CHICAGO JOURNALS

SHEA The Society for Healthcare Epidemiology of America

台北醫學大學・市立萬芳醫院
Taipei Medical University-Wan Fang Hospital

A Crossover Intervention Trial Evaluating the Efficacy of a Chlorhexidine-Impregnated Sponge (BIOPATCH®) to Reduce Catheter-Related Bloodstream Infections in Hemodialysis Patients

Hemodialysis center
Head Nurse: 劉秋芬
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Motivation and the importance

- Infection-related causes are second only to cardiovascular events as a cause for mortality among ESRD patients (Camins , 2013)
  - 感染相關疾病是末期腎病患者僅次於心血管事件的死因
- Up to 90% of all hemodialysis-related bloodstream infections occur in patients dialyzed through CVCs (central vein catheter) (Camins , 2013)
  - 高達90%血液透析相關血流感染是透過中心靜脈導管透析所致
- Use of CVCs can lead to bloodstream infection, frequently referred to as catheter-related bloodstream infection (CRBSI). (Zied ,2014)
  - 使用中心靜脈導管導致的血液感染，稱為導管相關血流感染(CRBSI)

Comparison intervention

Intervention

sodium hypochlorite solution (0.114% by volume)

A Crossover Intervention Trial Evaluating the Efficacy of a Chlorhexidine-Impregnated Sponge (BIOPATCH®) to Reduce Catheter-Related Bloodstream Infections in Hemodialysis Patients

