RESEARCH BRIEF

Surveillance of Device-Associated Infections in Intensive Care Units in South Brazil

The impact of healthcare-associated infections (HAIs) on public health is a subject of increasing concern. Based on the need for local data on device-associated infections (DAIs) in intensive care units (ICUs), a surveillance program was developed at Curitiba, Brazil. The initial goal was to provide baseline DAI rates and feedback to the notifying hospitals. This report promotes DAI diagnosis reviews and surveillance standards implementations. Local strategies aiming at DAI control may be developed and might be evaluated by follow-up data analysis.

Curitiba is the capital of Paraná State, has ~2 million inhabitants, and provides health care to people from the metropolitan area (4 million inhabitants), as well as those from other cities in South Brazil. Curitiba's Municipal Health Department has an HAI control division surveying DAI rates since 2002. Ventilator-associated pneumonia (VAP), central line–associated bloodstream infection (CLABSI), and urinary catheter–associated urinary tract infection (CAUTI) are evaluated. In 2010 the surveillance program "Vigilância Epidemiológica de Infecções em Terapia Intensiva de Curitiba" (VITIC) was established to benchmark the local HAI standards. A working group in HAI control with members of the notifying institutions was created.

VITIC-participating facilities report HAI data in response to state mandatory reporting requirements. CLABSI, CAUTI, and VAP are diagnosed and notified on a monthly basis by Infection Control Committee personnel. The whole procedure is based on national diagnostic criteria published in 2006 and reviewed in 2009 and 2010.[2-4]

From March 2002 to May 2009 data were reported in a standard file produced by the Department of Health of Paraná (DHP) and sent by mail or e-mail. In June 2009, DHP implemented an online system ("Sistema Online de Notificação de Infecção Hospitalar") to improve notifications, rate calculations, and epidemiologic analysis. This system generates MS Excel files.

In Curitiba there are 29 facilities with ICU beds. Services offered by the 25 notifying facilities included 20 adult (medical or medical/surgical) ICUs, 3 surgical ICUs, 9 cardiac ICUs, 4 pediatric ICUs, and 10 neonatal ICUs.

After the overall analyses, adult medical ICUs were further stratified by teaching status because percentile distributions differed between the 2 groups. Seven of the 25 facilities that notify regularly are teaching hospitals. The identity of all facilities is kept confidential.

Absolute numbers of infections (CLABSI, CAUTI, VAP), the corresponding ICU-specific denominator data, and the device use (DU) ratios were enrolled for DAI calculations.

DAI rates and DU ratios are reported in percentile distributions from June 2009 to June 2011 for each ICU category. DAIs included in these analyses were those related to DU ratios of at least 50 device-days. Only ICUs with stays of ≥50 patient-days were included. ICUs with <20 monthly reports of each DAI and DU ratio in these 24 months, such as pediatric and surgical ICUs of nonteaching hospitals, are not reported here. Birth weight category stratification in neonatal ICUs is not currently being reported in our region.

The participating institutions are predominantly general acute care hospitals with 41–660 beds and 8–70 ICU beds. Of 25 facilities, 22 offered private care, 10 offered public care, and 8 offered both. Most (92%) of the 25 notifying facilities filed monthly reporting plans, and 2 facilities reported >80% of the months in the 24-month period evaluated.

The overall distribution of DAIs in ICUs from 2009 to 2011 is the following: at nonteaching hospitals, the median number of patient-days was 240 in neonatal ICUs, 90.8 in pediatric ICUs, 68 in surgical ICUs, 233 in cardiac ICUs, and 329 in adult ICUs. At teaching hospitals, the median stay was 542 patient-days in neonatal ICUs, 250 in pediatric ICUs, 302 in surgical ICUs, 323 in cardiac ICUs, and 413 in adult ICUs. Distribution of the percentiles for DUs and DAIs are represented in Table 1.

Some countries and study groups publish DAI rates at national and regional levels.[6,7] In Brazil, DAI rates are published only by São Paulo State.[7] This is the first report to our knowledge of DAI from our region and aims to be a baseline analysis to provide follow-up comparative rates.

Present data showed willingness of notification by most of the facilities. However, the accuracy of DAI diagnosis cannot be measured. Assuming that the DAI diagnostic criteria are standard for the facilities and that the diagnostic and reporting criteria of the Agência Nacional de Vigilância Sanitária (ANVISA)[2-4] are similar to National Healthcare Safety Network (NHSN) criteria,[8-10] comparisons with other DAI reports may be possible. Medians of VITIC teaching hospital DAI rates are ~5 times higher for CLABSI and UTI in adult medical ICUs of the NHSN.

