profit-and-loss performance management, respectively.
10. Since the private hospital group is more profitable than the public hospital group regardless of whether cost accounting is implemented or not, it is possible to suspect that the difference in profitability of the hospital group as a whole with and without cost accounting is due to the difference in the proportion of private hospitals between the groups with and without cost accounting, and not the effect of cost accounting (that is, in other words, it may be because the proportion of private hospitals with generally good profitability is higher in the group of hospitals with cost accounting implementation). The ratio of private hospitals is indeed 39.1% in the group of hospitals with cost accounting, while it is 32.5% in the group of hospitals without cost accounting, indicating that the ratio of private hospitals is slightly higher in the group of hospitals with cost accounting. However, as shown above, even when analyzing public and private hospital groups separately, differences in profitability can be observed to some extent depending on whether cost accounting is implemented or not, and the reason why private hospitals are generally more profitable may be that they often have cost accounting and other business management systems in place. In addition, in Krupička (2021), who only analyzed private hospitals, it was found that the implementation of cost accounting by a responsibility center, such as a facility or department, resulted in significant differences in medical business profitability.
11. Shorter average length of stay leads to an increase in the unit cost of medical care per patient per day (hereinafter referred to as “unit cost of care”) because of the system of diminishing daily comprehensive payment under the separate comprehensive payment system, and because medical procedures subject to piece rate payment that are not comprehensive are packed in a shorter period.
12. In addition, from the standpoint of cost calculation techniques, if all-cost accounting is to be implemented, highly accurate calculations cannot be performed unless departmental cost accounting is used as a foundation.
13. In addition, there is a possibility of a strong linkage between the two due to the third factor of high awareness of management control (possibility that this is not a direct causal relationship between the two), but since it is thought that the awareness of management control is high and high awareness of management control is maintained thanks to departmental cost accounting in the first place (Nurkholis et al., 2023) It can be said that there is at least an indirect effect from departmental profitability management to specific profitability management.
14. Under the daily comprehensive payment revenue, profit/loss can be improved by reducing costs by switching to generic drugs that are cheaper than brand-name drugs or by stopping tests that had been performed.
15. In Kludacz-Alessandri (2020), profit per hospital bed, bed utilization ratio, status of important therapeutic actions, and discharge outcome indicators are not included in the analysis.

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