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計劃名稱

兒童加護照顧之評估

Evaluation of Pediatric intensive Care

執行機構：國立成功大學醫學院附設醫院

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(A) 中文摘要

背景說明: 疾病嚴重度的評估相當的重要，它不僅可以預測疾病預後是否良好，可給予病患家屬以及醫療團隊作為參考，更可以從嚴重度的變化來作為加護照顧好壞的指標。但是目前在國內卻缺乏一個有效的方法來評估兒童疾病的嚴重度及進一步預測其預後，而在衛生署評鑑兒童加護病房分級制度時，也因此欠缺收案適當度的參考。目前在國際上最常應用來作為對於兒童加護照顧的評估方法，大致是以 Dr. Pollack 提出的Pediatric Risk of Mortality Score (PRISM score) 為主。兒童死亡危險評估表(PRISM score)是一個利用住入加護病房當日24小時內的生命徵象，神經學檢查，和一些血液生化數值來評估兒童疾病的危險度，及預測病亡的機率。目前兒童危險評估表已於1996修改到第三版本 (PRISM III)。Dr. Pollack 所屬的 Children's National Medical Center 研究小組目前更將原本的 PRISM score 再加上病患的各項資料進行電腦化登錄並建立一個資料庫 (Pediatric ICU Evaluations, PICUEs).

目的: 本研究的目的,在於探討應用 PRISM III score, 來評估台灣重症兒童病患的嚴重度及預測死亡率的可靠性及可行性。並加入PICUEs,以取得美國同等級兒童加護病房資料和本院的兒童加護病

房作為比較，評估其效率以及品質的監測，並預期累積經驗來作為將來衛生署評鑑國內兒童加護病房的參考。

設計: 前瞻性，觀察性研究。

病患: 某南部大學醫院中心小兒科加護病房連續一年的住院病患。

方法及結果: 從民國88年11月到民國89年10月，一共有385位兒童的412人次(202位男童及183女童)住進小兒科加護病房;平均年齡是53.9月(範圍從1個月到18歲)。 分析最常住進加護病房的原因是呼吸衰竭(26.7%)。而有將近六成的住院病患具有一種以上的慢性重大疾病。而病童住加護病房的平均住院天數是5.06天(範圍從1天到81天)。平均兒童嚴重度指標是5.06分(範圍從0分到44分)。平均總體死亡率是8.17%，與預測死亡率(7.56%)兩者間並無統計上的意義差異(p 值為0.65)。 但是標準加護病房住院天數比值(Standardized PICU length of stay ratio, SLOSR)是1.33，與預測加護病房住院天數比值兩者間有統計上的意義差異 (p 值為6.1)。加護病房平均總體照顧效率為32.5%。

結論: 由本研究結論顯示，兒童死亡危險度評估表(PRISM III score)可以作為預測臺灣重症兒童預後指標。 但是在加護病房住院天數的預測性似乎有差異。我們推想在不同國家的醫療環境均有差異，因此我們要利用國外的兒童死亡危險度評估表來判斷我們的加護病房

住院天數或照顧效率時，仍必需考慮國內外情形的差異性。 有待將來對於重症兒童的加護照顧更大規模研究， 建立本土的資料庫後，累積經驗來作為將來衛生署評鑑國內兒童加護病房的參考。

關鍵字: 兒童加護病房, 加護照顧, 病患預後評估, 嚴重度指數

(B) 英文摘要 (English Abstract)

Background: Severity of illness assessment has been crucial in quality assessment, control for severity of illness in clinical studies, and resource utilization and management studies in pediatric intensive care unit (ICU). The Pediatric Risk of Mortality (PRISM) score is a means of predicting risk of mortality based on day-of-admission vital signs, neurologic examination, and laboratory results.

Objective: This study was to assess the validity of the PRISM III scoring system in accurately predicting the probability of mortality in a pediatric intensive care unit (PICU) in Taiwan.

Design: Prospective, observational study.

Setting: A university hospital pediatric intensive care unit in Tainan.

Patients: From Nov. 1999 to Oct. 2000, consecutive patients admitted to PICU during a one-year period.

Measurement and Results: our PICU had 412 admissions of 385 patients (202 boys and 183 girls) with an average age of 53.9±58.2 months (range: 1 month to 18 years). The most common cause for admission was respiratory failure (26.7%). Almost 60% of the patients had at least one underlying chronic disease. The average duration of stay was 4.52±8.43 days (range 1 day to 81 days). The average PRISM III score was 5.06±6.95 (range 0-44). The overall mortality rate in PICU was 8.17%. The mortality rate were not significant different from the predicted rate (7.56%) (p value =0.65). At the meanwhile, the efficiency of care was 32.5% and the standardized

PICU length of stay ratio (SLOSR) was 1.33. SLOSR ratio was significant higher than predicted rate (p value =6.1).

Conclusions: The PRISM III score is valid for assessing mortality risk of PICU patients in Taiwan. However, our SLOSR ratio was higher than predicted. We speculate that different pattern of medicine practice plays an important role in observed PICU length of stay. Special caution is still needed in adopting a severity of illness scoring system to assess performance of care, particularly in contexts different from the ones in which the instrument was originally developed. A further study including more units and other regions would have greater generalization.

Key words: pediatric intensive care, intensive care unit, outcome assessment, mortality prediction.

(I) 前言

雖然兒科醫學在不同的專科領域方面近年來日新月益，使得兒童的加護照顧 (pediatric intensive care) 有了極大的進展及突破。但是目前在國內卻缺乏一個有效的方法來評估兒童疾病的嚴重度及進一步預測其預後，也因此使得兒童加護照顧的成果無法更進一步來作比較。

疾病嚴重度的評估相當的重要，它不僅可以預測疾病預後是否良好，可給予病患家屬以及醫療團隊作為參考，更可以從嚴重度的變化來作為加護照顧好壞的指標。目前在國內，成人加護病房使用Dr. Knaus 所發展出來的 APACHE score [1]來評估，而且這套系統不止在國內、國外已被人廣為採納。而目前國內的新生兒加護病房也有 NTISS score [2] 來使用評鑑，我們也常用這些指數來評估一個加護病房收病患住院的適當度，甚至作為加護病房分級以及健保局給付參考的重要依據。但是兒童加護病房 (pediatric intensive care unit, PICU) 所照顧的病患年齡由一個月以上到十八歲以下， 範圍差異很大。 因此要設計一個方便使用，而且適合於兒童加護病房的評估表並不容易。因此目前國內在評鑑兒童加護病房時，並沒有規定使用任何評估系統。

目前對於兒童加護照顧的評估方法，國際文獻上大致有以下數種方法: Therapeutic Intervention Scoring System (TISS) [3-4], Physiologic stability Index (PSI) [5]. 以及 Pediatric Therapeutic and Diagnostic Intervention Score (PTDIS) [6]等方法。 但是以上方法在使用時有過於繁瑣的現象。例如 PSI score 所要記錄的生理指數有 34 項，因此恐怕在國內各個兒童加護病房無法一體適用。 Dr. Pollack 因此於西元 1988 年提出了一套新的方法：兒童死亡危險度評估表 Pediatric risk of mortality score (PRISM socre) [7]。以實用性以及方便性而言，PRISM score 所要記錄評分的指標已經簡化為 14 項，而且這 14 項都是加護病房內幾乎一定要評估的生理變化。因此目前 PRISM Score 已經成世界各國在作兒童加護病房評鑑時所採用的標準 [8-9]。而我們在過去的三年內也應用 PRISM score 來評估本院的兒童加護病房，並將研究的結果發表於國內學術會議及學術期刊中 [10-13]。

但是依據我們的這些研究結果發現，雖然 PRSIM score 不論在兒童內科或兒童外科的病人都有很良好的適用性[10-12]。但是對於一些我們預測是低危險度的病人其實際的亡率卻高於預測死亡率，且具有統計上的意義。但是在中高危險度的病人的實際死亡率和預測死亡率相差不多[13-14]。這種現象在世界其他各國也發現和我們的情形類似

[15-18]。檢討這些 PRSIM score 在國際各國使用的結果，Dr. Slonim 和 Dr. Pollock 推論可能是因為各國家之間的情形並不完全相同，而且在原始的 PRSIM score 中並沒有討論一些有慢性疾病例如癌症，可能會加重急性疾病的危險度[19]。

因此 Dr. Pollack 於西元 1996 年提出第三版 PRISM III score 之後[20]，目前更進一步將原本的 PRISM score 再加上病患的各項慢性疾病或先天疾病的醫療資料進行電腦化登錄並建立一個資料庫，其目的在於建立一套兒童加護病房評估系統(Pediatric ICU Evaluations, PICUEs)。Dr. Pollack 所屬的 Children's National Medical Center, Washington D.C. 並邀請各醫學中心參與 PICUEs (附件一)，並將各兒童加護病房作一比較。以目前科技之進步，醫療資訊電腦化作業已刻不容緩，重症醫療的品質監測更必須有科學化的統計分析。 因此本計劃的目的，就是加入 PICUEs，應用 PRISM III score，來評估台灣重症兒童病患的嚴重度及預測死亡率。 再則對本院的兒童加護病房，評估其效率以及品質的監測，並將臺灣的資料和美國國內同級的兒童加護病房作一比較，並預期累積經驗來作為將來衛生署評鑑國內兒童加護病房的參考。本計劃也同時希望藉此建立本土的資料庫， 透過電腦化資料登錄， 在連線之後可以為將來國內重症兒童通報系統，作前瞻性的歸劃。

(II) 研究對象與研究方法

本計劃的研究對象是在研究期間內，每一位住進成大醫院小兒加護病房的重症病童。我們將使用 PRISM III 評估量表(附件二)詳細記錄以下幾大項: (A) 病患的基本資料: 包括病患姓名，年齡，性別，病歷號碼等; (B) 住院時候的狀態: 包括由急診直接住院，轉診住院，普通病房轉入加護病房，或手術後住院; (C) 住院時候的診斷: 包括導致急性住院的原因及診斷，病人原先的疾病狀態 (Underlying disease); (D) PRISM III score : 包含(1)心肺功能監測: 血壓，呼吸，心跳，體溫; (2)血液氣體分析: 酸鹼度，氧氣值，二氧化碳值; (3)生化值: Na, K, Ca, Sugar, BUN, Creatine, Calcium, Total bilirubin; (4)血液數值: Hemoglbin, WBC, Differential count, Platelet count, PT, PTT; (5)神經學反應: 瞳孔大小，兒童昏迷指數; (E) 病患預後評估: 包括病患住院天數，死亡，出院或轉院。 (F) 病患住院期間介入性治療的項目及時間長短，包括：使用呼吸器天數，使用靜脈注射強心劑，血液透析，中心靜脈導管等。此份評估量表共有四頁，詳細的情形附於附件二。

為避免誤判結果，在登錄一些基本資料時，計劃由專任研究助理負責抄寫登記，但在涉及診斷及嚴重度評估時，將由小兒科醫師負責評分。在評估PRISM III score時，我們計劃在住院後的前12小時由

加護病房的小兒科醫師評估，並由此分數來作為預測疾病嚴重度。每份評估量表在完成之後，將交給計劃主持人或協同主持人審查，再由專任研究助理負責登錄PICUE電腦程式。 每月定期列印資料結果，並與原始資料交互比對，以免疏失。同時也將結果定期備份磁片。

於研究期滿後，將各項資料加以統計分析，以多變異數分析模式(multivariate logistic regression modeling)來由病患的 PRISM III score 來計算致死的機率(Risk of death)(附件 3)。另外我們也由 PRSIM III score 來計算預期住院天數(附件 4)。另外我們採用文獻上定義[21]來計算標準加護病房天數比值(Standardized PICU length of stay ratio)以及加護病房效率(附件 5)。最後各項資料同時也將磁片傳送給 Dr. Pollack 的研究小組進行進一步分析，完成結果報告。

