

ความสามารถของบุคลากรสุขภาพในการปฏิบัติตามระบบป้องกันการแพ้ยาซ้ำ ของผู้ป่วยใน, โรงพยาบาลพุทธโสธร

Performance of Healthcare Providers in the Prevention of Repeated Drug Allergies among Patients Admitted to the In-patient Department, Buddhasothorn Hospital

นิพนธ์ต้นฉบับ

Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อประเมินความสามารถของบุคลากรสุขภาพในการปฏิบัติตามมาตรฐานการปฏิบัติงานระบบป้องกันการแพ้ยาซ้ำของผู้ป่วยใน **วิธีการศึกษา:** การศึกษาแบบภาคตัดขวางประเมินการสามารถปฏิบัติงานแต่ละขั้นตอนของมาตรฐานระบบป้องกันการแพ้ยาซ้ำผู้ป่วยใน ที่โรงพยาบาลพุทธโสธร โดยใช้แบบประเมินที่สร้างขึ้นตามแนวทางมาตรฐานดังกล่าว เกณฑ์การคัดเลือก คือ ผู้ป่วยที่เข้ารับรักษาตัวช่วงเดือนสิงหาคม - กันยายน 2563 ได้รับการสัมภาษณ์ ทบทวนแฟ้มประวัติและเอกสารอื่น ๆ เพื่อประเมินการปฏิบัติตามมาตรฐานระบบป้องกันการแพ้ยาของบุคลากรทางการแพทย์ วิเคราะห์ข้อมูลโดยแสดงความถี่และร้อยละของแต่ละขั้นตอนที่ทำให้เหมาะสมและไม่เหมาะสม **ผลการศึกษา:** ในผู้ป่วยใน 98 คนที่เข้าร่วมการวิจัย พบว่ามี 45.9% ที่บุคลากรทำครบทุกขั้นตอน พบความบกพร่องในทั้ง 12 ขั้นตอน โดยพบมากที่สุด ได้แก่ ไม่พบรายงานการทบทวนแพ้ยาของแพทย์ (49.0% ของคนไข้ทั้งหมด) ไม่มีใบตรวจสอบแพ้ยาสีชมพูในแฟ้มประวัติผู้ป่วยหรือใส่ผิดตำแหน่ง (39.8%) ไม่ติดป้ายแพ้ยาหน้าเตียง (33.7%) และพยาบาลไม่ได้ตรวจประวัติแพ้ยาและไม่ได้ใส่ชื่อยาที่แพ้ให้ครบ (32.6%) ทั้งนี้ผลการสัมภาษณ์และสังเกตเพิ่มเติมพบว่า สาเหตุหลักคือ บุคลากรมีงานมาก และการเตือนประวัติแพ้ยาทางหน้าจอคอมพิวเตอร์ที่เกินไปจนแพทย์ไม่สนใจ สรุป: ขั้นตอนที่ไม่เหมาะสม คือ ไม่พบรายงานการทบทวนแพ้ยาของแพทย์ ไม่มีใบตรวจสอบแพ้ยาสีชมพูในแฟ้มประวัติผู้ป่วยหรือใส่ผิดตำแหน่ง และไม่ติดป้ายแพ้ยาหน้าเตียง หรือหน้าแฟ้มประวัติผู้ป่วย โรงพยาบาลควรปรับปรุงระบบการทำงานและการใช้ระบบสารสนเทศช่วยในการสั่งยาและตรวจสอบประวัติการแพ้ยาให้มากขึ้น ซึ่งอาจช่วยลดโอกาสการสั่งใช้ยาที่แพ้ได้