Population

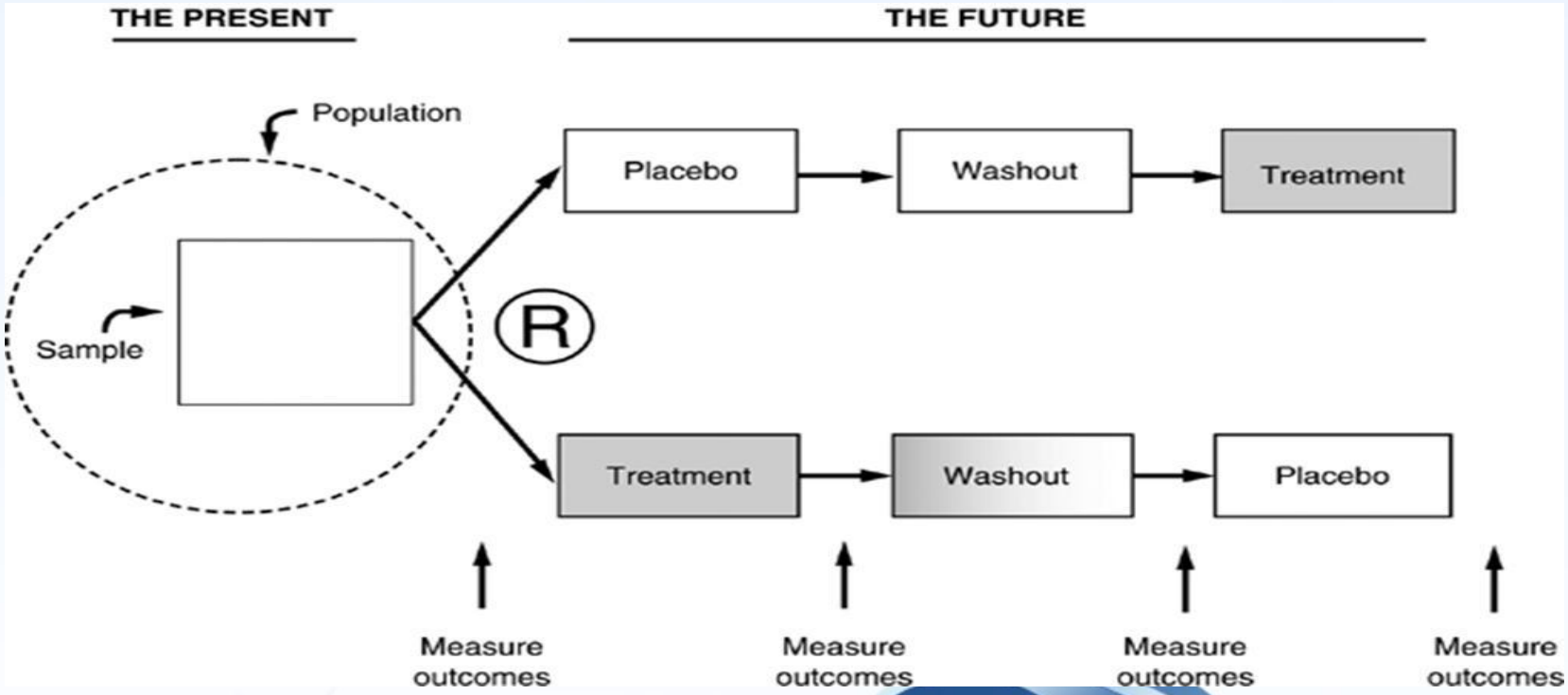
Outcome

Introdution

- 感染佔成人末期腎病變死亡原因之16-36%
- 血液透析病人發生血流感染中，以中央靜脈導管較自體動靜脈瘻管及人工瘻管相對高出許多。
- Biopatch抗菌敷料，是一種新型導管換藥敷料，用以預防導管相關血流感染
- 本研究為交叉試驗，研究Biopatch抗菌敷料對降低門診血液透析病人導管相關血流感染的功效

交叉設計(Crossover Design)

- 是按事先設計好的試驗次序，在各個時期對受試者逐一實施各種處理，以比較各處理組間的差異。



BIOPATCH® Protective Disk with CHG helps reduce CRBSIs

BIOPATCH® Disk
Reimbursement and Ordering Information

Patients need to be protected from their own skin's microflora

Without BIOPATCH® Protective Disk with CHG, the skin surface quickly returns to the pre-prep environment.[3]

With BIOPATCH® Disk, post-prep environment extends for up to 7 days.[4]

Patient Risk of Infection: Low Medium High

Estimate the Financial Impact BIOPATCH® Protective Disk with CHG can have on Your Hospital

Economic Outcomes			
	CVC management with current parameters	CVC management with BIOPATCH Every Single Time	Potential benefits ($ for eco. outcomes)
Cost of BIOPATCH ($)	$ 23,054	$ 46,108	$ -23,054
Cost of CRBSIs ($)	$ 1,116,344	$ 647,518	$ 468,826
Cost of local infections	$ 93,951	$ 65,090	$ 28,861

The Role of Chlorhexidine in the Prevention of Health Care-Associated Infections

Yu-Wen Chen, Chih-Jung Chen

Division of Pediatric Infectious Diseases, Department of Pediatrics,

Chang Gung Memorial Hospital, Tau-Yuan, Taiwan

- **Chlorhexidine**由英國—帝國化學工業(imperial chemical industries)發現，生產「**洗必泰hibitane**」消毒劑，所含成分為Chlorhexidine gluconate(CHG)

- **CHG**是一種廣效性，可同時殺菌以及抑菌作用，主要作用機轉為破壞微生物的細胞膜，對革蘭氏陽性菌和陰性菌都有抑制效果。

- **CHG**作用快，對皮膚刺激較小，即使接觸體液仍可以維持活性，有殘餘抗菌效果可持續作用48小時。

Research purpose

研究目的在評估BIOPATCH對降低血液透析病人之導管相關血流感染率的成效

Method

1. 共121例使用central venous catheters之血液透析病人
2. 分A、B二個門診透析中心
3. 對照組前6個月採無菌技術換藥以sodium hypochlorite solution (0.114% by volume) 清洗皮膚及導管，實驗組使用BIOPATCH® Antimicrobial Dressing
4. 6個月後再互換消毒方式

Primary outcome	Secorned outcome
二組在每1000透析天數之血流感染發生率	觀察長時間使BIOPATCH®抗菌敷料的耐受性

Definition

A catheter related bloodstream infection was defined as

- having a positive blood culture at the time the catheter was in place or
- within 48 hours of catheter removal along with clinical signs and symptoms of sepsis fever (temperature >38.0°C) or
- hypotension (systolic blood pressure < 90mmHg)] and
- no other documented primary site of infection.

Result

結果

- 實驗期有37 bloodstream infections(6.3 BSIs/1000 dialysis sessions)
- 對照期有30 bloodstream infections(5.2 BSIs/1000 dialysis sessions)

◆ In two patients (<2%) the use of the BIOPATCH© Antimicrobial Dressing was discontinued because of adverse events.

