*Original Article*

# Hand Hygiene of Emergency Medical Service Healthcare Providers

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***Background:*** Hand hygiene plays an important role in protecting against infections transmitted among patients via healthcare providers. However, no studies with regard to this have been conducted in EMS personnel in Thailand.

***Objective:*** To survey the hand hygiene of emergency medical service healthcare providers.

***Materials and Methods:*** This was an observational prospective study at the emergency medical services (EMS) department of Khon Kaen University's Srinagarind Hospital from 1 to 30 September 2019. The authors examined 52 EMS operations via ambulance closed-circuit television (CCTV).

***Results:*** The mean age of the study group was 37.6±8.2 years, and most participants were male (57.7%; 30 participants). The most common EMS operation levels were advanced and intermediate (38.5%). There were a total of 362 hand hygiene indications, with compliance in only 58 (16.0%), with the most common indication with which personnel complied was after patient contact (30.0%). We found that operating time and work experience were factors that affected hand hygiene.

***Conclusion:*** The hand hygiene of medical personnel in the EMS at Srinagarind Hospital was remarkably poor. The majority of hand washing occurred after risk of body fluid exposure, after patient contact, and after contact with patient surroundings.

***Keywords:*** Hand hygiene, Emergency medical services, Ambulances, Infections

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The World Health Organization (WHO) has stipulated that practicing hand hygiene is necessary for healthcare providers before patient contact, before cleaning or aseptic procedures, after risk of body fluid exposure, after patient contact, and after contact with patient surroundings. The incidence of infections related to healthcare providers in developed countries is 5 to 10%. These infections are associated with increases in mortality, economic costs, and the suffering of patients and their family members[1]. The most common mechanism of transmission is the spread of infection from one patient to another through the hands of healthcare providers. Hand hygiene is thus critical in reducing the incidence of infection.

Thailand's Emergency Medical Services (EMS) consist of emergency medical responders (EMRs), emergency medical technicians (EMTs), advanced emergency medical technicians (AEMTs), paramedics, nurses, and doctors, all of whom have frequent contact with patients in various conditions including various immunity characteristics[2], making hand hygiene extremely important[3]. Studies have found that patients transferred by advanced operation levels of EMS had higher infection rates[4,5]. In addition, another study showed a low level of hand hygiene among EMS personnel[6-8], despite evidence showing that good hand hygiene helps reduce hospital infections and results in improved patient outcomes[9]. As there have yet been no studies regarding hand hygiene in EMS, the objective of this study was conducted to survey that of EMS healthcare providers in Thailand.

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## Materials and Methods

This was an observational prospective study. We observed a total of 362 hand hygiene indications in 52 EMS operations in September 2019. The exclusion criterion was incomplete data from the ambulance's closed-circuit television (CCTV). Ethics approval was provided by The Khon Kaen University Ethics Committee for Human Research (HE621252).

The sample size was calculated based on the prevalence of hand hygiene indications reported in a previous study by Vikke et al[10]. In order to achieve a significance level of 5% and power of test of 0.8, the authors determined that a sample size of 362 would be required.

Statistical analysis was performed using SPSS for Windows version 16.0 (SPSS Inc., Chicago, IL, USA).

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Categorical data were presented as percentages, and continuous data were presented using mean and standard deviation. Univariable analysis was performed using a two-sample t-test for numerical data and a Pearson's correlation for data relationship between the two groups.

Data were recorded via ambulance CCTV while operating. Three third-year emergency medicine residents then evaluated the hand hygiene of the EMS healthcare providers based on WHO guidelines. Compliance was determined by the majority judgment of the evaluators. Hand hygiene data were recorded in the data form for this study.

## Results

Fifty-two EMS operations were examined, the characteristics of which are shown in Table 1. The mean age of the patients was 37.6±8.2 years, and 57.7% (n = 30) of them were male. The most common levels of operations were advanced and intermediate (38.5% each). The operations mostly took place during the morning and night shifts 34.6%. The most common duration of work experience was 1 to 5 years with 42.3%.

Observation of hand hygiene revealed a total of 362 indications with 58 compliances (16.0%), as shown in Table 2. When analyzing the data per indication, we found a compliance rate of 3.8% before patient contact, 5.0% before cleaning or aseptic procedures, 8.9% after risk of contact with body fluids, 30.0% after patient contact, and 22.9% after contact with patient surroundings.

Analysis of factors that affect hand hygiene (Table 3) revealed that operation level ($p<0.001$), operation time ($p = 0.022$), and duration of work experience ($p = 0.038$) are factors that significantly affect hand hygiene.

