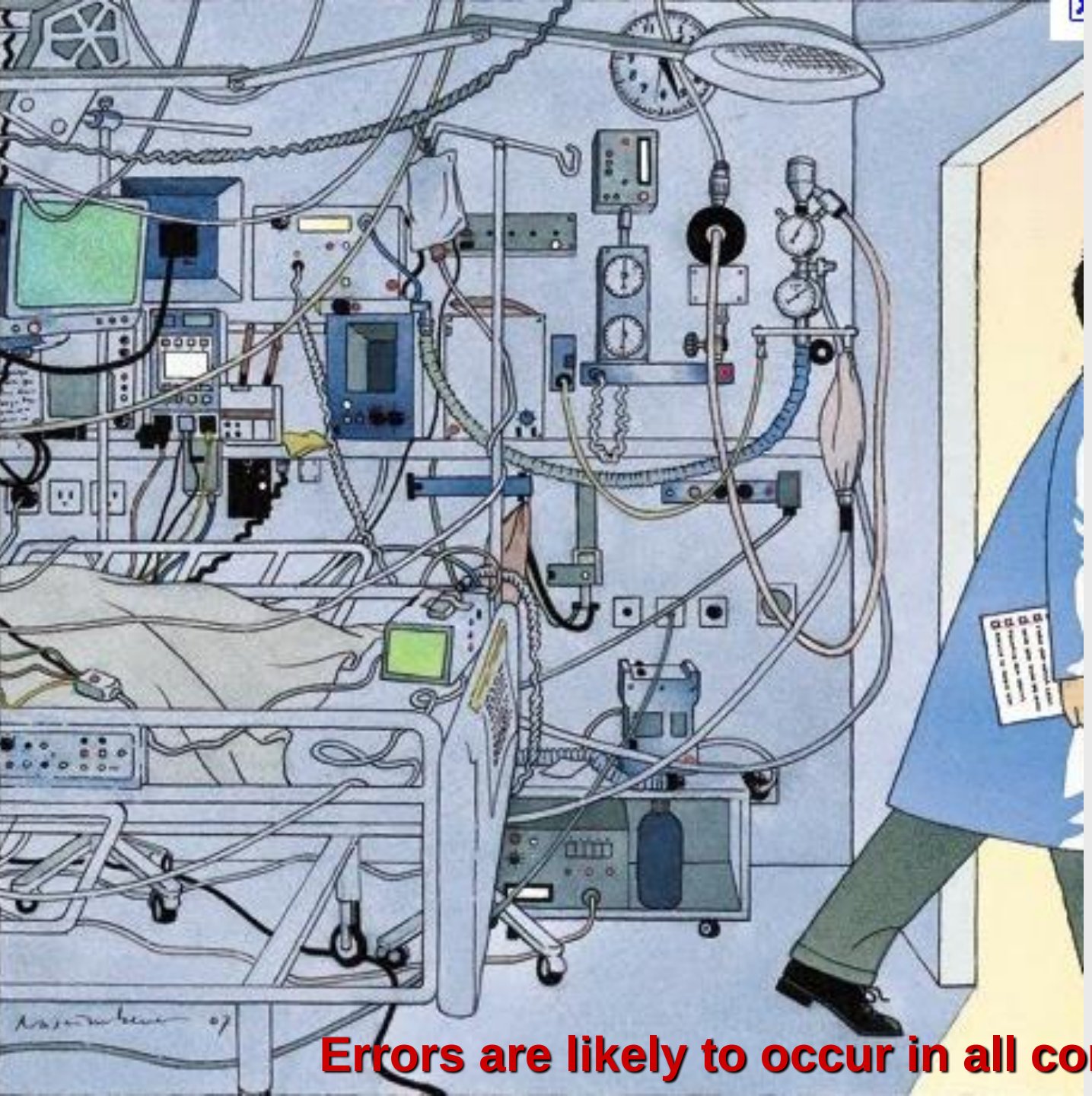
PRESENTACIÓN DE RESULTADOS DEL PROYECTO BACTERIEMIA ZERO

Mercedes Palomar Martínez,

Directora Técnica del Proyecto Bacteriemia Zero.

SEMICYUC

27 DE OCTUBRE DE 2011
Auditorio Ramón y Cajal
Facultad de Medicina de la Universidad Complutense de Madrid



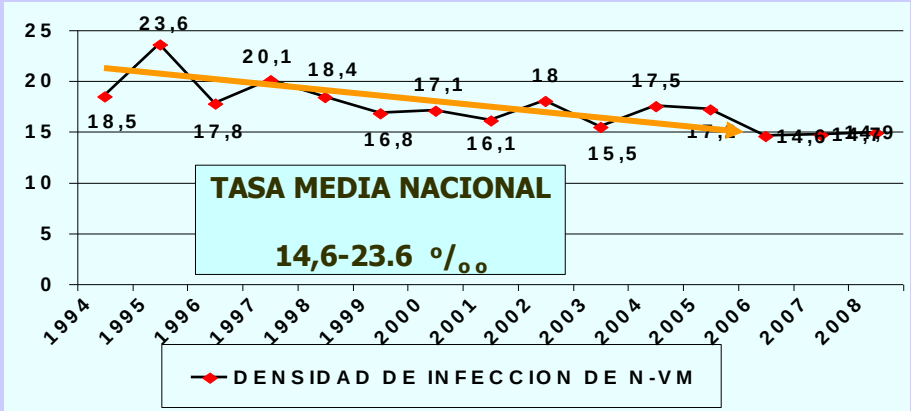
Errors are likely to occur in all complex systems.

TASAS DE IN ADQUIRIDA EN UCI. ESTUDIO ENVIN-HELICS 1994-20088

Consolidada la vigilancia

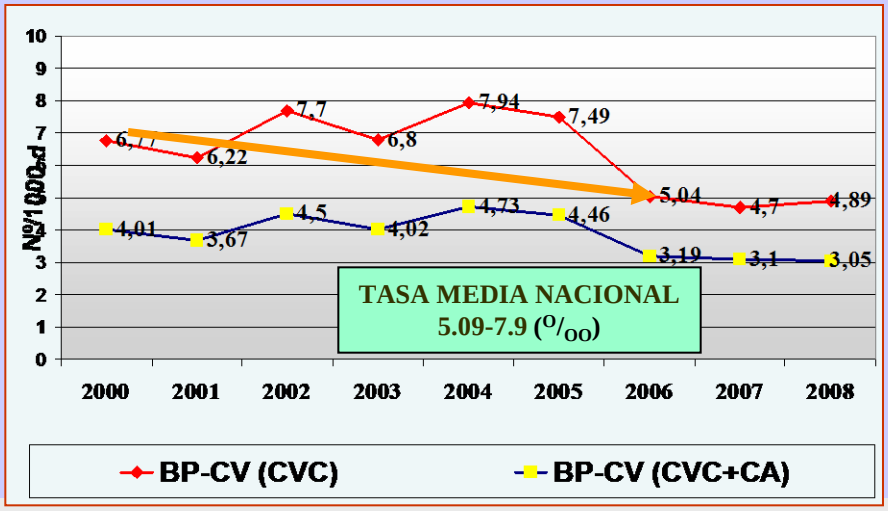
Reducción de las tasas pendiente

NEUMONIA RELACIONADA CON VM

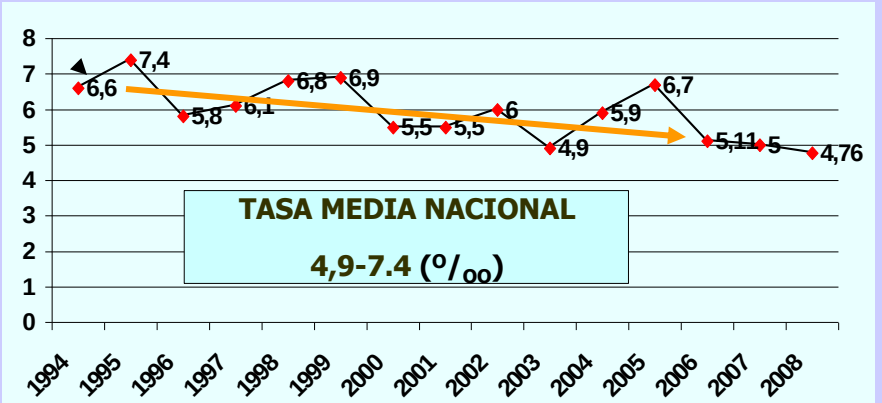


N-VM /1000 días de VM

BACTERIEMIA PRIMARIA-CV.



INFECCION URINARIA RELACIONADA CON SU



INFECCION URINARIA-SU / 1000 DÍAS DE SONDA URETRAL

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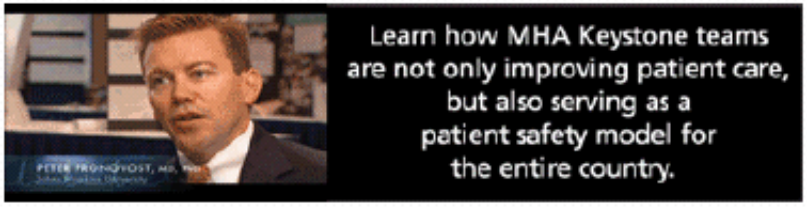
MHA Keystone Center for Patient Safety & Quality

The Michigan Health & Hospital Association's (MHA) Keystone Center for Patient Safety & Quality was created in March 2003 as a 501(c)(3) division of the MHA Health Foundation. MHA Keystone brings together hospitals, national experts and best practice evidence to improve patient safety by addressing the quality of health care delivery at the bedside. One of Keystone's most ambitious collaboratives, Keystone: ICU, exists through an ongoing and innovative partnership with patient safety experts at Johns Hopkins University.



MHA Keystone Center for Patient Safety & Quality

MHA Keystone Center

- Overview

About the Projects

- Keystone: ICU
  - Participating Teams
- Keystone: Stroke
- Keystone: Gift of Life

Recent News

- News Releases

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 28, 2006 VOL. 355 NO. 26

An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU

Peter Pronovost, M.D., Ph.D., Dale Needham, M.D., Ph.D., Sean Berenholtz, M.D., David Sinopoli, M.P.H., M.B.A., Haitao Chu, M.D., Ph.D., Sara Cosgrove, M.D., Bryan Sexton, Ph.D., Robert Hyzy, M.D., Robert Welsh, M.D., Gary Roth, M.D., Joseph Bander, M.D., John Kepros, M.D., and Christine Goeschel, R.N., M.P.A.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 28, 2006 VOL. 355 NO. 26

An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU

Mean from **7,7** epis/1.000 CVC days to **1,4** after 18 months (p<0,002).

Table 3. Rates of Catheter-Related Bloodstream Infection from Baseline (before Implementation of the Study Intervention) to 18 Months of Follow-up.*

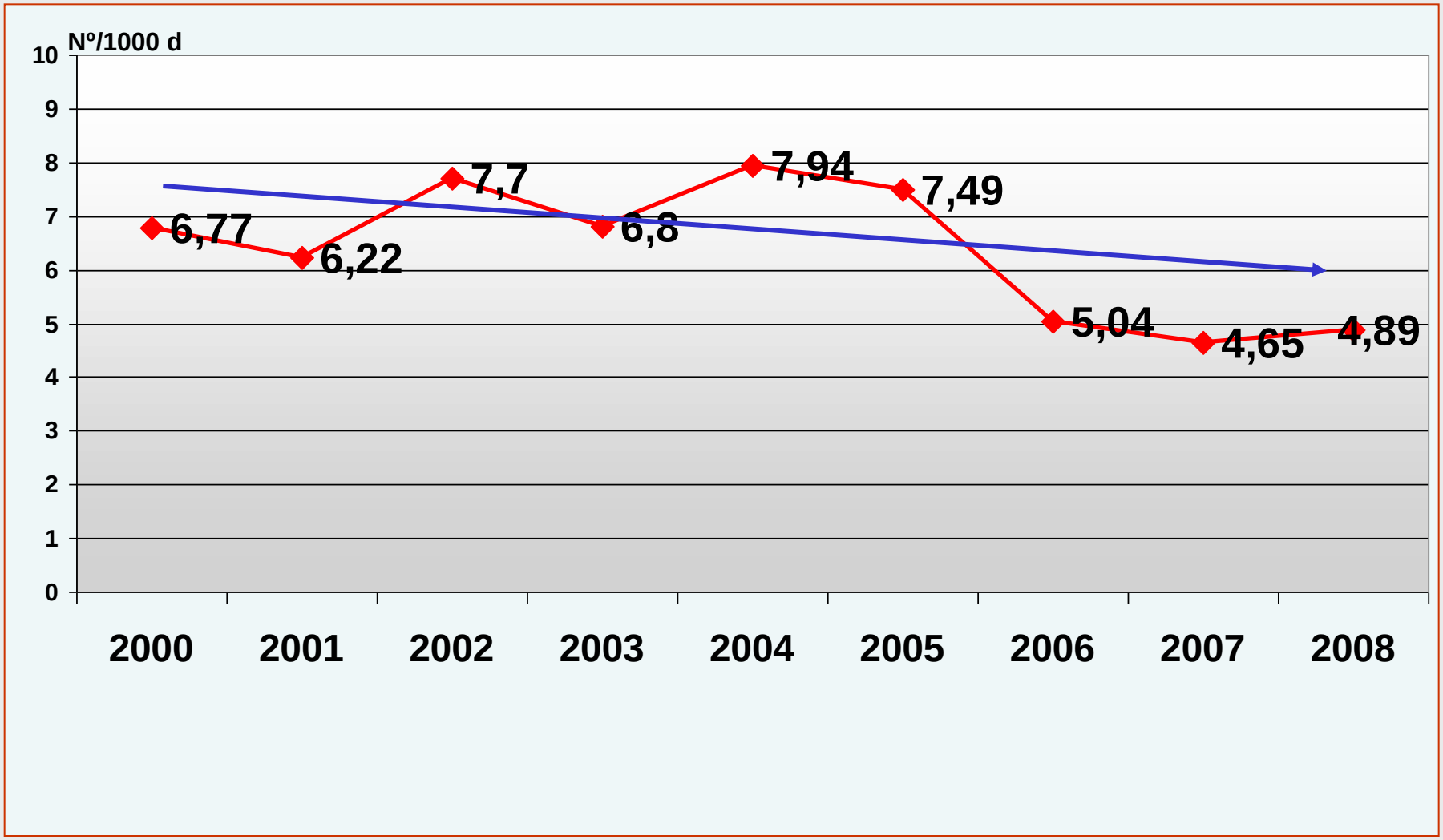
Study Period	No. of ICUs	No. of Bloodstream Infections per 1000 Catheter-Days				
		Overall	Teaching Hospital	Nonteaching Hospital	<200 Beds	≥200 Beds
		median (interquartile range)				
Baseline	55	2.7 (0.6–4.8)	2.7 (1.3–4.7)	2.6 (0–4.9)	2.1 (0–3.0)	2.7 (1.3–4.8)
During implementation	96	1.6 (0–4.4)†	1.7 (0–4.5)	0 (0–3.5)	0 (0–5.8)	1.7 (0–4.3)†
After implementation						
0– 3 mo	96	0 (0–3.0)‡	1.3 (0–3.1)†	0 (0–1.6)†	0 (0–2.7)	1.1 (0–3.1)‡
4–6 mo	96	0 (0–2.7)‡	1.1 (0–3.6)†	0 (0–0)‡	0 (0–0)†	0 (0–3.2)‡
7–9 mo	95	0 (0–2.1)‡	0.8 (0–2.4)‡	0 (0–0)‡	0 (0–0)†	0 (0–2.2)‡
10–12 mo	90	0 (0–1.9)‡	0 (0–2.3)‡	0 (0–1.5)‡	0 (0–0)†	0.2 (0–2.3)‡
13–15 mo	85	0 (0–1.6)‡	0 (0–2.2)‡	0 (0–0)‡	0 (0–0)†	0 (0–2.0)‡
16–18 mo	70	0 (0–2.4)‡	0 (0–2.7)‡	0 (0–1.2)†	0 (0–0)†	0 (0–2.6)‡

* Because the ICUs implemented the study intervention at different times, the total number of ICUs contributing data for each period varies. Of the 103 participating ICUs, 48 did not contribute baseline data. P values were calculated by the two-sample Wilcoxon rank-sum test.