(III) 研究結果

雖然第三版的兒童死亡危險度評估表(PRSIM III)的使用是公開而且免費的，但是要加入 Dr. Pollack 所主導的 PICUE 計劃並使用資料庫之前，必須由 Dr. Pollack 小組先行審核後再行付費使用。因此我們在本計劃開始後便積極和 Dr. Pollack 聯絡並簽約確定一個年度的使用許可(88 年 11 月 1 日到 89 年 10 月 31 日止)(附件 3)。

因此我們收集由民國 88 年 11 月 1 日到 89 年 10 月 31 日止，年齡於一個月到 18 歲(平均年齡 53.9±58.2 日)，住入本院小兒科加護病房的病患資料進行分析。一共有連續 385 位兒童(202 位男童，183 位女童)的 412 人次住入小兒科加護病房，平均每個月有 34.3 人次住院。其中有 79.4%的病人是內科急症住院，有 18.6%的病人是手術後照顧。最常見住入小兒科加護病房的原因是因為呼吸道疾病導致呼吸衰竭(26.7%)，其次是先天性心臟病(15.6%)以及敗血症(12.9%)(圖 1)。這些病患當中具有慢性重大疾病的有 242 個(59.9%)，其中以先天性心臟病的 65 例，癌症的 37 例以及腦性麻痺的 36 例。其次在疾病嚴重方面的 PRSIM score 最低是 0 分，最高是 44 分；平均是 5.06±6.95 分(圖 2)。

在預後方面 412 人次住院中，有 8 位病患因其他因素轉到別家醫院，而不列入預後分析比較。有 371 位順利存活出院，有 33 位病患死亡。實際死亡率是 8.17% (33/404)，預期的死亡率是 7.56%，在統

預期的死亡率是 7.56%，在統計上不具有差異(P=0.65)。當我們討論加護病房的預後時，我們發現病患若是由救護車送到醫院者，代表病情較為嚴重，其死亡率達 20.9%(圖 2)。在原因方面若是因為癌症或者是創傷而住入加護病房其死亡機率也高達 33%(圖 4)。

住院天數由 1 天到 81 天(平均是 4.52±8.43 天)(圖 5)，其中以缺氧性腦病變的住院天數最長(平均 13.1±27.2 天)(圖 6)。若是以標準住院天數比值來看，則先天性異常和早產兒肺病者都是造成住院延長的慢性病因(圖 7)。但全部而言，本院的標準住院天數值是 1.33，在統計上是具有明顯差異的(P 值= 6.1)。在照顧效率方面，全部的照顧效率是 32.5%；在存活者方面為 30.4%；但死亡者為 41.6%。若是以病因來看，先天性心臟病、休克和癌症都是照顧效能的前三位(65.2%，53.3%，52.2%)。最後由 Dr. Pollack 的資料庫中，找到在北美地區和本院加護病房相同規模的醫學中心加護病房共有 32 家(名稱以合約規定不得對外公佈)，若以粗死亡率來看，本院以 8.17% 排名第 28，但若以標準死亡率本院排名 21，若以內科急症的比率為 79%占第 23 位。若以住院天數，本院所住院的是 4.52% 排名第 27 位，但若是以標準住院商數值，則本院為 1.33%，是最差之表現。(Dr. Pollack 的來信和總結附於附錄 6)。

(IV) 討論

由本研究顯示，最常利用到小兒加護醫療資源的病患，有百分之60 具有先天性重大疾病，而最常導致小兒重症的問題也和呼吸循環系統的疾病占大多數。若和國外的加護病房的住院因素比較，則國外以創傷以及心血管疾病手術的病患比較多[8,9,15,16]。這也許是因國外的兒童加護病房以多功能導向(multidisciplinary)為主。

由本研究結果顯示若是應用 PRSIM III 的評估量表，已經可以相當準確的預測疾病嚴重度和死亡的關係。我們所觀察到的死亡率是8.17%，而預期的死亡率沒有統計上的差異。因此 PRSIM III score 在台灣的使用已比原始的 PRSIM score 有相當高的適用性，但是我們的死亡率在同等級的美國醫學中心比較下仍是屬於中下成績(第 24/33 名)。這也許說明代表我們的兒童加護照顧仍有成長的空間。

但是我們在加護病房的住院天數中，明顯的比預測的天數要長，且具有統計上的意義，這一點是值得深入去討論的。影響住院天數長短以及照顧效率的要素非常多，醫護人員的訓練，背景，文化，教育以及給付的方式卻可能會影響。另外在加護病房的照顧效率(Efficiency of Care) 我們為 32.5%。一般在文獻上的標準是30~60%[21]。因此我們大約是在標準的下限，在和美國的醫學中心比較上我們排名第 24 名，以也是屬於中下成績。但是我們覺得光以我

們一個醫學中心一年度的工作要來推估全台灣小兒加護病房的現況仍有不足的地方。因此更大規模研究來建立一個資料庫，是將來努力的方向。

(V) 結論與建議

由本研究結論顯示，兒童死亡危險度評估表(PRISM III score)可以作為預測台灣重症兒童預後指標。但是在加護病房住院天數的髖測性似乎有差異。我們推想在不同國家的醫療環境均有有差異，因此我們要利用國外的兒童死亡危險度評估表來判斷我們的加護病房住院天數或照顧效率時，仍必需考慮國內外情形的差異性。是否在小兒科加護病房也要仿效目前成人加護病房設置中間病房(Step-down units)來減少加護病房的住院天數，有待將來對於重症兒童的加護照顧更大規模研究，建立本土的資料庫後，累積經驗作為將來衛生署評鑑國內兒童加護病房的參考。

(VI) 參考文獻 (References)

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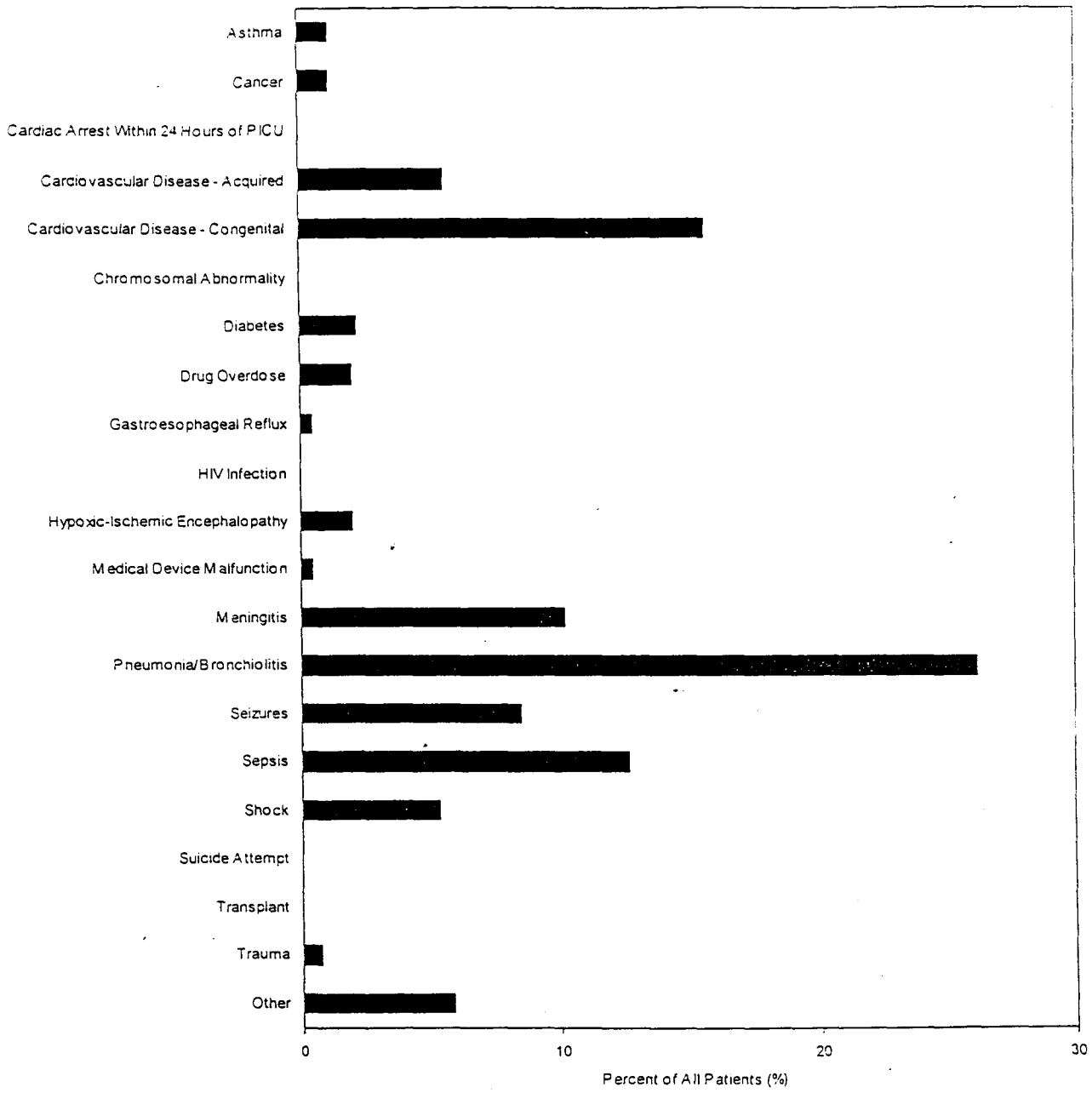
(圖1)：住進加護病房的主要病因分布圖

Institutional Report 3D: Acute Primary Diagnosis vs. PICU Outcome (continued)



Report Notes:

