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THE EFFECT OF THE HEALTH CARE INFECTION CONTROL COMMITTEE IN PATIENTS WITH URINARY CATHETERS ON COST CONTAINMENT

Pengaruh Komite Pengendalian Infeksi Pelayanan Kesehatan pada Pasien dengan Katheter Urin terhadap Pengendalian Biaya

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ABSTRACT

The high prevalence of healthcare-associated infections threatens hospital services. Urinary tract infections associated with the use of catheters could reach 0.2–4.8 per 1000 catheters/day. In response to this, the Centers for Disease Control and Prevention recommends using the Healthcare Infection Control Practices Advisory Committee (HICPAC) to reduce the incidence of infection in hospitals. To determine the effect of implementing HICPAC on reducing hospital costs for patients with urinary catheters at Delia Hospital, Langkat Regency, in 2019. At the Delia General Hospital in Langkat Regency, Malaysia, quantitative research using a quasi-experimental technique was carried out, in which all patients with urinary catheters were included as respondents. The paired t-test was used to evaluate the data using SPSS software. The results revealed a significant effect of the HICPAC application on the incidence of Catheter-Associated Urinary Tract Infection (CAUTI) in patients during treatment (p = 0.08). The HICPAC method can also reduce the risk of CAUTI by 3.902 times. This study did not evaluate the morbidity and mortality attributable to CAUTI. An assessment of the length of stay, cost analysis, and antibiotic resistance is needed to assess the benefits of the HICPAC guidelines. The use of HICPAC in patients with urinary catheters can reduce the cost of treatment at Delia Hospital, Langkat Regency.

***Keywords**: CAUTI, Cost Containment, HICPAC*

ABSTRAK

Tingginya prevalensi infeksi terkait layanan kesehatan mengancam layanan rumah sakit. Infeksi saluran kemih akibat penggunaan kateter bisa mencapai 0,2–4,8 per 1000 kateter/hari. Menanggapi hal ini, Pusat Pengendalian dan Pencegahan Penyakit merekomendasikan penggunaan Komite Penasihat Praktik Pengendalian Infeksi Layanan Kesehatan (HICPAC) untuk mengurangi kejadian infeksi di rumah sakit. Untuk mengetahui pengaruh penerapan HICPAC terhadap penurunan biaya rumah sakit pada pasien pemasangan kateter urin di Rumah Sakit Delia Kabupaten Langkat Tahun 2019. Di Rumah Sakit Umum Delia Kabupaten Langkat Malaysia, dilakukan penelitian kuantitatif dengan teknik quasi eksperimen, pada tahun 2019. dimana semua pasien dengan kateter urin dimasukkan sebagai responden. Uji-t berpasangan digunakan untuk mengevaluasi data menggunakan perangkat lunak SPSS. Hasil penelitian menunjukkan adanya pengaruh yang signifikan penerapan HICPAC terhadap kejadian Infeksi Saluran Kemih

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Terkait Kateter (CAUTI) pada pasien selama pengobatan (p=0,08). Metode HICPAC juga dapat menurunkan risiko CAUTI sebesar 3,902 kali. Penelitian ini tidak mengevaluasi morbiditas dan mortalitas yang disebabkan oleh CAUTI. Penilaian terhadap lama rawat inap, analisis biaya, dan resistensi antibiotik diperlukan untuk menilai manfaat pedoman HICPAC. Penggunaan HICPAC pada pasien pemasangan kateter urin dapat menekan biaya pengobatan di RS Delia Kabupaten Langkat.

Kata kunci: CAUTI, HICPAC, Pengendalian Biaya

INTRODUCTION

Health interventions are a series of integrated and sustainable activities to maintain and improve the health status of the community. The interventions include disease prevention and treatment, health improvement, and health restoration by the Government and/or the community. Based on reports from developed countries, many patients experience accidents while receiving health services. According to the Institute of Medicine (IOM), at least 44,000 to 98,000 individuals die in health facilities each year as a result of avoidable medical mistakes. Then in 2000, IOM published "*To Err is Human: Building a Safer Health System,"* which presented studies on unfavorable occurrences in Utah, Colorado, and New York hospitals. In hospitals in Utah and Colorado, 2.9 % of incidents resulted in death, whereas New York recorded 3 % of total occurrences with a 13.6 % rate of death. Four years later, the WHO collected research in America, England, Denmark, and Australia. They found a range of 3.2%–16.6% adverse events. The Ministry of Health Malaysia stated that 2,769 adverse incidents occurred in 2013. These reports moved the health system globally to change the healthcare paradigm toward patient safety. Indonesian health services were evaluated by establishing the National Patient Safety Committee (NPSC) in 2004 (National Health and Medical Research Council 2010). In 2007, NPSC announced 145 incidents related to patient safety, namely 46% adverse, 48% near-miss, and 6% others. The incident scattered throughout the state, with 37.9% in Jakarta, 15.9% in Central Java, 13.8% in Yogyakarta, 11.7% in East Java, 6.9% in South Sumatra, 2.8% in West Java, 1.4% in Bali, 0.69% in South Sulawesi, and 0.68% in Aceh (Erawati 2019).