† P≤0.05 for the comparison with the baseline (preimplementation) period.

‡ P≤0.002 for the comparison with the baseline (preimplementation) period.

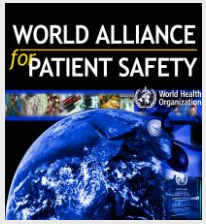
CRB+PB ID: EPISODES x 1000 CVC-DAYS
ENVIN-HELICS 2000-2008.



Bacteriemia zero

PROTOCOLO PREVENCIÓN DE LAS BACTERIEMIAS RELACIONADAS CON CATÉTERES VENOSOS CENTRALES (BRC) EN LAS UCI ESPAÑOLAS

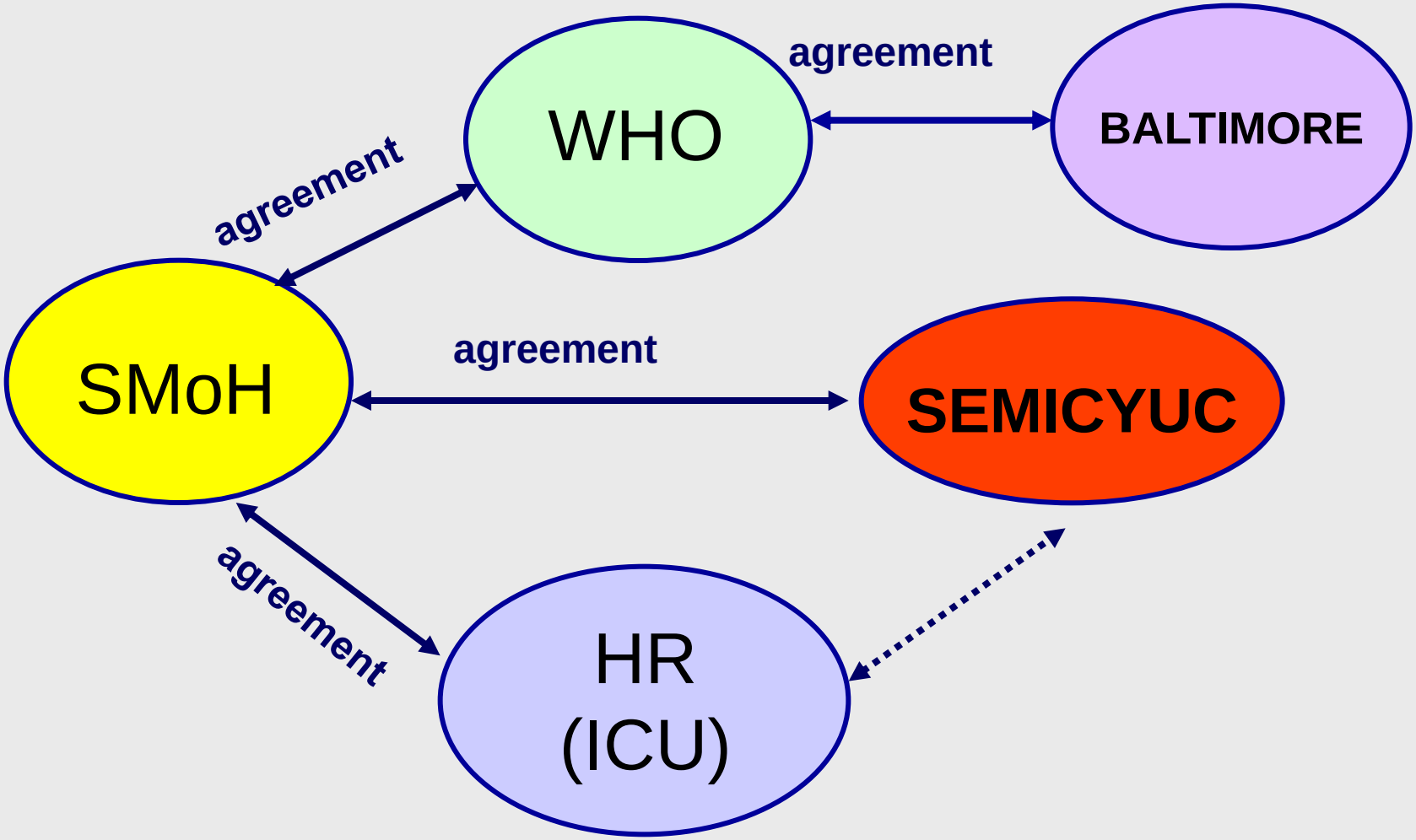
GOBIERNO DE ESPAÑA
MINISTERIO DE SANIDAD Y CONSUMO
Plan de Calidad para el Sistema Nacional de Salud



World Health Organization

SEMICYUC
LOS PROFESIONALES DEL ENFERMO CRÍTICO

GENERAL FRAMEWORK



Bacteriemia zero

- The WHO and the Spanish Ministry of Health provided supervision and program coordination across the Health Regions and secured funding from the SMH.
- The Armstrong Institute (Baltimore) provided technical support and advice.
- The Spanish Society led and coordinated scientific activities and technical aspects in the ICUs.

OBJECTIVES

- Reduce ICU CLABSI (< 4 episodes per 1000 CL days)
- Create through the HR an ICU network to apply effective Safe Practices
- Promote Safety Culture in the Spanish ICU
- Improve CLABSI information system

Bacteriemia zero

- The original Keystone ICU project was adapted to fit the organizational and cultural characteristics of the Spanish health care system.
- The model to engage, educate, execute, and evaluate was unchanged and a key element of the study implementation

Bacteriemia zero

STOP-BRC

a. **Hand hygiene.**
b. **Chlorhexidine skin antisepsis.**
c. **Maximal barriers precautions**
d. **Prefered site selection: subclavian vein.**
e. **Removal of unnecessary lines**
f. **Hygienic caheter managment**

Comprehensive Safety Plan

1. **Evaluate safety culture**
2. **Education on safety culture**
3. **Identify defects in clinical practice**
4. **Establish alliances with Executive Board**
5. **Learn from defects**

- A preparation phase (eg, activity planning, engagement of ICUs) with baseline data collection occurred from April to December 2008.
- An implementation phase was defined for the first 3 months of the study (beginning in January 2009), and the post-intervention phase that ended June 2010.
- A coordinating team including an ICU physician and a nurse was established for each Health Region with the responsibility to coordinate and interact with hospital authorities and participating ICUs in their region.
- A physician and a nurse in each participating ICU shared the leadership of the study.
- An electronic discussion platform and direct and timely access to ICU results were provided
- Nine meetings were held during the project with ICU leaders to facilitate engagement, training, problem-solving, and feedback.

Study Hypothesis, Exposure and Outcomes

- It was **hypothesized** that proper contextual adaptation and large scale implementation in Spanish ICUs of the Keystone project would be effective in decreasing CRBSI rates.

- The **primary outcome** was the quarterly rate of CRBSI.
- The **secondary outcome** was to assess the influence of ICU and hospital characteristics on rates of CRBSI.

- We defined exposure as the post-implementation period after full implementation of the study intervention, which involved six temporal variables, and compared these values with the baseline value.

Definitions

BSI	**A positive BC with recognized pathogen or two BCs with skin contaminant including clinical symptoms**	
CRBSI	**BSI with origin "Catheter" (BSI-C) + BSI with origin "Unknown" (BSI-U)**	
	BSI-C	**Isolated of the same microorganism (species and identical antibiotic susceptibility testing) in the BC from a peripheral vein and** a **A quantitative CVC tip culture ≥ 10^3 cfu/mL or semiquantitative CVC tip culture > 15 cfu** b **A quantitative blood culture ratio CVC blood sample/ peripheral blood sample > 5** c **Differential delay of positivity of blood cultures: CVC blood sample culture positive 2 hour or less before peripherals blood culture (blood sample drawn at the same time)** d **Positive culture with the same microorganism from pus from insertion site**
	BSI-U	**BSI without apparent focus of infection** a**Positive BC, negative CVC tip culture and disappearance of symptoms within 48 hour after removal of the venous line** b**Positive BC without identification of the responsible focus**
BSI-S	**BSI secondary to other infection site. BC positive for the same pathogen isolated from samples from secondary sites (wound site, urine, respiratory tract, other sterile site, and other nonsterile site)**	

Statistical Analysis

- The number of CRBSI, catheter-days, and incidence rates were expressed as medians and interquartile ranges (25th-75th percentile).
- Monthly data were aggregated into **3-month periods** (quarters) to coincide with the implementation periods. The quarterly infection rate was calculated as the number of infections per 1000 catheter-days for each 3-month period.
- To explore the exposure-outcome relationship, we used generalized **linear mixed regression models** with a Poisson distribution to calculate the incidence rates, incidence rate ratio (IRR), and 95% confidence intervals (CI), considering the ICU unit as random and the other factors as fixed effects.
- In the **final regression analysis**, period estimates were adjusted by **hospital size, teaching status, and seasonality**. All tests of significance were two-sided and set at $P < 0.05$. We used SAS version 9.2 software for the analyse (Cary, NC).

Online training course

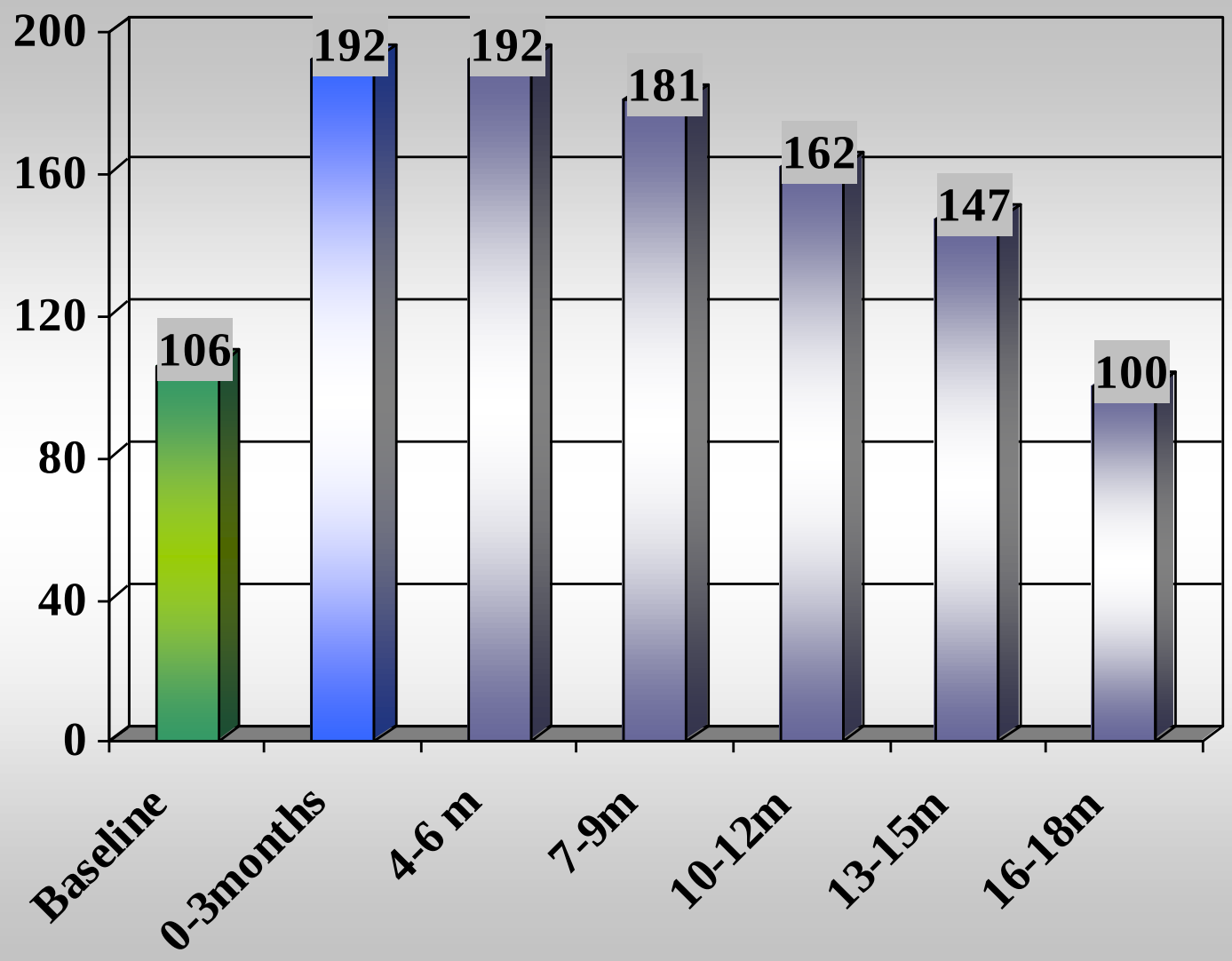
Health care professionals: 14,879

- Physicians 1,616
- Registered nurses: , 8,598 ,
- Clinical assistants: 4,331
- Other professionals: 334

