

Benchmarking Healthcare Associated Infections for Prevention in Developing Countries



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Background

- Benchmarking is of utter importance when it comes to assessing healthcare quality. Currently, in Brazil, few studies are made in this particular field, the majority of which consist in internal benchmarking, thus restricted to very specific populations.
- Applying benchmarks from high resource countries on low resource countries may result in misleading conclusions, thus improvements can be made in order to refine the precision of external benchmarks in developing countries.
- This multicenter study was developed in order to provide external benchmarks to the southeast population of Brazil and, hopefully, to similar populations in other developing countries.

Methods

- The **NOIS Project** uses SACIH, a software for hospital infection control (www.sacihweb.com), which retrieve data provided by different Brazilian hospitals. The hospitals use prospective Healthcare-Associated Infections - HAI surveillance according to the NHSN/CDC protocols.
- Benchmarks for Healthcare Associated Infections (HAI) rates from Medical/Surgical Intensive Care Units (ICU) and hospital wide HAI rates were defined as the 10 percentile and 90 percentile, considering data from 11 hospitals and 13 ICUs, collected between 2013 and 2017.
 - Benchmarks for surgical site infection (SSI) were defined as the limits of 95% confidence interval for surgical site infection rates.

Results

Table 1 - NOIS Project - Benchmarks for Healthcare Associated Infections (HAI) rates: data from 13 Medical/surgical ICU, > 15 beds, Other ICUs (not major teaching). Comparison with CDC/NHSN benchmarks.

Device-associated data	Study	Pooled mean	Percentile				
			10%	25%	50% (median)	75%	90%
Central line-associated primary bloodstream infections (CLABSI) per 1,000 central line-days	NOIS (2017)	6,5	0,0	0,0	4,9	10,0	16,0
	NHSN (2013)	0,8	0,0	0,0	0,6	1,2	2,0
Ventilator-associated pneumonias (VAP) per 1,000 ventilator-days	NOIS (2017)	8,8	0,0	0,0	6,5	12,8	20,6
	NHSN (2012)	0,9	0,0	0,0	0,4	1,3	2,8
Urinary catheter-associated urinary tract infections (CAUTI) per 1,000 urinary catheter-days	NOIS (2017)	3,6	0,0	0,0	1,8	5,7	9,4
	NHSN (2013)	1,7	0,0	0,6	1,4	2,3	3,4
Central line utilization ratio: (Number of central line-days)/(Number of patient-days)	NOIS (2017)	47%	30%	37%	47%	57%	65%
	NHSN (2013)	49%	30%	40%	51%	60%	69%
Ventilator utilization ratio: (Number of ventilator-days)/(Number of patient-days)	NOIS (2017)	39%	20%	29%	38%	50%	60%
	NHSN (2012)	34%	19%	25%	33%	41%	49%
Urinary catheter utilization ratio: (Number of urinary catheter-days)/(Number of patient-days)	NOIS (2017)	55%	32%	41%	58%	68%	76%
	NHSN (2013)	63%	46%	59%	68%	76%	81%

Obs.: 750 = N.o of month data meeting minimum requirements for percentile distributions: ≥ 50 device-days and ≥ 50 patient-days.

Table 2 - Benchmarks for ICU outcomes.

ICU outcomes	Pooled mean	Percentile				
		10%	25%	50% (median)	75%	90%
Hospital wide nosocomial infection rate per 100 Admissions (ICU Risk of infection)	12,2%	4,0%	6,0%	8,7%	14,0%	23,5%
Rate of infection per 1,000 patient-days	21,8	10,8	14,9	20,6	27,2	35,8
Average length of stay (days)	10,8	3,8	5,1	8,5	12,3	21,7
ASIS - Average Severity of Score Illness (1 to 5 points)	2,7	1,9	2,5	2,8	3,0	3,2
DU - Global device utilization (0% to 300%)	142%	99%	119%	143%	166%	186%
Risk of central line-associated primary bloodstream infections (CLABSI) per 100 Admissions	4,2%	0,0%	0,0%	2,6%	5,7%	10,3%
Central line-associated primary bloodstream infections (CLABSI) per 1,000 central line-days	6,5	0,0	0,0	4,9	10,0	16,0
Central line utilization ratio: (Number of central line-days)/(Number of patient-days)	47%	30%	37%	47%	57%	65%
Average length of central line stay (days)	9,4	3,9	3,9	8,4	11,7	15,5
Risk of vascular access infection (CVS-VASC per 100 Admissions)	0,9%	0,0%	0,0%	0,0%	1,6%	3,0%
Central line-associated vascular access infection (CVS-VASC) per 1,000 central line-days	2,0	0,0	0,0	0,0	3,3	6,5
Risk of ventilator-associated pneumonias (VAP per 100 Admissions)	5,8%	0,0%	0,0%	4,2%	8,3%	13,5%
Ventilator-associated pneumonias (VAP) per 1,000 ventilator-days	8,8	0,0	0,0	6,5	12,8	20,6
Ventilator utilization ratio: (Number of ventilator-days)/(Number of patient-days)	39%	20%	29%	38%	50%	60%
Average length of ventilator stay (days)	13,1	4,6	6,9	11,4	16,7	22,8
Risk of urinary catheter-associated urinary tract infections (CAUTI) per 100 Admissions	2,2%	0,0%	0,0%	0,8%	3,1%	6,3%
Urinary catheter-associated urinary tract infections (CAUTI) per 1,000 urinary catheter-days	3,6	0,0	0,0	1,8	5,7	9,4
Urinary catheter utilization ratio: (Number of urinary catheter-days)/(Number of patient-days)	55%	32%	41%	58%	68%	76%
Average length of urinary catheter stay (days)	8,7	3,6	5,0	7,6	10,7	14,5

