

# Impact of MRSA colonization pressure on MRSA acquisition and MRSA infection in pediatric care unit

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## INTRODUCTION

Acquisition rate of MRSA colonization was 4.1% (95% CI 1.2-8.6%) among NICU/PICU in Asia, North America and UK during 2000-2010.

MRSA colonization increased the risk of MRSA infection.

MRSA colonization pressure(CP) is a useful tool to measure the extent of MRSA reservoirs in health care settings.

The purpose to this study were to check the MRSA CP and the incidence of invasive MRSA infection in severely ill pediatric patients requiring pediatric intensive care unit(PICU)s stay, and to evaluate the association between MRSA CP and MRSA acquisition/invasive infection

## METHODS

### Setting and design

Between January 2016 and December 2020, all patients who admitted to 2 PICUs at Asan Medical Center children's hospital.

- 2 PICUs with a total of 25 beds

- >1,000 medical and surgical patients/year, included hematopoietic stem cell-transplant and organ-transplant patients, as well as cardiac, neurosurgical, orthopedic patients

Nasal and tracheal MRSA surveillance and MRSA clinical culture's data were collected.

### Infection prevention and control strategies

Routine nasal +/- tracheal surveillance culture for MRSA at the time of PICU admission and weekly thereafter.

Contact precautions were applied for MRSA colonized or infected patients.

Decolonization of colonized MRSA was not performed.

## Definition

**Colonization pressure(CP)** : monthly no. of MRSA colonizers/100 patients

### MRSA colonizer

#### Acquired

(1) Surveillance culture (+) for MRSA after  $\geq 3$  calendar day of PICU & no previous history of MRSA infection/colonization

(2) Surveillance culture (+) for MRSA after  $\geq 7$  calendar day of PICU & previous history of MRSA infection/colonization

#### Imported

MRSA colonizer except for acquired ones

**MRSA acquisition** : no. of acquired MRSA colonizers

**Invasive MRSA infection (incidence)** : no. of cases / 1,000 patients)

Recovery of MRSA from normally sterile body site

## RESULTS

• During study period, a total of 6,907 patients admitted to PICUs.

• MRSA colonizers : 8.4% (487/6,907)

- Acquired 2.4%/ Imported 6%
- Mean MRSA CP : 6.4/100patients \* month

• Invasive MRSA infection

- Total 22 cases : blood (n=17), deep seated infection(n=2), pleural fluid (n=2), intra- abdominal (n=1)
- overall incidence 3.1/1,000patients. (total 22cases)