◆ Both patients were thought to have developed dermatitis but one patient concomittantly received antimicrobial therapy for an exit site infection since it was difficult to ascertain if the erythema was from contact dermatitis or infection.

Discussion

1. Lok et al randomized 169 patients receiving hemodialysis through a central venous catheter to either receiving polysporin triple antibiotic ointment or placebo over a six-month period. Less infections were observed in the treatment group (12% *versus* 34%; *P* = 0.0013).
2. Johnson and colleagues also enrolled 50 patients in an open-label randomized trial comparing the application of mupirocin (n=27) thrice weekly around tunneled cuffed hemodilaysis catheter exit sites *versus* standard of care. Mupirocin-treated patients experienced significantly fewer catheter-related bacteremias (7% vs. 35%, P<0.01).
3. The mupirocin intervention also resulted in a delay in the occurrenceof bacteremia (108 days vs. 55 days; P<0.01).

Conclusion

- **BIOPATCH®抗菌敷料對於降低血液透析病人導管相關血液感染並無統計意義。**
- 抗生素 (如mupirocin或polysporin) 的應用已被證明是有效的介入措施，因此這些措施應首先考慮降低血液透析病人導管相關血流感染的發生率

- 仍應考慮長期使用產生之抗藥性

步驟2:研究探討的問題為何

招募(Recruitment) - 受試者是否具有代表性？	
最好的狀況是？	我可以在哪裡找到這些資訊？
我們是否知道病人族群為何(收案場所、納入 / 排除條件)？在理想情況下，納入本研究之受試者應具有連續性(有時為隨機取樣)，了解符合收案條件的對象且簽署同意書。	在文章的**方法(Methods)**章節的開頭，可以找到本研究篩選病人的方式。
評讀結果：□是 □否 □不清楚 說明：	

Informed consent was obtained from patients before using the BIOPATCH® Antimicrobial Dressing. **Any patient who received hemodialysis through a tunneled central venous catheter received the intervention if the dialysis center where he/she was dialyzed were in the intervention arm of the study.**

The intervention was continued in every patient who was dialyzed through a central venous catheter until the intervention period was over, the patient transferred his/her care to a different facility, a central venous catheter was no longer necessary (i.e., an AVgraft or fistula is in place), or if the patient was intolerant of the intervention. **The only exclusion criterion was a reported allergy to chlorhexidine gluconate**.

步驟2:研究探討的問題為何

分派(Allocation) - 分派方式是否隨機且具隱匿性... ？	
最好的狀況是？	我可以在哪裡找到這些資訊？
最理想的方式是以中央電腦進行隨機分配，此方式常用於多中心試驗，而較小型的試驗可由獨立人員(如醫院藥師)「監督」隨機分配的過程。	在文章的**方法(Methods)**段落中，可以找到病人分配到不同組的方式，以及隨機分配是否具隱匿性；作者應說明隨機分派方式「監督」或屏蔽(masking)的方式(如使用外觀相同的安慰劑、或給予一個「假的」治療 sham therapy）。
評讀結果：□是 ○否 □不清楚　說明：	

This study was not a randomized controlled trial. A total of 121 patients who were dialyzed through tunneled central venous catheters received the intervention during the trial.

Both dialysis centers had the same nurse to patient ratio, shared the same infection prevention specialist, and although each had its own medical director, both were in the renal division of the affiliated medical school.

步驟2:研究探討的問題為何

…每個組別，在研究開始時的情況是否相同？	
最好的狀況是？	**我可以在哪裡找到這些資訊？**
若隨機分配順利，各組研究對象的條件應是相近、可互相比較的。每組研究對象的基本條件越相近越好。應有指標可確認各組研究對象之間的差異是否達到統計上顯著的差異(如 *p* 值)。	在文章的**結果(Results)** 段落中，可以找到「研究對象基本資料」的表格，裡面包括幾個可能影響隨機分配的各組研究結果之重要變項(如年齡、風險因子等)。如果作者沒有用表格呈現，在**結果**章節的第一段中，可能可以找到各組研究對象特性的說明。
評讀結果： ☐是　☐否　☐不清楚　**說明：**	