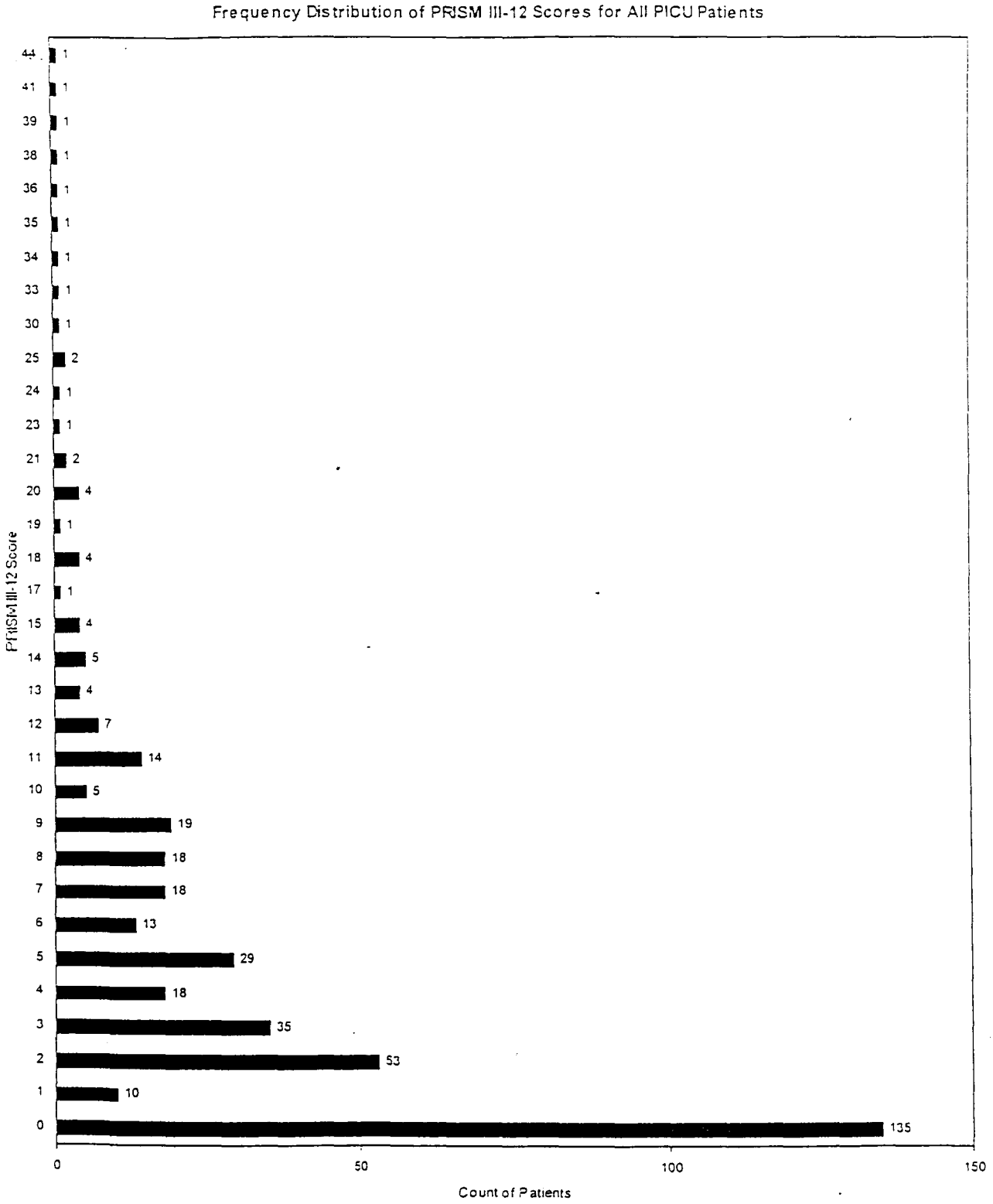
Data Source: PICU Evaluations Survey Question 4A (Acute Primary Diagnosis)

Data ID Code: PICUEs 00-52

Report Print Date: 11/22/2000

(圖2)：住院病患的 PRISM score 分布圖

Institutional Report 4H: Frequency Distribution of PRISM III-12 Scores (continued)



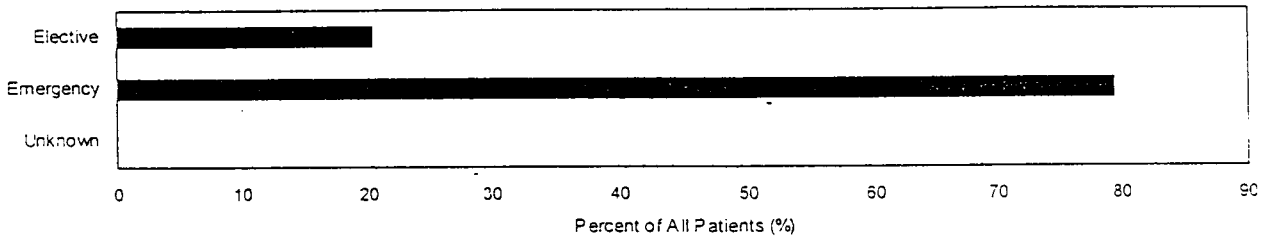
Report Notes:

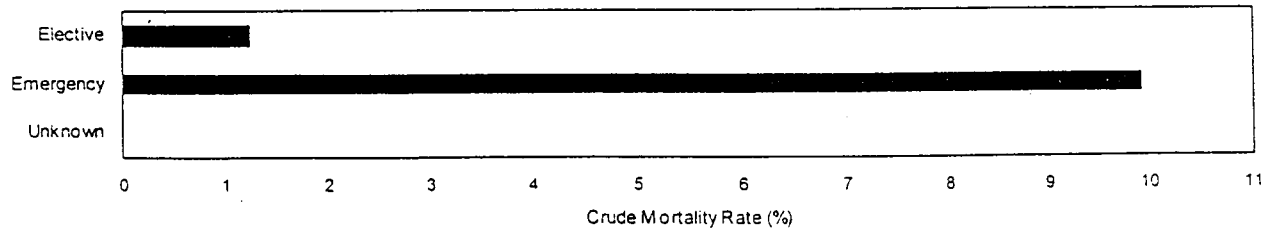
Data Sources:	PICU Evaluations Survey Question 7 (Physiologic Data)
Definitions:	PRISM III-12 Score = Pediatric Risk of Mortality III Score based on physiologic data collected during the first 12 hours of PICU care
Data ID Code:	PICUEs 00-52
Report Print Date:	11/22/2000

(圖3)：PICU住院方式和預防的關係

Institutional Report 3A: PICU Admission Status vs. PICU Outcome

PICU Admission Status	Observed PICU Outcome Groups								Crude Mortality Rate
	All Patients		Survivors		Deaths		Transfers		
	n	%	n	%	n	%	n	%	%
Elective	84	20.39	79	21.29	1	3.03	4	50.00	1.25
Emergency	327	79.37	291	78.44	32	96.97	4	50.00	9.91
Ambulance/Rescue Squad	44	10.68	34	9.16	9	27.27	1	12.50	20.93
Helicopter	0	0.00	0	0.00	0	0.00	0	0.00	N/A
Fixed Wing Aircraft	0	0.00	0	0.00	0	0.00	0	0.00	N/A
Private Vehicle	257	62.38	234	63.07	21	63.64	2	25.00	8.24
Other/Unknown	26	6.31	23	6.20	2	6.06	1	12.50	8.00
Unknown	1	0.24	1	0.27	0	0.00	0	0.00	0.00
Column Totals	412	100.00	371	100.00	33	100.00	8	100.00	8.17





Report Notes:

Data Source: PICU Evaluations Survey Question 3A (PICU Admission Status)

Column Headings: n = Number of patients with the specified PICU admission status in the specified PICU outcome group column

% = Percent of patients with the specified PICU admission status in the specified PICU outcome group column

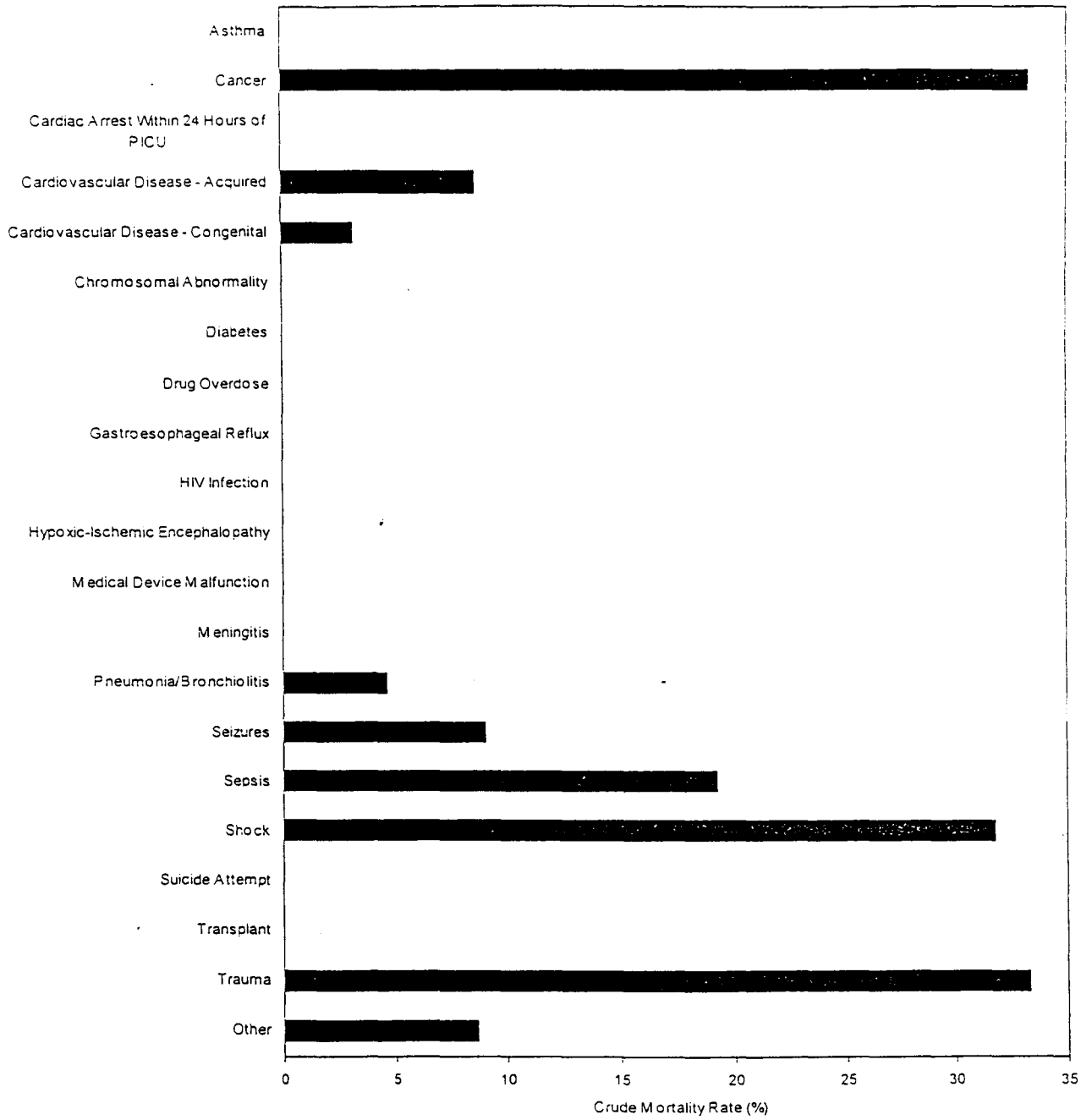
Definitions: Crude Mortality Rate = (Number of PICU Deaths) / (Number of PICU Survivors + Number of PICU Deaths) x 100%

Data ID Code: PICUEs 00-52

Report Print Date: 11/22/2000

(圖4)：主要導致病患死亡的病因

Institutional Report 3D: Acute Primary Diagnosis vs. PICU Outcome (continued)