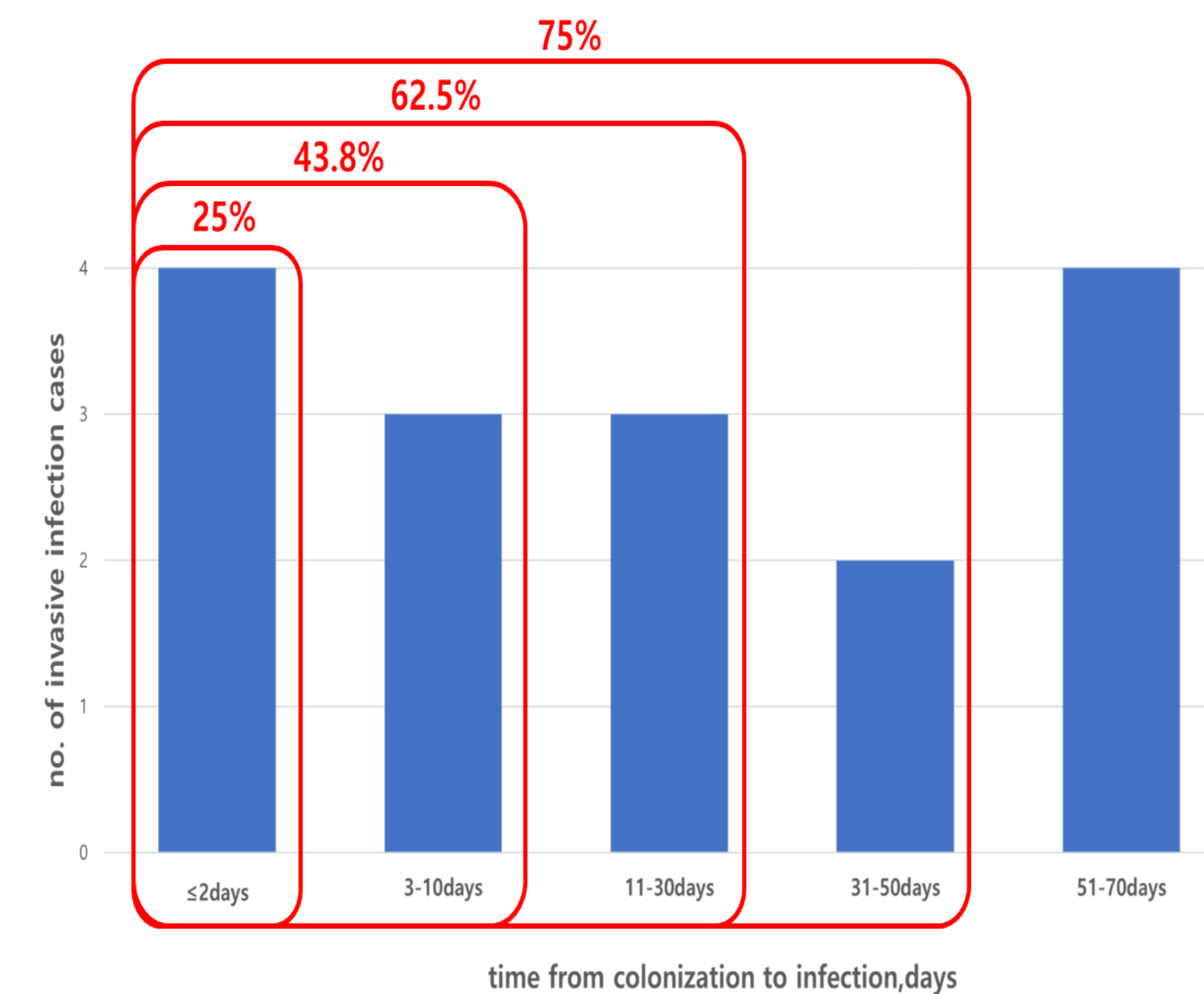
**Table 1.** Demographic and clinical characteristics of MRSA colonizers in PICUs

	Total (n=487)	Imported (n=333)	Acquired (n=154)
Male gender, n (%)	284(58.3)	198(59.5)	91(59.1)
Mean age (IQR) , months	18.5(0-9)	3(0-3)	32(3-74)
Length of ICU stay, median (IQR), days	8(4-19)	6(2.5-15)	14.0(8-37)
Length of hospital stay, median (IQR), days	28(14-66)	24(12-54)	38(21-86)
Time to colonization from ICU admission, median (IQR), days	1(1-6)	1(0-1)	7(5-11.25)
Type of ICU, n (%)			
surgical ICU	208(42.7)	147(44.1)	61(39.6)
medical ICU	279(57.3)	186(55.9)	93(60.4)
Underlying conditions, n (%)	487 (100)		
cardiovascular	235(48.3)	133(39.9)	101(65.6)
gastrointestinal	49(10.1)	36(10.8)	13(8.4)
nephrourology	13(2.7)	13(3.9)	6(3.9)
respiratory	40(8.2)	34(10.2)	0(0.0)
neurology	80(16.4)	65(19.5)	14(9.1)
metabolic	27(5.5)	19(5.7)	8(5.2)
hemato-oncologic	13(2.7)	10(3.0)	3(1.9)
others	30(6.2)	23(6.9)	9(5.8)
Number of invasive MRSA infection case, n (%)	16(3.3)	8(2.4)	8(5.1)