Characteristics of patients who received the Biopatch™ intervention

	Total (N=121)	Dialysis Center A (n=55)	Dialysis Center B (n=66)	*P*-value
	n(%)	n(%)	n(%)	
Gender				
Male	52 (43%)	25 (45%)	27 (41%)	0.75
Female	69 (57%)	31 (55%)	39 (59%)	
Median Age (range in years)	56 (19–88)	57 (26–87)	56 (19–88)	0.93
Race				
African-American	97 (80%)	42 (76%)	55 (83%)	0.46
Caucasian	23 (19%)	13 (24%)	10 (15%)	
Other	1 (1%)		1 (2%)	
Median BMI (range)	27.1 (14.7–71.6)	25.9 (16.3–53.6)	27.8 (14.8–71.6)	0.31

步驟2:研究探討的問題為何

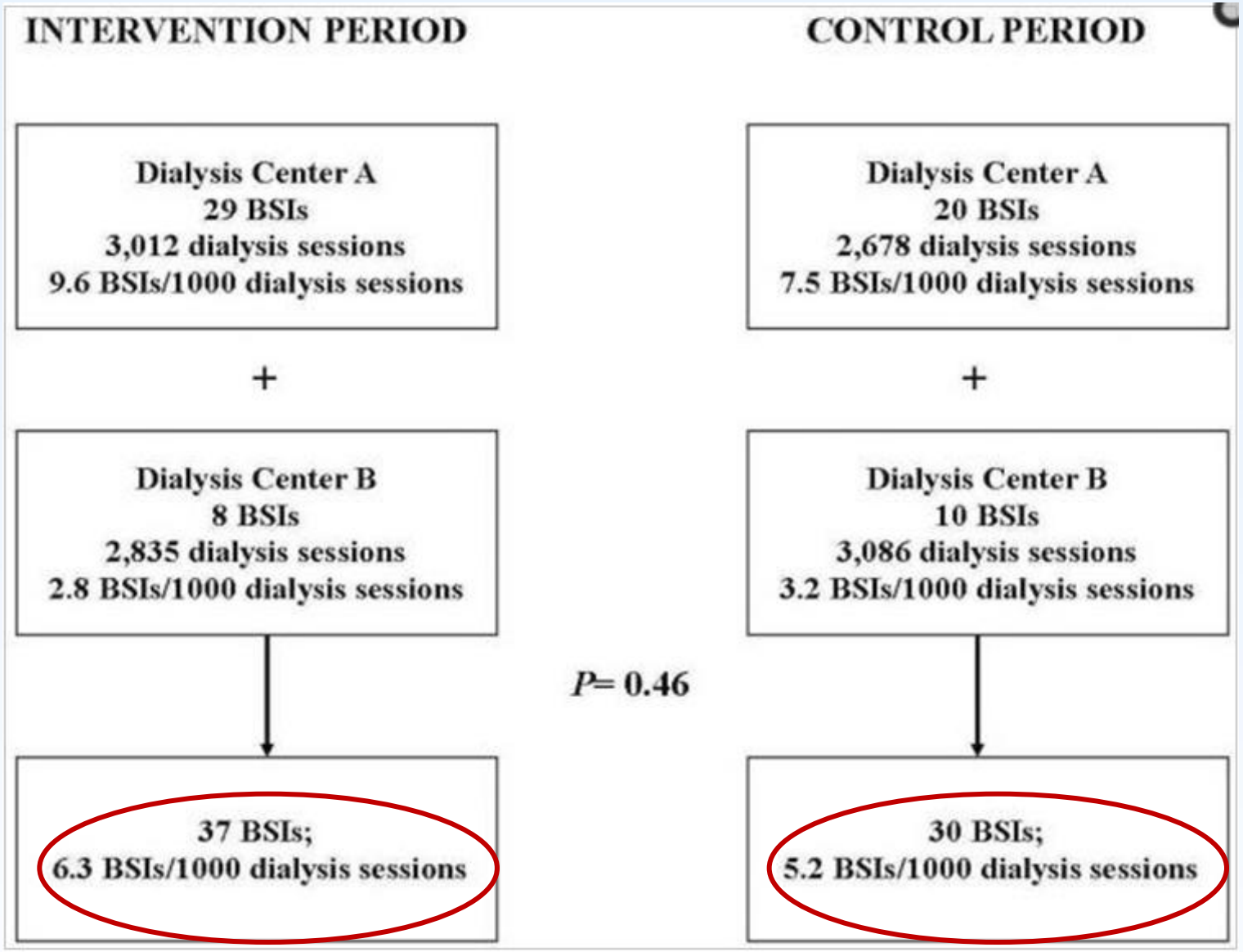
維持(Maintenance) - 各組是否給予相同的治療？	
最好的狀況是？	**我可以在哪裡找到這些資訊？**
各研究組別之間，除了對病人的介入之外，其餘的治療應完全相同(即為了執行本研究所增加的治療、檢驗或評估應相同)。	在文章的**方法**段落中，可以找到各組詳細的治療方式(如追蹤時間表、研究中可以使用的額外治療），在**結果**段落中，應該也可以找到更進一步的資訊。
評讀結果 □是 □否 □不清楚 說明：	