คำสำคัญ: แพ้ยาซ้ำ, ระบบป้องกันแพ้ยาซ้ำ, ผู้ป่วยใน, มาตรฐานการปฏิบัติงาน

Editorial note

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Abstract

Objective: To assess the performance of healthcare providers in complying with the standard operating procedure (SOP) in preventing repeated drug allergy among patients admitted to the in-patient department. **Methods:** This cross-sectional study assessed the compliance to each task according to the SOP among patients admitted to the in-patient department, Buddhasothorn Hospital. Patients admitted to the medical ward from August to September 2020 were included. They were interviewed and their medical records all related documents were reviewed to assess for the providers' compliance to the SOP. For each task, it was assessed whether the provider complied with the SOP and presented as frequency and percentage. **Results:** Of the 98 patients included, 45.9% of them were with all tasks completed by the providers. All 12 tasks were found incomplete, with the most frequently incomplete ones were no drug allergy history reviewed and verified by physicians (49.0% of all 98 patients), no pink allergy alert note in the medical chart or the note inserted in the wrong order (39.8%), no alert card on the bed head (33.7%), and drug allergy history not reviewed by nurses and incomplete list of allergic drugs (32.6%). Possible causes based on informal interview and observation included heavy workload and physician's indifference to the too frequent alert warning on the screen. **Conclusion:** Incomplete tasks in preventing repeated drug allergy included no drug allergy history review by physicians, drug allergy history review note not put on medical chart or put on the wrong order, no alert card on the bed head or on the medical chart. Works based on the SOP and the information system to prevent repeated drug allergy should be further improved to reduce the risk of repeated incidence.

Keywords: repeated drug allergy, repeated drug allergy prevention system, in-patients, standard operating procedure

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Introduction

Drug allergy has become a worrisome healthcare problem leading to the increased death rate and healthcare expenditure. The prevention of repeated drug allergy is considered a standard of hospital and healthcare system. To develop an effective program to prevent repeated drug allergy, computer system is inevitable.¹ The computerized database system helped processing the data by means of coding relevant terms for the documentation of drug allergy history,

drug allergy warning system, detecting the overrides of electronic drug allergy warning, and the evaluation.² However, problems could arise from incomplete or incorrect drug allergy data input including documenting wrong allergic drug name, underreporting drug allergy incidence, unclear drug allergy warning, and documentation of drug allergy data in the appropriate system.¹⁻³ The most crucial element of inputting the data into database system is the correct and specific

allergic drug names.^{1,2} These imperfect or inappropriate tasks done by healthcare providers could be considered factors aggravating the incidence of repeated drug allergies and were of great concern in this present study.

Strategies employing specific and clear warning for drug allergy could help reduce the physician's overrides of electronic drug allergy warning. A meta-analysis of Nuckols and colleagues examined the benefit of having physicians prescribing medications through an electronic system called computerized provider order entry or CPOE.⁴ They found that data input and retrieval on the CPOE helped reduce preventable adverse drug events (pADRs) by 50% and prevent other medication errors as well.⁴

It has been a worldwide effort to find solutions to alleviate the illnesses relating to errors from medication system. Repeated drug allergy is a frequently found error which could lead to serious consequences. Cresswell and Sheikh (2008) had discussed the merit of information technology in lessening the risk of repeated drug allergy.⁵ These technologies had to be clinically useful in real-time problem solving. Certain innovative information technologies helped the patient remember the drug they are allergic to. These include bar coding and biometric technologies.⁵

To prevent the repeated drug allergy effectively, the author recommended that the real-time technology aid for decision making should be available. If more than one means of data recording system including telephone, hard copy record, and computerized data recording, a single integrated system such as CPOE should be implemented to reduce the risk of data loss.¹ Of the seven studies about the incidence and prevention of repeated drug allergy in Thailand⁶⁻¹², three of them reported the development of computerized software to prevent repeated drug allergy^{7,8,10} while one study examined the patient's level of knowledge about and how to use the drug allergy alert card.¹¹

The prevention of repeated drug allergy is one of the standards for hospitals and healthcare system that requires all healthcare providers to comply. Based on the target set by the Department of Health Service Support, Ministry of Public Health, all public hospitals have been expected to be absolutely free from cases of repeated drug allergy.^{1,3} Buddhasothorn hospital, Chachoengsao province, Thailand, is a tertiary level hospital with a 595-bed capacity. Despite the hospital's long-standing effort, repeated drug allergy have not been become extinct. In the fiscal year of 2018, of a total of

351 drug allergy cases, 346 of them were new cases and five were repeated cases (1.4% of all cases). In the most recent fiscal year of 2019, of a total of 394 drug allergy cases, 388 of them were new cases and six were repeated cases (1.5% of all cases). Drugs most frequently causing repeated drug allergy were antibiotics and non-steroidal anti-inflammatory drugs (NSAIDs). The most found reactions were angioedema, urticaria and maculopapular rash. Despite a low incidence rate, repeated drug allergy could lead to life-threatening illness and death, and not achieving the hospital standard.

