



Results of a multicentre randomised controlled trial of statistical process control charts and structured diagnostic tools to reduce wardacquired meticillin-resistant *Staphylococcus aureus*: the CHART Project

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Introduction

- 從1900年代開始MRSA感染率不斷上升

(Albertini MT,2002 , Johnson A,2005... 等)

- 監控的目的是為了減少Ward-Acquired
Meticillin-Resistant Staphylococcus Aureus
(WA-MRSA)感染率

(Health Protection Agency,2006)

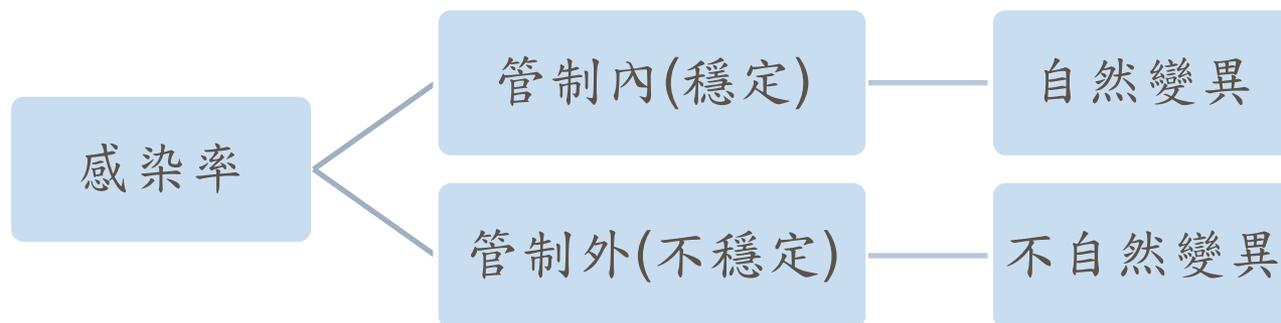
- 附加回饋系統，能有效的預防感染以及控制
(infection prevention and control ; IPC)

(Haley RW,1985 , McCoubrey J,2005)

- 將提高IPC品質的做法回饋給前線護理人員

(Benneyan JC, 1998 , Nelson EC, 2002)

- 不自然變異將會造成感染率上升



(Mohammed MA, 2001)

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- Infection control team (ICT) 產生SPC管制圖
提供解釋病房中的自然以及非自然變異

(Curran ET,2002)



- 此研究有以下兩點重點

- (1) 將WA-MRSA資料由SPC回饋給護理人員 (healthcare workers ; HCWs) 並建議改善感染控制做法

- (2) 另外使用品質改善工具，以改進整體系統

- 品質改善工具如：Pareto或是Fishbone cause-and-effect charts

Methods

■ 實驗資格

1. have not used SPC, Fishbone or Pareto charts before the study;
之前並無使用SPC以及魚骨圖或是Pareto charts
2. be stable in terms of size (past and future);
醫院規模穩定
3. be stable in terms of bed occupancy (past and future);
病床佔有率
4. be similar in focus, i.e. patient types/ treatments;
類似的病人類型或治療方法
5. be similar in design, e.g. bays and single-bedded rooms;
類似的單人房間或沿海房間設計
6. be able to provide WA-MRSA incidence data for 25 months before the start of the study;
能夠提供25個月開始研究WA- MRSA的發病數據
7. have a monthly WA-MRSA incidence average ≥ 1 as measured over the 12 months before the start of the study
每月WA-MRSA平均發病率 ≥ 1 來衡量過去 12個月前開始這項研究。

- 每間醫院提供三間病房，並隨機配合三種不同的 arms：
 1. wards receiving SPC chart feedback (SPC arm)
 2. wards receiving SPC feedback together with structured diagnostic tools (SPC + Tools arm)
 3. wards receiving no new feedback of either type (Control arm)
- 三者間資訊不會互相流通

- 每個中心使用相同”協議”，計算WA-MRSA，即相同方法
- 每個小組中需有一個高級微生物學家或是專家
- 每個月進行資料上傳及更新，並將簡易的註解描述傳送至病房

- 對於SPC + Tools wards ，感染控制護士 (infection control nurses ; ICNs)將在第4個月，10，17和22聆聽IPC作法
- 對於Control wards ，製作出SPC管制圖以及審查後即結束
- 魚骨圖可找出造成交叉傳染的原因。

Figure 1 Examples of annotated statistical process control (SPC) and Pareto charts. Diamonds/solid line: total; dashed line: centre line (mean); dotted lines: upper and lower control limits.