- Protocols for routine catheter care prior to the study included the use of a sodium hypochlorite solution (0.114% by volume) for skin/catheter antisepsis prior to each dialysis session.
- The catheter exit site was dressed with a transparent dressing every seven days unless there was visible blood, soiling, or if the dressing came off. The same dressing change schedule was continued when the intervention began.
- A new dialysis catheter care protocol incorporating the use of the BIOPATCH® Antimicrobial Dressing was instituted and standardized at both hemodialysis centers at the start of the intervention.

步驟2:研究探討的問題為何

…是否有足夠的追蹤(Follow up)？	
最好的狀況是？	我可以在哪裡找到這些資訊？
研究中流失(無法繼續追蹤)的病人，最好少於 20%。病人應依照隨機分配的組別進行統計分析(即「治療意向分析法」Intention – to-treat , ITT analysis)。	在文章的**結果**段落中，應可以找到接受隨機分配的病人人數，以及實際進行分析的人數。有時會有流程圖(如果沒有，可自行繪製)。
評讀結果：□是　□否　□不清楚　說明：	

- One hundred twenty-one patients with tunneled central venous catheters were treated with the chlorhexidine-impregnated dressing at both dialysis centers over the one-year period.
- Two patients withdrew consent after just two dialysis sessions so use of the BIOPATCH® Antimicrobial Dressing was discontinued on these patients.
- The intent to treat analysis included 5847 dialysis sessions in the intervention period and 5764 dialysis sessions in the control period.


INTERVENTION PERIOD
CONTROL PERIOD
Dialysis Center A
29 BSIs
3,012 dialysis sessions
9.6 BSIs/1000 dialysis sessions
Dialysis Center A
20 BSIs
2,678 dialysis sessions
7.5 BSIs/1000 dialysis sessions
+
+
Dialysis Center B
8 BSIs
2,835 dialysis sessions
2.8 BSIs/1000 dialysis sessions
Dialysis Center B
10 BSIs
3,086 dialysis sessions
3.2 BSIs/1000 dialysis sessions
P= 0.46
37 BSIs;
6.3 BSIs/1000 dialysis sessions
30 BSIs;
5.2 BSIs/1000 dialysis sessions

步驟2:研究探討的問題為何

評估(Measurement) - 受試者與評估者是否對治療方式及(或)評估目的維持盲法(blind)？	
最好的狀況是？	我可以在哪裡找到這些資訊？
在客觀結果(如：死亡)方面，盲法的重要性較低，但在主觀結果(如：症狀或功能)方面，評估者維持盲法非常重要。	在文章的**方法**段落中，可以找到研究結果的評估方式，以及評估者是否知道病人接受何種治療。
評讀結果：□是　□否　□不清楚　說明：	

- Infection rates between the control and intervention groups were compared using chi-square analysis.
- Catheter-related bloodstream infections were monitored by the infection control practitioner and the dialysis center staff.
- All blood cultures of all hemodialysis patients at the two dialysis centers were reviewed, as well as all their hospital admissions to identify catheter associated bloodstream infections.

步驟3:研究結果的意義為何

- Results.
  - Thirty-seven CRBSIs occurred in the intervention group, for an incidence of 6.3 CRBSIs per 1,000 dialysis sessions, and 30 CRBSIs occurred in the control group, an incidence of 5.2 CRBSIs per 1,000 dialysis sessions (risk ratio, 1.22 [95% CI, 0.75–1.97]; P =.46).
  - The chlorhexidine-impregnated foam dressing was well tolerated, with only 2 patients (< 2%) experiencing dermatitis that led to its discontinuation.
  - *The only independent risk factor for development of CRBSI was dialysis treatment at one dialysis center (adjusted odds ratio, 4.4 [95% CI, 1.77–13.65]; P = .002).*
  - Age of at least 60 years (adjusted odds ratio, 0.28 [95% CI, 0.09–0.82]; P = .02) was associated with lower risk of CRBSI.