Hospital survey on patient safety culture questionnaire: 6,629 professionals

	Period						
	Baseline	Implementation (0-3 months)	4-6 months	7-9 months	10-12 months	13-15 months	16-18 months
ICUs, No.[a]	106	192	192	181	162	147	100
ICU admissions, No.	14970	26160	26165	24097	21777	19631	10975
Patient-days, total No.	95000	164204	160983	154916	140797	118870	65678
Catheter-days, total No.	78092	128060	125834	117526	112719	93234	51983
BSI, total No.	467	610	732	591	576	384	245
CRBSI, total No.	334	379	454	336	308	191	110
BSI-C, total No.	148	153	194	144	139	102	52
BSI-U, total No.	186	226	260	192	169	89	58
BSI-S, total No.	133	231	278	255	268	193	135
Patients with BSI (%)	413 (2.76)	555 (2.12)	668 (2.55)	550 (2.28)	524 (2.41)	364 (1.85)	225 (2.05)
Patients with CRBSI (%)	292 (1.95)	345 (1.32)	416 (1.59)	313 (1.30)	283 (1.30)	183 (0.93)	106 (0.97)
Patients with >1 CRBSI	36 (12.3%)	29 (8.41)	33 (7.93)	20 (6.39)	21 (7.42)	6 (3.28)	4 (3.77)

N ICUs


200
160
120
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40
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106
192
192
181
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Baseline
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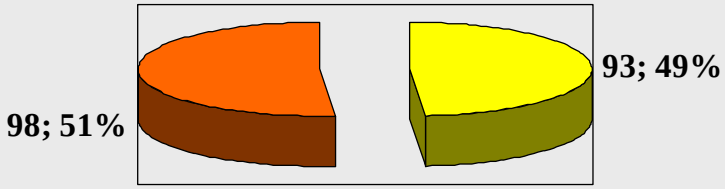
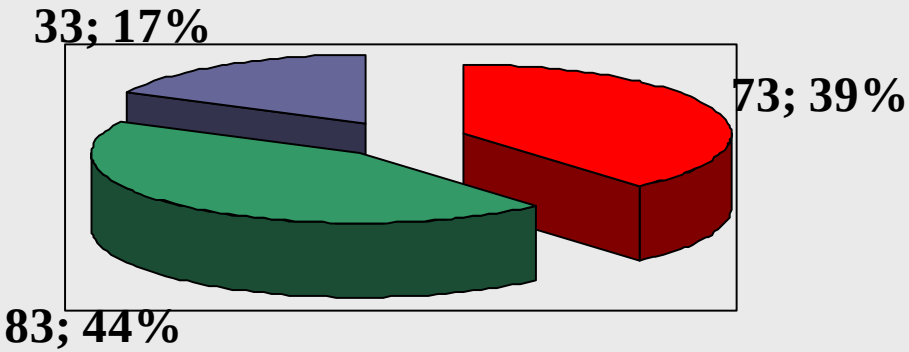
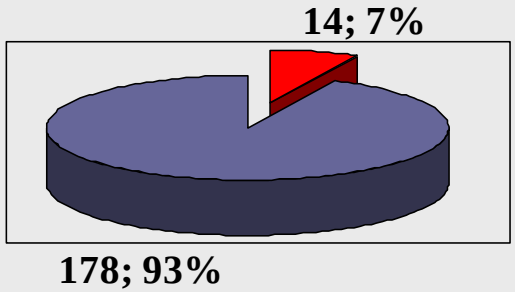
4-6 m
7-9m
10-12m
13-15m
16-18m