Table 6 - Benchmarks for Hospital wide nosocomial infection rate.

Hospital wide nosocomial infection rate (Risk of infection)	Pooled mean	Percentile				
		10%	25%	50% (median)	75%	90%
Hospital wide nosocomial infection rate per 100 Admissions (Risk of infection)	3,0%	1,5%	2,0%	2,7%	3,8%	4,7%
Rate of infection per 1,000 patient-days	8,0	4,4	5,7	7,4	9,8	12,7
Risk of EENT (Eye, ear, nose, throat, or mouth infection)	0,2%	0,0%	0,0%	0,1%	0,2%	0,4%
Rate of EENT per 1,000 patient-days	0,3	0,0	0,0	0,2	0,4	0,8
Risk of Pneumonia	0,5%	0,1%	0,3%	0,5%	0,7%	1,0%
Rate of Pneumonia per 1,000 patient-days	1,4	0,3	0,6	1,1	1,8	2,8
Risk of BSI (Bloodstream infection)	0,6%	0,1%	0,3%	0,5%	0,7%	1,1%
Rate of BSI (Bloodstream infection) per 1,000 patient-days	1,4	0,3	0,7	1,2	1,9	2,7
Risk of UTI (Urinary tract infection)	0,5%	0,1%	0,2%	0,4%	0,7%	1,0%
Rate of UTI (Urinary tract infection) per 1,000 patient-days	1,3	0,2	0,5	1,0	1,8	2,6
Risk of LRI (Lower respiratory tract infection, other than pneumonia)	0,4%	0,0%	0,1%	0,3%	0,6%	0,9%
Rate of LRI per 1,000 patient-days	0,8	0,0	0,3	0,7	1,2	1,7

Table 7 - Benchmarks: HAI stratified by service and by type of infection.

Medical services	N.o of month data	Global (any infection)			Pneumonia			Bloodstream infection			Urinary tract infection		
		Pooled mean	P10%	P90%	Pooled mean	P10%	P90%	Pooled mean	P10%	P90%	Pooled mean	P10%	P90%
Medicine	331	5,2	0,6	10,3	1,1	0,0	2,8	1,0	0,0	2,7	1,8	0,0	3,8
Pediatrics	179	0,8	0,0	3,5	0,1	0,0	1,7	0,4	0,0	1,5	0,1	0,0	1,5
Cardiology	238	2,3	0,0	6,2	0,4	0,0	1,8	0,4	0,0	2,0	0,9	0,0	3,1
Oncology	178	3,4	0,0	8,8	0,5	0,0	1,2	1,1	0,0	2,4	0,8	0,0	1,5
Nephrology	60	8,2	0,0	15,1	1,2	0,0	4,6	1,9	0,0	4,2	4,1	0,0	7,5
Gastroenterology	60	2,6	0,0	6,9	0,1	0,0	3,1	1,7	0,0	4,0	0,6	0,0	3,7
Neurosurgery	392	7,8	0,0	21,6	0,6	0,0	1,5	0,5	0,0	5,6	1,5	0,0	4,8
Cardiovascular Surgery	120	11,9	0,8	19,3	1,1	0,0	1,2	0,9	0,0	1,1	0,8	0,0	2,1
Orthopedics	451	6,3	0,0	13,9	0,2	0,0	1,5	0,2	0,0	1,4	0,5	0,0	1,5
Coloproctology	176	8,6	0,0	13,1	0,1	0,0	6,7	0,2	0,0	8,9	0,3	0,0	9,4
General Surgery	453	8,0	0,0	18,7	0,4	0,0	0,7	0,6	0,0	1,7	0,6	0,0	2,2
Pediatric Surgery	119	6,2	0,0	18,0	0,1	0,0	6,9	2,0	0,0	6,2	0,3	0,0	0,4
Urology	359	4,8	0,0	14,6	0,1	0,0	7,3	0,0	0,0	3,6	1,9	0,0	8,3
Plastic Surgery	302	6,5	0,0	9,6	0,1	0,0	2,4	0,0	0,0	0,0	0,2	0,0	3,3
Gynecology	119	5,3	0,0	7,3	0,0	0,0	0,7	0,0	0,0	0,0	0,4	0,0	2,3
Thoracic Surgery	120	4,4	0,0	12,3	0,6	0,0	2,5	0,5	0,0	2,2	0,9	0,0	2,4
Head and Neck Surgery	60	7,5	0,0	17,0	0,3	0,0	1,3	0,2	0,0	0,8	0,0	0,0	0,0
Otolaryngology Surgery	60	2,7	0,0	7,4	0,0	0,0	0,0	0,6	0,0	1,7	0,0	0,0	0,0