Sample size?
Quality of care?

- Conclusions.
  - The use of a chlorhexidine-impregnated foam dressing ***did not*** decrease the incidence of CRBSI among patients with tunneled central venous catheters who were undergoing hemodialysis.

Clinical and Cost Effectiveness of Guidelines To Prevent Intravascular Catheter-Related Infections in Patients on Hemodialysis

CNE
Continuing Nursing Education

Outcome

Population

As of December 31, 2007, there were 341,264 individuals in the U.S. on hemodialysis (HD) (U.S. Renal Data System [USRDS], 2009). Research has shown the incidence of morbidity and

Bakke, C.K. (2010). Clinical and cost effectiveness of guidelines to prevent intravascular catheter-related infections in patients on hemodialysis. *Nephrology Nursing Journal, 37*(6), 601-616.

Nephrology Nursing Journal

Research purpose

研究目的為針對血液透析公佈實施之指引在臨床和成本之效益評估。

Comparison & Intervention

198例使用標準護理→次氯酸鈉清洗出口處，聚維酮碘清洗導管集線器

198例使用CDC公佈指引→chlorhexidine清潔出口部位和導管集線器、洗手、採無菌技術換藥/換管

Data Sources/Population

受試者來自威斯康辛州Marshfield診所，使用血管內導管血液透析、21歲或以上門診之男性或女性，未排除共病(如糖尿病，癌症)。

Measurement

(標準治療)從2008年5月~2009年4月回顧透析單位所有CRI，(前瞻性)相比2009年5月~2010年4月的數據來測量。

Primary outcome

血管內導管相關血流感染比率

Table 2
Product Comparison/Cost-Effective Analysis

Dialysis Product/Cost Tracker

Cost-Effective Analysis of Three Different Products	Proposed Item	Current Item	Current Item
Costs	**Item A: Chlorhexidine 3.15%/Alcohol 70% Swab**	**Item B: Sodium Hypochlorite Solution**	**Item C: Chlorhexidine Soap 4%**
Direct Costs: Supplies and RN Time			
Product (item A = 7 swabs for site-care/HD lines; item B = 5 ml of solution; item C = 2.5 ml of soap)	$0.70	$0.16	$0.03
RN time @ $39/hour with benefits doing site care; A = 3 minutes, B = 3 minutes, C = 5 minutes	$1.95	$1.95	$3.25
NS syringe 10 cc			$0.30
4x4 gauze @ $0.05 each		$0.10	$0.10
Betadine swab for catheter hubs		$0.95	$0.05
RN time @ $39/hour with benefits doing HD hub/line care; A = 1 minutes, B = 3 minutes, C = 3 minutes	$0.65	$1.95	$1.95
Indirect Costs			
Same regardless of site-care used			
General and Administrative Costs			
Same regardless of site-care used			
Total production costs per unit	$3.30	$4.21	$5.68
Number of patients (variable) with HD cathter	18	18	18
Total production costs three times a week (TTW)	$178.20	$227.34	$300.72
Total production costs per year (52 weeks)	$9266.40	$11,821.58	$15,949.44

Figure 1
Retrospective (Pre-Intervention) and Prospective (Post-Intervention) Patients on Hemodialysis with Intravascular CRI