In an ongoing attempt to achieve a goal of lower incidence of new drug allergy and no repeated incidence, our comprehensive process to prevent repeated drug allergy needed urgent evaluation which could be used for further improvement. The compliance to the standard operating procedure (SOP) to prevent the exposure to the drug that the patient was allergic to could help prevent the repeated drug allergy incidence. This study aimed to assess the performance of healthcare providers in complying with the SOP among patients admitted to the in-patient department. The extent of the performance was presented as the proportion of checklist items appropriately performed by physicians, nurses and pharmacists on history taking regarding drug allergies at ER to verification and warning in the medical ward. The assessment was conducted using the checklist developed by the researcher and practicing pharmacists at Buddhasothorn hospital, Chachoengsao province, Thailand.

Methods

In this cross-sectional study, the researcher used a checklist to examine the performance of healthcare providers in the prevention of repeated drug allergies among patients admitted to the in-patient department based on the standard operating procedure (SOP). It was conducted at Buddhasothorn hospital, Chachoengsao province, Thailand. Patients with a history of drug allergy admitted to Buddhasothorn hospital were the study population. All patients with a history of drug allergy admitted to any of the 20 in-patient medical wards from August to September 2020 were eligible for recruitment. Patients who were unable to communicate and/or unwilling to participate were excluded.

The sample size was based on the equation of Yamane, $n = N / (1 + Ne^2)$. Based on the study population (N) of 120 patients with drug allergy and history admitted to the medical

ward within a period of 2 months and a degree of error (e) of 5%, a sample size of 93 patients was needed.

In this study, performance of healthcare providers in the prevention of repeated drug allergies among patients admitted to the in-patient department using the SOP was defined as the proportion of checklist items appropriately performed by physicians, nurses and pharmacists on history taking regarding drug allergies at ER to verification and warning in the medical ward. The appropriateness of each of these prevention tasks was judged by the researcher using the checklist developed by the researcher and practicing pharmacists at Buddhasothorn hospital.

Patients with history of drug allergies or precautions were defined as those diagnosed with allergy by the physician and causative drug(s) verified by the pharmacist. This history included the precaution and related causative drug(s). This information was documented in the electronic medical records (HOSxP™) of Buddhasothorn hospital.

Daily practice procedure for preventing repeated drug allergies among patients admitted to the in-patient department

The daily practice procedure for preventing repeated exposure to drug allergies among patients admitted to the in-patient department of Buddhasothorn hospital had been in a standard operating procedure (SOP). The SOP had long been continuously developed at Buddhasothorn hospital as promoted by the policy of the Ministry of Public Health. The detail of practice in the SOP are as follows.

At the ER, the ER physician examined and took history of drug allergies and precautions in each given patient both from the patient and relatives. If hospitalization needed, the patient was admitted to the medical ward. At the medical ward, physician and nurse examined and took history of drug allergies and precautions from the patient and relatives, regardless of the note from the ER. If history of drug allergies was not found in the ER note and/or was not found by the physician and/or nurse in the medical ward, the physician prescribed the medications as guided by standard treatment guidelines and the prescriptions were submitted to the in-patient pharmacy. However, if history of drug allergies and precautions was found in the ER note and/or was found by the physician and/or nurse in the medical ward, the nurse verified whether such history of allergies or precautions was

already in the electronic medical record (HOSxP™). The nurse also verified whether the patient already had a drug allergy alert card. The nurse provided the patient a drug allergy alert wristband. The causative drug name was written on a pink drug allergy alert page to be inserted in the assigned order in the medical chart. This pink page was also used to alert healthcare providers about drug allergy or precautions. The nurse followed all steps to prevent drug allergy as guided in the blue drug allergy verification flowchart as follows. The nurse checked whether the patient had the history of drug allergy in Buddhasothorn hospital. The nurse notified the pharmacist the patient's drug allergy history and documented date and time of the notification in the medical chart. The nurse attached the drug allergy alert sign on the bed end, attached drug allergy alert label/sticker on the front of the medical chart, and inserted pink drug allergy alert page in the assigned order in the medical chart.

In the case of the admitted case with drug allergy history from the ER note, but no drug allergy alert card carried by the patient or no history of drug allergy in the electronic medical record (HOSxPTM) was found by the ward nurse, the nurse notified the pharmacist at the ADR center (call: 1912) to come up to the ward and evaluate the patient's drug allergy. For patients with respiratory tube, history of drug allergies or precaution had to be obtained from relatives. Once off the respiratory tube, the history of drug allergy and precaution had to be obtained again but from the patients directly.

