Central Line-Associated Bloodstream Infection Reduction by Applying an Integrated Evidence-Based Care Bundles

in Critically Ill Patients

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Background

- Central line–associated bloodstream infection (CLABSI) is frequent causes of morbidity and mortality in intensive care units (ICU).

- Prevention of CLABSI therefore remains an important issue in intensive care medicine.

Objectives

⁌ The purpose of this study is to apply an integrated evidence-based care bundles in critically ills for reducing CLABSI rate in an MS ICU.

Methods

- The study was divided into in 2 phases.
  - Phase I: to develop an evidence-based Central line care bundles
  - Phase II : apply an integrated evidence-based care bundles in critically ills and test its effectiveness of reducing CLABSI rates

Phase I

Following the evidence-based medicine approach to perform a systematic literature review

- Types of participants: aged over 18, using intravascular catheters and staying in the acute care settings.

- Types of interventions: any stages of catheter in used in preventing CLABSI, including catheter insertions, texture of the catheters, daily care and removal of catheters.

Phase I

- Types of outcome measures: The outcome measures including: (1) CLABSI rates, (2) Length of stay and (3) Mortality rates.

- Types of studies: This review included any systematic reviews and guidelines that included the interventions for preventing CLABSI in adults.

- Types of languages: The review focusing on the language on English and Chinese.

Phase I

- Fifty-eight articles were met the inclusion criteria and selected for further evaluation.

- After the rigorous appraisal 24 articles were considered to be eligible for the present review.

- The guideline proposal which including 18 preventing interventions and 36 daily care interventions.

Phase I

- Two sessions of expert focus group were hold to evaluate feasibility and the meaningfulness of each intervention

- After revised the interventions based on the focus groups suggestions, a questionnaire survey was conducted to investigate the usefulness of interventions nationwide.

Phase I

- Five of fifty-four (5/54) interventions, the average agreement rate were below 70%

- 1 intervention was preventive intervention and 4 were daily care interventions.

- An Evidence-based guideline with 49 interventions were formed based on the systematic review, expert consensus and clinicians nationwide.

Phase II

- the expert focus group study approach selected 5 items to form the Central line care bundles which included
  - hand hygiene
  - maximum sterile barrier precautions
  - Central line maintaining
  - daily inspection of the insertion site
  - daily reviewing of the need for Central line

Phase II Methods

- A pre-post experimental design study was conducted in a 42-bed medical surgical ICU in a medical center in Taiwan.

- Data collection from October 2009 until December 2010

Methods

- There were 74 patients in experimental group and 61 patients in control group.

- Study interventions include

  - an education program for all staff; including

    8 Doctors and 90 nurses

  - implement the care bundles into daily practice

Methods

- The data collection included patients' demographic data, CLABSI risk assessment sheet, and checklist of nurses' compliance with central line care bundles.

- The outcomes indicators were CLABSI incidence rates, length of stay in ICU and the compliance rate of nurses.
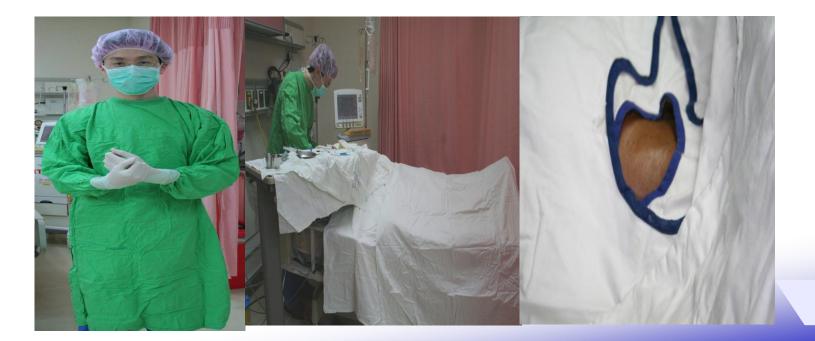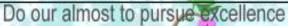
Central line care bundles

■ hand hygiene

Central line care bundles

- maximum sterile barrier precautions
- Provider & Patient

Central line insertion standard package

CVP 標準包

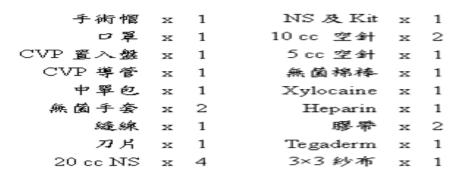|					
手術帽	x	1	NS 及 Kit	x	1
口罩	x	1	10 cc 空針	x	2
CVP 置入盤	x	1	5 cc 空針	x	1
CVP 導管	x	1	無菌棉棒	x	1
中單包	x	1	Xylocaine	x	1
無菌手套	x	2	Heparin	x	1
縫線	x	1	膠帶	x	2
刀片	x	1	Tegaderm	x	1
20 cc NS	x	4	3×3 紗布	x	1

Central line care bundles

- ## Catheter and tubing maintenance policy

  - Replace tubing used to administer blood products or lipid emulsions within 24 hours of initiating the infusion

  - Replace tubing used to administer propofol infusions every 12 hours, depending on its use, per the manufacturer's recommendation

  - the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 72 hours.