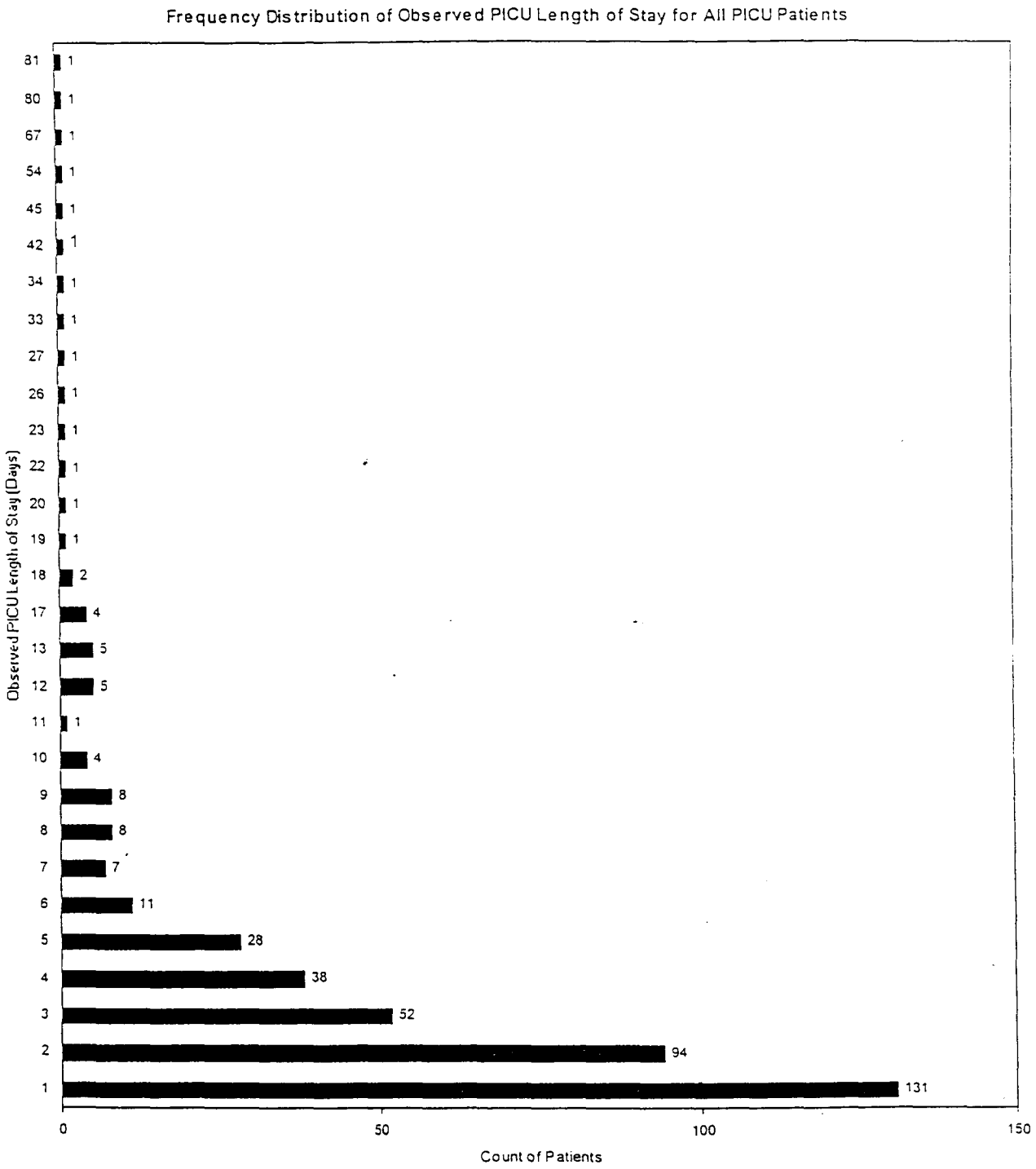


Report Notes:

Data Source:	PICU Evaluations Survey Question 4A (Acute Primary Diagnosis).
Definitions:	Crude Mortality Rate = (Number of PICU Deaths) / (Number of PICU Survivors + Number of PICU Deaths) x 100%
Data ID Code:	PICUEs 00-52
Report Print Date:	11/22/2000

(圖5)：住院天數分布圖

Institutional Report 6I: Frequency Distribution of Observed PICU Length of Stay (continued)

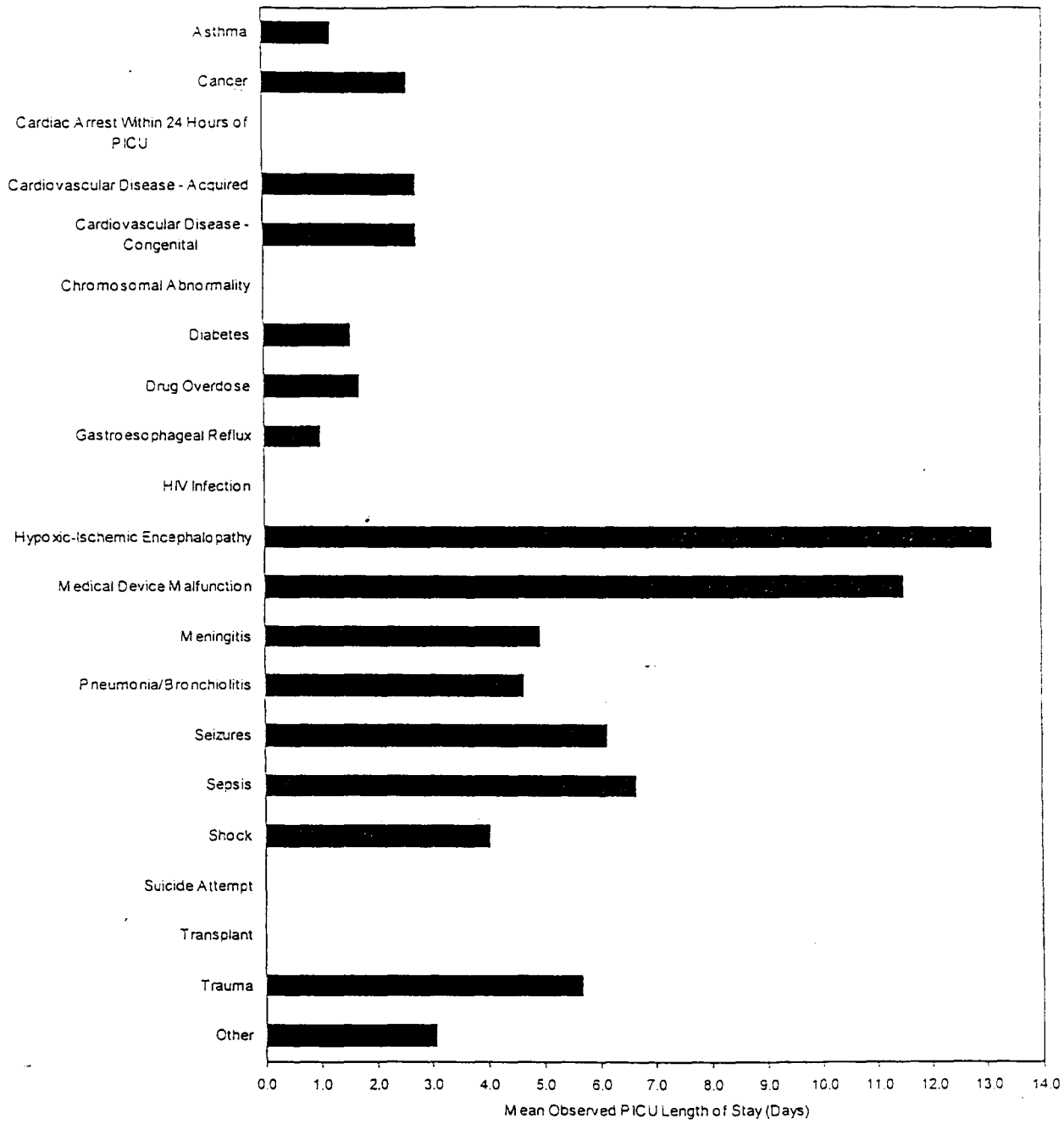


Report Notes:

Data Sources:	PICU Evaluations Survey Questions 2B and 8 (PICU Admission and Discharge Dates and Times)
Graph Notes:	Counts for PICU Lengths of Stay of 0.3 and 0.5 days have been combined with the counts for 1.0 days
Data ID Code:	PICUEs 00-52
Report Print Date:	11/22/2000

(圖6)：住院天數長短和主要病因的關係

Institutional Report 6E, Part 1: Acute Primary Diagnosis vs. Observed PICU Length of Stay (continued)



Report Notes:

Data Sources: PICU Evaluations Survey Question 4A (Acute Primary Diagnosis)
PICU Evaluations Survey Questions 2B and 8 (PICU Admission and Discharge Dates and Times)

Definitions: Observed PICU LOS

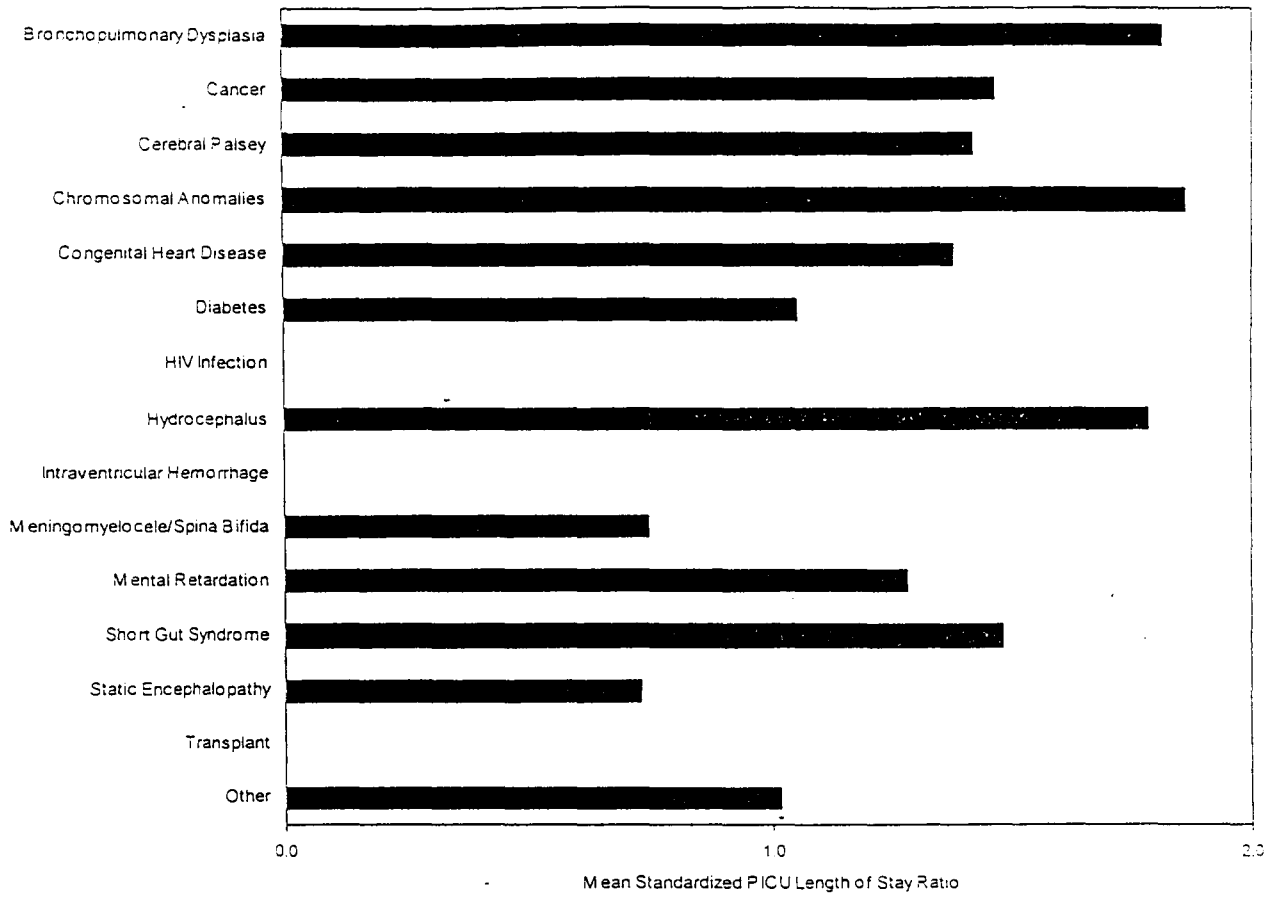
1. For same calendar day PICU admission and discharge:
   a. If admitted to PICU before noon (<12:00), then observed PICU LOS = 0.5 days
   b. If admitted to PICU after noon (>=12:00), then observed PICU LOS = 0.3 days
2. For different calendar day PICU admission and discharge:
   a. Observed PICU LOS = (Number of calendar days - 1)

Data ID Code: PICUEs 00-52

Report Print Date: 11/22/2000

(圖7)：標準住院天數比值和慢性疾病的關係

Institutional Report 6F, Part 2: Chronic Diagnoses vs. Standardized PICU Length of Stay Ratio (continued)



Report Notes:

Algorithm:	Expected PICU length of stay algorithm, 1996 version
Data Sources:	PICU Evaluations Survey Question 4B (Chronic Diagnoses)
Definitions:	Standardized PICU LOS Ratio = (Patient's observed PICU length of stay) / (Patient's expected PICU length of stay)
Data ID Code:	PICUEs 00-52
Report Print Date:	11/22/2000

附錄1：兒童加護病房評估系統說明信函

PICUES

Pediatric ICU Evaluations

Please visit our website www.picues.org

Dear Participant,

We know that medical care changes. As changes occur, there is a shift in the relationship between our physiology-based measure of severity of illness and mortality. Therefore, the *PICUEs* team routinely recalibrates the PRISM III algorithms. This is one of the primary purposes of the *PICUEs* program – to maintain the reliability of the PRISM III prediction algorithms. We recently completed recalibration of the PRISM III algorithms. The drift in the previous predictors was relatively minor, but with a sample of almost 20,000 pediatric ICU admissions, we have the power to detect and correct even small changes. *Details of this recent recalibration can be found on our web site (www.PICUEs.org).*

The *PICUEs* program strongly believes that performance should be measured in two ways. First, your institution's performance should be compared to a historic group (j.e. the group that contributed the data for calibration). More importantly, your institution should be compared to other reference sites because your relative performance should not substantially change even if the algorithms change.