For pharmacist, in addition to the task mentioned above, more tasks are detailed as follows. For the patients with newly verified drug allergy either at out-patient department, ER, or the medical ward, the pharmacist joined physician and nurse in evaluating the ADR or drug allergy and provided recommendations for management to the team. The pharmacist documented the patient's physical findings and history and the results of ADR/allergy investigation in the progression note. The drug allergy alert card was prepared by the pharmacist and given to the patient and relatives. This card contained causative drug(s), related symptoms, and probability of causative drug(s). Advice was given to the patient and relatives by the pharmacist. ADR investigation was documented in the official form of the adverse health product reaction monitoring (APRM) center of the Thai Food and Drug Administration. This APRM form was subject to submitting to the APRM center. All information about ADR was put into the

electronic medical record by the pharmacist right after the investigation.

In patients with drug allergy history, the pharmacist examined the prescription against the patient's history of drug allergy and precaution in the electronic medical record. This was done at the in-patient pharmacy department. It could be that the physician did not document any drug allergy history investigation at all. In addition, the pharmacist screened and monitored for severe drug allergy, glucose-6-phosphate dehydrogenase deficiency, and intensive ADR. If any drug with allergy history was prescribed, the suspected drug was not dispensed and nurses in the medical ward were notified by call about the decision. For any prescribed drugs with a chance of cross-hypersensitivity reaction or drugs with precaution, the pharmacist notified the physician and asked for verification or modification. If no such problematic drug was prescribed, the pharmacist prepared and dispensed the drug to the medical ward. If such problematic drug was prescribed and the physician confirmed the prescription, the prescribing physician was requested by the pharmacist to fill a drug re-challenge form. The pharmacist dispensed the prescribed drug and monitored for any drug allergy.

Research instrument

To evaluate the performance of healthcare providers to comply with the SOP for preventing repeated exposure to drug allergies among patients admitted to the in-patient department, the checklist had been developed. Like the SOP, the checklist had long been developed by the researcher and the practicing pharmacists of Buddhasothorn hospital. Even though no formal testing on the quality of the checklist was conducted, a long-standing revision of more than 2 months on the practicality of the checklist to reflect the performance of the healthcare providers helped grant the quality of the checklist. This checklist to judge the appropriateness on each of all steps of ADR prevention had been developed in accordance with the content in the SOP. The checklist contained 11 topics. With some sub-topics under certain topics, a total of 26 sub-topics (items) were included in this checklist (Table 1).

Once notified by the nurse in the medical ward and/or the prescriptions submitted to the in-patient pharmacy department, the researcher went to the medical ward to evaluate all the appropriateness on each step/task using the checklist. The appropriateness of each item was judged by

the researcher. For example, item 1 "Drug allergy alert sign with the allergic drug name attached on the bed head" was a positive statement. If the researcher found that the allergic drug name was written by the nurse the pink allergy alert sign and attached on the bed head, a "Yes" was given. A "No" was given if no sign or an incomplete sign was on the bed head. For a negative statement, item 4 contained a statement of "letter written in the pink drug allergy alert page with too fine line, less readable." If the drug name and related allergy was written with a regular fine-line pen, the researcher judged such work as "Yes" which indicated an inappropriate work. However, if written with broad-line pen, such as whiteboard marker or labelling pen, a "No" was chosen indicating an appropriate work. For item 11, the patient was expected to state that the drug allergy alert card was for alerting healthcare providers about the patient's allergy and they were not supposed to take the drug(s) documented in the card. If the patient did not show the understanding on both parts, the researcher judge the item as "No" indicating no knowledge on drug allergy on the patient part.

In addition to the quantitative evaluation, informal interview and observations on the physicians, nurses and pharmacists on relevant issues were performed. This was for the possible causes of the inappropriate tasks found.

Table 1 Checklist items to judge the appropriateness of the tasks.