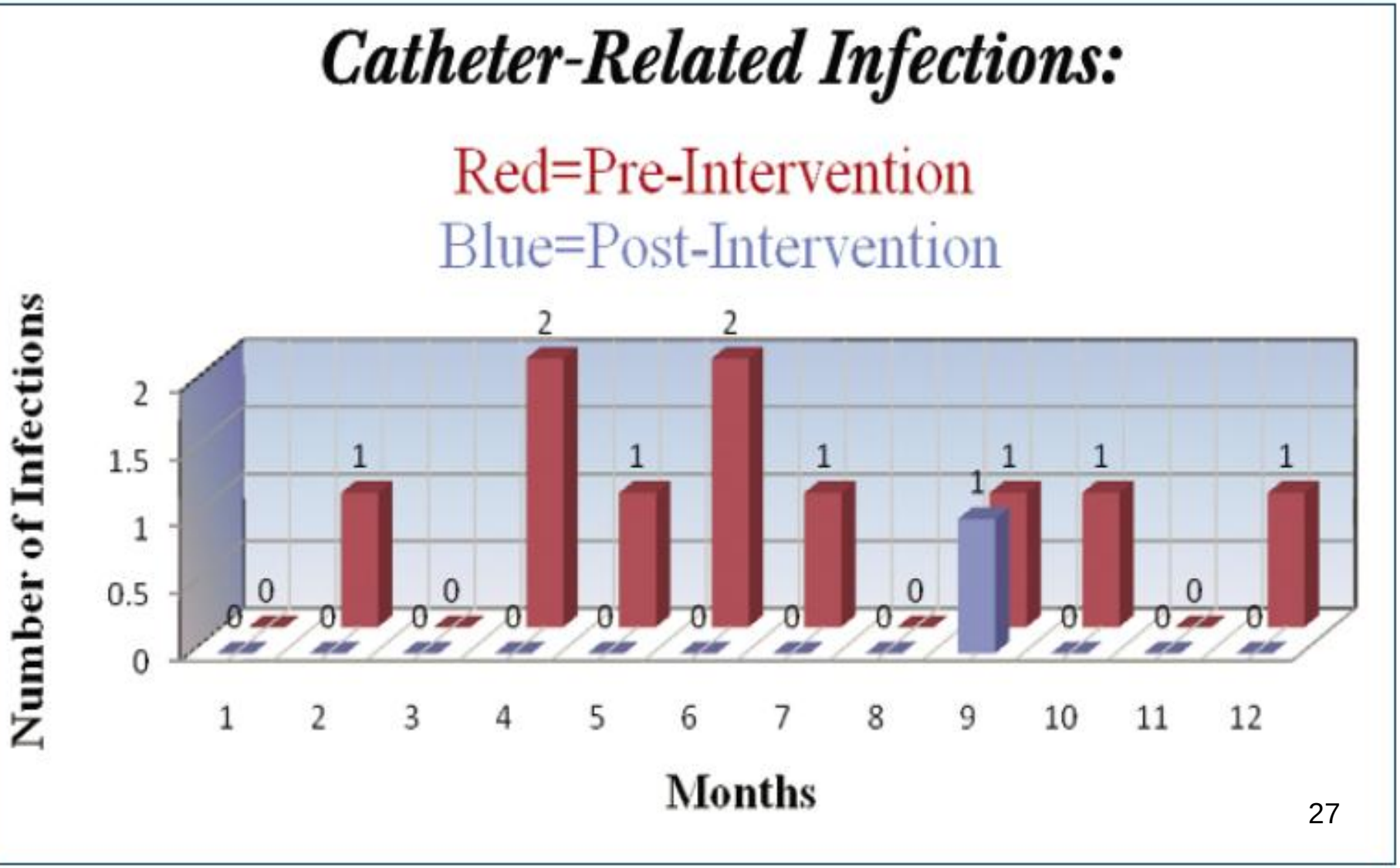


Table 5

Retrospective and Prospective Group Comparison for Catheter-Related Infections

Groups	Infections in 12 Months	M/SD	Sig ($p < 0.05$)	95% CI Lower/Upper
Retrospective ($N = 198$)	10	0.8333/0.71774		
Prospective ($N = 187$)	1	0.0833/0.28868		
			0.005	0.27247/1.22753

Outcome

- 為期12個月的監測，感染數由10下降到1(P = 0.005)或1.7下降到0.2/1000導管日。
- 每年可節省一個透析單位141,606美元，具統計顯著差異。

Discussion Point

- 本院導入Chlorhexidine作為bundle care介入措施已行之有年，臨床上亦證實其能有效降低中心靜脈導管血流感染率
- 目前門診病人使用perm catheter作為血液透析管路，而perm cath. 應可認定為中心靜脈導管，**建議院方改以Chlorhexidine 進行穿刺前的消毒?**

同意:25人

懷疑:1人

不同意:0人

- **Act!**
  - 跟藥庫協調領用！

THANK YOU FOR YOUR ATTENTION

咁听鳴?

YESSS FINALLY IT'S OVER