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Letters to the Editor

Surgical site infections in very small hospitals in inner Brazil: Unveiling a relevant issue for developing countries

To the Editor:

Ever since the World Health Organization (WHO) embraced infection control and patient safety as global priorities, efforts have been directed at measuring the influence of health care-associated infections (HAIs) in developing countries. A systematic review by Allegranzi et al[1] reported strikingly higher rates of HAIs (including surgical site infections [SSIs]) in those countries when compared with the United States or Europe. Nevertheless, that review was based on published studies mostly presenting data from large and/or teaching hospitals. There is a gap in current knowledge on the incidence of HAIs in smaller hospitals, which play a major role in providing health care in the developing world.

In Brazil, there are presently (as of January 20, 2017) 6,581 hospitals registered in the National Healthcare Settings Database (cnes.datasus.gov.br) spread over 5,570 municipalities. Two-thirds of those hospitals have < 50 beds.[2] Although those small hospitals provide low-complexity care, they perform a huge number of surgical procedures.[3] Our study aimed at quantifying the incidence of SSIs and identifying determinants for this outcome in very small hospitals (defined as those with up to 49 beds). The study was conducted in 3 hospitals from inner São Paulo State, Brazil.

One of the authors (VCBA, a nurse with hospital epidemiology skills) spent 1 month in each of the study hospitals and watched each and every surgical procedure performed during that period. Data on work processes (eg, hair removal and antimicrobial prophylaxis) and characterization of procedures (eg, wound classification and length of the surgery) were collected, alongside demographic characteristics, comorbidities, and other clinically relevant information. The appropriateness of antimicrobial prophylaxis was analyzed according to guidelines from Brazil's Federal Medical Council.[4] Besides staying in the operating room during all procedures, the epidemiologist nurse performed active surveillance for SSI (defined according to National Healthcare Safety Network guidelines)[5] in patients during hospital stays and up to the 30th day after discharge. Postdischarge surveillance included telephone calls on days 15 and 30.[6] Statistical analysis was performed using SPSS version 20 (IBM-SPSS Inc, Armonk, NY) and included descriptive statistics, univariate nonparametric tests, and logistic regression models aimed at identifying predictors for SSI. Selection of variables for logistic regression was performed using a forward strategy, with *P* value limits of .05 and .1 for inclusion and removal of the models, respectively.[7] The Hosmer-Lemeshow test was performed to assess goodness-of-fit in multivariable models. The study was approved by the local committee for ethics in research and all subjects signed informed consent forms.

We included 185 subjects (each submitted to a single procedure) in the study. The most common procedures were related to the following specialties: obstetrics (cesarean section, 25.9%), general/gastric surgery (23.2%), orthopedics (15.7%), and gynecology (11.9%). Most patients were admitted <24 hours before the procedure. General anesthesia was used in 23.2% of subjects. Antimicrobial prophylaxis was instituted for 85.9% of patients. However, in 41.0% of all subjects the timing of infusion was inadequate (either long before or after the surgery). Also, in 59.5% of all procedures, antimicrobial use was unnecessarily extended. The overall incidence of SSI was 8.1% (95% confidence interval [CI], 4.8%-12.7%). Table 1 presents risk factors for the development of SSI. Independent predictors were a score in the American Society of Anesthesiologists physical status classification of 3 or more (odds ratio [OR], 6.65; 95% CI, 1.31-33.69; $P = .02$), contaminated or dirty wound (OR, 5.33; 95% CI, 1.19-23.93; $P = .03$), perioperative hair removal (OR, 4.60; 95% CI, 1.03-20.55; $P = .04$), and placement of drains (OR, 3.97; 95% CI, 1.02-15.46; $P = .04$).

Our results acknowledge the intense surgical and obstetric activity in small hospitals in Brazil. They also point to a surprisingly high incidence of SSIs, averaging 5 infections per hospital-month. If we assume that the approximately 4,000 small hospitals in Brazil have similar rates of infection, then the monthly absolute number of SSIs may exceed 20,000. This is by no means a negligible burden, and it is reasonable to assume that infectious complications of surgical procedures also affect a great number of people in other developing countries.

The WHO Safe Surgery Campaign chose an appropriate target.[8] But is that enough to ensure safety of patients undergoing surgery in such an unequal world? Brazil is a huge example of paradoxes. First, it has a mixed-up health system, with the state paying for most medical care, but allowing the existence of private health care settings.[9] Also, it harbors hospitals with different sizes and complexities spread over a continental area. A recent countrywide survey of structure for infection control found huge deficiencies both in preventive programs and in sterilization processes, and both aspects were substantially worse in small hospitals.[10] Therefore, infection control policies must be comprehensive enough to be applicable to those settings.