No.	Checklist item	Evaluation result
1.	Drug allergy alert sign with the allergic drug name attached on the bed head (+)	<input type="radio"/> Yes <input type="radio"/> No
2.	Drug allergy alert label/sticker attached on the front of the medical chart (+)	<input type="radio"/> Yes <input type="radio"/> No
3.	Pink drug allergy alert page inserted in the assigned order in the medical chart (+)	<input type="radio"/> Yes <input type="radio"/> No
4.	Problems found in the pink drug allergy alert page inserted in the medical chart (-)	<input type="radio"/> Yes <input type="radio"/> No
	A. Letters written with too fine line, less readable (-)	<input type="radio"/> Yes <input type="radio"/> No
	B. Pink drug allergy alert page inserted in the wrong order (-)	<input type="radio"/> Yes <input type="radio"/> No
	C. Drug name(s) written only on one side of the pink page (-)	<input type="radio"/> Yes <input type="radio"/> No
	D. Wrong drug name(s) written (-)	<input type="radio"/> Yes <input type="radio"/> No
	E. Incomplete list of drug names written (-)	<input type="radio"/> Yes <input type="radio"/> No
5.	Name of the allergic drug(s) notified on the physician's history and physical examination note from ER (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 5) history of drug allergy reviewed and specified in the ER note (+)	<input type="radio"/> Yes <input type="radio"/> No
6.	Drug allergy verified by physician's history taking (detailed in medical chart) (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 6) 6.1 correct drug name(s) written by the physician (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 6) 6.2 complete list of drug name(s) written by the physician (+)	<input type="radio"/> Yes <input type="radio"/> No
7.	Drug allergy verified by nurse's history taking (detailed in medical chart) (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 7) 7.1 correct drug name(s) written by the nurse (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 7) 7.2 complete list of drug name(s) written by the nurse (+)	<input type="radio"/> Yes <input type="radio"/> No
8.	Name of the allergic drug(s) recorded in the hospital electronic medical records (HOSxP™)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 8) 8.1 correct drug name(s) recorded (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 8) 8.2 no prescription of the causative drug(s) allowed (+)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 8) 8.3 cross-hypersensitivity recorded (+)	<input type="radio"/> Yes <input type="radio"/> No
9.	Prescription of causative drug(s) found (detailed in medical chart) (-)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 9) 9.1 prescription of allergic drug(s) (-)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 9) 9.2 prescription of drug(s) with pharmacologic actions similar to that of allergic drug(s) (-)	<input type="radio"/> Yes <input type="radio"/> No
	(if "yes" for no. 9) 9.3 prescription of cross-hypersensitive drug(s) (-)	<input type="radio"/> Yes <input type="radio"/> No
10.	Drug allergy card given to the patient (+)	<input type="radio"/> Yes <input type="radio"/> No
11.	The patient's knowledge about drug allergy found.	<input type="radio"/> Yes <input type="radio"/> No

Ethical consideration

This study was approved by the Ethics Committee for Human Study of Buddhasothorn hospital (approval number: BH-IRB 027/2563).

Data analysis

Demographic and clinical characteristics of participants were presented with descriptive statistics (frequency with percentage). Each item of the checklist representing each task judged that was inappropriately conducted was presented as frequency and percentage. The percentage was calculated as the number of patients with the given inappropriate task divided by either all inappropriate tasks found and by the total number of patients. Items were presented in a descending order from the most to the least frequently inappropriate conducted. In addition to the quantitative measures, qualitative information from informal interviews and observations relating to possible causes of inappropriate tasks were summarized.

Results

Of all the 98 patients participating, the majority were women (59.2%), older than 60 years old (53.1%), and with co-morbidities (77.6%) (Table 2). The most frequent illness leading to hospitalization was gastrointestinal diseases (15.3%), followed by cardiovascular diseases (14.3%) and respiratory diseases (11.2%). The majority of them were allergic to antibiotics (68.4%), followed by anti-hypertensive agents (19.4%) and non-steroidal anti-inflammatory drugs (NSAIDs) (18.4%). Most of them had the drug allergy alert card and the related knowledge (93 participants, or 94.9%).

Of a total of 98 patients, 45 of them (45.9%) were with all appropriate tasks done, which left the rest 53 of them with at least one inappropriate task (54.1%). Certain tasks were inappropriately conducted as shown in Table 3. The most found was the lack of history of drug allergy reviewed and specified by the physician in the ER note (item 5) which was found in 48 of 98 patients (49.0%) (or 17.8% of 269 inappropriate tasks found). The second most found problem was the lack of inspection of drug allergy history which was evident as no pink drug allergy alert page inserted in the assigned order in the medical chart (item 3). It was found in 39 patients (39.8% of 98 patients or 14.5% of 269 inappropriate tasks found). This was followed by drug allergy alert sign with the allergic drug name attached on the bed

Table 2 Demographic and clinical characteristics of the participants (N = 98).

