



Original Research Article

## Complete Audit Cycle: CLABSI Bundle Compliance in ICU

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### ABSTRACT

Central line associated blood stream infection (CLABSI) has a tremendous effect on the outcome of patients, as well as a heavy financial burden on healthcare systems. CLABSI bundles were designed to decrease CLABSI, and were proven to improve CLABSI rates when compliance rates are high.

**Aims:** To measure the percentage of compliance with individual CLABSI bundle components, as well as overall compliance, before and during an educational intervention.

**Methods:** CLABSI bundle forms were retrospectively reviewed for compliance rates, during January, February, and March 2014. Then, an educational campaign, with different modalities was launched for three months (April, May, and June 2014), during which the same forms were being prospectively reviewed for compliance rates.

**Results:** The overall compliance with CLABSI bundle during the pre-campaign period was 84%, while during the campaign the overall compliance rates increased to 96% ( $Z = \pm 3.762$ ,  $p=0.0002$ ).

**Conclusions:** Compliance rates can be improved with educational campaigns, that use different approaches and modalities, to serve as continuous reminder for the medical staff, in our strive to attain a high quality medical service.

**Key words:** clinical audit, CLABSI, critical care

### INTRODUCTION

Central venous catheters (CVCs) are being used increasingly in the inpatient and outpatient setting to provide long-term venous access, making infection possible due to disruption of the skin, and account for 90% of catheter related bloodstream infections, which are termed central line associated blood stream infection (CLABSI).<sup>[1]</sup> It is estimated that 48% of ICU patients have central lines that result in an average of 5.3 CLABSI cases per 1000 central line days.<sup>[2]</sup>

The impact of CLABSI is highly influential on patients' mortality and

morbidity, as catheter related bloodstream infection mortality rates range from 0 to 26%,<sup>[3]</sup> that is to say as high as 28,000 deaths per year in some estimates.<sup>[1]</sup> As for the effect on morbidity, length of stay due to CLABSI is increased by 8 and 12 days in ICU and hospitals respectively,<sup>[4]</sup> resulting in a great increase in the cost of health care, that is estimated to be between 1 and 18 billion dollars annually in USA.<sup>[5]</sup>

The magnitude of burden that CLABSI imposes on health care systems, lead many authorities (like IHI and CDC) to promote and advocate central line bundles, that were later proven by studies to result in

lower rates of CLABSI when compliance is high. [6]

### **Aims**

To measure the percentage of compliance with individual CLABSI bundle components, as well as overall compliance, before and during an educational intervention.

### **Audit Standards**

All adult (18 years or more) patients with central line, in the ICU of King Saud Medical City, Riyadh, Saudi Arabia. From January till June 2014.

## **MATERIALS AND METHODS**

This audit was carried out in the adult ICU (105 beds) of King Saud Medical City, Riyadh, Saudi Arabia.

Retrospective analysis of the central line insertion bundle form, that is an appendix of our central line insertion policy, [7] during the months of January, February, and March 2014. The forms were analyzed for individual components' compliance, as well as overall compliance.

The components of the CLABSI bundle are:

- Hand hygiene.
- Use of maximal barrier precautions.
- Skin disinfection with chlorhexidene.
- Optimal site of insertion: Avoid femoral insertion as much as possible, otherwise central line insertion in the femoral vein must be justified.
- Daily review of the necessity of the central line, and early removal.

Prospective analysis of the same form, and of the same elements, after and during an educational campaign about CLABSI, in the months of April, May, and June 2014.

Our educational campaign had the title "Zero is our vision", it was composed of:

- A series of lectures presented weekly to our staff by ICU consultants, infection control, and quality

division. The lectures touched elements such as the scope of the problem, the impact of CLABSI on the healthcare system, best practices, and CLABSI bundle orientation.

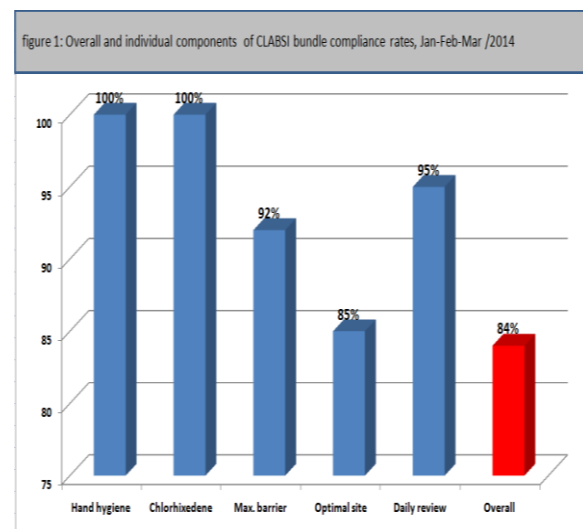
- Audio visual material displayed on billboards inside the ICU.
- CLABSI awareness posters.
- Pocket cards with the CLABSI bundle elements.
- Weekly one-on-one talks to address reported issues of non compliance.