  - Change all add-on devices when changing the administration set

Central line care bundles

- daily inspection of the insertion site
  - Use either sterile gauze or sterile, transparent, semi-permeable dressing to cover the catheter site.
  - If the patient is diaphoretic, or if the site is bleeding or oozing, a gauze dressing is preferable to a transparent,semi-permeable dressing.
  - Change tape and gauze dressings q48 hours, transparent dressings should be changed every 7 days

Central line care bundles

- daily reviewing of the need for central line

  - Assess the need for continuing intravascular access on a daily basis during multidisciplinary rounds.

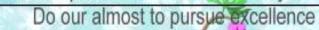 - Remove catheters not required for patient. as soon as possible

Measurement

- Central line insertion checklist

- Central line daily checklist

- CLABSI incident：

  - Surveillance for CLABSIs was performed by the infection control nurse daily

  - CLABSI identification was confirmed by laboratory based on hospital's infection control handbook

Central line insertion check list

Hand hygiene	yes	no
1. Wash hands before to touch patient		
2. use Antigem solution or steridol solution for hand washing		
Maximum sterile barrier		
1. sterile gloves, sterile gown, cap, and mask		
2. large sterile drape：head to toes		
3. keep aseptic technique during insertion process		
Skin preparation		
1. Prepare skin with tincture of iodine		
2. Prepare skin range with antiseptic over 10cm		
3. Iodine stay in skin at least two minutes or until it is dry		21

Central line daily checklist

Central line daily checklist	yes	no
1.Apply transparent semipermeable dressing		
2. use gauze only with bleeding and/or oozing		
3. Replace dressing if it becomes damp, loosened,or visibly soiled ）		
4. puncture site no infection sign		
5. catheter no residual blood including three- way）		
6. review of Central line necessity		

Results

Results-Demographic characteristics

	Experimental N=74		Control N=61			
	Mean	(SD)	Mean	(SD)	t/χ^2	p
Age	70.0	(14.8)	70.1	(19.0)	.037	.971
APACHE II	23.7	(7.7)	24.0	(8.7)	1.170	.281
	N	**(%)**	**N**	**(%)**		
Gender					.593	.441
Male	45	(60.8)	41	(67.2)		
Female	29	(39.2)	20	(32.8)		

Results- Outcome data

	Experimental N=74		Control N=61			
	Mean	(SD)	Mean	(SD)	t / χ^2	p
ICU stay	15.6	(7.8)	18.5	(12.6)	9.294	.003
central line days	23.7	(7.7)	24.0	(8.7)	10.407	.002
	N	**(%)**	**N**	**(%)**		
CLABSI					4.820	.028
Yes	6	(8.1)	13	(21.3)		
No	68	(91.9)	48	(78.7)		

Results- compliance rate of nurses

	Experimental N=74		Control N=61		
	N	(%)	N	(%)	P
rates of hand hygiene	70	(94.6)	31	(50.8)	.000
maximum sterile barrier precautions	73	(98.6)	3	(4.9)	.000

Results- compliance rate of nurses

	Experimental N=447		Control N=460		
	N	(%)	N	(%)	P
central line maintaining	413	(92.4)	390	(84.8)	.000
daily inspection of the insertion site	422	(94.4)	372	(80.9)	.000
daily review of the need for central line	438	(98.0)	317	(68.9)	.000

Discussion

- The care bundles in this study was different from IHI's suggestion.
  - Sterilized skin by using chlorhexidine
    - No Chlorhexidine skin preparation in clinical setting.
  - Choosing the best puncture site and avoiding femoral vein
    - Doctors' CVP insertion considerations and techniques

Discussion

- Nurses' compliance rate increased
  - 60 minutes education program and demonstration.
  - maximum sterile barrier protection
  - "Time out" skin preparation policy
  - Total support from ICU director
  - Using daily check list to check and monitor the efficacy of care bundles.

Conclusions

This study results provide a strong evidence for clinicians in preventing CLABSI by application Central line care bundles in critically ills.

Thanks for your attention

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