Characteristics	N (%)
Gender	
Male	40 (40.8%)
female	58 (59.2%)
Age (year)	
0 - 15	3 (3.0%)
16 - 30	8 (8.2%)
31 - 45	12 (12.2%)
46 - 60	23 (23.5%)
> 60	52 (53.1%)
Having co-morbidity (one patient could have more than one illness)	
No	22 (22.4%)
Yes	78 (77.6%)
Cardiovascular diseases	95 (96.9%)
Endocrine diseases	28 (28.6%)
Kidney diseases	12 (12.2%)
Bone and joint diseases	8 (8.2%)
Respiratory diseases	6 (6.1%)
Infections	5 (5.1%)
Central nervous system diseases	4 (4.1%)
Malignant diseases and immunosuppression	4 (4.1%)
Nutrition and blood diseases	1 (1.0%)
Illness relating to the hospitalization	
Gastro-intestinal diseases	15 (15.3%)
Cardiovascular diseases	14 (14.3%)
Respiratory diseases	11 (11.2%)
Surgery	10 (10.2%)
Bone and joint diseases	8 (8.2%)
Infections	7 (7.2%)
Malignant diseases and immunosuppression	7 (7.2%)
Other	6 (6.1%)
EENT diseases	5 (5.1%)
Kidney diseases	5 (5.1%)
Obstetrics, gynecology and urinary-tract disorders	4 (4.1%)
Central nervous system diseases	3 (3.0%)
Nutrition and blood diseases	3 (3.0%)
Type of drug causing allergy (one patient could have more than one drug allergy)	
Antibiotics	67 (68.4%)
Anti-hypertensive agents	19 (19.4%)
NSAIDs	18 (18.4%)
Analgesics	7 (7.1%)
Other	7 (7.1%)
Anti-lipidemic agents	4 (4.1%)
Muscle relaxants	4 (4.1%)
Anti-epilepticus agents	3 (3.0%)
Anti-viral agents	3 (3.0%)
Anti-emetic agents	3 (3.0%)
Anti-fungal agents	2 (2.0%)
Urate-lowering agents	2 (2.0%)
Vaccines	2 (2.0%)
Having drug allergy alert card and related knowledge	
No	5 (22.4%)
Yes	93 (94.9%)

head by the nurse (item 1) (33 patients, or 33.7% of 98 patients and 12.3% of 269 inappropriate tasks found). Drug allergy not verified by nurse's history taking (detailed in medical chart) (item 7) and incomplete list of drug name(s) written by the nurse (item 7.2) combined were found in 32.6% of 98 patients (or 11.9% of 269 inappropriate tasks found).

Some other inappropriate tasks were found with lower incident rates. For example, both no drug allergy alert label/sticker attached on the front of the medical chart by the

nurse (item 2) and no drug allergy verified by physician's history taking by the ER physician (detailed in medical chart) (item 6) were found in 27 patients (27.5% of 98 patients or 10.0% of 269 inappropriate tasks found). The other six types of inappropriate tasks were found with incident rates of lower than 20% (of 98 patients) (Table 3).

Table 3 Inappropriate tasks based on the checklist items (N = 98).

Order	Inappropriate tasks found	Number found	% (of a total of 269 tasks)	% (of a total of 98 patients)
1	Lack of history of drug allergy reviewed by the physician in the ER note (item 5)	48	17.8	49.0
2	No pink drug allergy alert page inserted in the assigned order in the medical chart (item 3)	39	14.5	39.8
3	Drug allergy alert sign with the allergic drug name attached on the bed head by the nurse (item 1)	33	12.3	33.7
4	Drug allergy not verified by nurse's history taking (detailed in medical chart) (item 7) and incomplete list of drug name(s) written by the nurse (item 7.2)	32	11.9	32.6
5	No drug allergy alert label/sticker attached on the front of the medical chart by the nurse (item 2)	27	10.0	27.5
6	No drug allergy verified by physician's history taking by the ER physician (detailed in medical chart) (item 6)	27	10.0	27.5
7	Incomplete list of drug name(s) written by the physician (item 6.2)	15	5.6	15.3
8	Drug name(s) not written on either side of the pink page by the nurse (item 4C)	14	5.2	14.3
9	Letters written with too fine line, less readable by the nurse (item 4A)	12	4.5	12.2
10	Drug allergy card not given to the patient (item 10)	12	4.5	12.2
11	The patient with no knowledge about drug allergy (item 11)	5	1.9	5.1
12	Wrong or unclear drug name(s) written by the nurse on the pink drug allergy alert page inserted in the medical chart (item 4D)	5	1.9	5.1
Total		269		

