

# Hospital-Acquired Bacterial Infection at Thammasat University Hospital, Thailand (2008 to 2013)

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Hospital-acquired infections mainly are caused by bacteria and have increased globally. The causative agents include *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), and *Enterococci* spp. Treatment has become more complicated; therefore, effective surveillance is essential in preventing spread. The authors investigated the epidemiology of strains isolated from Thammasat University Hospital, Thailand. Our results indicated a gradual increase in infected patients with hospital-acquired bacteria at Thammasat University Hospital. The highest number of infections was found in the neonatal intensive care unit (NICU) in 2013 (14.73%). Infections of less than 10% were also found in other units: Neonatal Intensive Care, General Male Internal Medicine, General Male Surgery, General Female Surgery, and Surgical Intensive Care. *A. baumannii* (MDR), *P. aeruginosa*, *K. pneumoniae* (ESBL), *E. coli* (ESBL), *Candida albicans*, and MRSA were frequently detected. Urinary tract infections were the most common, from *E. coli* (ESBL), *E. coli*, *C. albicans*, *P. aeruginosa* and *K. pneumoniae*. Even if strains are not yet resistant, medical personnel should be vigilant and prevent patient-to-patient infection.

**Keywords:** Hospital-acquired infections, Bacterial infections, Antibiotic resistance

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Hospital-acquired infections have dramatically increased worldwide. Causative agents include *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), and *Enterococcus* spp. Many cause high mortality. Reports have revealed failures in treatment when there is higher minimal inhibitory concentration (MIC)<sup>(1-3)</sup>. Common sites of bacterial infection are the respiratory tract, urinary tract, surgical sites, skin and tissue, and the bloodstream<sup>(4,5)</sup>. Elderly and immunocompromised patients are prone to be at high risk of hospital-acquired infections<sup>(6)</sup>. Moreover, medical instruments such as catheters, respiratory machines, and other hospital tools are significant factors associated with infections, causing high morbidity and mortality<sup>(7)</sup>.

The unnecessary or inappropriate use of prescribed antibiotics is the most important factor leading to antibiotic resistance found in both humans and animals. Another factor is the spread of resistant strains from one patient to others, or infection from an environmental source. Nosocomial infections are increasingly difficult to control; therefore, effective surveillance to prevent and control bacteria spread,

track resistant bacteria, and improve antibiotic use, is essential. The authors scrutinized the prevalence of bacteria isolated from Thammasat University Hospital. Our results will be informative for further study on prevention and to control unknown impacts from treatment.

## Materials and Methods

### Study setting

Thammasat University Hospital, Pathumthani is located approximately 40 km from Bangkok Metropolitan and provides tertiary medical care in all service sectors to an average of 1,000 outpatients per day, with 500 beds for inpatients.

### Data collection

This was a retrospective study of bacterial prevalence isolated from Thammasat University Hospital from 2008 to 2013; 3,057 infected patients were analyzed. Microbiology data were provided by Infectious Control Unit, Thammasat University Hospital.

### Criterion of community and hospital-acquired infections

Patients infected with community-acquired infection are defined by culture-confirmed bacterial infection when presenting at an outpatient clinic or within 48 hours of hospitalization without history of exposure to healthcare facilities during the previous two months. Hospital-acquired infected patients are defined as those whose history did not

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meet the definition of community-acquired infection.

## Results and Discussion

It was revealed that the number of infected patients increased every year from 2008 to 2013 (Figure 1). Bacterial infection of the bloodstream increased every year, except in 2012. All others declined (Figure 2). *Escherichia coli* (28.15%) and MRSA (9.36%) were mainly found in the bloodstream (data not shown). The highest prevalence of MRSA from bloodstream infections was isolated from the surgical ward and both internal medicine wards. The neonatal intensive care unit (NICU) had the highest amount of nosocomial infections in 2013 (14.73%) (Figure 3).