Sample chart for an SPC + Tools ward at the end of the study

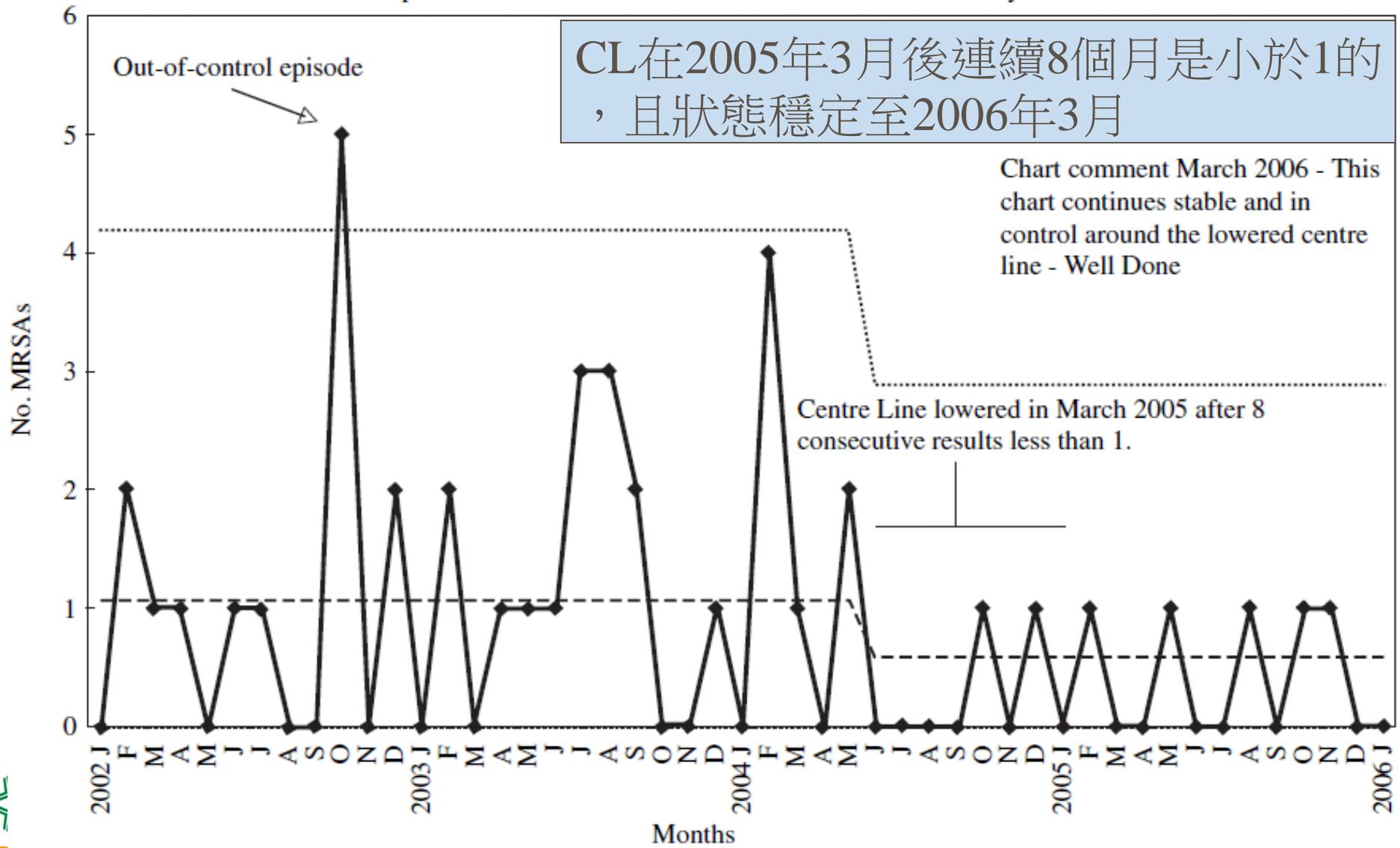
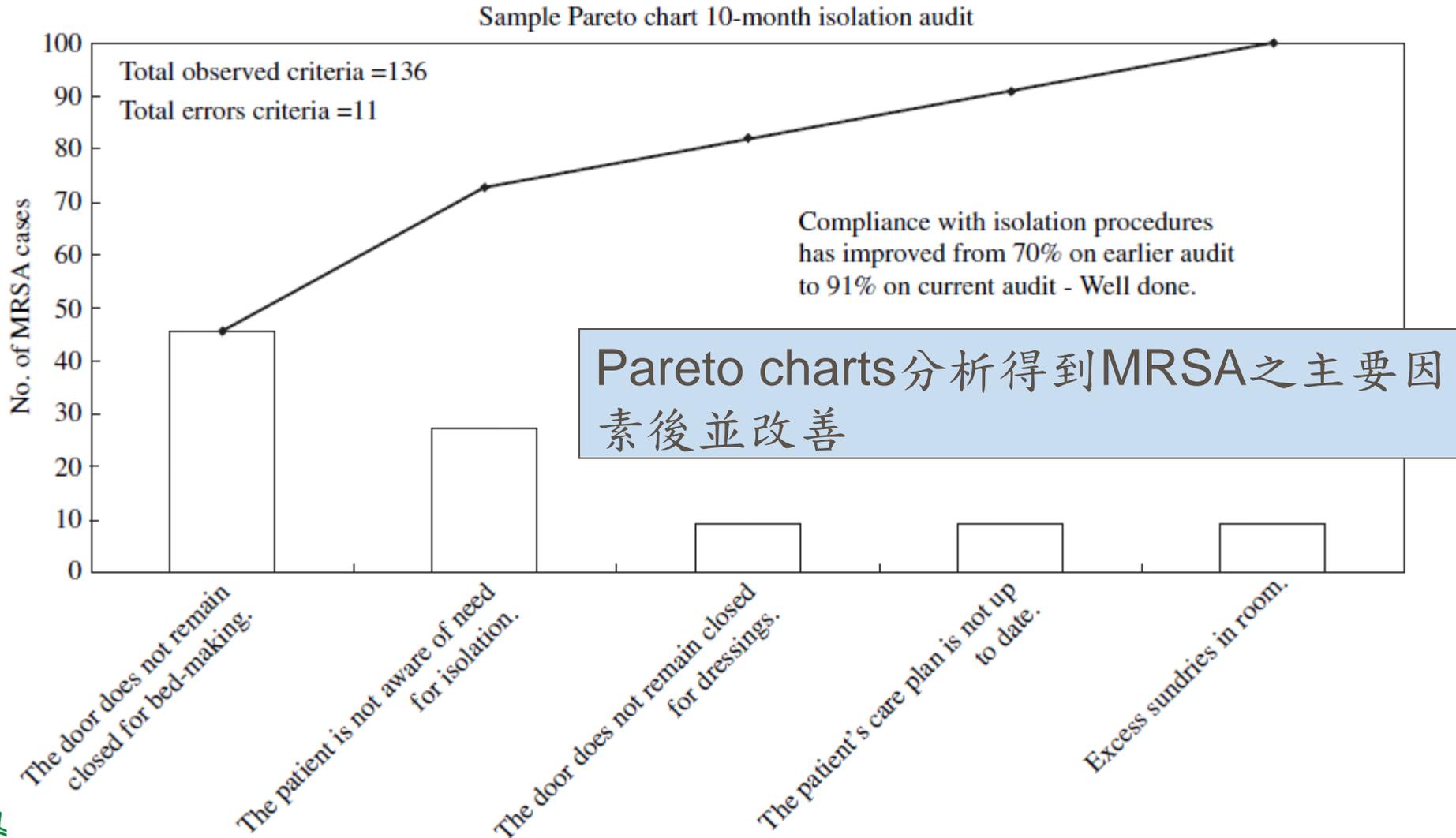