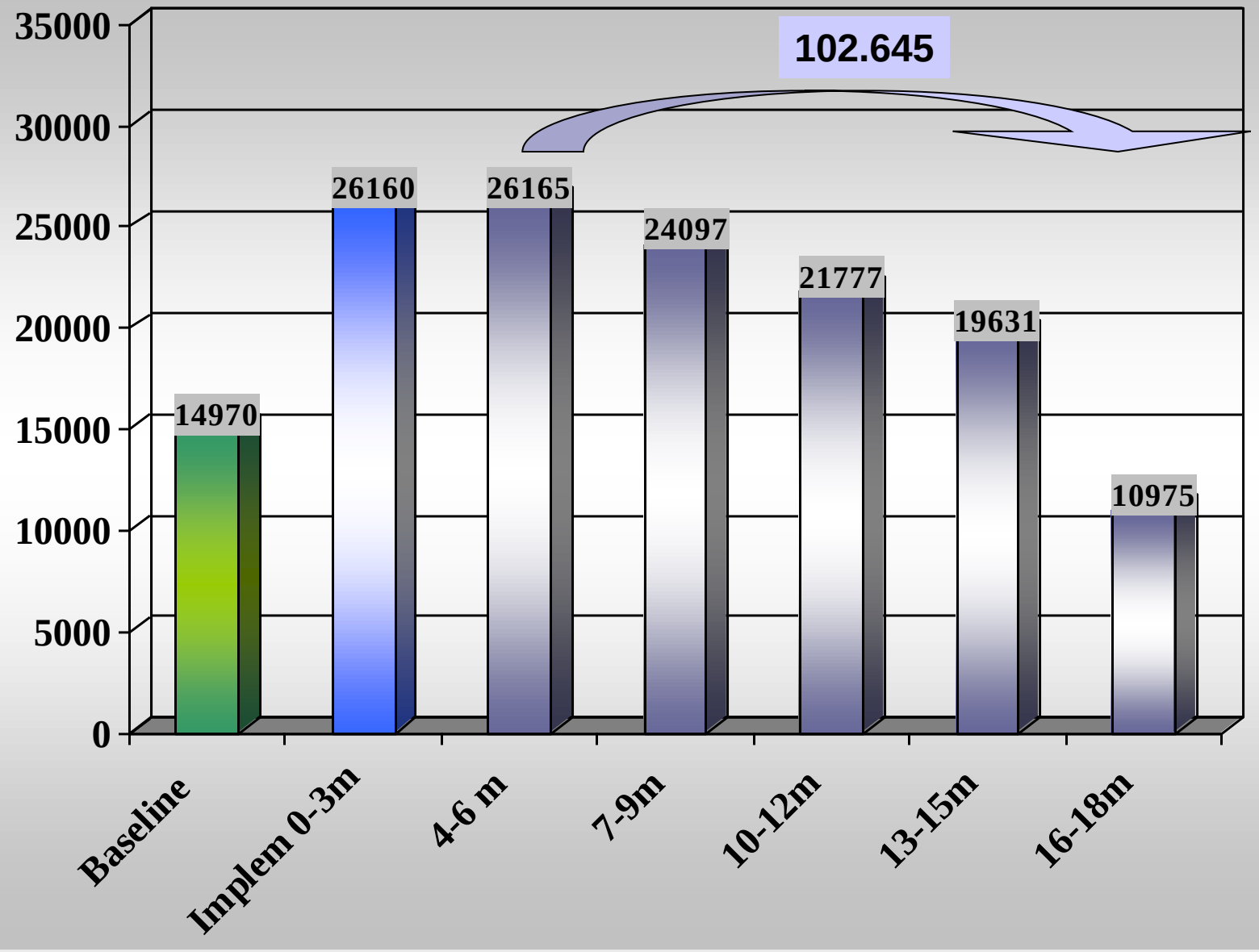
SIZE AND TYPE OF ICUs



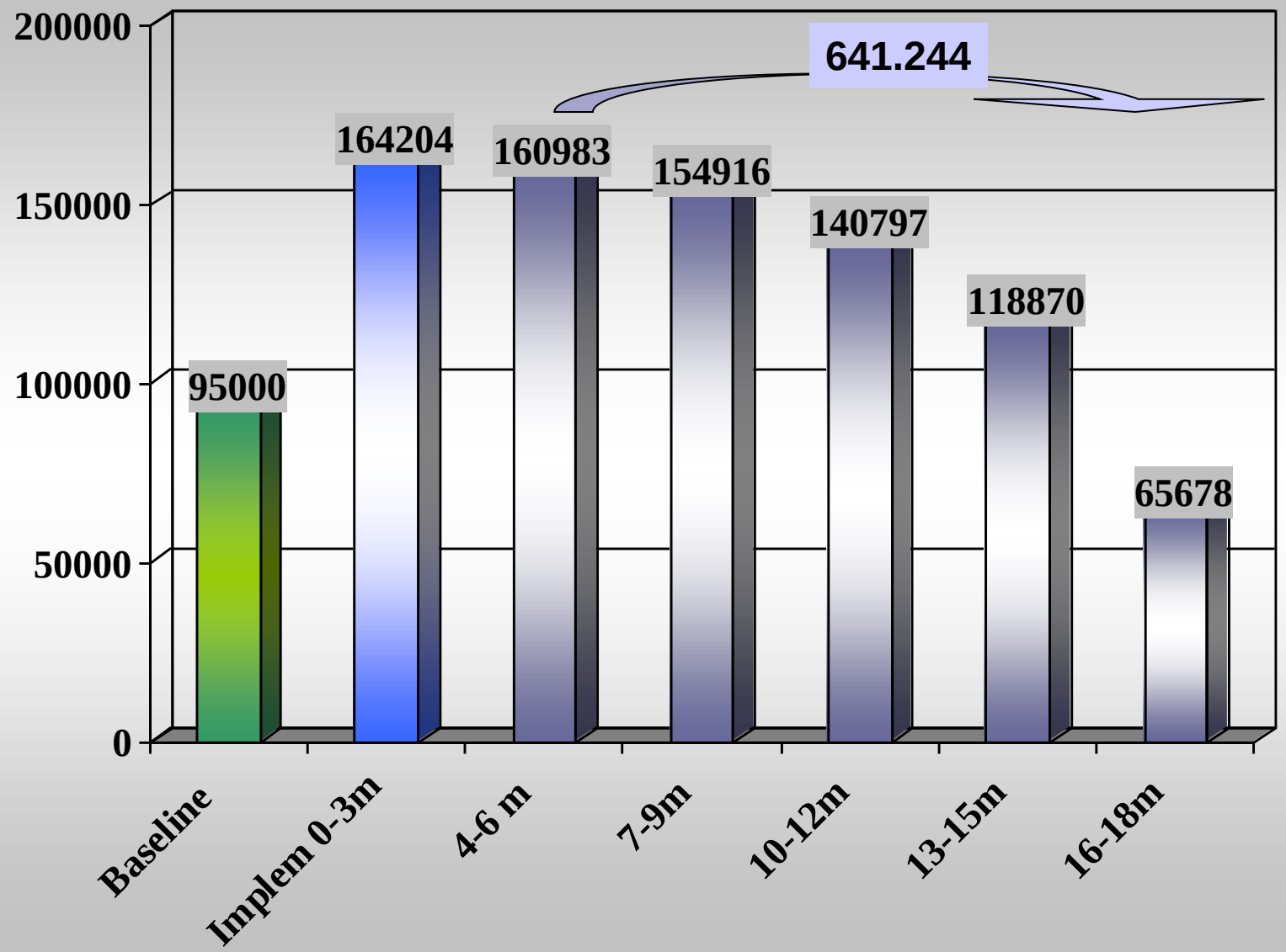




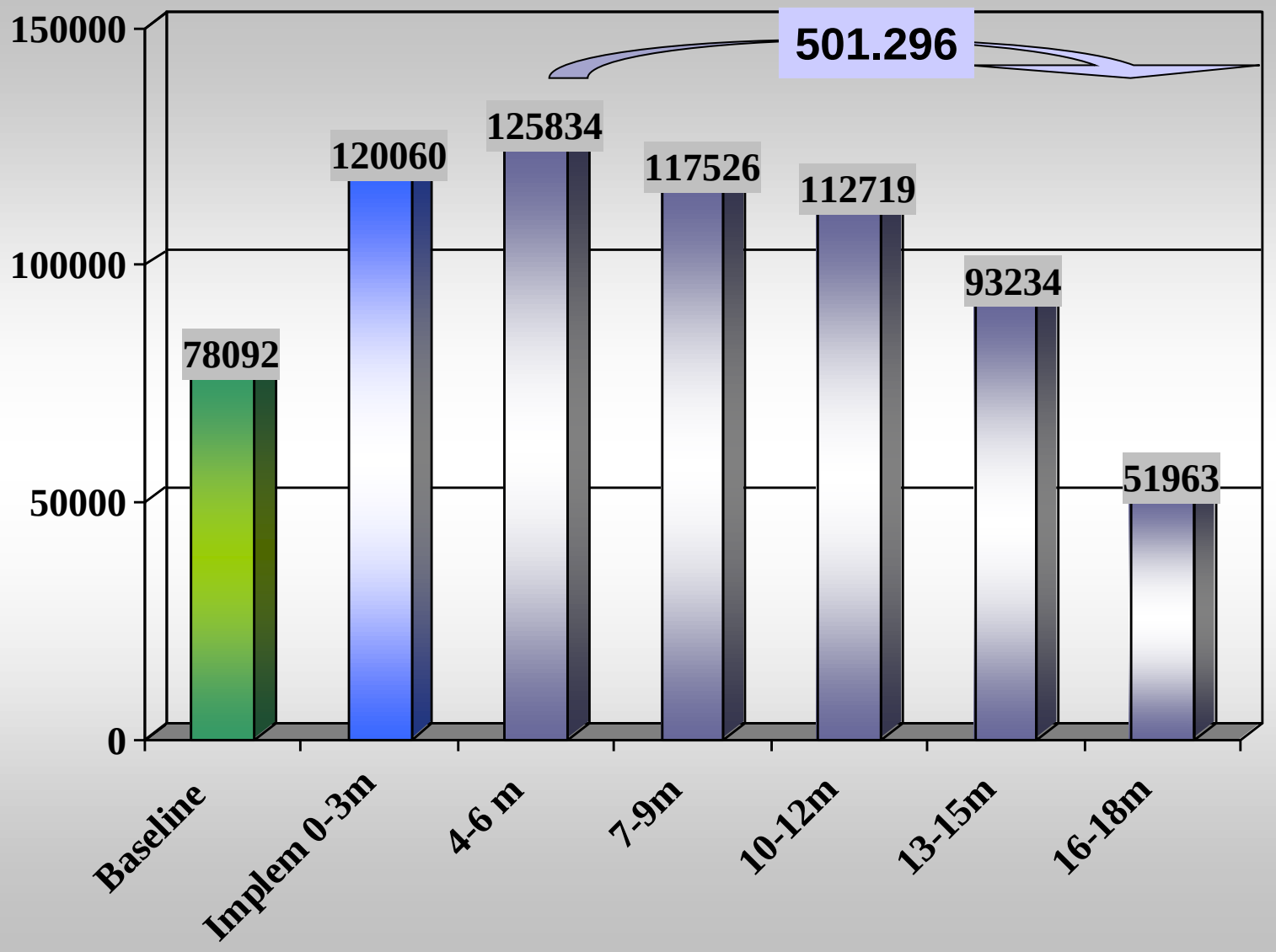
ICU admissions



Patient-days



CVC-days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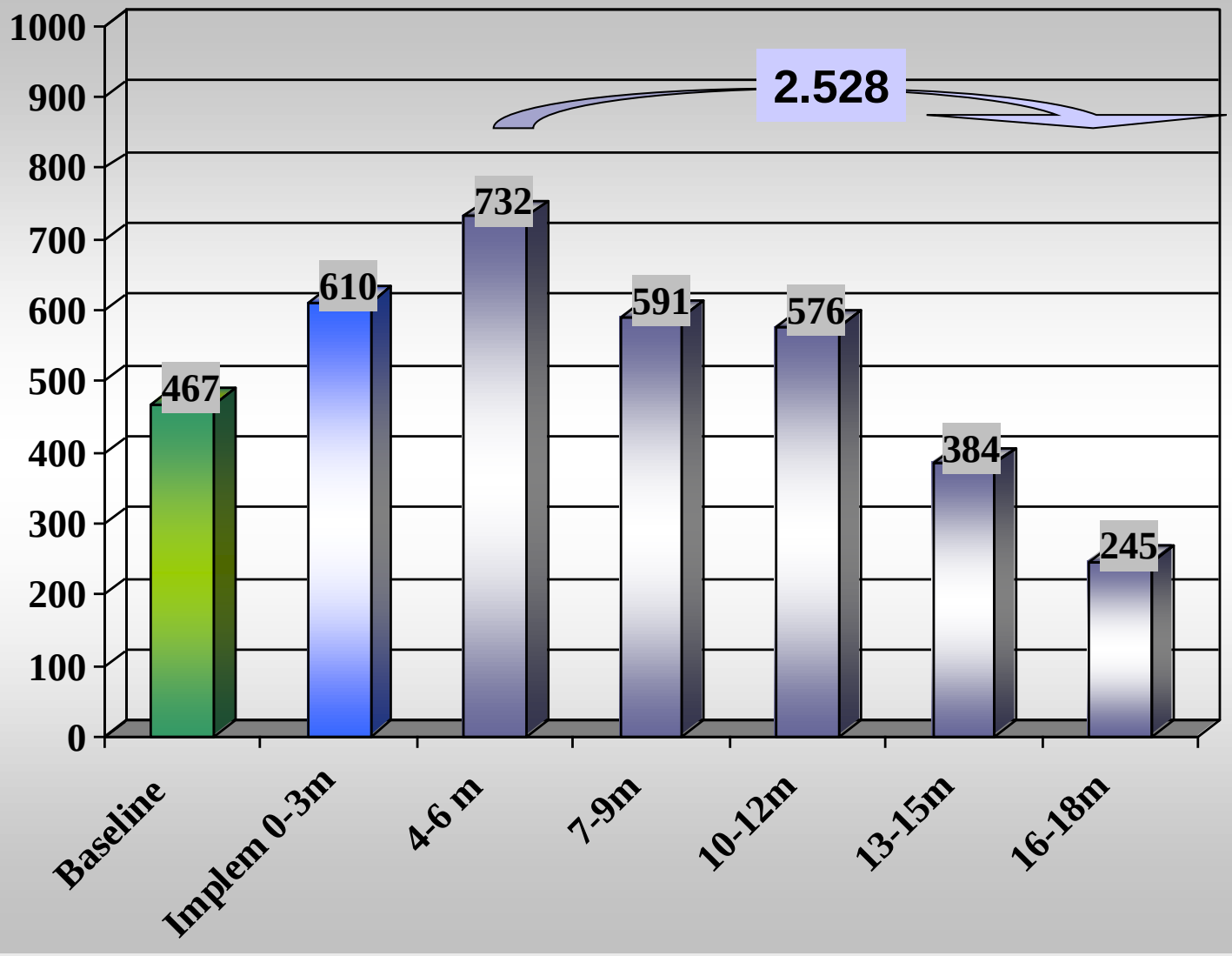
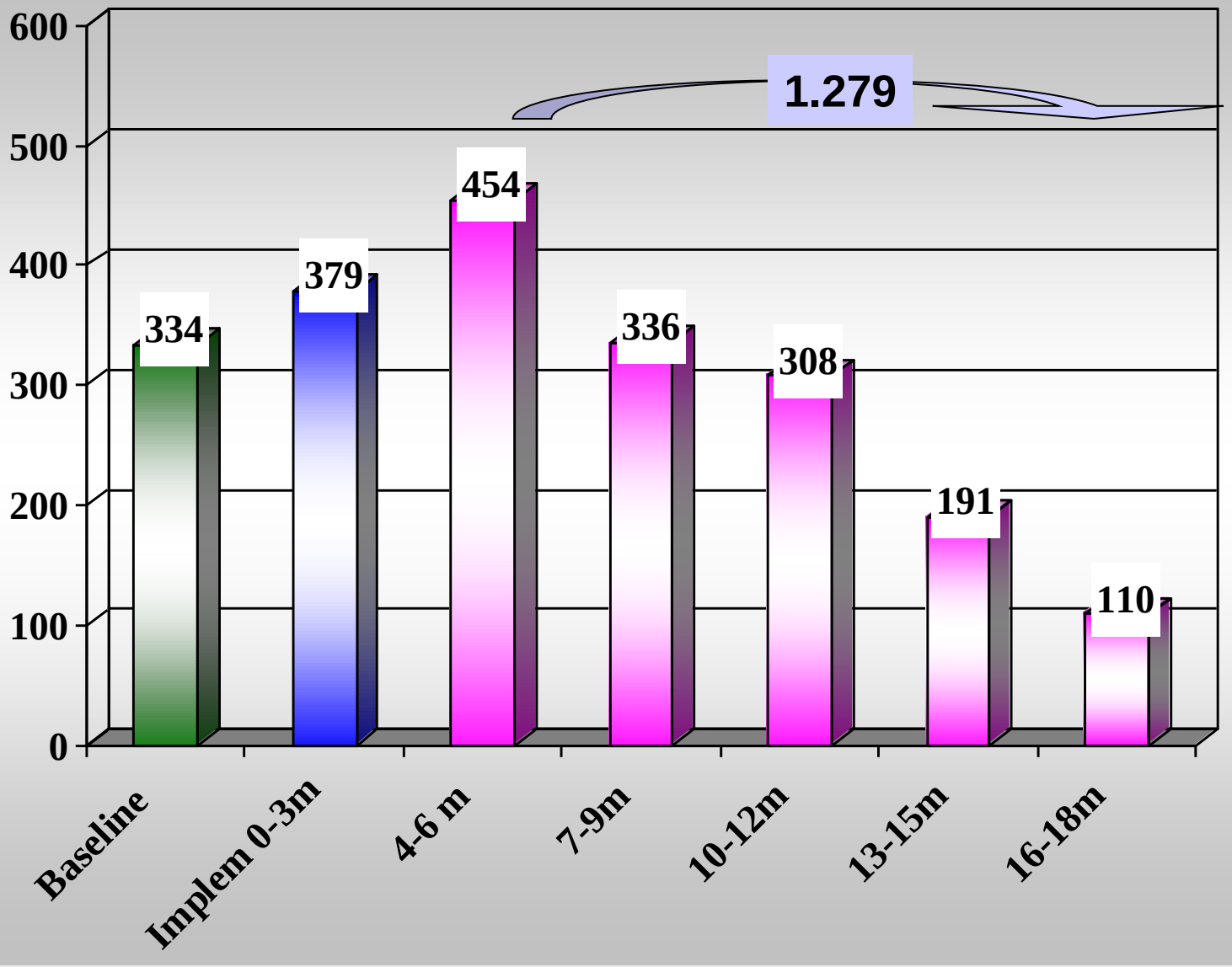
7-9m
10-12m
13-15m
16-18m

BSI (CRBSI+BSI-S)



CRBSI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336
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191
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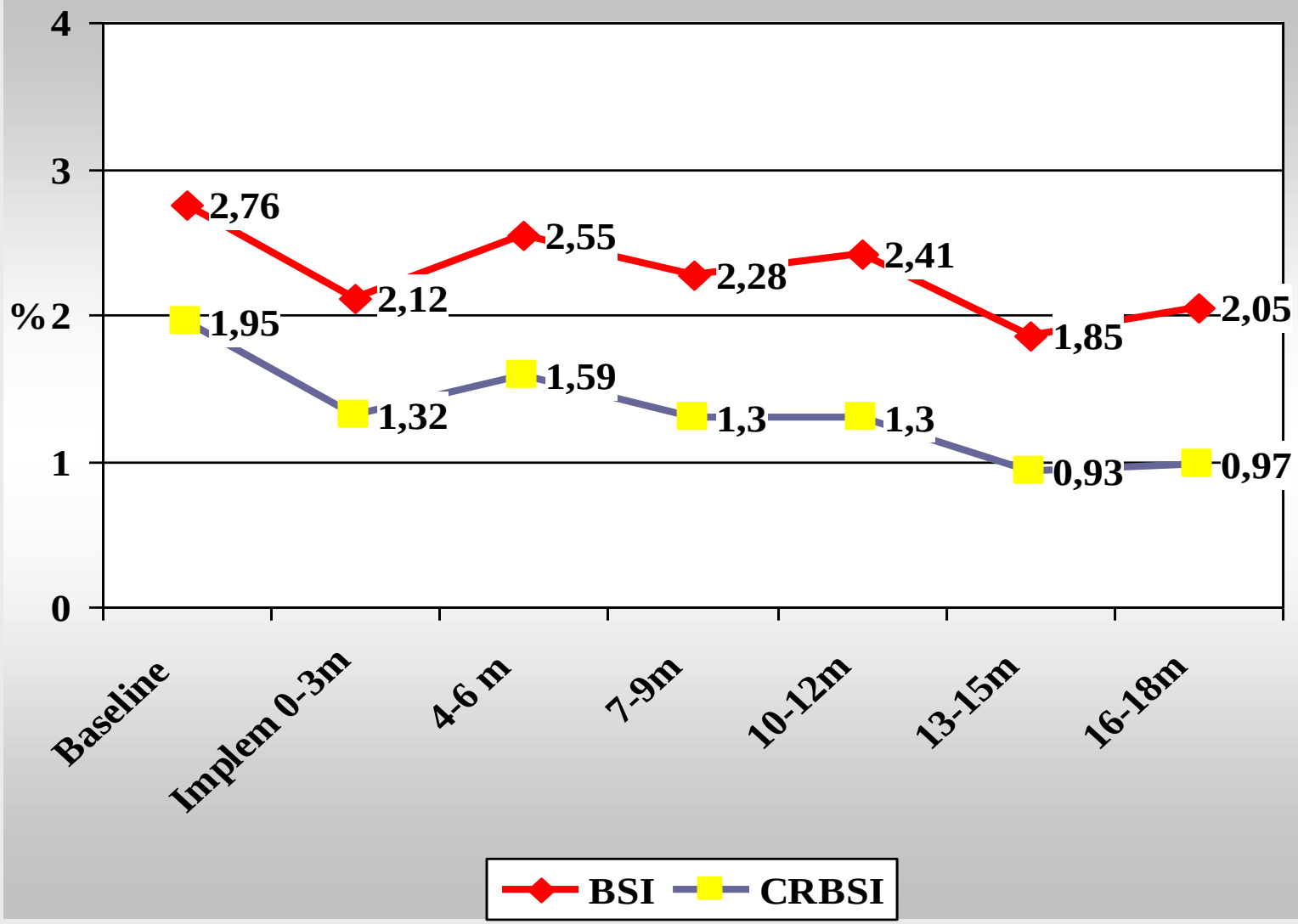
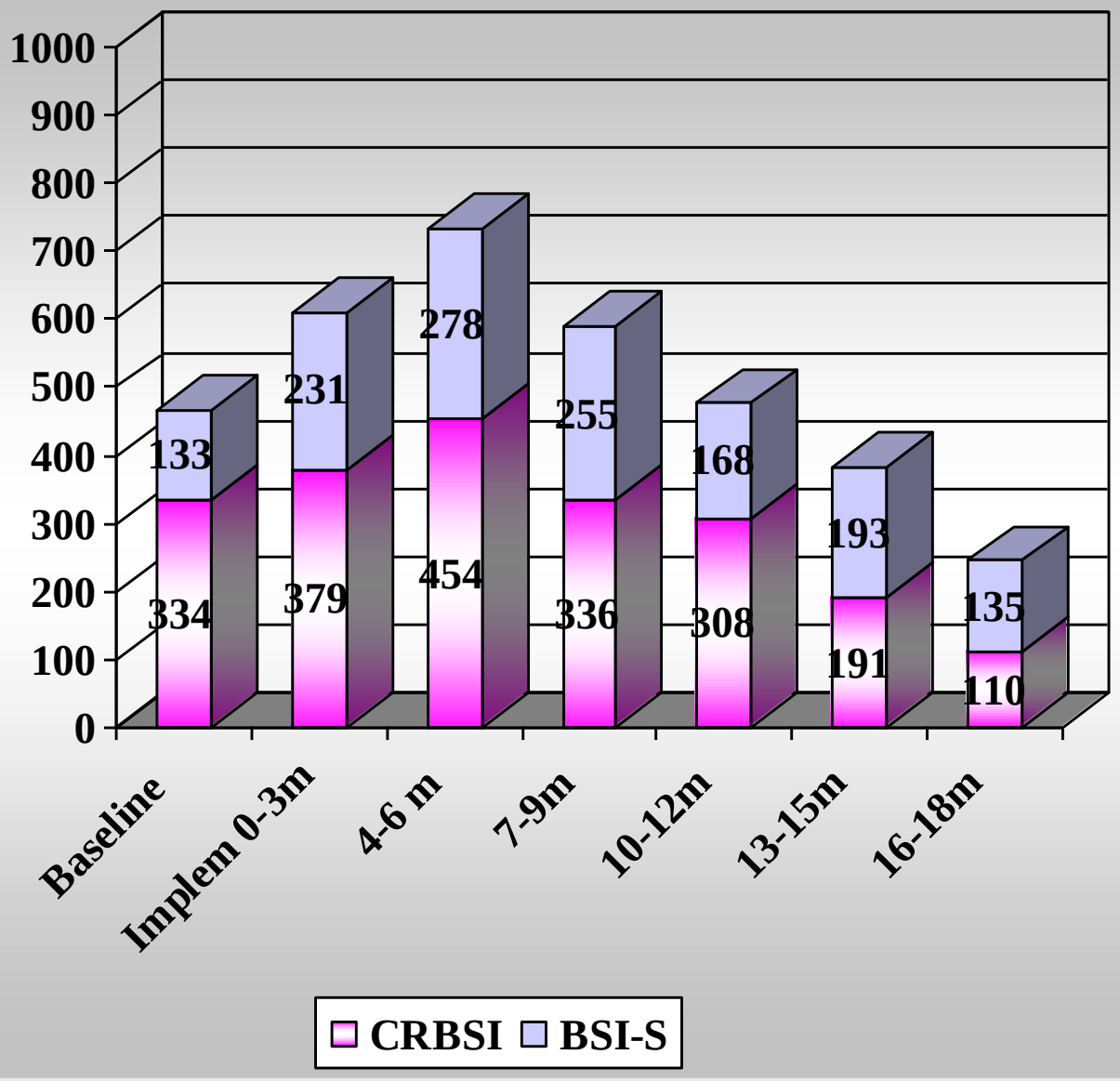
Baseline
Implem 0-3m
4-6 m
7-9m
10-12m
13-15m
16-18m