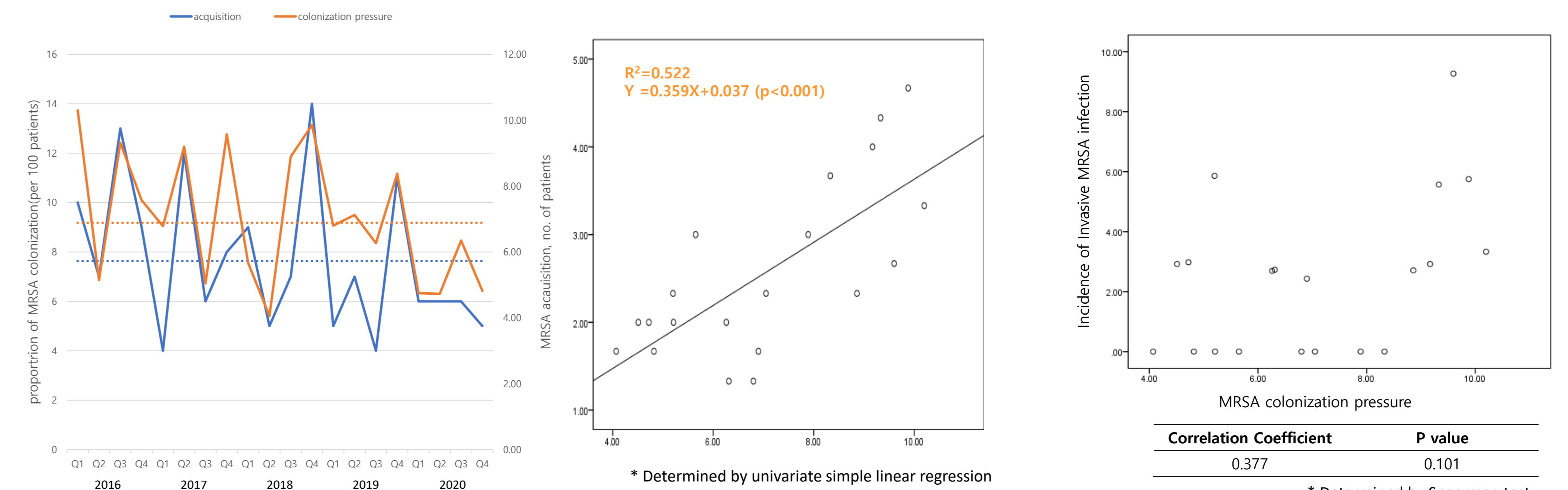
**Table 2** Demographic and characteristics of patients with invasive MRSA infections

	invasive infection case (total =22)
Male gender, n (%)	10 (45.5)
Mean age (IQR) , months	3 (0-22)
Length of ICU stay, median (IQR), days	36 (9.75-79)
Length of hospital stay, median (IQR), days	85.5(44.7-144.2)
Time to infection from ICU admission, median (IQR), days	10 (1.75-35.5)
Nosocomial infection <sup>*</sup> , n (%)	19(86.3)
Underlying conditions, n (%)	22(100)
cardiovascular	8 (36.4)
gastrointestinal	2 (9.1)
nephrourology	0 (0.0)
respiratory	1 (4.5)
neurology	3 (13.6)
metabolic	2 (9.1)
hematooncologic	0 (0.0)
others	6 (37.3)
MRSA colonization before infection, n (%)	16(72.7)
Time to infection from colonization, median (IQR), days	24(2.25-49.75)
Site of invasive infection, n (%)	
Bloodstream	17(77.3)
Pleural fluid	2(9.1)
Ascites	1(4.5)
Deep tissue	2(9.1)