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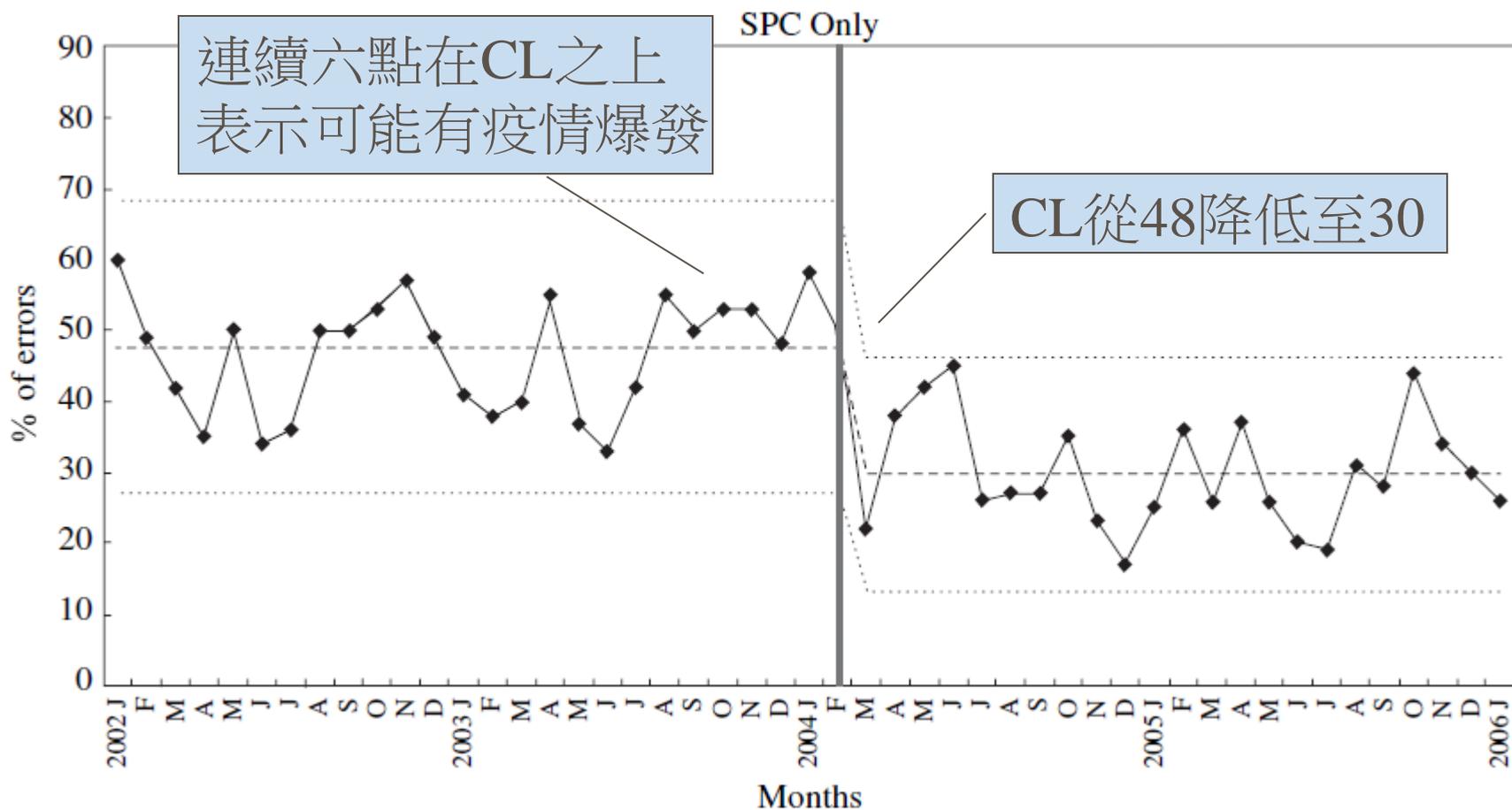