With the changes in our algorithms, your standardized mortality ratio (SMR) and standardized length of stay ratio (SLOSR) may change. In most cases, these changes will be minor. Your relative performance as assessed in our comparative database may also change; however, in most cases institutions will remain in the same performance quartile.

In order to allow those institutions which use *PICUEs* for internal benchmarking to adjust to these new data, we will continue to provide reports using the previous algorithms (referred to as Algorithm Version 1996), as well as reports using the new PRISM III algorithms (referred to as Algorithm Version 1999), for the near future.

If you have any questions or comments, please contact me (e-mail preferred).

Sincerely,

Murray M. Pollack, MD
Director, *PICUEs* Program

Murray M. Pollack, MD • Children's National Medical Center • 111 Michigan Avenue, NW • Washington, DC 20010
Telephone: 202-884-3969 • Facsimile: 202-884-5724 • Electronic Mail: mpollack @ cnmc.org • Web Page: www.picues.org

附錄2：PRISM III (兒童死亡危險評估量表)(共四頁)

PRISM III PICU EVALUATIONS

missions to the ICU count as separate admissions, requiring a separate form. Exclude admissions for recovery from procedures normally cared for in other locations, patients staying U less than 2 hours, and patients admitted in a state of continuous CPR who do not achieve vital signs compatible with life for at least 2 hours.

collector initials: ____ ____ ____

ATIENT INFORMATION

edical record # _____

ender ❑ Female ❑ Male

ate of birth _____/_____/_____

ethod of payment _____

ocal identification number _____

ATIENT ADMISSIONS DATA
Use time of initial vital sign)

	Date	Time *(24 hr clock)*
ospital admission	____/____/____	____:____
CU admission	____/____/____	____:____

ICU ADMISSION DATA

Elective
Emergency→Transported to hospital by:
- ❑ Ambulance/rescue squad
- ❑ Helicopter
- ❑ Fixed wing aircraft
- ❑ Private vehicle
- ❑ Other/unknown

ost-operative care: ❑ Yes ❑ No
yes, specify the primary operation(s):

_____

peration was: ❑ corrective ❑ palliative ❑ unknown

CU admission was from *(check one)*:
Your hospital
Another hospital
Clinic, MD office
Home

from yours or another hospital, was it from
heck one):
Emergency dept. → minutes in ER _____.
Operating/recovery room
Catheterization lab
Other inpatient care area
Other

ny previous PICU admissions during this
ospitalization?
Yes ❑ No

yes, list all admission dates:

_____

4. DIAGNOSTIC DATA

A. **Acute diagnoses** *(check one primary & all applicable secondary)*

	Primary	2ndary	Do
Asthma (reactive airway disease)	❑	❑	
Cancer (oncologic disease)	❑	❑	4C
Cardiac arrest w/in 24hrs of PICU (closed chest massage)	❑	❑	4D
Chromosomal abnormality (not hereditary conditions)	❑	❑	4G
Diabetes (e.g. DKA)	❑	❑	
Drug overdose (e.g. ingestion, toxicity)	❑	❑	4H
Gastroesophageal reflux	❑	❑	
Cardiovascular disease - acquired (e.g. vasculitis)	❑	❑	4E
Cardiovascular disease - congenital	❑	❑	4F
HIV infection	❑	❑	
Hypoxic-ischemic encephalopathy (acute, not static)	❑	❑	
Medical device malfunction	❑	❑	4I
Meningitis	❑	❑	4J
Pneumonia/Bronchiolitis	❑	❑	4K
Seizures (includes complications of seizure therapy)	❑	❑	
Sepsis	❑	❑	4L
Shock	❑	❑	4M
Suicide attempt (includes intentional drug overdose)	❑	❑	
Transplant	❑	❑	4P
Trauma	❑	❑	4N,O
Other	❑	❑	
(specify under primary or secondary)	_____	_____	

B. **Chronic diagnoses** *(check all that apply)*:

		Do
Bronchopulmonary dysplasia	❑	
Cancer (oncologic disease)	❑	4C
Cerebral palsy	❑	
Chromosomal anomalies (not hereditary conditions)	❑	4G
Congenital heart disease	❑	
Diabetes	❑	
HIV infection	❑	
Hydrocephalus	❑	
Intraventricular hemorrhage (from perinatal period)	❑	
Mental retardation	❑	
Meningomyelocele/spina bifida	❑	
Short gut syndrome	❑	
Static encephalopathy	❑	
Transplant	❑	4P
Other	❑	
(specify)	_____	

Diagnosis-Related Data
(Conditionally required. Complete sections as indicated in 4A and 4B, above)

C. **Cancer data**
Is cancer in remission? ❑ Yes ❑ No
Received chemotherapy within last month? ❑ Yes ❑ No
Primary system/region of cancer *(check one)*:
❑ Bone ❑ Lymphatics ❑ Soft tissue (e.g. Rhabdomyosarcoma)
❑ Blood (e.g. ALL) ❑ Neuroblastoma ❑ Testicular
❑ CNS ❑ Renal ❑ Other/unknown

D. **Cardiac arrest data**
Where did it occur? *(check all that apply)*:
❑ At the scene ❑ During transport ❑ Emergency dept. ❑ O.R.
❑ Routine care area ❑ Cath. lab ❑ Other/unknown
Duration of cardiac massage _____ *(in minutes)*

E. **Acquired heart disease data** *(check all that apply)*:
❑ Cardiac arrest ❑ Myocarditis ❑ Vasculitis
❑ Cardiomyopathy ❑ Overdose with cardiac effects ❑ Other
❑ Congestive heart failure ❑ Rheumatic fever
❑ Dysrhythmia ❑ Supraventricular tachycardia
❑ Kawasaki's disease ❑ Tumor

F. **Congenital he**
- ❑ Anomalous corc
- ❑ Anomalous puln
- ❑ Anomalous puln
- ❑ Aortic insufficien
- ❑ Aortic stenosis:v
- ❑ AV canal
- ❑ ASD
- ❑ Cardiac arrest dia
- ❑ Coarctation of th
- ❑ Congestive heart
- ❑ Double outlet rigt
- ❑ Dysrhythmia
- ❑ Ebstein's anomal
- ❑ Hypoplastic aortic
- ❑ Hypoplastic left h ase
- ❑ Hypoplastic right t dis
- ❑ Mitral insufficienc
- ❑ Mitral stenosis

G. **Chromosomal a**
- ❑ Trisomy 21 ❑
- ❑ Trisomy 13 ❑
- ❑ Trisomy 22 ❑
- ❑ Trisomy 18 ❑

H. **Reason for drug**
- ❑ Accidental ❑ Ia

I. **Medical device m**
- ❑ Central venous cat aker
- ❑ Feeding tube (gastostomy
- ❑ Ventriculo-peritone

J. **Meningitis etiolo**
- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -
- ❑ "Clinical"/Unknown

K. **Pneumonia/Bronc**
- ❑ Aspiration nown
- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -

L. **Sepsis** *(check one)*
- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -

M. **Shock etiology** *(ch*
- ❑ Cardiogenic ❑ Her n

N. **Trauma data** *(checl*
- ❑ Cardiac contusion ord injury
- ❑ Cervical spinal chord
- ❑ Closed head trauma
- ❑ Fractures
- ❑ Hematoma, epidural
- ❑ Hematoma, intracran
- ❑ Hematoma, subdural natoma
- ❑ Liver laceration/hema a

O. **Trauma etiologies** *(check all that apply)*:
- ❑ Bicycle ❑ Gun shot wound ❑ Self-inflicted,accider
- ❑ Child abuse ❑ Knife wound ❑ Suicide attempt
- ❑ Fall ❑ Motor vehicle accident
- ❑ Farm equipment ❑ Near drowning ❑ Other

P. **Transplant data** *(check all that apply)*:
- ❑ Bone marrow ❑ Bowel ❑ Heart ❑ Kidne
- ❑ Liver ❑ Lungs ❑ Pancreas ❑ Other

5. CHRONIC CARE DEVICES

Does patient use chronic care devices or services:
- ❑ Yes→ If yes, *check all that apply*:
- ❑ No
  - ❑ Chronic care hospitalization
  - ❑ Feeding tube (gastrastomy, NG, etc.)
  - ❑ Home IV access (e.g. broviac, portacath)
  - ❑ Home parenteral nutrition
  - ❑ Home mechanical ventilation
  - ❑ Home oxygen ❑ Tracheostomy
  - ❑ Other ❑ Unknown

6. CLINICAL SERVICES

Check 1 primary, & all applicable co-managed and consultir

	Primary	Co-managed	Consultir
Adult medical/surg	❑	❑	❑
Allergy/immunology	❑	❑	❑
Anesthesiology/pain	❑	❑	❑
Cardiology	❑	❑	❑
Cardiovascular surgery	❑	❑	❑
Critical/intensive care	❑	❑	❑
Endocrinology	❑	❑	❑
ENT surgery	❑	❑	❑
Gastroenterology	❑	❑	❑
General pediatrics	❑	❑	❑
General surgery	❑	❑	❑
Genetics	❑	❑	❑
Hematology/oncology	❑	❑	❑
Infectious diseases	❑	❑	❑
Metabolic	❑	❑	❑
Miscellaneous surgery	❑	❑	❑
Neurology	❑	❑	❑
Neurosurgery	❑	❑	❑
Ophthalmology	❑	❑	❑
Oral surgery/dentistry	❑	❑	❑
Orthopedic surgery	❑	❑	❑
Plastic surgery	❑	❑	❑
Psychiatry	❑	❑	❑
Pulmonary	❑	❑	❑
Renal/nephrology	❑	❑	❑
Rheumatology	❑	❑	❑
Trauma surgery	❑	❑	❑
Urologic surgery	❑	❑	❑
Other	❑	❑	❑

. **Congenital heart disease data** *(check all that apply)*:

- ❑ Anomalous coronary artery
- ❑ Anomalous pulmon. VR, partial
- ❑ Anomalous pulmon. VR, total
- ❑ Aortic insufficiency
- ❑ Aortic stenosis:valvar,subvalvar
- ❑ AV canal
- ❑ ASD
- ❑ Cardiac arrest
- ❑ Coarctation of the aortic
- ❑ Congestive heart failure
- ❑ Double outlet right ventricle
- ❑ Dysrhythmia
- ❑ Ebstein's anomaly
- ❑ Hypoplastic aortic arch
- ❑ Hypoplastic left heart syn
- ❑ Hypoplastic right heart syn
- ❑ Mitral insufficiency
- ❑ Mitral stenosis
- ❑ PDA
- ❑ Pulmonary hypertension
- ❑ Pulmonary stenosis: valvar, subvalvar
- ❑ Pulmonary atresia
- ❑ Single ventricle
- ❑ s/p central or BT shunt
- ❑ Supraventricular tachycardia
- ❑ Tetralogy of Fallot
- ❑ Transposition of the Great Vessels
- ❑ Tricuspid insufficiency
- ❑ Tricuspid stenosis
- ❑ VSD
- ❑ Other cyanotic heart disease
- ❑ Other non-cyanotic heart dis
- ❑ Unknown

3. **Chromosomal abnormalities data** *(check one)*:

- ❑ Trisomy 21
- ❑ Trisomy 13
- ❑ Trisomy 22
- ❑ Trisomy 18
- ❑ Deletions (p- and q- syndromes, e.g. 4p-)
- ❑ Turner's
- ❑ XYY (Klinefelter)
- ❑ Other extra chromosome
- ❑ Other

4. **Reason for drug overdose** *(check one)*:

- ❑ Accidental
- ❑ Iatrogenic
- ❑ Purposeful
- ❑ Unknown

. **Medical device malfunctions** *(check one)*:

- ❑ Central venous catheter (including chronic cath)
- ❑ Feeding tube (gastrostomy, NG, etc.)
- ❑ Ventriculo-peritoneal shunt
- ❑ Pacemaker
- ❑ Tracheostomy
- ❑ Other

. **Meningitis etiology** *(check one)*:

- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -
- ❑ "Clinical"/Unknown
- ❑ Fungal
- ❑ Viral
- ❑ Other

K. **Pneumonia/Bronchiolitis etiology** *(check one)*:

- ❑ Aspiration
- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -
- ❑ Fungal
- ❑ RSV
- ❑ Other viral
- ❑ "Clinical"/Unknown
- ❑ Other

. **Sepsis** *(check one)*:

- ❑ Bacterial, Gram +
- ❑ Bacterial, Gram -
- ❑ "Clinical"/Unknown
- ❑ Fungal
- ❑ Other

M. **Shock etiology** *(check one)*:

- ❑ Cardiogenic
- ❑ Hemorrhagic
- ❑ Septic
- ❑ Unknown

N. **Trauma data** *(check all that apply)*:

- ❑ Cardiac contusion
- ❑ Cervical spinal chord injury
- ❑ Closed head trauma
- ❑ Fractures
- ❑ Hematoma, epidural
- ❑ Hematoma, intracranial
- ❑ Hematoma, subdural
- ❑ Liver laceration/hematoma
- ❑ Non-cervical spinal chord injury
- ❑ Non-penetrating
- ❑ Open head trauma
- ❑ Penetrating
- ❑ Pulmonary contusion
- ❑ Seizure
- ❑ Splenic laceration/hematoma
- ❑ Urinary system trauma
- ❑ Other

O. **Trauma etiologies** *(check all that apply)*:

- ❑ Bicycle
- ❑ Child abuse
- ❑ Fall
- ❑ Farm equipment
- ❑ Gun shot wound
- ❑ Knife wound
- ❑ Motor vehicle accident
- ❑ Near drowning
- ❑ Self-inflicted,accider
- ❑ Suicide attempt
- ❑ Other

P. **Transplant data** *(check all that apply)*:

- ❑ Bone marrow
- ❑ Bowel
- ❑ Heart
- ❑ Kidne
- ❑ Liver
- ❑ Lungs
- ❑ Pancreas
- ❑ Other

5. CHRONIC CARE DEVICES

Does patient use chronic care devices or services:

- ❑ Yes→ If yes, *check all that apply*:
- ❑ No

- ❑ Chronic care hospitalization
- ❑ Feeding tube (gastrastomy, NG, etc.)
- ❑ Home IV access (e.g. broviac, portacath)
- ❑ Home parenteral nutrition
- ❑ Home mechanical ventilation
- ❑ Home oxygen
- ❑ Tracheostomy
- ❑ Other
- ❑ Unknown

6. CLINICAL SERVICES

Check 1 primary, & all applicable co-managed and consultir

	Primary	Co-managed	Consultir
Adult medical/surg	❑	❑	❑
Allergy/immunology	❑	❑	❑
Anesthesiology/pain	❑	❑	❑
Cardiology	❑	❑	❑
Cardiovascular surgery	❑	❑	❑
Critical/intensive care	❑	❑	❑
Endocrinology	❑	❑	❑
ENT surgery	❑	❑	❑
Gastroenterology	❑	❑	❑
General pediatrics	❑	❑	❑
General surgery	❑	❑	❑
Genetics	❑	❑	❑
Hematology/oncology	❑	❑	❑
Infectious diseases	❑	❑	❑
Metabolic	❑	❑	❑
Miscellaneous surgery	❑	❑	❑
Neurology	❑	❑	❑
Neurosurgery	❑	❑	❑
Ophthalmology	❑	❑	❑
Oral surgery/dentistry	❑	❑	❑
Orthopedic surgery	❑	❑	❑
Plastic surgery	❑	❑	❑
Psychiatry	❑	❑	❑
Pulmonary	❑	❑	❑
Renal/nephrology	❑	❑	❑
Rheumatology	❑	❑	❑
Trauma surgery	❑	❑	❑
Urologic surgery	❑	❑	❑
Other	❑	❑	❑

PHYSIOLOGIC DATA *(Record high and low values separately for first & second 12-hour periods of PICU care. If data was not obtained, leave space blank. If a single measurement was obtained, record that measurement.)*

	First 12 hours		Second 12 hours	
	High	Low	High	Low
Cardiovascular (Notes 1, 2)				
Systolic BP *(mm Hg)*				
Diastolic BP *(mm Hg)*				
Heart rate *(beats/min)*				
Respiratory rate *(breaths/min)*				
Temperature ❑ °F ❑ °C				
Acid-base/blood gases (Notes 3, 4)				
pH				
PaO_2 ❑ mm Hg ❑ kPa				
PCO_2 ❑ mm Hg ❑ kPa				
Chemistry tests (Notes 5, 6)				
Na *(mmol/L)* ❑ serum ❑ whole				
K *(mmol/L)* ❑ serum ❑ whole				
Total CO_2 *(mmol/L)*				
BUN ❑ mg/dL ❑ mmol/L				
Creatinine ❑ mg/dL ❑ µmol/L				
Glucose ❑ mg/dL ❑ mmol/L ❑ serum ❑ whole				
Total Calcium ❑ mg/dL ❑ mmol/L				
Ionized CA ❑ mg/dL ❑ mmol/L				
Total bilirubin ❑ mg/dL ❑ µmol/L				
Albumin ❑ g/dL ❑ g/L				
Hematology tests (Note 7)				
Hemoglobin ❑ g/dL ❑ g/L				
WBC count *(cells X 10^9/L)*				
% segmented forms				
Platelet count *(cells X 10^9/L)*				
PT *(seconds)*				
PTT *(seconds)*				

Neurologic vital signs *(See Note 8)*		First 12 hrs	Second 12 hrs
Pupillary	Both reactive	❑	❑
	One non-reactive (>3mm)	❑	❑
	Both non-reactive(>3mm)	❑	❑
Worst Coma Status	Normal	❑	❑
	Lethargy	❑	❑
	Stupor	❑	❑
	Coma	❑	❑
Worst Glasgow Coma Scale Score		_____	_____

8. PICU DISCHARGE AND OUTCOME DATA

PICU discharge or PICU death Date ____/____/____ Time (24 hr clock) ____:____

PICU Outcome

If patient died in your PICU or in the OR from a therapy required for the PICU disease, check "Died" below:

❑ Survived *(complete 8A)*
❑ Died *(complete 8D)*

A. PICU Survival

i. To where was patient discharged *(check one)*:
❑ Your hospital ❑ Home
❑ Another hospital ❑ Other
❑ Chronic care facility

ii. If discharged to your or another acute care hospital, where in the hospital? *(check one)*:
❑ Routine care area
❑ "Step-down" unit
❑ Another PICU *(complete 8B)*
❑ Neonatal ICU *(complete 8B)*
❑ Adult ICU *(complete 8B)*

iii. Was patient terminally ill & discharged for "comfort care"?
❑ Yes *(complete 8C)* ❑ No

B. What was the reason for transfer to another ICU:
❑ For services unavailable in your PICU
❑ Parental request ❑ Hospital routine
❑ Insurance reasons ❑ Other

C. If patient was terminally ill and discharged from your PICU for comfort care:

i. Was patient receiving technologic support (e.g., mech. ventilation) when discharged from PICU?
❑ Yes ❑ No

ii. How soon after PICU discharge did patient die?
❑ Within 24 hours of discharge or discontinuation of technologic support
❑ After 24 hours of discharge or discontinuation of technologic support
❑ Did not die
❑ Unknown

D. If patient died in your PICU, which of these circumstances applied *(check all that apply)*:
❑ Failed resuscitation - cardiac massaged performed
❑ Failed resuscitation - no cardiac massage
❑ Do No Resuscitate (DNR) order
❑ Associated with withdrawal/limitation of care
❑ Brain death

9. HOSPITAL OUTCOME

If patient went from your PICU to other care area (either yours or another hospital) or directly home, what was the outcome of that hospital stay *(check one)*:
❑ Survived and discharged
❑ Stay > 90 days (not yet discharged)
❑ Died in hospital

	Date	Time *(24 hr clock)*
Hospital discharge or Hospital death	____/____/____	____:____

If patient survived the PICU stay, but died prior to hospital discharge, *check all that apply*:
- ❑ Died in the PICU after subsequent PICU admission
- ❑ Died in the operating room
- ❑ Died in another pediatric, neonatal or adult ICU
- ❑ Died within 24 hrs of PICU discharge

→ If patient died within 24 hrs of PICU discharge, *check all that apply*:
- ❑ Patient was terminally ill
- ❑ Patient was receiving technologic support (e.g., mechanical ventilation)

. FUNCTIONAL STATUS

Pediatric Cerebral Performance Category (PCPC)

On admission	*On discharge*
❑ Normal	❑ Normal
❑ Mild disability	❑ Mild disability
❑ Moderate disability	❑ Moderate disability
❑ Severe disability	❑ Severe disability
❑ Coma/vegetative	❑ Coma/vegetative
	❑ Dead

ii. Pediatric Overall Performance Category (POPC)

On admission	*On discharge*
❑ Normal	❑ Normal
❑ Mild disability	❑ Mild disability
❑ Moderate disability	❑ Moderate disability
❑ Severe disability	❑ Severe disability
❑ Coma/vegetative	❑ Coma/vegetative
	❑ Dead

11. ETHICS

Were orders given for DNR, limitation of care, or withdrawal of care?
❑ Yes ❑ No *(If no, skip to 12. CARE ITEMS.)*

What was the rationale for these orders? *(check best answer)*:
- ❑ Imminent death
- ❑ No relational potential - based on chronic disease
- ❑ No relational potential - based on acute disease
- ❑ Burdens outweigh benefits - based on chronic disease
- ❑ Burdens outweigh benefits - based on acute disease