Simple statistical analysis was used to compare pre and post campaign compliance rates.

## **RESULTS**

For the pre-campaign period (January to March 2014), we reviewed 180 central line insertion bundle forms (62 forms in January, 65 in February, and 53 in March).

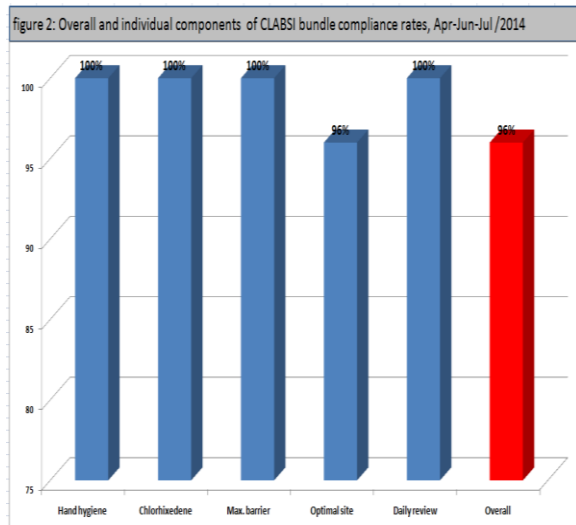
Compliance with both hand hygiene and the use of chlorhexidene was 100%, use of maximal barrier precautions had a compliance of 92%, optimal site of insertion 85%, and daily review of necessity 95%. The over-all compliance with the CLABSI bundle (defined as compliance with ALL components) was 84% (figure 1).



Our educational campaign started on the first of April, hand in hand with prospective review of central line insertion bundle forms, for three months.

During the intervention period, we reviewed 176 forms (62 forms in April, 59 forms in May, and 55 forms in June).

The intervention period, showed compliance percentages of 100% with four elements of the bundle, namely hand hygiene, use of chlorhexidine, maximal barrier precautions, and daily review of necessity, and a compliance percentage of 96% with optimal site component. Thus, the overall compliance percentage with the CLABSI bundle was 96% (figure 2).



The overall compliance percentages in the two periods were compared using Z test ( $Z = \pm 3.762$ ,  $p=0.0002$ ).

## DISCUSSION

The results of our audit show that before the intervention, there was 100% compliance rate with only two components of the CLABSI bundle, namely hand hygiene and the use of chlorhexidine, whereas optimal site selection had the least compliance rate of 85%, possibly because of the relative easiness of cannulation the

femoral vein, and the potential risk of pneumothorax associated with central line insertion in the subclavian or internal jugular veins. Both of these two findings are consistent with findings in similar studies, where compliance with hand hygiene and the use of chlorhexidine was 99%, [8] optimal site selection, although not the lowest compliance rate, was close to our finding at 87%, likewise, hand hygiene and use of chlorhexidine had compliance rates of 100% and 99.6% respectively in another study, [9] leaving optimal site selection at the lowest rate of 62.2%, in similarity to our findings. Our pre-intervention overall compliance rate with the CLABSI bundle of 84% was higher than that reported in both studies.

The post intervention overall compliance rate significantly improved to 96%, with maximal barrier precaution reaching 100%, due to the emphasis by the assisting nurse, and availability of needed materials. Daily review of necessity also increased to 100%, with the cooperation of ICU consultants during the daily rounds.

Although optimal site selection also showed an improvement from 85% to 96%, its impact on rates of CLABSI remains uncertain. [10,11]

However, it was one of the components of the bundle that was always included in the intervention, as it is one of the integral components of the bundle, and has an effect on the overall compliance, which can affect CLABSI rate only when it is at least 95% as suggested by Yoko Furuya. [6]

## CONCLUSIONS

Continuous and persistent reminding and endorsement, using different approaches and techniques, can result in significant changes in practice and behaviour. Although the medical personnel are well aware of the “right thing”, they may need to be reminded

constantly to do it “every time, from the first time”, as they tend to forget or become reluctant under the stress and overload of work in ICU.

High rates of compliance with policies, procedures and guidelines, can be achieved through a well organized plan, that utilizes different approaches and techniques, the cooperation and commitment of all medical personnel, nurses bedside physicians and consultants, and the support and enforcement of the leadership.

### **Recommendations**

- To conduct an audit on CLABSI rates during the same six months, in which this audit was carried out, to identify if the improvement in CLABSI bundle compliance, resulted in a coinciding improvement in CLABSI rates.
- To continue the education, endorsement, and reminding of staff about all issues of concern in the ICU.
- Recognition and reward of compliance, which will be an incentive to keep up the effort.

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