(Quoting D Berwick, please remember, 'Feedback is for improvement not judgement' - well done)

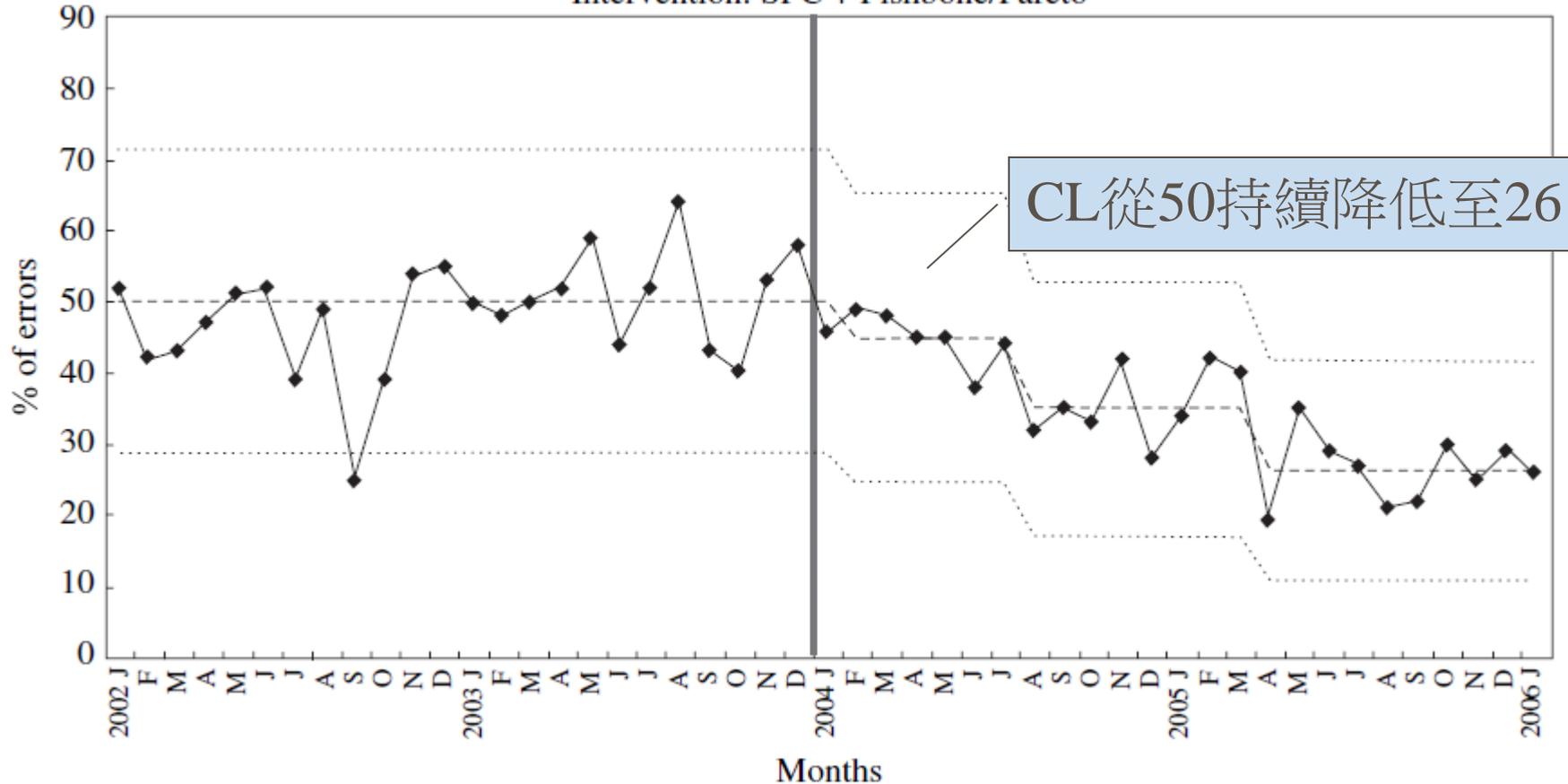


Results

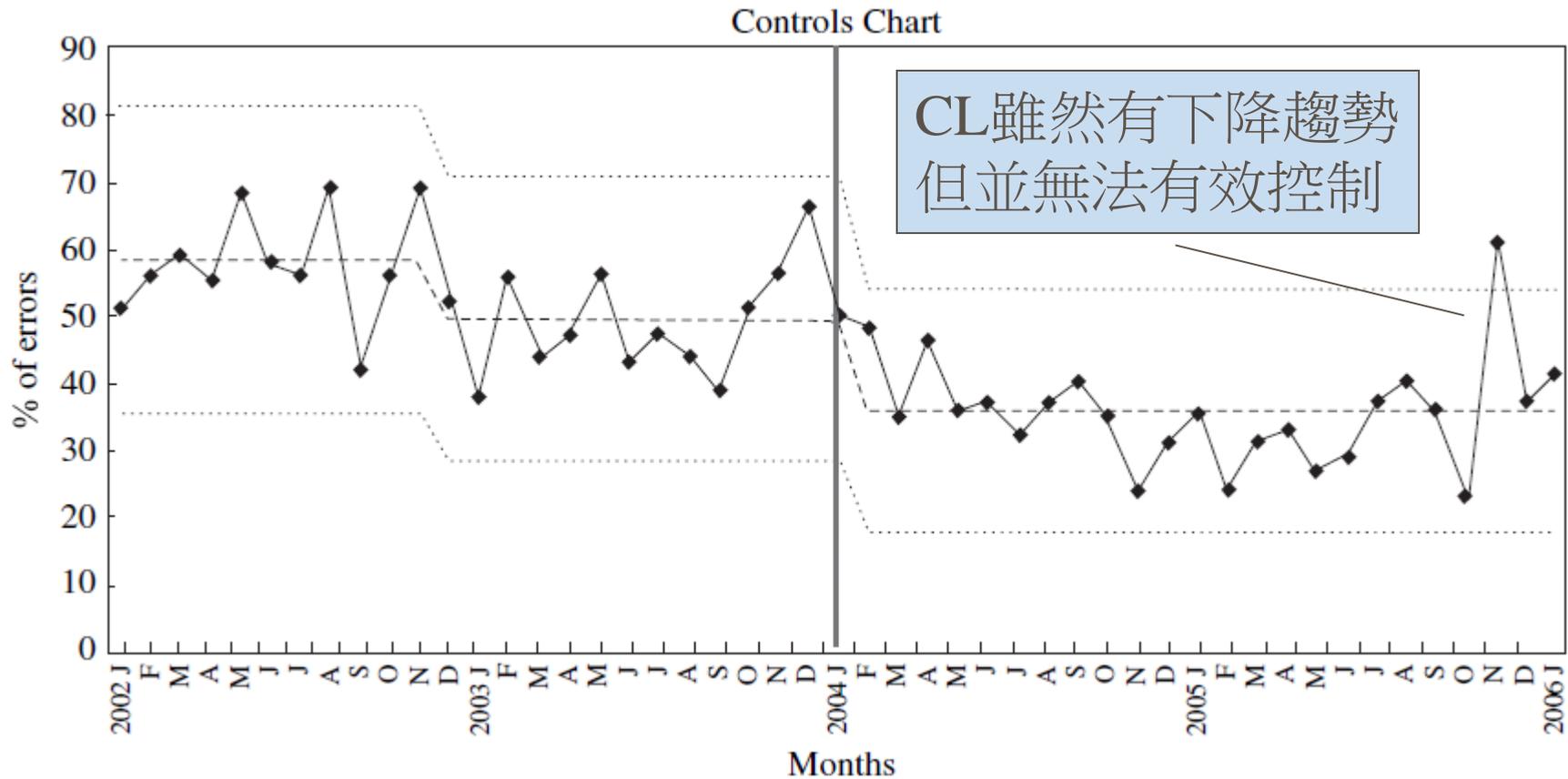
Within-arm MRSA rate stability



Intervention: SPC + Fishbone/Pareto



CL從50持續降低至26



Results

Percentage rate reductions

- 無論何種方式都為顯著降低WA-MRSA
- 在使用arm後之平均明顯降低(紅色框)
- SPC+Tool在Mean out-of-control months after intervention為最小(藍色框)，表示此方法更能有效控制感染

Table 1 Mean number of out-of-control months after intervention and mean (SD) number of new MRSA cases per month per ward before and after intervention

Arm	No. of wards	Mean out-of-control months after intervention	No. of new MRSA cases per month				
			Before	After	Mean % reduction	95% CI	P-value
All data							
SPC only	25	0.28	1.93 (0.72)	1.26 (0.59)	32.3 (31.5)	19.3–45.3	<0.001
SPC + Tools	25	0.28	1.99 (1.08)	1.47 (0.78)	19.6 (37.6)	4.1–35.1	0.015
