

The effect of an infection control checklist on the incidence of CAUTI in the Medical Intensive Care Unit

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Abstract

Aim: This prospective study was done to evaluate the effectiveness of an infection control checklist on the incidence of CAUTI in the medical ICU of a tertiary care hospital.

Materials and Methods: CAUTI was defined according to CDC guidelines. Patients catheterized in the MICU who developed fever 48 hours after catheter insertion were included in the study. The rate of CAUTI in the MICU was calculated from January 2016 to June 2016. In July 2016 health care workers were trained and CAUTI control checklist was implemented. Hand hygiene was assessed. Then the rate of CAUTI was noted again from August 2016 to January 2017 and the change in infection rate was calculated.

Observation and Results: The rate of CAUTI dropped from 9.45/1000 catheter days in the first 6 months to 4.67 /1000 catheter days in the next 6 months following intervention. The result was statistically significant ($p=0.001$).

Conclusion: The study shows that simple measures like hand hygiene, training of health care workers and implementation of catheter care checklists are effective in controlling CAUTI rates. Similar checklists can be used to reduce the rate of other device associated infections.

Key Word: CAUTI, catheter, MICU, infection control

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Received Date: 12/12/2018 Revised Date: 18/01/2019 Accepted Date: 04/02/2019

DOI: <https://doi.org/10.26611/1008923>

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 09 February 2019

INTRODUCTION

Catheter associated urinary tract infection is a common healthcare associated infection and an important cause of mortality and morbidity among patients. It also puts a significant strain on the health budget. The risk of developing CAUTI increases with increased duration of catheterization¹. The organisms causing CAUTI are the

patients' perineal flora as well as multi drug resistant organisms from the hospital^{2,3}. Surveillance of CAUTI plays a major role in controlling this infection and is employed in many countries for hospital infection control and quality assurance⁴. Evidence based infection control practices to prevent CAUTI can be collectively termed as 'bundle'. This includes simple things like adherence to asepsis protocols, cleaning the perineum before catheter insertion, maintaining a closed drainage system, taking care of the catheter etc. Studies have shown that implementation of a 'bladder bundle' can be effective in reducing the rate of CAUTI.¹ Introduction of a checklist in the CAUTI control programme serves to remind the health care workers of the bundle elements and helps ensure adherence to the asepsis protocols. Such checklists have been found to be helpful in reducing the rate of CAUTI in USA, Indonesia etc^{5,6}. However, not many studies have been carried out in India on an infection control checklist for CAUTI. Keeping that in mind, the

present study was conducted to determine the effectiveness of an infection control checklist on the incidence of CAUTI in the MICU of a tertiary care hospital.

MATERIALS AND METHODS

A patient developing UTI after 48 hours of urinary catheter insertion in MICU from January 2016 to June 2016 and July 2016 to January 2017 comprised the study group. Patients who had a urinary catheter inserted before admission to the MICU and patients in sepsis during the time of admission were excluded from the study. CAUTI was defined as per CDC guidelines⁷. Urine was collected from suspected cases of CAUTI before the next dose of antibiotics was administered. Urine was collected on the first day and then on alternate days starting from the third day⁸. Urine specimens were processed within 2 hours of collection⁹. A colony count of $>10^5$ CFU/mL was taken as significant and the organism was identified as per standard guideline¹⁰. Yeast samples were not processed further. Following surveillance for 6 months, an intervention was undertaken. The healthcare workers at the MICU were trained for a month with the help of power point presentations and one-on-one talks, and posters were put up at the MICU to remind them to stick to infection control practices. The nursing personnel, student nurses and the on-duty physicians were included in the training. The nursing personnel had to fill out a checklist during catheter insertion to ensure adherence to proper asepsis protocols and then check for the elements of urinary catheter care bundle each day and mark them appropriately in the checklist. The checklist was used for all patients catheterized in the MICU and infection control practices were supervised weekly. Hand hygiene was monitored once a week, randomly, for 30 minutes. Due to fresh allotment of duties of resident doctors and student nurses, the training was continued as an ongoing process in an effort to educate them on the risk factors for CAUTI. Following intervention for 1 month in July 2016, surveillance of CAUTI was again carried out in the MICU from August 2016 to January 2017 and the rates of CAUTI in the MICU before and after the intervention were compared. The numerator data was the number of CAUTI cases occurring in a month. The denominator data was taken as the number of catheter days. The number of catheter days was taken as the number of catheterized patients present in the MICU. Data was collected each day at a specified time (5.30 pm)¹¹.

OBSERVATION AND RESULTS

Out of 405 patients catheterized in the MICU during the course of the study, 57 patients were culture positive on admission, 31 patients took discharge against medical

advice and 38 patients succumbed. 171 patients either did not develop a fever or were transferred out of the MICU. A total of 108 patients who developed fever and who were culture negative on admission could be followed up with repeat samples in the MICU during the study. 55 patients were followed up from January to June 2016 and 53 patients from August 2016 to January 2017. 39 of 108 patients developed CAUTI. In the pre-intervention period, the incidence of CAUTI was 49.1% and it was 21.5% in the post intervention period, the decrease in incidence being statistically significant ($p=0.03$). 23 of the 39 CAUTI cases were more than 60 years of age ($p=0.016$). 24 patients out of 39 were female (female : male = 1.6 : 1), which is statistically significant. 61.53% of CAUTI cases were diabetic ($p < 0.05$), thus showing Diabetes Mellitus is a risk factor for development of CAUTI. Maximum duration of stay in the MICU among the 39 CAUTI cases was 11 days. 25 patients (64.10%) developed CAUTI in the first week of catheterization while 14 patients (35.9%) developed CAUTI after the first week of catheterization. Mean duration of catheterization was 7 days.