Table 3 - Benchmarks for SSI rates by surgical wound classification.

Classification of surgical wounds	No. of procedures	SSI rate	Benchmark	
			[I.C.]	95%
Clean	91083	1,9%	1,8%	2,0%
Clean-contaminated	71986	1,3%	1,2%	1,4%
Contaminated	7445	3,7%	3,2%	4,1%
Dirty or infected	3588	3,9%	3,3%	4,5%

Table 4 - Benchmarks for SSI rates by surgical service.

Surgical Service	No. of procedures	SSI rate	Benchmark	
			[I.C.]	95%
Neurosurgery	9392	4,9%	4,5%	5,3%
Cardiovascular Surgery	15308	4,3%	4,0%	4,6%
Orthopedics	51770	2,7%	2,6%	2,8%
Coloproctology	3809	2,4%	2,0%	3,0%
Vascular Surgery	4879	2,2%	1,8%	2,7%
General Surgery	50525	1,9%	1,8%	2,0%
Pediatric Surgery	3777	1,5%	1,1%	1,9%
Obstetrics	3531	1,4%	1,0%	1,8%
Urology	11467	0,9%	0,7%	1,1%
Plastic Surgery	10238	0,7%	0,6%	0,9%
Gynecology	30909	0,7%	0,6%	0,8%
Thoracic Surgery	3186	0,6%	0,4%	1,0%
Head and Neck Surgery	4114	0,5%	0,3%	0,8%
Mastology Surgery	1888	0,5%	0,2%	0,9%
Ophthalmology	1381	0,4%	0,2%	1,0%
Dental Surgery	315	0,3%	0,0%	2,0%
Otolaryngology Surgery	5804	0,1%	0,0%	0,2%

Table 5 - Benchmarks for SSI rates by operative procedure type.

Operative procedure description	No. of procedures	SSI rate	Benchmark	
			[I.C.]	95%
Coronary bypass with chest and donor incision	1701	13,9%	12,3%	15,7%
Bile duct, liver or pancreatic surgery	745	8,7%	6,8%	11,0%
Kidney transplant	443	8,6%	6,2%	11,7%
Cardiac surgery	1910	7,1%	6,0%	8,3%
Abdominal aortic aneurysm repair	918	6,9%	5,4%	8,7%
Spleen surgery	138	6,5%	3,0%	12,0%
Immobilization of spinal column	2209	5,7%	4,8%	6,8%
Craniotomy	3692	5,7%	5,0%	6,5%
Limb amputation	1990	5,0%	4,1%	6,1%
Exploratory abdominal surgery	4759	4,7%	4,1%	5,3%
Ventricular shunt	731	4,7%	3,3%	6,5%
Small bowel surger	509	4,5%	3,0%	6,8%
Neck surgery	624	4,5%	3,1%	6,5%
Open reduction of fracture	16023	3,6%	3,0%	3,9%
Hip prosthesis	3179	3,6%	3,0%	4,3%
Colon surgery	4849	3,5%	3,0%	4,1%
Laminectomy	319	3,1%	1,6%	5,9%
Knee prosthesis	3041	2,9%	2,3%	3,5%
Pacemaker surgery	2613	2,4%	1,9%	3,1%
Gastric surgery	7856	2,0%	1,7%	2,4%
Kidney surgery	1180	1,5%	0,9%	2,5%
Appendix surgery	4895	1,4%	1,1%	1,8%
Herniorrhaphy	11838	1,3%	1,1%	1,6%
Vaginal hysterectomy	847	1,2%	0,6%	2,2%
Thoracic surgery	3212	1,1%	0,8%	1,5%
Abdominal hysterectomy	3425	1,0%	0,7%	1,4%
Peripheral vascular bypass surgery	10396	0,8%	0,6%	1,0%
Gallbladder surgery	15208	0,8%	0,7%	1,0%
Cesarean section	22628	0,7%	0,6%	0,9%
Breast surgery	3063	0,6%	0,3%	0,9%
Prostate surgery	2215	0,5%	0,3%	1,0%