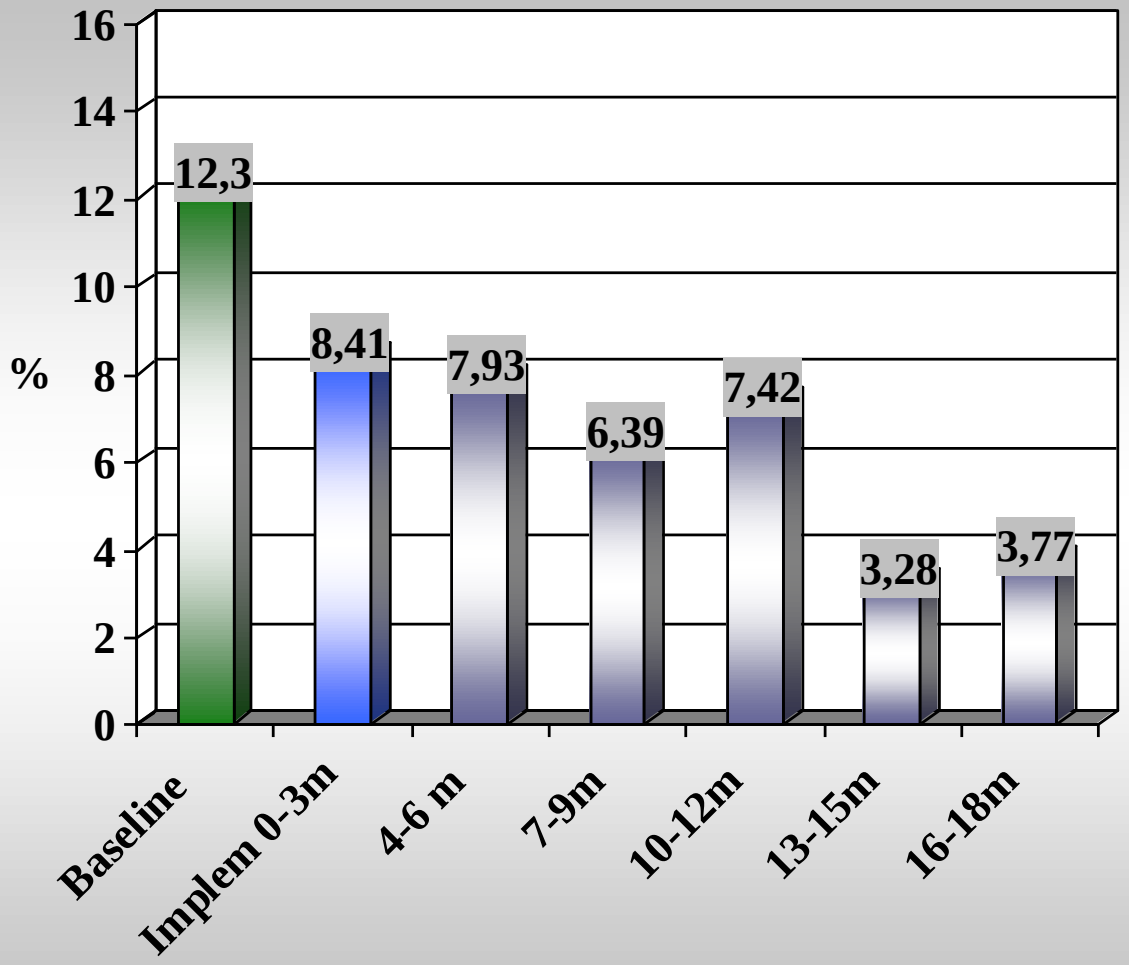
Patients with BSI and CRBSI (%)



CRBSI and BSI-S (No)



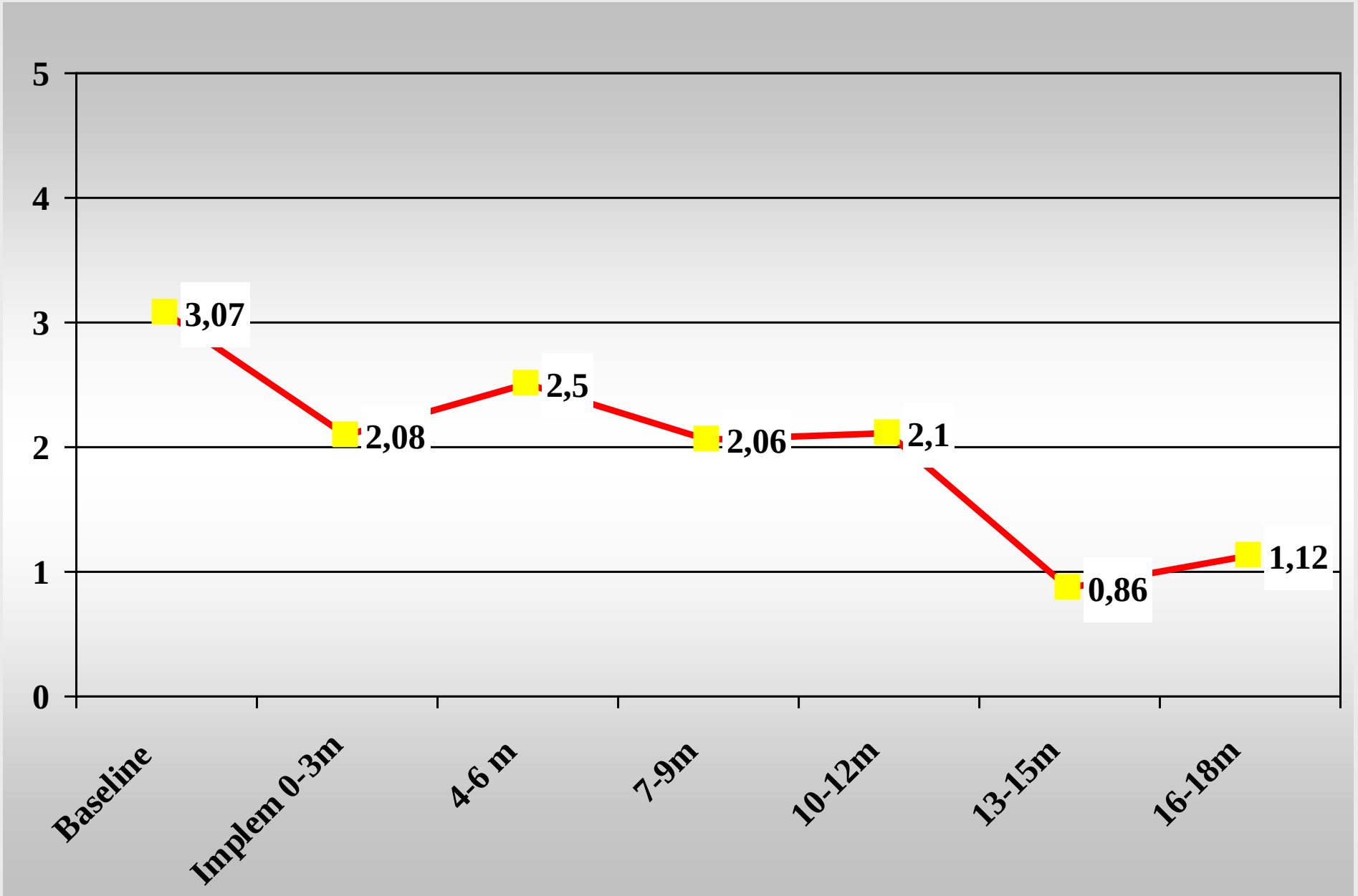
Patients with >1 CRBSI



Incidence of Catheter-Related Bloodstream Infection

Period	ICUs	Events		Catheter-days		Incidence rate[a]
		No.	Median (IQR)[b]	No.	Median (IQR)	. Median (IQR)
Baseline	106	334	2 (0-5)	78092	582 (308 - 1022)	3.07 (0.00 - 5.35)
Implementation (0-3 months)	192	379	1 (0 - 3)	128060	529 (280 - 930)	2.08 (0.00 - 3.71)
4-6 months	192	454	1 (0 - 3)	125834	492 (282 - 903)	2.50 (0.00 - 4.71)
7-9 months	181	336	1 (0 - 3)	117526	514 (277 - 894)	2.06 (0.00 - 4.07)
10-12 months	162	308	1 (0 - 3)	112719	519 (323 - 961)	2.10 (0.00 - 3.80)
13-15 months	147	191	1 (0 - 2)	93234	473 (253 - 876)	0.86 (0.00 - 2.58)
16-18 months	100	110	1 (0 - 2)	51983	370 (222 - 702)	1.12 (0.00 - 3.24)

CRBSI: Incidence rate (Median)



Variable	Effect	Univariate Analysis[a]		Adjusted Multivariate Analysis[b]	
		Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio Estimate (95%CI)	Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio: Estimate (95%CI)
Period	Baseline	4.27 (3.75 - 4.86)	Ref. (*P* < 0.001)	3.64 (3.04 - 4.35)	Ref. (*P* < 0.001)
	Implementation (0-3 months)	3.00 (2.64 - 3.39)	0.70 (0.60 - 0.82)	2.83 (2.38 - 3.37)	0.78 (0.66 - 0.92)
	4-6 months	3.66 (3.26 - 4.10)	0.86 (0.74 - 1.00)	3.31 (2.81 - 3.89)	0.91 (0.78 - 1.07)
	7-9 months	2.92 (2.56 - 3.33)	0.68 (0.58 - 0.80)	2.87 (2.40 - 3.45)	0.79 (0.66 - 0.95)
	10-12 months	2.79 (2.43 - 3.20)	0.65 (0.55 - 0.77)	2.74 (2.28 - 3.30)	0.75 (0.63 - 0.91)
	13-15 months	2.06 (1.74 - 2.45)	0.48 (0.40 - 0.59)	1.94 (1.57 - 2.39)	0.53 (0.43 - 0.65)
	16-18 months	2.19 (1.77 - 2.71)	0.51 (0.41 - 0.65)	1.80 (1.40 - 2.32)	0.50 (0.39 - 0.63)
Hospital size	>500 beds	3.31 (2.99 - 3.67)	Ref. (*P* = 0.026)	2.94 (2.58 - 3.34)	Ref. (*P* = 0.383)
	200-500 beds	2.69 (2.33 - 3.12)	0.81 (0.68 - 0.97)	2.61 (2.26 - 3.01)	0.89 (0.74 - 1.07)
	<200 beds	2.28 (1.53 - 3.40)	0.69 (0.45 - 1.04)	2.45 (1.65 - 3.63)	0.83 (0.55 - 1.27)
University Unit	Yes	3.37 (3.07 - 3.69)	Ref. (*P* < 0.001)	3.06 (2.58 - 3.64)	Ref. (*P* = 0.006)
	No	2.33 (1.99 - 2.74)	0.69 (0.58 - 0.83)	2.31 (1.93 - 2.76)	0.75 (0.62 - 0.92)
Seasonality	May-June	3.58 (3.24 - 3.96)	Ref. (*P* < 0.001)	2.97 (2.53 - 3.48)	Ref. (*P* < 0.001)
	Other	2.82 (2.57 - 3.09)	0.79 (0.71 - 0.87)	2.38 (2.05 - 2.77)	0.80 (0.71 - 0.90)
Hospital type	Public	3.08 (2.83 - 3.35)	Ref. (*P* = 0.176)		
	Private	2.28 (1.48 - 3.50)	0.74 (0.48 - 1.15)		
Study follow-up	5-6 months	4.54 (3.25 - 6.34)	Ref. (*P* = 0.190)		
	7-9 months	3.16 (2.27 - 4.40)	0.70 (0.43 - 1.11)		
	10-12 months	2.80 (2.09 - 3.77)	0.62 (0.40 - 0.96)		
	13-15 months	2.94 (2.46 - 3.52)	0.65 (0.44 - 0.94)		
	16-18 months	2.99 (2.69 - 3.34)	0.66 (0.46 - 0.94)		