Which of the following were used? *(check all that apply)*:
- ❑ DNR (Do Not Resuscitate)
- ❑ Limitation of care (DNR implied) ❑ Withdrawal of care

If "limitation of care" was instituted, which types of care were limited: *(check all that apply)*:
- ❑ Cardiopulmonary resuscitation (DNR)
- ❑ Mechanical ventilation ❑ Fluids/food
- ❑ Vasoactive infusion ❑ Other

If "withdrawal of care" was instituted, which types of care were limited? *(check all that apply)*:
- ❑ Mechanical ventilation ❑ Fluids/food
- ❑ Vasoactive infusion ❑ Other

. CARE ITEMS. *Complete one column for each 24 hr period. :ord the date (day/month) that the 24 hr period began. If number of 24 periods in your PICU exceeds the number of columns here (14), then a CARE ITEMS continuation sheet. Check all modalities that were d at any time during the 24 hr period. For unplanned extubation, ord the number of extubations.*

ate the 24 hr eriod began→														
4 hr period	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th
herapeutic interventions														
echanical ventilation														
nplanned extubation *(record number)*														
asoactive infusions														
ntimicrobials														
teroids														
-2 blockers														
ardiac compressions														
CMO														
arenteral nutrition														
emofiltration														
emodialysis														
eritoneal dialysis														
lonitoring modalities														
rterial catheter														
entral venous catheter														
CP monitor														
rinary catheter														

. NOSOCOMIAL INFECTIONS. *Complete one row, below for each unique combination of period, infection site, and organism. Record in 1st . the corresponding period # from table, above. Note that this is the 24 hr period of infection onset. Use multiple rows per 24 hr period if there are ltiple infections in that period. Indicate site & organism. Include all infections up to 72 hrs after discharge. Use continuation sheet if necessary.*

· hr period # *(from above)*	Primary Infection Site								Organism *(write name below)*
	sepsis	lower respiratory tract/tracheitis	pneumonia	GI tract	urinary tract	skin/soft tissue	surgical wound	other	
____	❑	❑	❑	❑	❑	❑	❑	❑	
____	❑	❑	❑	❑	❑	❑	❑	❑	
____	❑	❑	❑	❑	❑	❑	❑	❑	
____	❑	❑	❑	❑	❑	❑	❑	❑	
____	❑	❑	❑	❑	❑	❑	❑	❑	

附錄3：與Dr. Pollack 簽訂 PICUS 計劃的合約

SITE AGREEMENT - SOFTWARE AND DATA ANALYSIS SERVICES

This SITE AGREEMENT (the "Agreement") is made as of this 15 day of November 1999, between Children's Research Institute (CRI), an affiliate of Children's National Medical Center, a Washington, D.C., corporation having its principal place of business at 111 Michigan Avenue, N.W., Washington, D.C., 20010 ("CNMC"), and National Cheng Kung Univ. Hosp, Tainan corporation having its principal place of business at 138 Sheng-li Rd., Tainan, Taiwan ("User").

WHEREAS, CRI has developed prediction algorithms using Pediatric Risk of Mortality scores (PRISM and PRISM III) that can be used to predict risk of patient mortality, lengths of stay and other information in a Pediatric Intensive Care Unit ("PICU") based on data gathered from diagnostic procedures and examinations;

WHEREAS, the User wishes to use one or more PRISM and PRISM III scores and algorithms for purposes of quality assessment, research and patient management; and

WHEREAS, the User also wishes to license data collection software from CRI and receive data analysis and report generation services from CRI, which will allow the User to compare the data from its PICU to the results from other PICUs in a database.

NOW, THEREFORE, in consideration of the mutual covenants and undertakings set forth herein, the parties mutually agree as follows:

1. THE SUBJECTS OF THE LICENSE:

a. CRI will provide to the User copies of all PRISM and PRISM III scores, algorithms, a data collection manual, and other technical support, information, materials and documents ("Materials") designated on Exhibit A.

b. CRI will provide to the User the computer software products and such technical support, information, materials and documents identified on Exhibit A which have been deemed necessary and appropriate by CRI to allow the User to collect data for analysis and report generation (the computer software products and the technical support, information, materials and documents are hereinafter collectively referred to as the "Products"). The User is hereby granted the right to use a single copy of the computer software.

c. CRI will provide the services of its data center for analysis of the data collected by User. User will be entitled to receive analysis of its data at any time during the term of this license, but not more often than quarterly. User is hereby informed that severity-adjusted mortality rate evaluations may not be reliable when the patient sample contains less than 15 PICU deaths. Analyses and reports will be returned to User within two months after the data is submitted to CRI. Exhibit A states the analyses and reports that will be provided pursuant to this Agreement and the format in which such analyses and reports will be provided. Additional or specialized reports may be available upon request or for an additional fee.

2. TERMS AND SCOPE OF AGREEMENT; ROYALTY:

a. The User agrees that it shall use PRISM and PRISM III scores, the algorithms, the Materials, and the Products for purposes of quality and unit assessment, monitoring and research. If the User has any questions about the

appropriateness of a use of the PRISM and PRISM III scores, algorithms, Materials or the Products under the terms of this Agreement, User shall present such questions to an authorized representative of CRI before engaging in such use. It will be solely within the discretion of CRI to determine the appropriateness of a use. This Agreement allows User to use the PRISM and PRISM III scores, algorithms, Materials and the Products only at the site specified in Exhibit A. User may not make copies of the PRISM and PRISM III scores, algorithms, Materials and/or products but may duplicate data collection papers to the extent necessary to collect data. This Agreement authorizes the User to create and use an extra copy of the software for back-up or archival purposes only, and to maintain the copy only for so long as the Agreement remains in effect.

b. The duration of this Agreement will be for one (1) year from the date entered above. This Agreement may be renewed for additional periods of one (1) year on terms and conditions mutually agreed upon by the parties (and set out in writing), unless terminated by either party in accordance with paragraph 11.

c. User shall pay to CRI a royalty of $4,250 per year for this Agreement and all services provided hereunder.

d. This Agreement provides a non-exclusive license to the User.

3. NONDISCLOSURE OF PROPRIETARY INFORMATION: The User acknowledges that this Agreement regarding use of the PRISM and PRISM III scores, algorithms, Materials and the Products provides the User with access to information and materials that are proprietary and confidential to CRI (the "Proprietary Information"). Both during and after the term of this Agreement, the User agrees to preserve and protect the confidentiality of the Proprietary Information and all physical forms thereof, whether disclosed to the User before this Agreement is signed or afterward. The User shall not disclose or disseminate the Proprietary Information to any third party, including employees of the User without a need to know, and shall not use the Proprietary Information for its own benefit or for the benefit of a third party. Specifically, the User may not divulge the algorithms in publications, to other investigators or to other institutions. The User shall advise all of its employees or agents authorized to use the PRISM and PRISM III scores, algorithms, Materials and/or the Products that they are bound by this nondisclosure obligation both during and after the term of this Agreement, without regard to the status of their employment or other relationship with User. The foregoing obligations shall not apply to any information which the User can establish to have (i) become publicly known without breach of this Agreement; (ii) been given to the User by a third party who is not obligated to maintain confidentiality; or (iii) been developed by the User prior to the date this Agreement is signed, as established by documentary evidence.

4. TITLE AND RESTRICTIONS:

a. All rights, title and interest in and to the PRISM and PRISM III scores, algorithms, Materials and/or the Products shall at all times remain vested in CRI. The User shall not alter or modify the PRISM and PRISM III scores, algorithms and/or Materials, or any part of them, without the prior written authorization of CRI. Moreover, the Products are protected by copyright laws and international treaty, and are proprietary products of CRI. The User may not decompile, disassemble, reverse engineer, copy, create a derivative work, or otherwise use the Products except as stated in this Agreement.

b. The User hereby assigns to CRI all rights, title and interest in and to the data collected by the User. The User acknowledges and agrees that CRI may use any or all of the data it collects for purposes including but not limited to enhancement or refinement of its comparison data bank. CRI shall make reasonable efforts to ensure the confidentiality of patients' identities and the User's identity.

5. RETURN OF PRISM AND PRISM III SCORES, ALGORITHMS, MATERIALS AND PRODUCTS: The User shall return all copies of the PRISM and PRISM III scores, algorithms, Materials and the Products not later than three (3) days after the termination of this Agreement. The User shall retain no copies, in any form whatsoever, of the Products.

6. NO REPRESENTATIONS OR WARRANTIES: CRI makes no representations and no express or implied warranties of any kind, including but not limited to any implied warranties of merchantability or fitness for a particular purpose or other attributes, whether express or implied (in law or in fact), oral or written, with regard to the PRISM and PRISM III scores, algorithms, materials or products.

7. LIMITATIONS OF LIABILITY; INDEMNIFICATION: The user acknowledges and agrees that it remains responsible for the care of all patients, and that its use of the PRISM and PRISM III scores, algorithms, materials or products in connection with the care and treatment of a patient does not alter its responsibility for that patient's care, in whole or in part. CRI shall not be liable to the user, its patients, or any other parties for direct, indirect, incidential or consequential loss or damage in connection with or arising out of the furnishing, performance, or use of the PRISM and PRISM III scores, algorithms, materials or products. The user agrees that, should any patient or patient's family make a claim against CRI related to or stemming from the user's use of the PRISM and PRISM III scores, algorithms, materials or products in treating the patient, user shall indemnify and hold cri harmless from and against any and all damages, claims, costs and expenses, including reasonable attorney's fees, based on or arising, directly or indirectly, from the claim.

8. REMEDIES FOR BREACH OF AGREEMENT: The parties acknowledge and agree that:

a. Any breach or attempted or threatened breach of this Agreement by the User could result in irreparable injury to CRI for which there would be no adequate remedy at law;

b. If the User should breach or attempt or threaten to breach this Agreement, CRI shall have the right to seek to enjoin the User from further breaches, or attempted or threatened breaches, of this Agreement, or to compel compliance with this Agreement by specific performance, in addition to any other remedies available to the Company in equity or at law; and

c. If a court of competent jurisdiction determines that the User has breached or attempted or threatened to breach this Agreement, the User shall consent to the granting in such proceeding of an injunction restraining it from further breaches, or attempted or threatened breaches of, or compelling compliance by specific performance with this Agreement.

9. ASSIGNMENT: Neither this Agreement, nor any rights granted in this Agreement may be assigned, transferred, conveyed or encumbered by the User without the prior written consent of CRI. Any attempted loan, transfer, encumbrance, sale or other disposition of the PRISM and PRISM III scores,

algorithms, Materials or Products shall be null and void and shall automatically terminate this Agreement.

10. TERMINATION OF AGREEMENT:

a. Renewal of this Agreement will occur in accordance with paragraph 2.

b. In the event that the User shall at any time neglect, fail or refuse to comply with the terms of this Agreement, CRI, at its option, may terminate this Agreement without prior notice.

c. Either party may terminate this Agreement without cause by providing ninety (90) days prior written notice to the other party. If the User notifies CRI of its intention to terminate this Agreement within ninety (90) days of its inception, and returns all Products within the first ninety (90) days of the Agreement, User shall receive a pro-rata refund of the annual royalty.

d. Termination of this Agreement will not relieve the User from its obligation to comply with the provisions and agreements contained in paragraphs 2, 3, 4, 5 and 8.

e. Except as noted in paragraph 10(c), above, termination of this Agreement shall not result in a refund of the royalty.

11. GOVERNING LAW: This Agreement shall be governed in all respects by the laws of the District of Columbia.

12. ENTIRE AGREEMENT: This document constitutes the entire Agreement between CRI and the User with respect to its subject matter, superseding any prior negotiations and agreements. This Agreement may not be changed in any respect except by a written agreement signed by both the User and CRI.