Prolonged use of a catheter directly affects the risk of urinary tract infection, with a daily risk of up to 3%–7%. When the catheter was left in place for more than a week, the risk of bacteriuria increased to 25% and 100% in one month (Gunawan et al. 2015). Up to 10% of patients with bacteriuria may develop urinary tract infections, and 3% will have bacteremia. Catheter-associated urinary tract infections (CAUTI) may result in excessive antibiotic administration, and urine drainage systems frequently become reservoirs of multidrug-resistant bacteria and a transmission source to other patients.

Reducing healthcare-associated infectious (HAI) diseases is one of the International Patient Safety Goals' patient safety points. HAI events will have an impact on length of stay, long-term impairment, mortality, increasing resistance to microbes, greater costs for the health system, patients, and their families, income loss, and deaths (Undang-Undang Republik Indonesia Nomor 36 Tahun 2009 2009). The impact of HAI is very broad and becomes a big burden for the state and the hospital, such as the national health insurance. For this reason, the CDC issued guidelines to prevent CAUTI through the Healthcare Infection Control Practices Advisory Committee (HICPAC) in 2017. It contains six main points: the correct indication for the use of urinary catheters, the correct catheter insertion technique, the correct catheter care technique, quality improvement programs, administrative infrastructure, and surveillance (Hadi 2017). Approximately 17%–69% of CAUTI events are preventable, meaning that 380,000 infections and 9,000 CAUTI-related deaths could be avoided (Suhartoyo 2018). Based on these recommendations, using HICPAC can reduce CAUTI and, in turn, reduce containment costs (Kementerin

Kesehatan RI 2017). However, this correlation has not been widely studied. Thus, this study aims to determine how implementing HICPAC reduces hospital costs.

METHODS

Research Design

This quantitative study used a quasi-experimental approach to assess the magnitude of changes in containment cost due to a decrease in the incidence of CAUTI after applying HICPAC. From February to June 2019, all patients who utilized a urinary catheter at Delia Hospital in Langkat Regency were included in the study. Based on the Slovin formula by purposive sampling, 90 out of 300 patients were chosen as the sample and divided into two groups, treated and untreated with HICPAC (Blanck et al. 2014). The inclusion criteria were that the patient had a urinary catheter attached for 2 × 24 hours and was cooperative. The exclusion criteria were that the patient was unconscious and had just been admitted to treatment.

Data Collection and Analysis

The primary and secondary data were collected from patients' medical records and then processed through editing, data entry, and cleaning (Society for Clinical Data Management 2021; Campbell and Sweatman 2022).

Statistical Analysis

The data were analyzed using the SPSS program and presented in a frequency distribution table. Given that the interval scale data were normally distributed, the analysis proceeded with parametric statistical techniques using paired t-tests (Kim 2022; Liu and Lee 2023).

RESULTS

Characteristics of Respondents

The respondents were mostly females (63.3%), ranging in age from 41 to 60 years (53.3%), with a duration of catheter application was more than five days (42,2%).

Table 1. Characteristics of respondents in Delia Hospital

Characteristic	n (%)
Sex	
Male	33 (36.7)
Female	57 (63.3)
Total	**90 (100)**
Age	
< 20 years	3 (3.3)
20–40 years	17 (18.9)
41–60 years	48 (53.3)
> 60 years	22 (24.4)
Total	**90 (100)**

HICPAC Implementation on Treatment Cost at Delia Hospital in 2019

There was a decrease in patient care costs after implementing HICPAC at Delia Hospital (Table II), as indicated by the average treatment costs before and after the implementation were 9.73E6 and 8.71E6, respectively. In addition, the t-test also confirmed this result with a t-value of 3,697. Furthermore, the r-value of 0.972 and p-value of 0.001 indicate that the HICPAC implementation has a substantial influence on the cost of treatment at Delia Hospital.

Table 2. The effect of implementing HICPAC on treatment costs at Delia Hospital in 2019

HICPAC	n	Mean	SD	SE	t	R	p-*value*
Not Implemented	45	9.73E6	7,096,550	1,057,891	3.697	0.972	0.001
Implemented	45	8.71E6	6,077,000	905,905			

HICPAC Implementation on Secondary Diagnosis at Delia Hospital in 2019

Based on the analysis using a paired t-test, the HICPAC application significantly affects pneumonia, cervical cancer, stroke, and hypertension as the secondary diagnosis. Meanwhile, no impact was noted on type 2 DM, Congestive Heart Failure, Preeclampsia, Acute Coronary Syndrome, and chronic obstructive pulmonary.