Variable	Effect	Univariate Analysis[a]		Adjusted Multivariate Analysis[b]	
		Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio Estimate (95%CI)	Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio: Estimate (95%CI)
Period	Baseline	4.27 (3.75 - 4.86)	Ref. (*P* < 0.001)	3.64 (3.04 - 4.35)	Ref. (*P* < 0.001)
	Implementation (0-3 months)	3.00 (2.64 - 3.39)	0.70 (0.60 - 0.82)	2.83 (2.38 - 3.37)	0.78 (0.66 - 0.92)
	4-6 months	3.66 (3.26 - 4.10)	0.86 (0.74 - 1.00)	3.31 (2.81 - 3.89)	0.91 (0.78 - 1.07)
	7-9 months	2.92 (2.56 - 3.33)	0.68 (0.58 - 0.80)	2.87 (2.40 - 3.45)	0.79 (0.66 - 0.95)
	10-12 months	2.79 (2.43 - 3.20)	0.65 (0.55 - 0.77)	2.74 (2.28 - 3.30)	0.75 (0.63 - 0.91)
	13-15 months	2.06 (1.74 - 2.45)	0.48 (0.40 - 0.59)	1.94 (1.57 - 2.39)	0.53 (0.43 - 0.65)
	16-18 months	2.19 (1.77 - 2.71)	0.51 (0.41 - 0.65)	1.80 (1.40 - 2.32)	0.50 (0.39 - 0.63)

Variable	Effect	Univariate Analysis[a]		Adjusted Multivariate Analysis[b]	
		Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio Estimate (95%CI)	Incidence[c] Estimate (95%CI)	Incidence-Rate Ratio: Estimate (95%CI)
Period	Baseline	4.27 (3.75 - 4.86)	Ref. (*P* < 0.001)	3.64 (3.04 - 4.35)	Ref. (*P* < 0.001)
	Implementation (0-3 months)	3.00 (2.64 - 3.39)	0.70 (0.60 - 0.82)	2.83 (2.38 - 3.37)	0.78 (0.66 - 0.92)
	4-6 months	3.66 (3.26 - 4.10)	0.86 (0.74 - 1.00)	3.31 (2.81 - 3.89)	0.91 (0.78 - 1.07)
	7-9 months	2.92 (2.56 - 3.33)	0.68 (0.58 - 0.80)	2.87 (2.40 - 3.45)	0.79 (0.66 - 0.95)
	10-12 months	2.79 (2.43 - 3.20)	0.65 (0.55 - 0.77)	2.74 (2.28 - 3.30)	0.75 (0.63 - 0.91)
	13-15 months	2.06 (1.74 - 2.45)	0.48 (0.40 - 0.59)	1.94 (1.57 - 2.39)	0.53 (0.43 - 0.65)
	16-18 months	2.19 (1.77 - 2.71)	0.51 (0.41 - 0.65)	1.80 (1.40 - 2.32)	0.50 (0.39 - 0.63)
Hospital size	**>500 beds**	**3.31 (2.99 - 3.67)**	**Ref. (*P* = 0.026)**	**2.94 (2.58 - 3.34)**	**Ref. (*P* = 0.383)**
	200-500 beds	**2.69 (2.33 - 3.12)**	**0.81 (0.68 - 0.97)**	**2.61 (2.26 - 3.01)**	**0.89 (0.74 - 1.07)**
	<200 beds	**2.28 (1.53 - 3.40)**	**0.69 (0.45 - 1.04)**	**2.45 (1.65 - 3.63)**	**0.83 (0.55 - 1.27)**
University Unit	**Yes**	**3.37 (3.07 - 3.69)**	**Ref. (*P* < 0.001)**	**3.06 (2.58 - 3.64)**	**Ref. (*P* = 0.006)**
	No	**2.33 (1.99 - 2.74)**	**0.69 (0.58 - 0.83)**	**2.31 (1.93 - 2.76)**	**0.75 (0.62 - 0.92)**
Seasonality	**May-June**	**3.58 (3.24 - 3.96)**	**Ref. (*P* < 0.001)**	**2.97 (2.53 - 3.48)**	**Ref. (*P* < 0.001)**
	Other	**2.82 (2.57 - 3.09)**	**0.79 (0.71 - 0.87)**	**2.38 (2.05 - 2.77)**	**0.80 (0.71 - 0.90)**

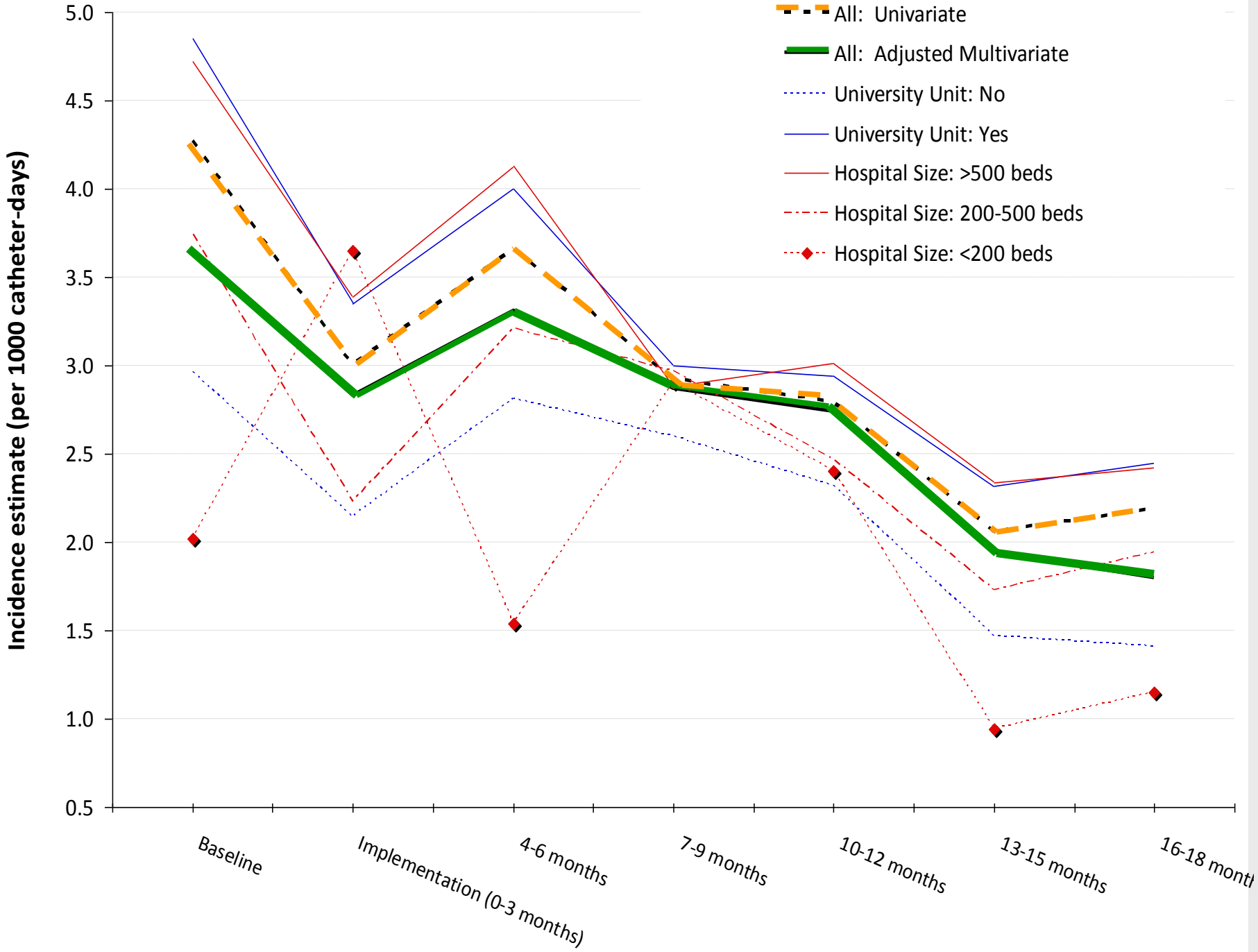
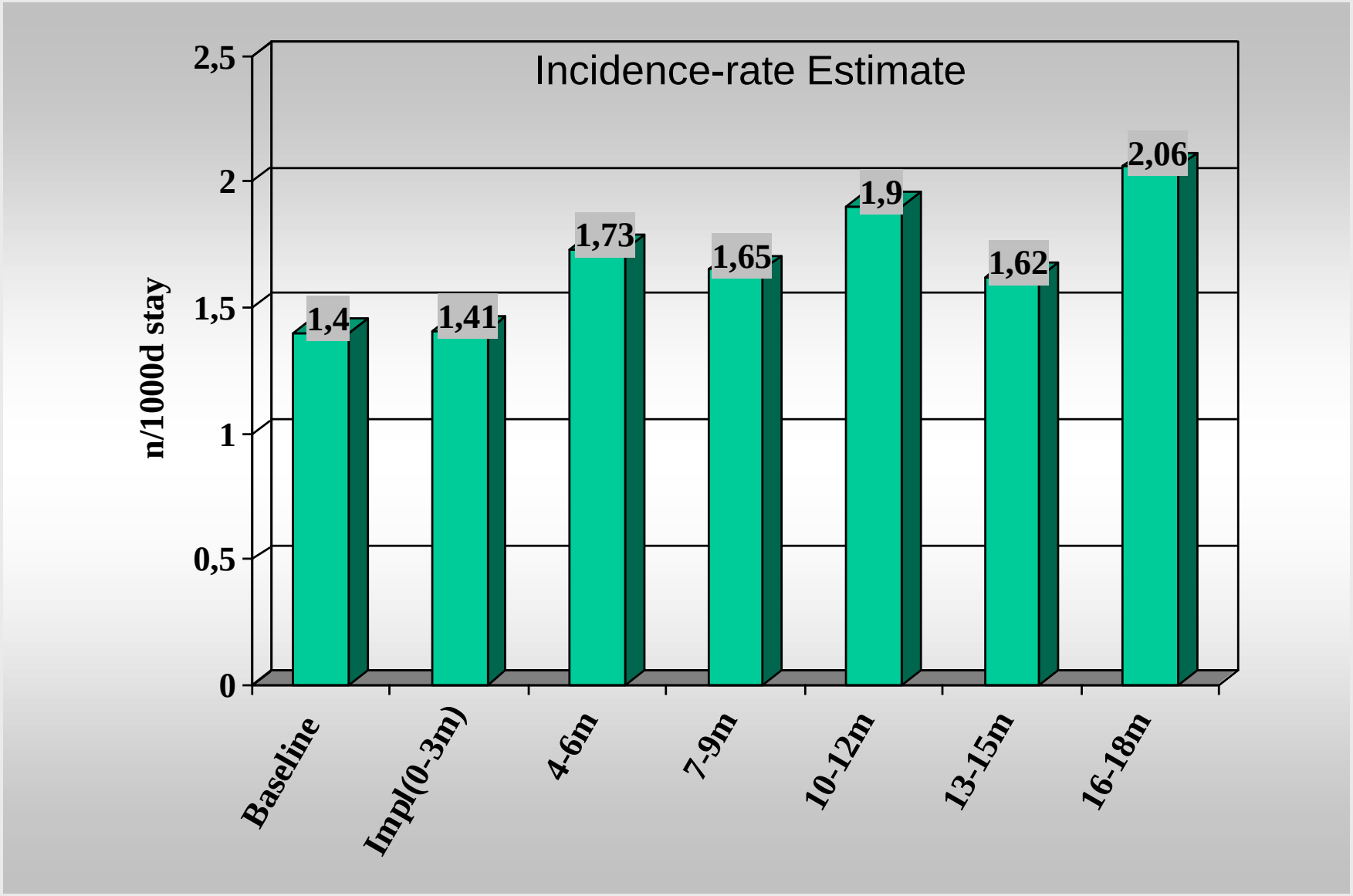

Incidence estimate (per 1000 catheter-days)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
All: Univariate
All: Adjusted Multivariate
University Unit: No
University Unit: Yes
Hospital Size: >500 beds
Hospital Size: 200-500 beds
Hospital Size: <200 beds
Baseline
Implementation (0-3 months)
4-6 months
7-9 months
10-12 months
13-15 months
16-18 month

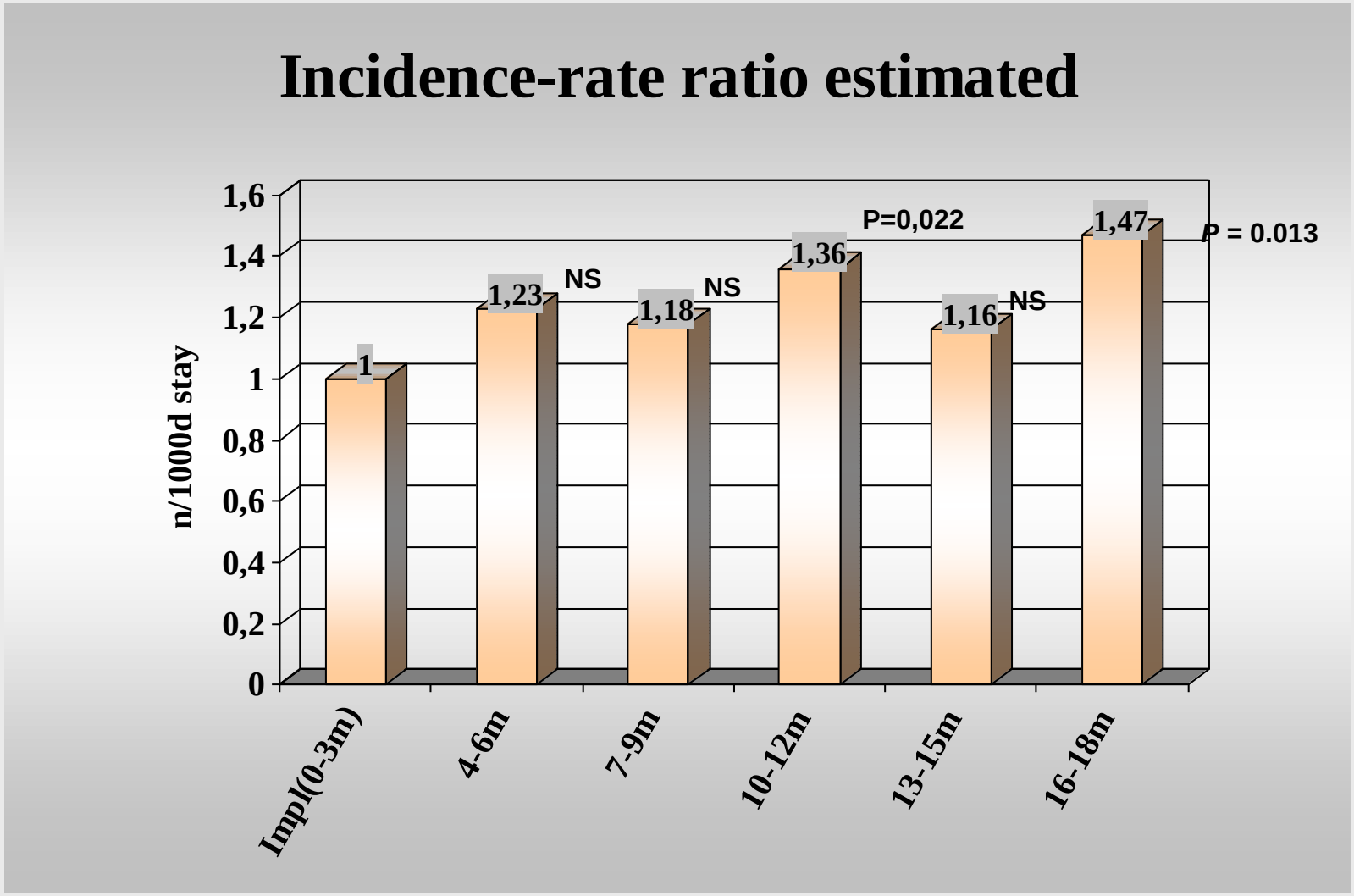
Table 1-e. BSI-Secondary to other Infection Sites during the Study Period