Control	25	0.60	2.15 (1.35)	1.46 (0.78)	23.1 (27.4)	11.8–34.4	<0.001
Final 12 months before and after intervention							
SPC only	25	0.12	1.95 (0.88)	1.22 (0.54)	30.2 (34.5)	15.9–44.4	<0.001
SPC + Tools	25	0.08	2.09 (1.26)	1.27 (0.79)	28.0 (53.7)	5.9–50.2	0.015
Control	25	0.32	2.01 (1.33)	1.42 (0.81)	18.8 (30.5)	6.3–31.4	0.005

MRSA, methicillin-resistant *Staphylococcus aureus*; SPC, statistical process control.

Discussion

- 三種arm之方法都能有效管控WA-MRSA，但其中SPC+Tool比起其他兩種(SPC only & Control charts)更能有效控制
- 透過每月所建立的管制圖進行分析檢討，創造一個類似'品管圈'以預防感染率上升
- 此方法可用於其他HCAIs(醫院醫療感染)

■ 此研究結果

1. ICT小組能在第一時間調查WA-MRSA率升高原因
2. 可協助醫院發掘新株菌產生
3. 改進整體醫院之體制，透過直接醫療人員(護士長或其他相關人員)進行改善預防感染及控制
4. 可有效的管制感染

THE END

- SPC在偵測感染率已被證實為有效的工具，當感染率偏高時，護理人員往往並不知道原因以及改善措施，因此，此篇提出了SPC+Tool合併工具使用，將能有效的預防感染及控制



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