**Table 1.** Characteristics of the subjects

| | Number (%) |
|---|---|
| Age (years), mean ± SD | 37.6±8.2 |
| Sex: male | 30 (57.7) |
| Level of operation | |
| Advance team | 20 (38.5) |
| Intermediate team | 20 (38.5) |
| Basic team | 12 (23.0) |
| Operation time (shift) | |
| 8AM to 4PM | 18 (34.6) |
| 4PM to 0AM | 16 (30.8) |
| 0AM to 8AM | 18 (34.6) |
| Work experience (years) | |
| Less than 1 | 8 (15.4) |
| 1 to 5 | 22 (42.3) |
| 6 to 10 | 20 (38.5) |
| More than 10 | 2 (3.8) |

**Table 2.** Hand hygiene indications

| Indications | Overall | Personnel acting (%) |
|---|---|---|
| General | 362 | 58 (16.0) |
| Before patient contact | 52 | 2 (3.8) |
| Before cleaning or aseptic procedures | 20 | 1 (5.0) |
| After the risk of contact with body fluids | 112 | 10 (8.9) |
| After patient contact | 60 | 18 (30.0) |
| After contact with patient surroundings | 118 | 27 (22.9) |

**Table 3.** Factors that affect hand hygiene

| Factors | Action (%) | Not action (%) | *p*-value |
|---|---|---|---|
| Gender | 24 (46.2) | 28 (53.8) | 0.064 |
| Level of operation | 40 (76.9) | 12 (23.1) | <0.001* |
| Operation time | 35 (67.3) | 17 (32.7) | 0.022* |
| Work experience | 30 (57.7) | 22 (42.3) | 0.038* |

* Statistical significance

## Discussion

In the present study, the authors collected data via observation of ambulance CCTV, rather than self-reporting, to prevent bias[11]. The authors found low hand hygiene compliance rates in EMS personnel, which are consistent with the results from previous study[10] that used the same methods in Australia (6%), Sweden (13%), Finland (15%), and Denmark (24%). However, another study conducted in Denmark that collected data via self-reporting, and found a greater than 80% hand hygiene compliance rate among medical personnel in EMS[12].

Our data indicate that most EMS personnel wash their hands to protect themselves rather than their patients. The indications with which they most commonly complied occurred after the risk of contact with body fluids, after patient contact, and after contact with patient surroundings, while the rate of hand-washing before touching the patient and before conducting a procedure was very low, which is consistent with previous studies[10,12]. The authors also found that work experience was a factor affecting hand hygiene, which is also consistent with the results of a previous study[10]. One way in which the present study differs from previous studies is that, in Western countries, paramedics are dispatched in all EMS cases, while in Thailand's EMS[13,14], nurses, who tend to be more aware of the importance of hand hygiene, are usually deployed for advanced-level cases. Despite this, the results of the present study were similar to those from studies in Western countries[15]. However, it should be noted that data were collected from only one emergency medical services center in the present study.

## Conclusion

Hand hygiene of healthcare providers in the Srinagarind Hospital EMS center was poor. Most compliance

occurred after the risk of contact with body fluids, after patient contact, and after contact with patient surroundings. Factors affecting hand hygiene are operational level, operating time, and duration of work experience.

## What is already known on this topic?

The World Health Organization (WHO) has stipulated that practicing hand hygiene is necessary for healthcare providers before patient contact, before a cleaning or aseptic procedures, after risk of body fluid exposure, after patient contact, and after contact with patient surroundings.

## What this study adds?

Hand hygiene of healthcare providers in the Srinagarind Hospital EMS center was poor. Most compliance occurred after the risk of contact with body fluids, after patient contact, and after contact with patient surroundings.


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## Potential conflicts of interest

The authors declare no conflicts of interest.