Variable	No.	Events		Admission days		Incidence-rate	Incidence-rate	Incidence-rate ratio
		No.	Median (IQR)	No.	Median (IQR)	Median (IQR)	Estimate (95% CI)	Estimate (95% CI), *P* value
Baseline	106	133	1 (0-2)	95000	774 (436-1184)	0.59 (0-2.02)	1.40 (1.13-1.74)	Reference
Implementation 0-3 months	192	231	0 (0-2)	164204	723 (415-1168)	0.0 (0-1.98)	141 (1.20-1.66)	1.0 (0.77-1.32) $P=0.972$
After implementation		NS	NS					
4-6 months	192	278	0 (0-2)	160983	707 (403-1070)	0 (0-2.64)	1.73 (1.49-2.0)	1.23 (0.95-1.60) $P=0.115$
7-9 months	181	255	0 (0-2)	154916	695 (382-1128)	0 (0-2.22)	1.65 (1.41-1.92)	1.18 (0.90-1.53) $P=0.231$
10-12 months	162	268	1 (0-2)	140797	719 (420-1111)	0.93 (0-2.22)	1.90 (1.64-2.21)	1.36 (1.05-1.77) $P=0.022$
13-15 months	147	193	1 (0-2)	118870	617 (370-1056)	0.58 (0-2.42)	1.62 (1.36-1.94)	1.16 (0.88-1.53) $P=0.298$
16-18 months	100	135	1 (0-2)	65678	508 (339-827)	0.52 (0-2.65)	2.06 (1.66-2.54)	1.47 (1.08-1.99) $P=0.013$

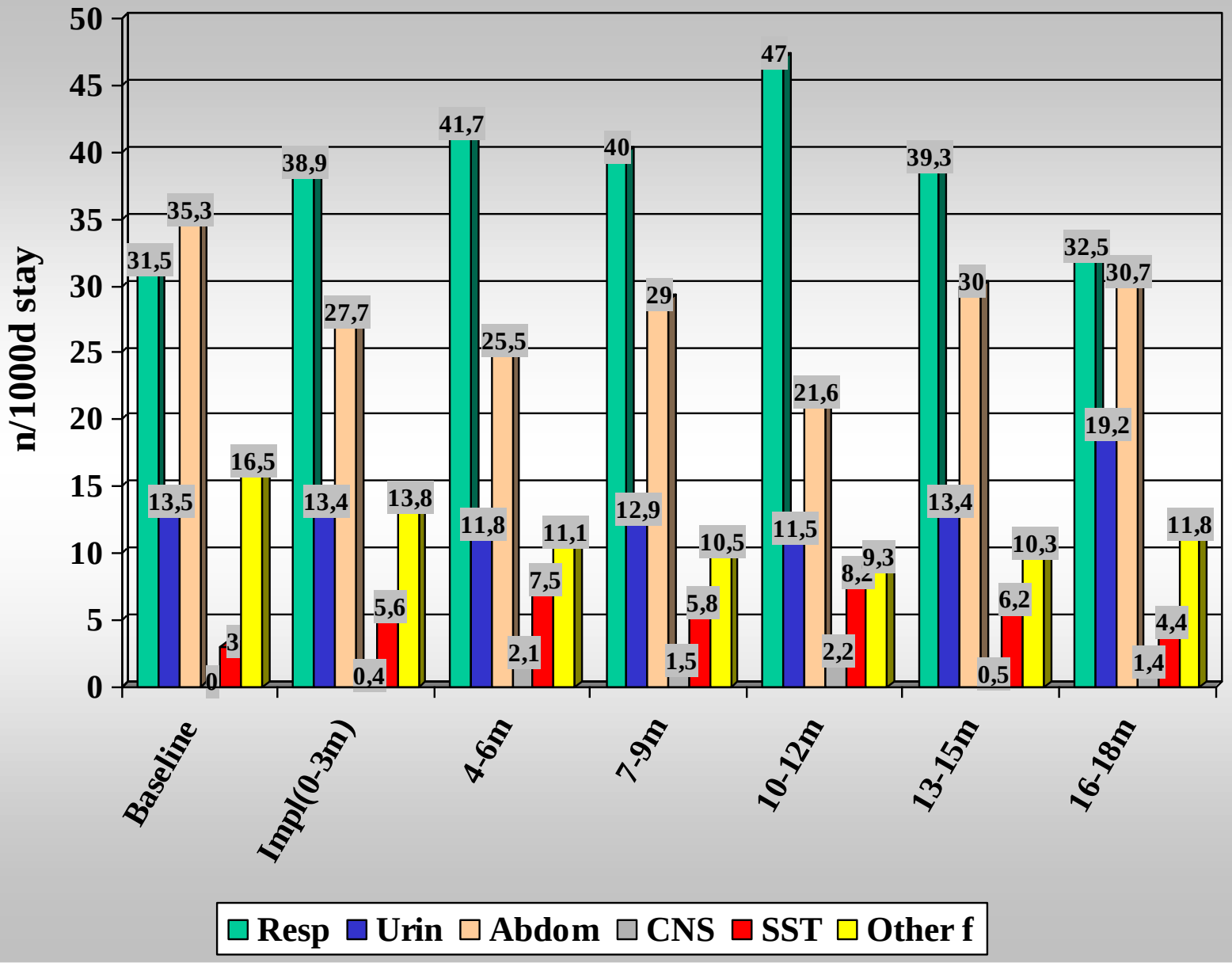
BSI-Secondary to other Infection Sites



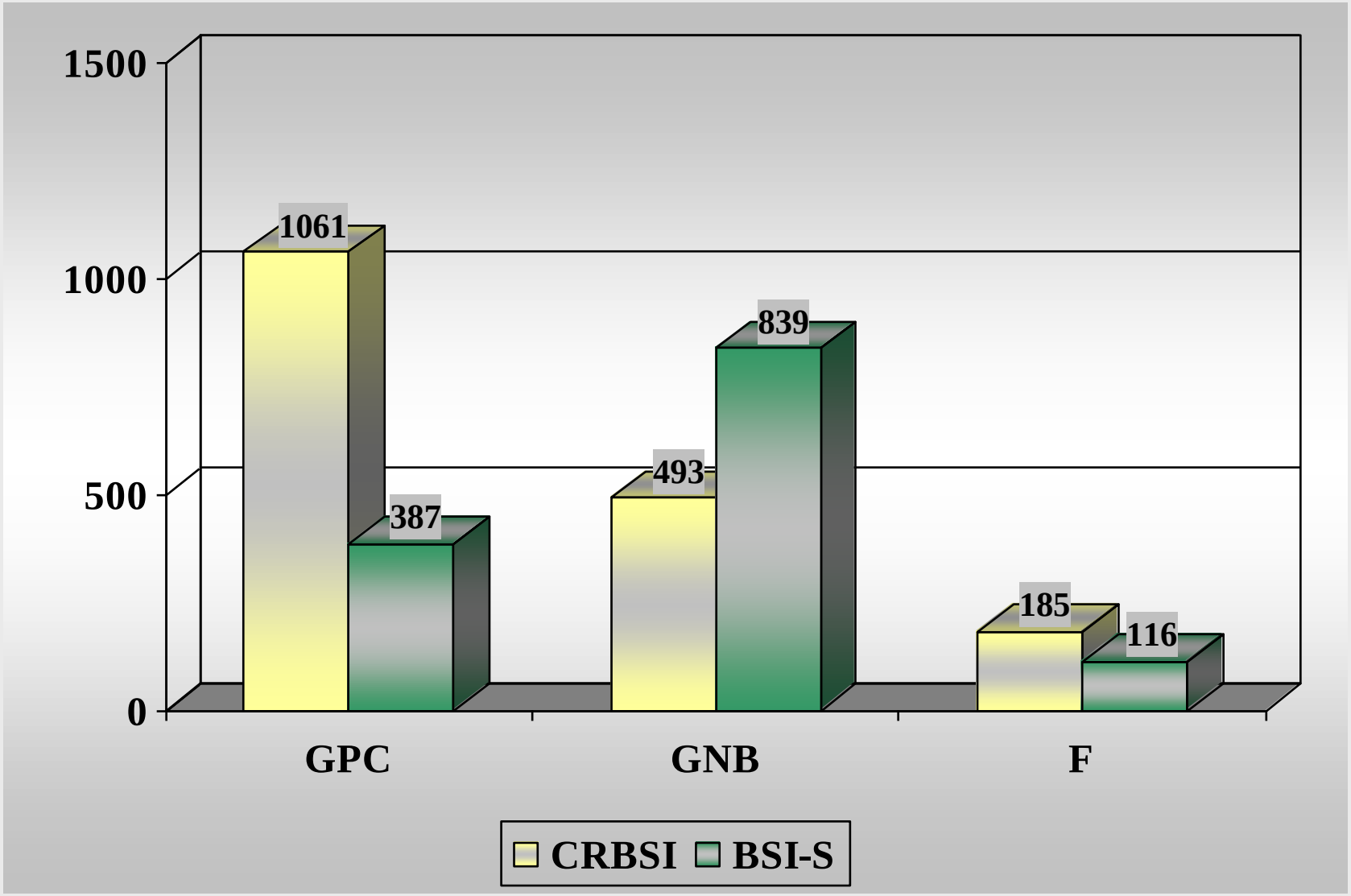
BSI-Secondary to other Infection Sites



Distribution of BSI-S in relation to the infection site



Etiologies of CRBSI and BSI-S



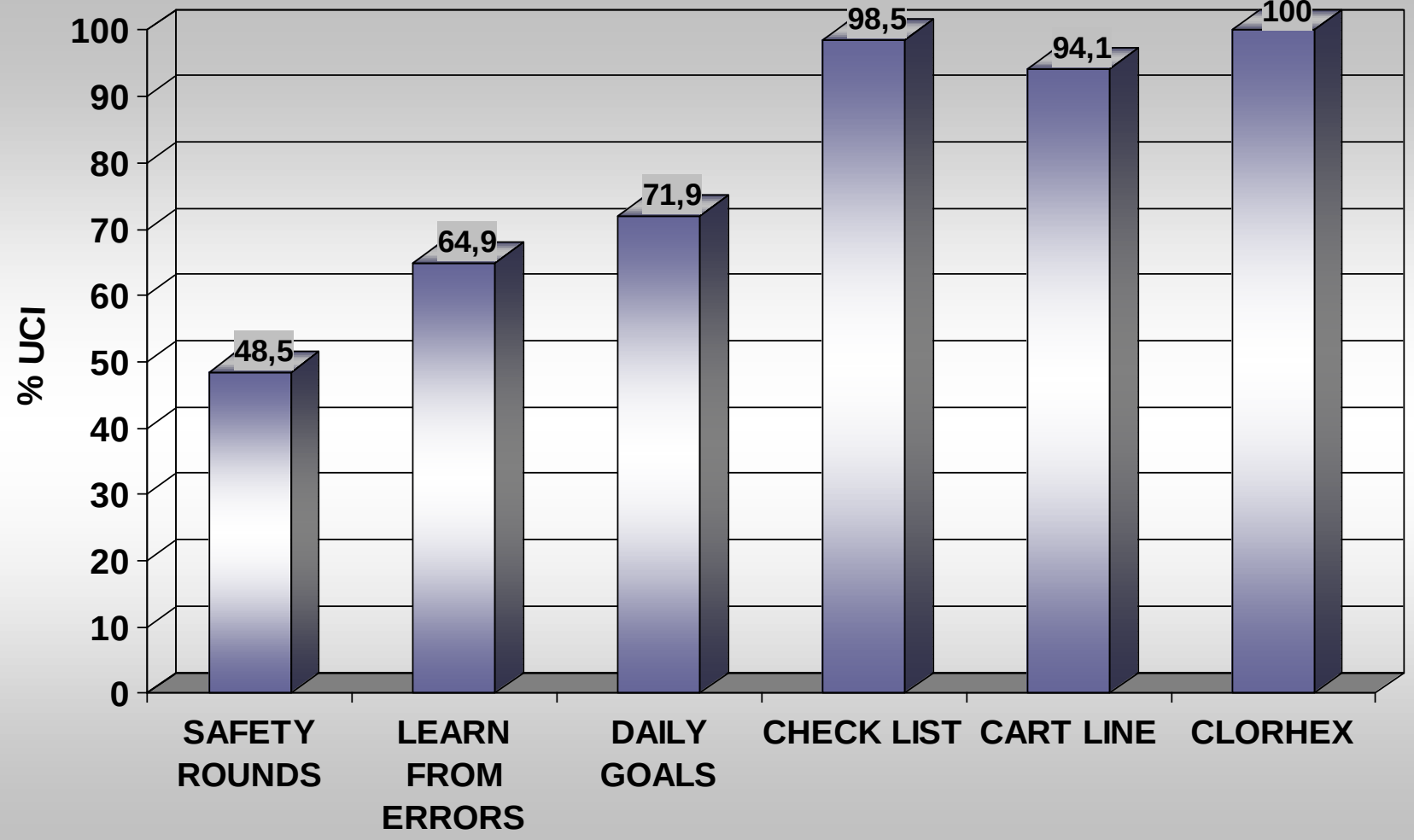
Etiologies of CRBSI and BSI-S

	CRBSI	BSI-S
Gram-positive cocci	1061 (60.52)	387 (28.75)
Staphylococcus epidermidis	458 (26.13)	70 (5.20)
Coagulase-negative *Staphylococcus*	263 (15.0)	38 (2.82)
Enterococcus faecalis	112 (6.39)	84 (6.24)
Other *Staphylococcus* spp.	77 (4.39)	17 (1.26)
Methicillin-susceptible Staphylococcus aureus	47 (2.68)	40(2,97)
Enterococcus faecium	43 (2.45)	70 (5.20)
Methicillin-resistant *Staphylococcus aureus*	34 (1.94)	37 (2.75)
Other *Streptococcus* spp.	17 (0.97)	13 (0.97)
Streptococcus pneumoniae		10 (0.74)
Other Gram-positive pathogens	10 (0.57)	8 (0.59)
Fungi	185 (10.55)	116 (8.61)
Candida albicans	77 (4.39)	59 (4.38)
Candida parapsilosis	62 (3.54)	17 (1.26)
Candida glabrata	23 (1.31)	14 (1.04)
Candida tropicalis	9 (0,51)	10 (0.74)
Other *Candida* spp.	12 (0.69)	13 (0.97)
Other fungi	2 (0.11)	3 (0.22)
Other microorganisms	14 (0.80)	4 (0.30)