Table 3. HICPAC Implementation on Secondary Diagnosis at Delia Hospital

Type of Diagnosis	HICPAC	n	*Mean*	SD	SE	t	p-*value*
Pneumonia	Not Implemented	8	1.95E7	5906607.875	2088301.241	2.978	0.021
	Implemented	8	1.66E7	5994787.754	2119477.536		
Cervical Cancer	Not Implemented	2	5.35E6	908879.701	642675.000	6.696	0.094
	Implemented	2	4.79E6	791005.001	559325.000		
Stroke	Not Implemented	14	1E7.21	4470553.370	1194805.646	9.111	0.001
	Implemented	14	1.03E7	3965677.016	1059871.764		
Type 2 Diabetes Mellitus	Not Implemented	3	5.31E6	1532743.800	884930.045	1.261	0.334
	Implemented	3	4.58E6	679770.852	392465.884		
Congestive Heart Failure	Not Implemented	4	3.89E6	453395.773	226697.886	−2.855	0.065
	Implemented	4	5.47E6	1152397.000	576198.500		
Hypertensive Crisis	Not Implemented	4	3.36E6	219293.788	109646.894	3.202	0.049
	Implemented	4	3.06E6	330832.846	165416.423		
Severe Preeclampsia	Not Implemented	3	1.41E7	1023029.253	590646.215	1.008	0.420
	Implemented	3	1.39E7	1298591.878	749742.371		
Acute Coronary Syndrome	Not Implemented	5	2.29E6	1121278.564	501451.018	−0.006	0.996
	Implemented	5	2.29E6	438376.008	196047.711		
Chronic Obstructive Pulmonary	Not Implemented	2	1.65E6	753754.616	532985.000	−0.885	0.539
	Implemented	2	2.00E6	194051.314	137215.000		

The Duration of Catheter Use on the Incidence of CAUTI in Patients at Delia Hospital in 2019

Furthermore, this study discovered that the majority of CAUTI cases occurred in patients who had used a catheter for more than 4 days (Table IV), with 3 incidences emerging in 4-5 days of use, 3 cases emerging in more than 5 days of use, and 1 case emerging in fewer than 3 days of use. On the other hand, no incidence of utilizing a catheter for a single day was discovered.

Table 4. The duration of catheter uses on the incidence of CAUTI in patients at Delia Hospital in 2019

Catheter Duration	CAUTI				Total	
	Developed		Undeveloped			
	n	%	N	%	N	%
1 day	0	0.0	5	100.0	5	100.0
2–3 day	1	5.3	18	94.7	19	100.0
4–5 day	3	10.7	25	89.3	28	100.0
> 5 day	3	7.9	35	92.1	38	100.0
Total	**7**	**7.8**	**83**	**92.2**	**90**	100.0

Out of the 90 respondents studied, 6 cases (13.3%) of CAUTI were recorded before the implementation of HICPAC, while just one case happened after the implementation. The chi-square test yielded a p-value of 0.008, indicating a positive correlation between the application of the HICPAC and the prevalence of CAUTI in Delia Hospital patients during therapy in 2019. The HICPAC procedure can minimize the risk of CAUTI by 3.902 times based on the odds ratio value.

DISCUSSION

Delia Hospital recorded at least 7 cases (7.8%) of CAUTI from February to April 2019 (Table V). CAUTI is one of the most frequent infections in health-care settings, particularly hospitals (Insani and Sundari 2018). It frequently results in the use of unneeded antibiotics, and the urine drainage system frequently serves as a storage for multidrug-resistant bacteria (Hadi 2017).

Table 5. HICPAC implementation of HICPAC on the incidence of CAUTI in patients at Delia Hospital in 2019

HICPAC Implementation	CAUTI				Total		p-*value*	OR
	Developed		Undeveloped					
	n	%	n	%	n	%		
Before HICPAC	6	13.3	39	86.7	45	100.0		
After HICPAC	1	2.2	44	97.8	45	100.0	0.008	3.902
Total	**7**	**7.8**	**83**	**92.2**	**90**	100.0		

The method used to determine the frequency of CAUTI cases varies. The CDC measures the annual incidence by dividing the number of new CAUTI occurrences per month by the number of catheter users daily (Harijanto 2015). Meanwhile, several other studies utilized a generic incidence estimate based on the number of new CAUTI cases per number of patients with catheters in a given time unit. The CDC's incidence estimate is more accurate since CAUTI incidents can occur at any point during the application or even after the catheter is withdrawn (Faizah 2019).