*E. coli* (ESBL) (15.68%), *E. coli* (12.89%), *C. albicans* (10.30%), *P. aeruginosa* (7.85%), *K. pneumoniae* (6.87%) and yeast (6.80%) were isolated from urinary tract infections, whereas multidrug-resistant *A. baumannii* (MDR) (16.69%) was a major cause of hospital-acquired pneumonia. Other bacteria including *K. pneumoniae* (14.43%), *P. aeruginosa* (10.47%), *A. baumannii* (10.18%) and *K.*

*pneumoniae* (ESBL) (8.20%) were also isolated from respiratory tract infections. Gram negative and gram positive bacteria including coagulase-negative *Staphylococcus*, MRSA, *E. coli* (ESBL), *E. coli*, *P. aeruginosa*, *K. pneumoniae* and *A. baumannii* (MDR) and yeast were isolated from bloodstream, surgical sites and skin.

An increase in nosocomial infections occurred every year from 2008 to 2013: almost four times higher in 2013 than 2008. During the same interval, Slovakia and Morocco had a higher prevalence rate of hospital-acquired infections than us, 5.2, 8.9 and 3.02%, respectively<sup>(8)</sup>. Despite this good news, the authors should still vigilant in infection prevention and control.

Multiple factors are associated with hospital-acquired infections involving patient conditions and their environment. Certainly, more infections occur in the elderly or newborn patients, who are often hospitalized. The authors also see contaminated medical apparatus leading to infections as previously reported<sup>(8)</sup>. As in the present study, others have indicated that urinary and respiratory tract infections are frequent<sup>(9-11)</sup>. The authors found *E. coli*, *P. aeruginosa*, *K. pneumoniae* and *C. albicans*, and *E. coli* (ESBL). Lee, et al reported on the prevalence of unknown MRSA in surgical wards (62%). MRSA was detected on admission (3.6%), and potential risk factors include age, wounds, nursing home residency and tracheostomy<sup>(12)</sup>.

## Conclusion

Our research suggests Thammasat University Hospital likely has effective antibiotic prescription guidelines, as our antibiotic resistance appears to be under control, especially compared to other contexts. Medical personnel generally have more awareness of prevention, surveillance and tracking bacterial spread. Methods such as antibiograms to determine resistance, patient isolation to manage infections, and strict hospital hygiene protocols remain essential in the

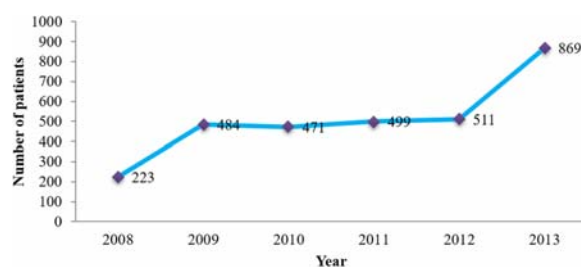
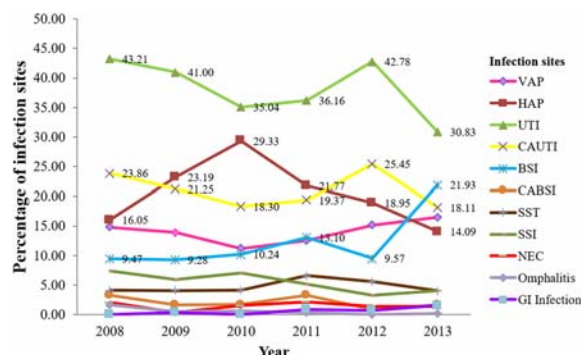
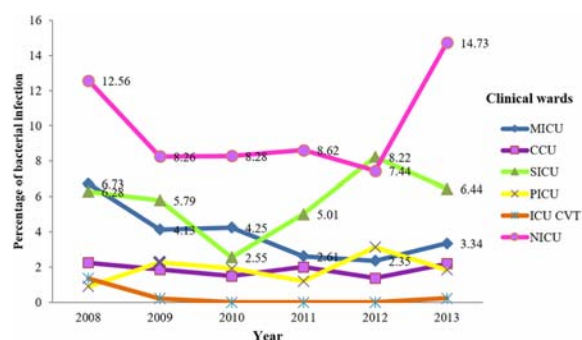


Figure 1. Number of patients with bacterial infections (2008 to 2013).