13. SEVERABILITY: In the event that any provision of this Agreement conflicts with the law of the District of Columbia or if any such provision is held invalid by a court with jurisdiction over the parties to this Agreement, such provision shall be deemed to be restated to reflect as nearly as possible the original intentions of the parties in accordance with applicable law, and the remainder of this Agreement shall remain in full force and effect.

14. REMEDIES: All remedies provided herein are cumulative and in addition to all other remedies which may be available at law or in equity.

15. WAIVER: No act or failure to act by CRI shall waive any right contained herein. Any waiver by CRI must be in writing and signed by an officer of CRI to be effective.

16. CONSTRUCTION: No inference shall be drawn against and no construction shall be adverse to the party drafting or preparing this Agreement or any portion hereof by virtue of such drafting or preparation.

17. MISCELLANEOUS:

a. The individuals signing below on behalf of CRI and User represent that they have the authority to enter into this Site Agreement and that it is binding on the institutions on whose behalf they have signed.

b. This Site Agreement shall bind the parties' employees, officers and directors, successors and assigns.

IN WITNESS WHEREOF, duly authorized representatives of the parties have executed this Agreement.

Department of Pediatrics
National Cheng Kung University Hospital
"USER"

By: Jieh-Neng Wang

Date: Oct. 1, 1999

Title: Attending Physician

Witness: Jing-Ming Wu

Children's Research Institute

By:

Date: 10/22/99

Title: Director, DICUES.

Witness: Ann Hamlin

[附錄4]：由 PRISM score 計算致死機率 Risk of death的公式

PRISM III-12. **Risk of mortality computed using data from the first 12 hours of PICU care.**

Equation. $R = -5.8294 + 0.3318(\text{PRISM III-12}) - 0.00265(\text{PRISM III-12})^2 + 0.4899(\text{Pre-ICU Care Area}) - 0.6619(\text{Operative Status}) + 0.6620(\text{Previous ICU Admission}) + 1.7463(\text{Acute Diagnosis of Diabetes}) + 0.5148(\text{Chromosomal Anomaly}) + 0.7634(\text{Acute or Chronic Oncologic Disease}) + 0.6737(\text{Acute Non-Operative Cardiovascular Disease}) + 1.1103(\text{Pre-ICU Cardiac Massage})$

Where:

- $(\text{PRISM III-12})^2$ is the PRISM III-12 term squared.
- Pre-ICU Care Area = 1 if the admission is from an inpatient location, excluding the operating room or recovery room; otherwise, Pre-ICU Care Area = 0.
- Operative Status = 1 if the admission is for post-operative care; otherwise, Operative Status = 0.
- Previous ICU Admission = 1 if there was a previous ICU admission during the current hospitalization; otherwise, Previous ICU Admission = 0.
- Acute Diagnosis of Diabetes = 1 if the acute problem requiring ICU admission is associated with diabetes (such as ketoacidosis); otherwise, Acute Diagnosis of Diabetes = 0.
- Chromosomal Anomaly = 1 if there is a chromosomal anomaly such as an extra chromosome, a long or short arm deletion, or a long or short arm addition; otherwise, Chromosomal Anomaly = 0.
- Acute or Chronic Oncologic Disease = 1 if there is currently or has been a malignant oncologic disease (cancer); otherwise, Acute or Chronic Oncologic Disease = 0.
- Acute Non-Operative Cardiovascular Disease = 1 if the acute problem requiring ICU admission is associated with congenital or acquired cardiac or vascular disease, excluding post-operative care; otherwise, Acute Non-Operative Cardiovascular Disease = 0.
- Pre-ICU Cardiac Massage = 1 if there was closed or open chest cardiac massage (cardiac compressions) immediately prior to ICU admission; otherwise, Pre-ICU Cardiac Massage = 0.

[附錄5]：由 PRISM score 來計算預期住院天數的公式

Severity-Adjusted Length of Stay. **Severity-adjusted length of stay computed using data from the first 24 hours of PICU care.**

Equation 1. Predicted length of stay in days = $\exp(b_{PRISM\ III\text{-}24} + d_0 + d_1x_1 + \ldots + d_ix_i)$

Where:

- exp is base e = 2.71828
- $b_{PRISM\ III\text{-}24}$ = coefficient determined from PRISM III-24 score as follows:

PRISM III-24	$b_{PRISM\ III\text{-}24}$
0 - 13	0.5823 + 0.0530(PRISM III-24)
14 - 16	1.2725
17 - 23	3.3365 - 0.1214(PRISM III-24)
24 - 27	0.5442
28 - 34	0.3564
>34	0.0000

- d_0= - 0.4167
- $d_1x_1 + \ldots + d_ix_i$ = coefficients for the diagnostic groups as follows, and x_i = 1 if the condition is present and x_i = 0 if the condition is not present:

Diagnosis	d_i
Admission from inpatient area (excluding operating or recovery room)	+ 0.2554
Central nervous system infections	+ 0.3973
Drug overdose	- 0.1973
ICU admission for treatment of acute diabetes or its complications	- 0.2528
ICU admission for treatment of congenital heart disease (non-operative)	+ 0.1749
Oncologic disease	+ 0.1529
Pneumonia (viral or bacterial)	+ 0.4291
ICU admission for post-operative care	+ 0.1529
Previous ICU admission during the current hospitalization	+ 0.1754
Use of mechanical ventilation during the first 24 hours	+ 0.5102

附錄6

計算標準加護病房住院天數比值及照顧效率的公式

$$\text{A) 標準加護病房住院天數比值} = \frac{\text{實際住加護病房天數}}{\text{預期病患住加護病房天數}}$$

$$= \frac{\text{Standardized PICU length of stay Ratio}}{\text{(Patient's observed PICU length of stay)}}$$

$$\frac{\text{(Patient's expected PICU length of stay)}}{}$$

$$\text{B) 照顧效率} = \frac{\text{使用呼吸器或使用針劑強心劑病患的天數}}{\text{總住院天數}} \times 100\%$$

$$= \frac{\text{Efficiency of Care (\# of Periods in which mechanical ventilation and /or vasoactive infusions were used)}}{\text{(Total of 24-hour periods)}} \times 100\%$$

[附錄7]：Dr. Pollack 對本院加護病房的總結

PICUES
Pediatric ICU Evaluations

November 22, 2000

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138 Sheng-li Road
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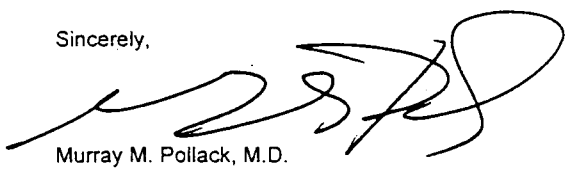
Dear Dr. Wang,

Enclosed is your PICUEs report for the time period 11/1/1999 to 10/31/2000 (i.e. PICUEs 00-52). Summary data for this time period (with respect to the Original Comparative Reference Set) are contained in the following table.

Variables	*Results*
Patients (n)	412
Transfers (n)	8
Deaths (n)	33
Percentage of PICU Sample Admitted for Emergency Care	79.37%
Percentage of PICU Sample Admitted for Post-Operative Care	18.45%
Observed Mortality Rate	8.17%
Algorithm Version 1996	
Predicted Mortality Rate	7.56%
Standardized PICU Mortality Ratio (SMR)	1.08
Z-Score (p-Value) for SMR	0.65 ($p > 0.500$)
Quartile Analysis for SMR Z-Score	Third Quartile
Algorithm Version 1999	
Predicted Mortality Rate	6.33%
Standardized PICU Mortality Ratio (SMR)	1.29
Z-Score (p-Value) for SMR	1.92 ($0.050 < p < 0.100$)
Quartile Analysis for SMR Z-Score	Fourth Quartile
Algorithm Version 1996	
Standardized PICU Length of Stay Ratio (SLOSR)	1.33
Z-Score (p-Value) for SLOSR	6.10 ($p < 0.001$)
Quartile Analysis for SLOSR Z-Score	Fourth Quartile
Algorithm Version 1999	
Standardized PICU Length of Stay Ratio (SLOSR)	1.25
Z-Score (p-Value) for SLOSR	5.19 ($p < 0.001$)
Quartile Analysis for SLOSR Z-Score	Fourth Quartile
Efficiency of Care	32.52%
Percentage of PICU Sample Classified as Length of Stay Outliers	6.07%
Percentage of 24-Hour Periods Utilized by Length of Stay Outliers	38.61%

Our reports contain a large amount of data. As always, please call me if there are any questions concerning the interpretation of this information and with any other comments.

Sincerely,



Murray M. Pollack, M.D.
Director, *PICU Evaluations*

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May 5, 1999

Dear PICU Site #

Enclosed are your Institutional and Comparative Reports. We have tried to make the maximum use of the data you provided. Thus, there are many tables and graphs. You may find all or only some of them useful. Of course, the quality of the data that you provided must be considered whenever interpreting the information. Our method of assessing data reliability focuses on the accuracy of the severity of illness information. We have not focused on the reliability of the descriptive information. There are explanatory notes at the bottom of many pages. In addition, there are notes of explanation contained in a separate section of each of the reports that will help you interpret the information.

Each of the reports has a Table of Contents and this will be helpful in isolating those sections of the data that you feel are especially useful.

Institutional Report:

Report 1. Sample Data. Your Identification Number, data collection period, and crude outcome data are contained in this section.

Report 2. Severity of Illness Adjusted Mortality Information. Your overall Standardized Mortality Ratio (SMR) is in Report 2A. Various other analyses using SMR's are in Reports 2B – 2G. *Please see accompanying note of explanation for using SMR's and interpreting the results.*

Report 3. General PICU Mortality Data. Crude outcome data along with sizes of the various classification groups are contained in Reports 3A – 3I. 3H contains the survey identification numbers for the PICU deaths and their PRISM III-12 scores. 3I contains the survey numbers of the hospital deaths.

Report 4. General Severity of Illness Data

Report 5. Ethics information.

Report 6. PICUE Length of Stay (LOS) Information 6A contains the overall, unadjusted LOS data (part 1) and the LOS data adjusted for severity of illness and other case mix variables (part 2). *Please see the accompanying note of explanation for using and interpreting LOS ratios.* Similarly reports 6B – BG contain unadjusted (part 1) and adjusted (part 2) information. 6H contains the survey numbers of the LOS outliers. 6I contains the frequency distribution of your LOS.

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Report 7. PICU Resource Use Information. This section tabulates the efficiency of care and use of monitoring and therapeutic resources. *See the accompanying note for an explanation for using and interpreting the information.*

Report 8. Age Information. This section contains age data not contained in previous reports.

Report 9. Miscellaneous Information. This section contains miscellaneous information primarily based on clinical services that were not contained in previous reports.

Comparative Report:

Report 1. Sample Data. A variety of comparative analyses are contained in this section. Comparison of descriptive data will enable you to better understand how your unit is similar or different from other PICUs.

Report 2. Severity Adjusted PICU Mortality Information. This section contains a comparison of how your unit's severity adjusted mortality compares to other PICUs in our national data base.

Report 3. PICU Length of Stay Information. This section contains information on how your unit's crude and adjusted LOS compares to other PICUs in our national data base.

Report 4. PICU Resource Use Information. This section contains information on how your efficiency rating compares to other PICUs in our national data base.

Report 5. Age Information. This section contains a comparison of ages.

Thank you for your participation in *PICUEs*. If there is any way we can help you better use this information, please call. If there are any other analyses that you want, please let me know and we will try to do them for you and/or include them in future reports.

Sincerely,

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Director, *PICUEs*

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