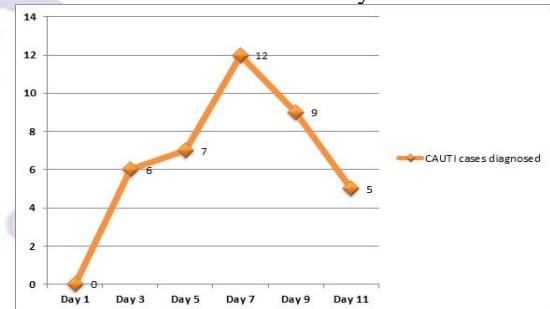


Figure 1: Number of CAUTI cases diagnosed according to the duration of catheterization



Figure 2: Rate of CAUTI in the MICU before and after intervention

The mean rate of CAUTI in the MICU in the first six months was 9.45/1000 catheter days. July 2016 was the period of intervention, hence no data was collected that month. Following intervention, the mean rate of CAUTI in the MICU over the next six months came down to 4.67/1000 catheter days. Comparing the pre and post intervention data, the t-value was 4.958 ($p=0.001$). This decrease in CAUTI rate was statistically significant.

Table 1: Association between the duration of catheterization and the development of CAUTI

Study	CAUTI cases in 1 st week	CAUTI cases in 2 nd week	CAUTI cases in 3 rd week
Bagchi <i>et al</i> (Nagpur,2014)[11]	50%	-	-
Mangukiya <i>et al</i> (Gujrat,2015)[18]	54.83%	32.26%	12.91%
Billote-Domingo <i>et al</i> (Europe,1998) [17]	58.20%	30.90%	10.90%
Present study	64.10%	35.90%	-
Al-Hazmi <i>et al</i> (Saudi Arabia,2015) [20]	68%	-	-

Table 2: Comparison of the CAUTI rate with other studies

Study	Rate of CAUTI in pre-intervention period(per 1000 catheter days)	Rate of CAUTI in post intervention period(per 1000 catheter days)
Saint <i>et al</i> (USA,2016) [22]	2.40	2.05
Clarke <i>et al</i> (USA,2013) [5]	5.2	1.5
Present Study	9.45	4.67
Kanj SS <i>et al</i> (Lebanon,2013) [23]	13.07	2.21
Amine <i>et al</i> (Egypt,2014) [1]	90.12	65.69

DISCUSSION

The incidence of CAUTI in our study in the pre-intervention period was 49.1%. Following intervention, the incidence rate was 21.5%. Bagchi *et al* in their 2014 study in Nagpur found the incidence of CAUTI to be 29.09%¹¹. Dund *et al* found the incidence to be 32% in Gujarat in 2015¹². The incidence of CAUTI was 7.03% in the 2016 study by Hanumantha *et al* in Vishakhapatnam, Andhra Pradesh¹³ and 43.5% in the study by Bhani *et al* in Jaipur in 2017¹⁴. Maximum cases of CAUTI were detected in patients over 60 years of age. Our study results are in concordance with the results obtained by Joon Ho Lee in 2013 in Korea¹⁵ and Amine *et al* in an Egyptian ICU in 2014¹. Yousuf Khan *et al* found in their 2016 study in Telangana that 70.27% patients of CAUTI were over 50 years of age and 56.44% were less than 50 years of age¹⁶. 61.53% patients in the present study were diabetic. Billote-Domingo *et al*¹⁷ in Europe found 21.81% CAUTI patients to be diabetic, whereas Mangukiya *et al*¹⁸ found the percentage to be 30.64 in Gujarat. Al-Hazmi *et al* found the mean duration of catheterization to be 8 days.²⁰ Sen *et al* found the mean duration of catheterization to be 6 days²¹. In our study, the mean duration of catheterization was 7.0 days. The mean rate of CAUTI in the MICU for the first 6 months was 9.45 per 1000 catheter days. The mean rate after 1 month of intervention was 4.67 per 1000 days. The rate of CAUTI in our study before and after intervention was higher compared to the studies conducted in USA by Saint *et al*²² and Clarke *et al*⁵. The rate, was, however, lower than those found by Kanj *et al*²³ in Lebanon in 2013 and Amine *et al*¹ in Egypt in 2014. Comparing the rates of CAUTI in the pre and post

intervention periods, it was found that the rate of CAUTI in the medical ICU has decreased. The result was statistically significant (p value=0.01). Kulkarni *et al*¹⁹ in Aurangabad and Joon Ho Lee¹⁵ in Korea found the percentage to be 39.09 and 65.57 respectively.

Strengths of the study: The study employed simple techniques like hand washing and maintaining a checklist for catheter care to successfully and significantly bring down the rate of catheter associated urinary tract infection in the medical intensive care unit of a tertiary care hospital.

Limitations of the study: The present study included only patients who were catheterized in the MICU and excluded the ones catheterized outside. The study also did not look for association between CAUTI and abnormal renal function test.

CONCLUSION

The study shows that implementation of a CAUTI checklist is a simple yet important tool that can lower the rate of CAUTI significantly. This is of particular importance in ICUs where patients are more likely to contract an infection. A checklist attached to each patient's file will show at a glance whether the device inserted has been cared for properly. Similar checklists can also be employed in controlling the rates of Ventilator Associated Pneumonia and Central Line Associated Blood Stream Infections. Controlling device associated infection rates will also reduce the financial strain borne by hospitals and care giving institutes thus allowing better allocation of funds in the health care system.

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Source of Support: None Declared
Conflict of Interest: None Declared