Opinions of providers about non-compliance to the SOP to prevent repeated drug allergy

The causes of non-compliance to the SOP for preventing repeated drug allergy of the patient with drug allergy history admitted to the medical ward were identified. It was found that all physicians prescribed medications through HOSxP™ computerized system. However, the history of drug allergy was not reviewed and verified and the screen pop-up warning was not viewed before prescribing either. This non-compliance resulted in incomplete process of preventing repeated drug allergy and ultimately re-hospitalization because of such repeated incidence. The lack of compliance among ER physicians to the SOP could be attributable to a high level of workload. The frequent pop-up warnings on the screen could have caused indifference and consequently the overrides of the warnings.

Unlike the ER physicians that prescribed medications through the computerized HOSxP™ system, physicians at the

medical ward prescribed medications by handwriting. The pharmacist at the in-patient pharmacy department transcribed such prescriptions to the HOSxP™ system. All other steps of the SOP were followed perfectly. This suggested that more attention and effort should be paid to ER physicians for SOP compliance.

The shortcomings found in pharmacists working at the in-patient pharmacy department were that they did not verify the prescriptions with the possibility of repeated drug allergy and cross-hypersensitivity. These pharmacists reported that their work overload could have prevented them from completing the SOP tasks.

For the nurse, both at ER and medical wards, most crucial steps of the SOP were missed. These included verifying and documenting drug allergy history in the medical chart at the ER and writing drug names on card to put on the bed head and on the cover of the medical chart in the medical ward. They reported the reasons similar to those of the pharmacist, which were urgent and large amount of workload. In addition, it was agreed by all nurses that they were subject to verifying drug allergy history right before administering any medications to the patient.

Discussions and Conclusion

In our study, most patients with drug allergy history were the elderly, with cardiovascular diseases. Antibiotics were found the most allergic drugs, followed by anti-hypertensive drugs including calcium channel blocker and angiotensin converting enzyme inhibitor, and NSAIDs.

We found that 54.1% of the patients were with at least one inappropriate tasks done by healthcare providers, leaving the rest 45.9% with perfect tasks carried out. This 45.9% of perfect SOP tasks to prevent repeated drug allergy was relatively consistent with a 49% compliance reported by Siriraj Hospital.¹⁴

The most found improper tasks were that providers forgot to review and verify history of drug allergy, to specify the allergic drugs, to document the complete list of the names of the allergic drugs, to document complete information, and to document correct names of allergic drugs. Our findings were somewhat similar to those in the study of Légat et al² and Fernando et al.³ Based on these findings, there is a room for improvement. Pharmacists should be more proactive in promoting awareness among physicians and nurses about

tasks to prevent repeated drug allergy. Various kinds of reminders could be provided when imperfect tasks were carried out. In an attempt to build a blame-free culture, facilitating all involved parties to improve the work rather than finding the person responsible for the mistake should be emphasized.¹⁵ In addition, based on our findings, providers should pay more attention for elderly patients with comorbidities and poly-pharmacy especially antibiotics, anti-hypertensive drugs and NSAIDs (68.4%), followed by anti-hypertensive agents (19.4%) and non-steroidal anti-inflammatory drugs (NSAIDs).

For ER physicians, the indifference toward the too-frequent screen pop-ups of drug allergy history led to the overrides of such warnings. Other ways of warning on the screen should be developed so that more attention of the physicians could be paid. Algorithm for assessing, selecting and presenting drug allergy history by software program had to be improved.

For physicians in the medical wards, the hand-written prescribing was burdensome and error-prone. Electronic prescribing method should be used. For example, the Computerized Physician Order Entry (CPOE) should be adopted and modified to fit the work environment at Buddhasothorn Hospital. However, there is still a need to draw the physician's more attention to review drug allergy history. Pharmacist's informal and friendly approach to remind the physician when the drug that the patient was allergic to was prescribed should be carried out more often. This is based on the concept that building safety awareness culture is more sustainable than immediate installation of interventions. For nurses in the medical ward, informal and friendly approach similar to that to the physician could also be tried. For pharmacists in the in-patient pharmacy department, the allocation of workforce specifically for the pre-dispensing and dispensing time should help identify more prescriptions of the allergic drugs and facilitate the communication with nurses and physicians. Ultimately, computerized system and algorithm to improve the warning should be improved so that the providers could perform the tasks in preventing the exposure of allergic drug more effectively. Periodical revision and training on preventing the exposure are also needed.