## References


1. World Health Organization (WHO). Report on the burden of endemic healthcare-associated infection worldwide. Geneva: WHO Document Production Services;2011: 6-12.
2. Skuntaniyom S, Malathum K, Tipluy P. Evaluation of using alcohol based hand rub bottle holders for hand hygiene among healthcare personnel in an emergency unit. Ramathibodi Nurs J 2018;24:196-209.
3. Bucher J, Donovan C, Ohman-Strickland P, McCoy J. Hand Washing Practices Among Emergency Medical Services Providers. West J Emerg Med 2015;16:727-35.
4. Alter SM, Merlin MA. Nosocomial and community-acquired infection rates of patients treated by prehospital advanced life support compared with other admitted patients. Am J Emerg Med 2011;29:57-64.
5. Garus-Pakowska A, Sobala W, Szatko F. Observance of hand washing procedures performed by the medical personnel before patient contact. Part I. Int J Occup Med Environ Health 2013;26:113-21.
6. Garus-Pakowska A, Sobala W, Szatko F. Observance of hand washing procedures performed by the medical personnel after the patient contact. Part II. Int J Occup Med Environ Health 2013;26:257-64.
7. Tenias JM, Mayordomo C, Benavent ML, Mico MS, Garcia Esparza MA, Oriola RA. Impact of an educational intervention for promoting handwashing and the rational use of gloves in a hospital. Rev Calid Asist 2009;24:36-41.
8. Allegranzi B, Pittet D. Role of hand hygiene in healthcare-associated infection prevention. J Hosp Infect 2009;73:305-15.
9. Teter J, Millin MG, Bissell R. Hand hygiene in emergency medical services. Prehosp Emerg Care 2015;19:313-9.
10. Vikke HS, Vittinghus S, Giebner M, Kolmos HJ, Smith K, Castren M, et al. Compliance with hand hygiene in emergency medical services: an international observational study. Emerg Med J 2019;36:171-5.
11. Simundiae AM. Bias in research. Biochem Med (Zagreb) 2013;23:12-5.
12. Vikke HS, Vittinghus S, Betzer M, Giebner M, Kolmos HJ, Smith K, et al. "Hand hygiene perception and self-reported hand hygiene compliance among emergency medical service providers: a Danish survey". Scand J Trauma Resusc Emerg Med 2019;27:10.
13. Apiratwarakul K. Development of emergency medical service. Srinagarind Med J 2017;32:289-94.
14. Apiratwarakul K, Ienghong K, Mitsungnern T, Kotruchin P, Phungoen P, Bhudhisawasdi V. Use of a motorlance to deliver emergency medical services; a prospective cross sectional study. Arch Acad Emerg Med 2019;7:e48.
15. Neo JR, Sagha-Zadeh R, Vielemeyer O, Franklin E. Evidence-based practices to increase hand hygiene compliance in health care facilities: An integrated review. Am J Infect Control 2016;44:691-704.

## สุขอนามัยการล้างมือของบุคลากรทางการแพทย์ในระบบการแพทย์ฉุกเฉิน

กรกฎ อภิรัตน์วรากุล, กชกร จำเริญเกตุประทีป, กมลวรรณ เอี้ยงฮง, วัชระ รัตนสีหา, มธุรส บูรณศักดา, วัชรพงศ์ พุทธิสวัสดิ์

***ภูมิหลัง:*** สุขอนามัยการล้างมือถือเป็นส่วนสำคัญในการป้องกันการแพร่กระจายของเชื้อโรคผ่านบุคลากรทางการแพทย์อย่างไรก็ตามยังไม่มีการศึกษาบุคลากรทางการแพทย์ในระบบการแพทย์ฉุกเฉินในประเทศไทย

***วัตถุประสงค์:*** เพื่อสำรวจสุขอนามัยการล้างมือของบุคลากรทางการแพทย์ในระบบการแพทย์ฉุกเฉิน

***วัสดุและวิธีการ:*** การศึกษาเชิงสังเกตแบบไปข้างหน้าที่หน่วยบริการการแพทย์ฉุกเฉิน โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่นระหว่างวันที่ 1 ถึง 30 กันยายน พ.ศ. 2562 โดยสังเกตผ่านกล้องวงจรปิดบนรถพยาบาลจำนวน 52 การออกปฏิบัติการ

***ผลการศึกษา:*** อายุเฉลี่ยของกลุ่มที่ศึกษา 37.6±8.2 ปี ส่วนใหญ่เป็นชาย 30 คน (ร้อยละ 57.7) ระดับการออกปฏิบัติการส่วนใหญ่เป็นระดับสูงและระดับกลาง ร้อยละ 38.5 มีข้อบ่งชี้เกี่ยวกับสุขอนามัยการล้างมือทั้งหมด 362 ข้อบ่งชี้ ซึ่งมีการปฏิบัติเพียง 58 ครั้ง (ร้อยละ 16.0) โดยข้อบ่งชี้ที่มีการปฏิบัติมากที่สุดคือ หลังสัมผัสผู้ป่วย (ร้อยละ 30.0) ปัจจัยด้านช่วงเวลาการออกปฏิบัติการและประสบการณ์ทำงานเป็นปัจจัยที่มีผลต่อสุขอนามัยการล้างมือ

***สรุป:*** สุขอนามัยการล้างมือของบุคลากรทางการแพทย์ในระบบการแพทย์ฉุกเฉิน โรงพยาบาลศรีนครินทร์อยู่ในระดับต่ำ ซึ่งส่วนใหญ่ของการล้างมือเกิดขึ้นหลังสัมผัสสารคัดหลั่งผู้ป่วย ตัวผู้ป่วยและสิ่งของที่อยู่รอบตัวผู้ป่วย