We also found SSI rates higher than those reported in the Brazilian government surveillance system.[3] It may be due to postdischarge surveillance, but it also suggests that official data are missing the point. Finally, the predictors identified in the analysis are not surprising.[5] But the failure to comply with preventive recommendations points to the necessity of education measures and auditing of processes.

It is understandable that teaching hospitals assume leadership in research and education for infection control in developing countries. However, if we are to comply with WHO global challenges for patient safety, governments must take a closer look at small, low-resource hospitals that are distant from urban centers.

Table 1
Factors predictive of surgical site infections (SSIs) in 3 small hospitals in inner Brazil

	Univariate				Multivariable	
Risk factor	SSI (n = 15)	Other (n = 170)	Odds ratio (95% confidence interval)	*P* value	Odds ratio (95% confidence interval)	*P* value
Demographic characteristic						
Male gender	4 (26.7)	46 (27.1)	0.98 (0.30-3.23)	1.00		
Age, y	34 (24-57)	37.5 (25-52)	–	.69		
Hospital						
Hospital A (reference)	9 (60.0)	91 (53.5)	–	–		
Hospital B	2 (13.3)	46 (27.1)	0.44 (0.91-2.12)	.31		
Hospital C	4 (26.4)	33 (19.1)	1.23 (0.35-4.25)	.76		
Comorbidities						
Heart disease	**3 (20.0)**	**7 (4.1)**	**5.82 (1.33-25.42)**	**.04**		
Lung disease	2 (13.3)	3 (1.8)	8.35 (0.92-60.93)	.05		
Liver disease	2 (13.3)	3 (1.8)	8.35 (0.92-60.93)	.05		
Diabetes mellitus	2 (13.3)	15 (8.9)	1.58 (0.33-7.67)	.63		
Neoplasia	1 (6.7)	7 (4.1)	1.60 (0.19-14.50)	.50		
Obesity	3 (20.0)	24 (14.1)	1.52 (0.40-5.79)	.46		
Hypertension	4 (26.7)	30 (17.6)	1.70 (0.51-5.69)	.48		
Charlson index ≥ 2	**4 (26.7)**	**10 (5.9)**	**5.82 (1.57-21.58)**	**.02**		
American Society of Anesthesiologists index ≥ 3	**4 (26.7)**	**8 (4.7)**	**7.36 (1.92-28.31)**	**.01**	**6.65 (1.31-33.69)**	**.02**
Smoking	1 (6.7)	16 (9.4)	0.69 (0.09-5.58)	1.00		
Alcoholism*	1 (6.7)	13 (7.6)	0.84 (0.11-7.09)	1.00		
Procedure data						
Preoperative stay, d	0 (0-3)	0 (0-1)	–	.10		
Contaminated or dirty wound	**4 (26.7)**	**10 (5.9)**	**5.82 (1.57-21.58)**	**.02**	**5.33 (1.19-23.93)**	**.03**
Endoscopic procedure	0 (0.0)	11 (6.5)	0.00	.60		
General anesthesia	6 (40.0)	37 (21.8)	1.10 (0.38-3.25)	1.00		
NHSN risk index						
0 (reference)	5 (33.3)	121 (71.2)	–	–		
1	**7 (46.7)**	**43 (25.3)**	**3.94 (1.19-13.07)**	**.03**		
2 or 3	**3 (33.3)**	**6 (3.5)**	**12.16 (2.33-62.97)**	**.003**		
Preoperative bath	7 (46.7)	48 (28.2)	2.22 (0.76-6.47)	.15		
Preoperative hair removal	12 (80.0)	94 (56.0)	3.15 (0.86-11.57)	.10	**4.60 (1.03-20.55)**	**.04**
Inadequate timing of antimicrobial prophylaxis	5 (33.3)	71 (41.8)	0.70 (0.23-2.13)	.59		
Unnecessary extension of prophylaxis	8 (53.3)	102 (60.0)	0.76 (0.25-2.31)	.78		
Length of the procedure, min	55 (35-105)	45 (30-70)	–	.14		
Placement of drains	**5 (33.3)**	**16 (9.4)**	**4.81 (1.46-15.83)**	**.02**	**3.97 (1.02-15.46)**	**.04**
Postoperative wound dressing	11 (73.3)	97 (57.1)	2.07 (0.63-6.76)	.28		
Invasive devices						
Urinary catheter	7 (50.0)	58 (34.1)	1.93 (0,63-5.77)	.25		
Central venous catheter	1 (7.1)	3 (1.8)	4.28 (0.42-44.12)	.27		

NOTE. Data for SSIs and other are presented as n (%) or median (interquartile range). Bold values are statistically significant ($P < .05$).
NHSN, National Healthcare Safety Network.
*Alcoholism was defined as report of daily consumption of alcoholic beverages.

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Conflicts of interest: None to report.

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