International Nosocomial Infection Control Consortium (INICC) hospitals present with even higher rates of UTI than VITIC hospitals. VAP and CLABSI medians in VITIC were similar to INICC- and São Paulo State–reported medians. When VITIC teaching hospitals were evaluated, medians were higher than those reported by INICC and São Paulo. The similarities with INICC and São Paulo State rates may be explained by the health system peculiarities in developing countries, mainly due to the lack of nurse personnel per patient and possibly to poorer hand hygiene practices.

VITIC is a successful program in public health. However,

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TABLE 1. Percentiles of the Device Use Ratios and Infections Rates, by Type of Intensive Care Unit (ICU), from June 2009 to June 2011

Device use and ICU type	Percentile, %				
	10	25	50	75	90
Central line use					
Neonatal ICU					
Teaching hospital	91	122	147	194	246
Nonteaching hospital	64.40	77.5	97	125	162
Surgical ICU					
Teaching hospital	116	138	268	304	328
Cardiac ICU					
Teaching hospital	58.8	83	281	380	404
Nonteaching hospital	54.8	64.5	82	125	179
Adult (medical/surgical) ICU					
Teaching hospital	160.5	213.3	303	381	506
Nonteaching hospital	56.8	91	140	208.5	332
CLABSI rate					
Neonatal ICU					
Teaching hospital	0	6.02	11.7	18.2	27.6
Nonteaching hospital	0	7.16	18.2	26.1	38.6
Surgical ICU					
Teaching hospital	0	0	3.32	9.58	14.5
Cardiac ICU					
Teaching hospital	0	2.14	6.85	11.2	15.2
Nonteaching hospital	0	0	6.37	16.2	21.2
Adult (medical/surgical) ICU					
Teaching hospital	1.76	4.46	8.72	13.4	25.8
Nonteaching hospital	0	0	6.44	12.2	21.1
Urinary catheter use					
Surgical ICU					
Teaching hospital	112	154	230	337	356
Cardiac ICU					
Teaching hospital	80.1	91.8	121	174	267
Nonteaching hospital	55	68	92	161	223
Adult (medical/surgical) ICU					
Teaching hospital	159.7	235	338	385	645.6
Nonteaching hospital	93	152.5	228	290.5	446.8
UTI rate					
Surgical ICU					
Teaching hospital	0	0	3.8	7.97	11.6
Cardiac ICU					
Teaching hospital	0	0	0	9.5	12.2
Nonteaching hospital	0	0	5.38	14.8	22
Adult (medical/surgical) ICU					
Teaching hospital	0	2.49	5.43	10.6	15.9
Nonteaching hospital	0	0	3.17	7.41	12.2
Ventilator use					
Neonatal ICU					
Teaching hospital	71.4	89.5	111	143	178
Nonteaching hospital	56.3	63.5	86.5	110	155
Surgical ICU					
Teaching hospital	65.4	112	196	214	229
Cardiac ICU					
Teaching hospital	58.4	140	201	235	258
Nonteaching hospital	56.4	68	92	122	158
Adult (medical/surgical) ICU					
Teaching hospital	131	160	237	323	397.8
Nonteaching hospital	66	91	122	178	256
VAP rate					

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TABLE 1 (*Continued*)

Device use and ICU type	Percentile, %				
	10	25	50	75	90
Neonatal ICU					
Teaching hospital	0	0	3.19	14	18.9
Nonteaching hospital	0	0	0	0	8.01
Surgical ICU					
Teaching hospital	0	4.85	16	30.7	46.3
Cardiac ICU					
Teaching hospital	0.4	9.33	17.8	25.5	40.3
Nonteaching hospital	0	0	11.8	17.9	20.4
Adult (medical/surgical) ICU					
Teaching hospital	4.94	8.97	20.1	31.3	53
Nonteaching hospital	0	7.74	15.4	26.7	41.7

NOTE. CLABSI, central line-associated bloodstream infection; UTI, urinary tract infection; VAP, ventilator-associated pneumonia.

a 4-semester period is a short time frame, and longer observation is needed to analyze rate evolution and support the validity of this first report. Future analyses may permit estimation of diagnostic and reporting standards and evaluation of local quality improvement activities aiming at DAI control.

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