Etiologies of CRBSI and BSI-S

	CRBSI	BSI-S
Gram-negative bacilli	493 (28.12)	839 (62.33)
Pseudomonas aeruginosa	106 (6.05)	205 (15.23)
Klebsiella pneumoniae	81 (4.62)	107 (7.95)
Acinetobacter baumannii	69 (3.94)	102 (7.58)
Enterobacter cloacae	51 (2.91)	60 (4.48)
Escherichia coli	44 (2.51)	132 (9.81)
Serratia marcescens	30 (1.71)	50 (3.71)
Proteus mirabilis	21 (1.20)	30 (2.23)
Enterobacter aerogenes	18 (1.03)	21 (1.52)
Stenotrophomonas maltophilia	14 (0.80)	23 (1.71)
Klebsiella oxytoca	13 (0.74)	28 (2.08)
Bacteroides fragilis		17 (1.26)
Other Gram-negative bacilli	46 (2.62)	43 (3.23)

QUALITY INDICATORS



IMPACT

Upon extrapolating the study results to the baseline rates, approximately **742 CRBSI** were prevented with the Bacteremia Zero intervention.

With an **attributable mortality** of **9%** and a **prolonged ICU stay of 12 days** per bacteraemia (1), with an **average cost of 3,103 €/ ICU day** (2), this decrease saved

-66 lives,

-8,904 ICU days

-27,629,112€

(1) Olaechea PM, Álvarez-Lerma F, Palomar M, et al "Mortality attributable to primary and catheter-related nosocomial bacteremia. A case control study".. Intensive Care Med 2009: pp: S1-269

(2) Ministerio de Sanidad, Política Social e Igualdad [Internet]. Madrid: Estadística de Establecimientos Sanitarios con Régimen de Internado. Indicadores Hospitalarios. Evolución 2000-2008; .[cited 2011 Jul 4].

MSPSI Costs: **2,340.000 euros**

CONCLUSIONS

- Results of the Bacteremia Zero project confirmed the effectiveness of the intervention to reduce significantly CRBSI in large scale implementation in Spanish ICUs.

- It suggests that the original intervention pioneered in Michigan can be also effective in relatively different health care systems with varying levels of organizational structure and safety culture.

BACTEREMIA ZERO WORKING GROUP

- **SEMICYUC**

  Mercedes Palomar, Francisco Álvarez-Lerma, Cristobal León, Alba Riera and Juan José Otal,

- **Quality Agency of the National Health System, Spanish Ministry of Health, Social Policy and Equality**

  Yolanda Agra, Eduardo Sierra, Mar Fernández, and Enrique Terol

- **Patient Safety Programme, World Health Organization**

  Itziar Larizgoitia and Maria Teresa Díez

- **Health Region Coordinators**

- **Armstrong Institute for Patient Safety and Quality at Johns Hopkins Medicine, Johns Hopkins University School of Medicine**

  Christine A. Goeschel, Peter J. Pronovost,

Health Region Coordinators

- **ANDALUCÍA**: Rafael Sierra, Maria Aranzazu Isastola, Lourdes Benítez, Carmen Díaz Marisa Dotor, Concepción Barrera, and Enrique Fernández
- **ARAGON**: Isabel Gutiérrez, Sonia Delgado, Teresa Giménez, and Carlos Aibar
- **ASTURIAS**:Armando Blanco, Manuel Valledor, Carmen Martínez, and Belén Suárez
- **BALEARES**: Marcio Sa-Borges and Carlos Campillo
- **CANARIAS**: Manuel Sánchez, Pablo Jadraque, Carlos Agustín Cruz, and Paloma Garcia de Carlos
- **CANTABRIA**: Jose Luis Teja, Lourdes Gómez, Ana Rosa Díaz, Francisco Antolín, Henar Rebollo, and Trinidad Valle
- **CASTILLA-LA MANCHA**: Enriqueta Muñoz, Llanos Soriano, María Ángeles Arrese, and Sonia Cercenado
- **CASTILLA-LEÓN**:Maria Jesus López Pueyo, Celia Díaz Tobajas, Sonsoles Paniagua Tejo, and María José Pérez Boíllos
- **CATALUNYA**: Francisco Álvarez-Lerma, Mercedes Palomar,, Alba Riera, Rosa María Balaguer, Milagros Calizaya, Elisabet Gallart, Pilar Latre, María Isabel Quintana, Jordi Vallés, Juan Carlos Yebenes, Magdalena Campins, Joan María Ferrer, and Josep Davins

Health Region Coordinators

- **EXTREMADURA**: Marta Montans, Isabel María Román, Nieves García, and Carmen Gómez
- **GALICIA**: Ana María Díez, Concepción Miralles , Dolores Martin, and Mercedes Carreras
- **LA RIOJA**: Ángel Caballero and Mª Jesús Navaridas
- **MADRID:** Joaquín Álvarez, Mercedes Nieto, Susana Sánchez, María Jesús Luengo, María del Mar García, Francisco Javier Morón, and Juan Carlos Ansande
- **MURCIA**: Juan Antonio Martínez and Susana Valbuena
- **NAVARRA**: Eduardo Layana
- **PAÍS VASCO**: Pedro Olaechea, Ana María Sánchez, David Cantero, and Marbella García
- **VALENCIA**: Paula Ramírez, Josefina Monzón, Rafael Zaragoza, Roberto Reig, Cristina Huertas, and Ricard Meneu.

- **ANDALUCIA**: H. de Valme. Hospital Virgen de la Macarena. H. de la Merced. H. San Juan de Dios del Aljarafe. H. Comarcal de la Axarquía. H. General Básico de la Serranía de Ronda. H. Universitario Virgen de la Victoria. H. Costa del Sol. H. U. Médico Quirúrgico (Compl. Hosp. de Jaén). H. San Juan de la Cruz. H. Neurotraumatológico de Jaén. H. Alto Guadalquivir, H. Médico Quirúrgico Virgen de las Nieves (UCI), H. General Básico de Baza, H. General Básico Santa Ana, H. Médico Quirúrgico Vírgen de las Nieves (UC y UCC), H. U. Puerta del Mar, H. del SAS de Jerez, H. Universitario de Puerto Real, H. Punta Europa, H. de Antequera, H. de Montilla, H. Reina Sofía, H. Valle de los Pedroches, H. Infanta Margarita, H. General de Huelva Juan Ramón Jiménez, H. General Básico de Riotinto, H. Torrecárdenas, H. de Poniente, H. Comarcal La Inmaculada, H. de La Línea.

- **ARAGON**: H. Clínico U. Lozano Blesa, H. Royo Villanova, H. General San Jorge, H. Obispo Polanco.

- **ASTURIAS**: H. Central de Asturias (UCI 1), H. Central de Asturias (UCI pediátrica), H. Central de Asturias (UCI HGA), H. Central de Asturias (UCI INS), H. de Cabueñes, H. de San Agustín, H. Valle del Nalón.

- **BALEARES**: H. Son Dureta, USP Clínica Palmaplanas, H. Son Llàtzer, Fundación Hospital Manacor, Clínica Rotger Hospita, H. Mateu Orfila , H. Can Misses. Eivissa.

- **CANARIAS**: H. U. Insular de Gran Canaria, H. U. de Gran Canaria Dr. Negrín (U. Cardiología), H. U. de Gran Canaria Dr. Negrín (U. Neurotrauma), H. General de Lanzarote, H. General de Fuerteventura, H. U. de Canarias, H. Ntra. Sra.de Candelaria, H. General, Hospital de La Palma.

- **CANTABRIA**: H. Marqués de Valdecilla (UCI 1), H. Marqués de Valdecilla (UCI 2 Politrauma), H. Marqués de Valdecilla (UCI 3).

- **CASTILLA-LA MANCHA**: H. Sierrallana (URCE), H. Virgen de la Salud, H. Nacional de Parapléjicos, H. Virgen de la Salud (U.C. Críticos Cirugía Cardíaca), H. Provincial de la Misericordia, H. Nuestra Señora del Prado, H. General U. de Albacete, H. General U. de Albacete, H. General de Ciudad Real, H.U.de Guadalajara, H. Virgen de la Luz.

- **CASTILLA LEON**: H. U. Río Hortega, H. Clínico U. de Valladolid, H. Virgen de la Vega, H. Clínico de Salamanca, Complejo Hospitalario de Soria, H. General de Segovia, H. Ntra. Sra. de Sonsoles, H. General Yagüe, H. de León (UCI polivalente), Complejo Hospitalario de Palencia, H. Virgen de la Concha.

- **CATALUNYA**: H. General Hospitalet (Unidad de semi-intensivos), Capio H. General de Catalunya, H. General Vall Hebron (UCI), H. de Traumatología Vall Hebron, H. General Vall Hebron (UPCC), H. Clínic i Provincial (UCI Quirúrgica), H. Asepeyo. Sant Cugat del Vallés, H. de Sant Pau (UCI Polivalente), Centro Médico Delfos. Barcelona, H. del Mar, H. Dos de Maig, H. Plató, H. U. Sagrat Cor, H de Barcelona (SCIAS), H. General Hospitalet, H. de Traumatologia Vall Hebron (U. Quemados), Clínica Corachán, H. U. Mutua Terrassa, H. de Terrassa, H. Parc Tauli, H. de Mataró. Consorci Sanitari del Maresme, H. Sant Joan de Deu de Manresa, H. de Igualada, H. General de Granollers, Clínica Girona, H. Universitari de Girona Doctor Josep Trueta, H. U. Arnau de Vilanova de Lleida (UCI), H. de Santa María de Lleida, H. U. Joan XXIII, H. U. de Sant Joan, H.Verge de la Cinta.

- **EUSKADI**: H. Santiago de Vitoria, H. de Txagorritxu. Vitoria, H. Donostia (Ntra. Sra. de Aranzazu), H. de Basurto, H. de Galdakao.

- **EXTREMADURA**: H. de Mérida, H. San Pedro de Alcántara, H. San Pedro.

- **GALICIA**: Complexo Hospitalario Universitario Juan Canalejo (Reanimación), Complexo Hospitalario Universitario Juan Canalejo (Quemados), Complexo Hospitalario Universitario A Coruña (UCI 6), Complexo Hospitalario Universitario de A Coruña (UCI 5ª), H. Clínico U. de Santiago (UCI), H. Arquitecto Marcide, Complexo Hospitalario de Ourense, H. Montecelo, H. Povisa, Hospital Meixoeiro - Complexo Hosp. Universitario de Vigo (UCI Médica).

- **MADRID**: H. Clínico U. San Carlos (U. Médico-Quirúrgica), H. Clínico U. San Carlos (U. Neuro-Politrauma), H. La Paz (Unidad de Quemados), H. La Paz (UCI polivalente), Fundación Jiménez Díaz, Clínica Puerta de Hierro, H. Ramón y Cajal, H. Clínico U. San Carlos (U. Cardiovascular), H. U. Fundación Alcorcón, H. Gregorio Marañón, Clínica Moncloa, H. U. 12 de Octubre, H. U. 12 de Octubre (UCI Traumatología), H. Príncipe de Asturias, H. General. Móstoles, H. Severo Ochoa. Leganés, H. del Henares, H. de Getafe (UCI Polivalente), H. Infanta Cristina, H. U. 12 de Octubre (UCP), H. de la Princesa, H. U. de Fuenlabrada, H. del Sureste, H.del Tajo, H. Infanta Sofía, H. Infanta Leonor.

- **MURCIA:** H. Virgen de la Arrixaca, H. U. J. Mª Morales Meseguer, H. Santa María del Rosell, H. General U. Reina Sofía.
-
- **NAVARRA**: H. de Navarra, H. Virgen del Camino, H. García Orcoyen, Clínica San Miguel.

- **VALENCIA**: H. U. La Fe (U. Reanimación), H. U. La Fe, H. Arnau de Vilanova de Valencia, H. Clínico U. de Valencia (U. Polivalente), H.General U. de Valencia (UPCC), H. General de Requena, H. Doctor Peset, H. de Sagunto. Valencia, Hospital de la Ribera, H. Francesc de Borja de Gandía, H. Marina Baixa de Villajoyosa - departamento 16 AVS, H. Lluís Alcanyís de Xàtiva, H.de Torrevieja Salud, H. General U. de Alicante (UCI), H. General U. de Elche, H. de Sant Joan, H. General de Castellón, Consorcio Hospitalario Provincial de Castellón, H. Comarcal de Vinaròs.

TO ERR IS HUMAN:
BUILDING A SAFER HEALTH SYSTEM

With adequate lidership, attention and resources, improvements can be made