The majority of CAUTI infections at Delia Hospital happened after the catheter had been in place for four days or more (Table 4). The NHSN observed a higher incidence of CAUTI inner units of 0.2-4.8 per 1000 catheter days, increasing to 1.2-4.5 in critical care (ICU). Furthermore, a cross-sectional study conducted in different Australian hospitals revealed a CAUTI prevalence ratio of 1.4%. In India, a relatively significant incidence occurred in one teaching hospital (42.9% basis points) and one tertiary hospital (59%).

CAUTI has a direct influence on treatment length, long-term impairment, increasing microorganism resistance, additional economic burden to the health system, patients, and their families, and unexpected fatalities (Undang-Undang Republik Indonesia Nomor 36 Tahun 2009 2009). Some patients struggle to accept the cost of treatment charges levied by the hospital.

In Indonesia, the cost of hospital treatment rises year after year due to a variety of factors such as degenerative diseases, a focus on curative care in funding, individual fees for facility, services determined by the provider, technological advancement, the advancement of subspecialties in medical science, and inflation (Taha et al. 2017; Handayani et al. 2018). With current conditions and scenarios like this, access, and quality of healthcare services are jeopardized, particularly for those who cannot pay for treatment. Nonstandardized hospital rates aggravate the situation since each hospital sets its charges (Lilissuriani et al. 2017). As a result, cost containment in hospitals is required to lower the amount of patient complaints.

Quality and cost control in each hospital service unit are indispensable in the era of Universal Health Coverage (Lilissuriani et al. 2017). Cost control is carried out by ensuring that the costs charged to patients must be for medical needs. This study fo-

cuses on applying HICPAC, which is expected to reduce not only the infection due to a catheter but also the cost containment of ICU patients at Delia Hospital.

The cost containment analysis (Table 3) of ICU patients at Delia Hospital was based on several secondary diagnoses, including pneumonia, cervical cancer, stroke, type 2 diabetes, congestive heart failure, hypertensive crisis, severe preeclampsia, acute preeclampsia coronary syndrome, and chronic obstructive pulmonary disease (Blanck et al. 2014). This study noted a significant decrease in treatment costs after HICPAC was applied (Table 2).

Cost containment in hospitals is a continuous management process to change poor-quality products into good-quality products (Institute for Healthcare Improvement; Permatasari 2013). Quality expenses may be divided into four categories: preventive, assessment, internal, and external failure costs (Rahayuningrum et al. 2017). Prevention costs are needed to reduce the amount of poor-quality production, while the assessment costs are to examine products that do not meet specifications. Internal failure costs are incurred on a defective product before it is shipped to the customer.

These findings suggested that using the HICPAC recommendations can lower the incidence of CAUTI and patient care expenses, especially in ICU patients who require catheters at Delia Hospital. This conclusion is supported by Taha et al. in the same hospital using 300 samples, which found 11 cases (84.6%) of CAUTI before the implementation of HICPAC and 2 cases (15.4%) after it (Taha et al. 2017). Following the implementation of HICPAC, medical personnel's knowledge, attitudes, and behaviors about infection control in patients with catheter insertion improved (Blanck et al. 2014).

Research by Mulyanto on Cost Containment with Indonesian National Health Insurance (BPJS) shows a decrease in the difference between the claims of the Indonesian Case Base Group (INA-CBG) and total hospital bills in 2016 when compared to 2015 (Mulyanto and Puspitowati 2013). This is due to the inadequate implementation of the Clinical Pathway in hospitals.

CONCLUSION

The adoption of the Healthcare Infection Control Practices Advisory Committee (HICPAC) standards led to a substantial decrease in treatment expenses for patients, highlighting the efficacy of standardised infection control methods. Prior to the implementation of HICPAC procedures, the expenses related to patient care were significantly elevated, indicating the economic strain of handling healthcare-associated illnesses. The decrease in expenses after implementation indicates that these guidelines not only enhance patient outcomes by lowering infection rates but also result in significant financial advantages for healthcare organisations.

The consequences of these findings are crucial for hospital administration and public health policy. The financial benefits achieved by implementing HICPAC standards emphasise the significance of investing in infection prevention techniques as a cost-efficient method of healthcare administration. Furthermore, the study emphasises the importance of ongoing surveillance and compliance with infection control methods in order to maintain these advantages. Subsequent studies could investigate the extended cost-effectiveness of HICPAC guidelines in various hospital environments and assess the possibility of additional cost reductions through technological improvements and improved training programs for healthcare personnel.

Suggestions

This study did not evaluate the morbidity and mortality attributable to CAUTI. An assessment of the length of stay, cost analysis, and antibiotic resistance is needed to assess the benefits of the HICPAC guidelines. It is suggested to continuously monitor the HICPAC evaluation for all medical personnel on duty to eliminate CAUTI incidents and minimize patient complaints related to service quality.

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