VAP = Ventilator-associated pneumonia, HAP = Hospital-associated pneumonia, UTI = urinary tract infection, CAUTI = Catheter-associated UTI, BSI = Bloodstream infection, CABSI = Catheter-associated BSI, SST = Skin and soft tissue infection, SSI = Surgical site infection, NEC = Necrotizing enterocolitis, GI = Gastrointestinal tract infection

Figure 2. Percentage of infection sites of bacteria (2008 to 2013).



MICU = Medical intensive care unit, CCU = Coronary care unit, SICU = Surgical intensive care unit, PICU = Pediatric intensive care unit, ICU CVT = Intensive care unit cardiovascular and thoracic, NICU = Neonatal intensive care unit

Figure 3. Percentage of bacterial infections in different wards.

fight against antibiotic resistance.

### What is already known on this topic?

None is previously known on this topic.

### What this study adds?

Surveillance, prevention and control strategy of antibiotic resistance are suggested to be necessary.

### Acknowledgements

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### Potential conflicts of interest

The authors declare no conflict of interest.

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## การกระจายของการติดเชื้อในโรงพยาบาลในโรงพยาบาลธรรมศาสตร์ (พ.ศ. 2551 ถึง พ.ศ. 2556)

พิพิมลวรรณ โกคาพันธ์, สุมาลี คอนโด, พลวัฒน์ ดั่งเพชร, อนุชา อภิสารธนรักษ์

การติดเชื้อในโรงพยาบาลส่วนใหญ่สาเหตุเกิดจากเชื้อแบคทีเรียและมีเพิ่มขึ้นทั่วโลก โดยเชื้อสาเหตุได้แก่ *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), และ *Enterococcus* spp. เนื่องจากการรักษาการติดเชื้อในโรงพยาบาลเหล่านี้มีความซับซ้อน การเฝ้าระวังที่มีประสิทธิภาพจึงเป็นสิ่งสำคัญในการป้องกันการแพร่ระบาด ผู้เขียนได้ทำการสำรวจการระบาดของเชื้อที่ก่อให้เกิดการติดเชื้อในโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติระหว่างปี พ.ศ. 2551 ถึง พ.ศ. 2556 และพบว่ามีเพิ่มขึ้นของจำนวนผู้ป่วยติดเชื้อในโรงพยาบาลอย่างต่อเนื่อง โดยพบจำนวนผู้ป่วยที่ติดเชื้อมากที่สุดที่หอผู้ป่วยหนักทารกแรกเกิด (ร้อยละ 14.73) และยังพบอัตราการติดเชื้อที่น้อยกว่าร้อยละ 10 ในแผนกอื่นๆ ได้แก่ หอผู้ป่วยทารกแรกเกิดระยะวิกฤต หอผู้ป่วยสามัญอายุรกรรมชาย หอผู้ป่วยสามัญศัลยกรรมชาย หอผู้ป่วยสามัญศัลยกรรมหญิง และหอผู้ป่วยศัลยกรรมระยะวิกฤต เชื้อที่ตรวจพบได้บ่อยได้แก่ *A. baumannii* (MDR), *P. aeruginosa*, *K. pneumoniae* (ESBL), *E. coli* (ESBL), *Candida albicans* และ MRSA การติดเชื้อในทางเดินปัสสาวะพบได้บ่อยที่สุด โดยพบเชื้อที่เป็นสาเหตุคือ *E. coli* (ESBL), *E. coli*, *C. albicans*, *P. aeruginosa* และ *K. pneumoniae* การสำรวจนี้แสดงให้เห็นถึงความสำคัญของการเฝ้าระวังเพื่อป้องกันการติดเชื้อในโรงพยาบาล

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