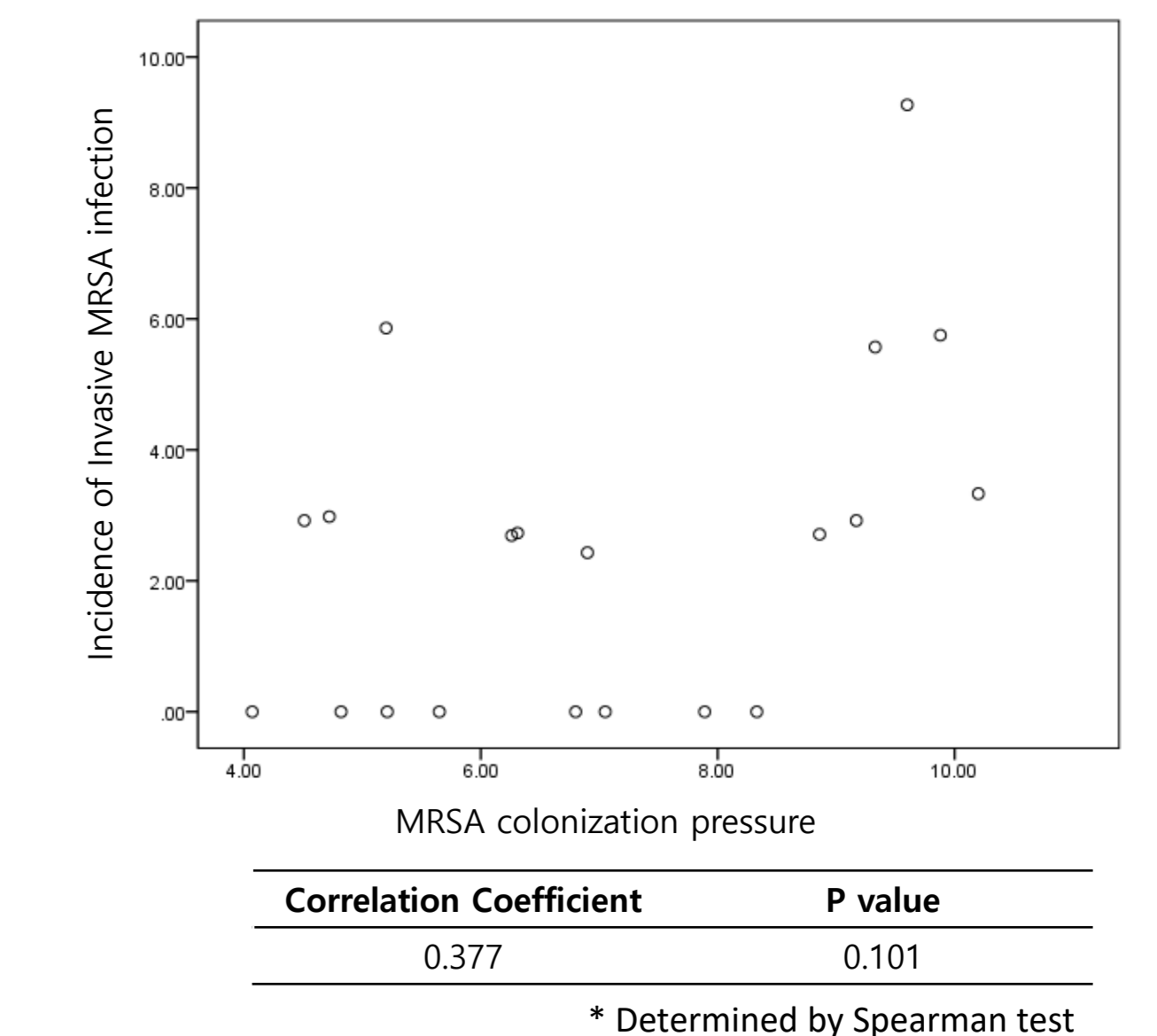
\* The date of event after the 3<sup>rd</sup> calendar day of admission



**Figure 1.** Time to invasive MRSA infection from MRSA colonization



**Figure 2.** Association MRSA CP and MRSA acquisition



**Figure 3.** Association MRSA CP and invasive MRSA infection

## Summary & Conclusion

In PICUs at Asan Medical Center Children's Hospital from Jan 2016 to Dec 2020,

Prevalence of MRSA colonization was 8.4%(487/6,907). Acquisition rate was 2.4%(154/6,907).

Among MRSA colonized patients, infection rate was 3.1% (16/487).

Colonization was preceded in 72% (16/22) of MRSA infected patients.

The association MRSA CP and acquisition, incidence of invasive MRSA infection was identified.

MRSA CP influenced the new acquisition of MRSA during PICU stay

no statically significant correlation between MRSA CP and MRSA infection in this study.

but, newly acquired colonizers are more likely to experience invasive MRSA infection.

(imported 2.4%/ acquired 5.1%)

Continuous multi-faceted efforts to minimize MRSA CP can provide opportunities for reducing MRSA colonization and infections rates in PICU settings.