This study had certain limitations. First, with a relatively short duration, the study could not capture a full picture of the inappropriate tasks and possible causes. Studies with longer period would allow for more in-depth and broader

understanding. Second, since there was certain difficulties to access the patient's data in certain part of medical records, both hardcopy and electronic ones, the judging on appropriateness of the tasks could be less perfect. Future studies should plan to overcome such obstacles. Third, since some patients were discharged within a very short period of time, their information on drug allergy history could not be fully obtained. As a result, the judging on the tasks in some cases could be less perfect. Future studies should set inclusion criteria to include only those with adequate information. Fourth, since checklist items were not formally tested for validity and reliability, the results based on this instrument performance should be interpreted with certain caution. Further studies on validity and reliability of such tool should be conducted and the tool should be revised accordingly. In addition, we proposed that the SOP for preventing the exposure to allergic drug should be improved and further studied. Ultimately, formal root-cause analysis should be conducted in the future.

In conclusion, only 45.9% of the patients were taken care of with appropriate tasks to prevent repeated drug allergy. The two most found inappropriate tasks were no documentation of the allergic drug because of no review of drug allergy history and incorrect or unclear allergic drug names specified in the medical chart. More improvement is needed in preventing repeated drug allergy.

References

1. Kuperman GJ, Gandhi TK, Bates DW. Effective drug-allergy checking: methodological and operational issues. *J Biomed Inform* 2003;36(1-2):70-79.
2. Légat L, Van Laere S, Nyssen M, Steurbaut S, Dupont AG, Cornu P. Clinical decision support systems for drug allergy checking: Systematic review. *J Med Internet Res* 2018;20(9):e258. (doi: 10.2196/jmir.8206)
3. Fernando B, Morrison Z, Kalra D, Cresswell K, Sheikh A. Approaches to recording drug allergies in electronic health records: qualitative study. *PLoS One* 2014;9(4):e93047. (doi: <https://doi.org/10.1371/journal.pone.0093047>)
4. Nuckols TK, Smith-Spangler C, Morton SC, et al. The effectiveness of computerized order entry at reducing preventable adverse drug events and medication errors in hospital settings: a systematic review and meta-analysis. *Syst Rev* 2014;3:56. (doi: 10.1186/2046-4053-3-56)
5. Cresswell KM, Sheikh A. Information technology-based approaches to reducing repeat drug exposure in patients with known drug allergies. *J Allergy Clin Immunol* 2008;121(5):1112-1117.e7.
6. Lertvipapath P, Rerkvaleekul S, Pudchakan P, Veerapong C, Nuanming P. Incidence study of re-prescribing allergic drugs before and after the implementation of the project to prevent the re-exposure to allergic drugs. *Thai J Hosp Pharm* 2018;28(1):11-26. (in Thai)

7. Tharapoompiput P. Development of informatics for preventing repeated drug allergy in the out-patient department of Phahonpolpayuhasena Hospital. *J Clin Pharm* 2017;23(2):20-25. (in Thai)
8. Sriudorn P, Chaichalermpong W. System development to prevent repeated drug allergy in Roi Et province by linking drug allergy data through the HOSxP system. The National and International Graduate Research Conference, 2017. Khon Kaen, Thailand. Khon Kaen University. March 10, 2017. (in Thai)
9. Panya O, Chaiyasong S. Guidance for preventing repeated drug allergy in sub-district health promoting hospitals, Kamalasai district, Kalasin province. *J Sci Technol MSU* 2016;35(5):548-558. (in Thai)
10. Suthapradit C, Sakunrag I. Development of computerized drug allergy alert system combined with management of drug allergy database at a hospital in Samutsakhon. *Thai J Pharm Pract* 2019;11(2):431-444. (in Thai)
11. Chaipichit N, Jarernsiripornkul N, Chumworathayi P. Knowledge, understanding of drug allergy and drug allergy card carrying behavior of drug allergic patients in Srinagarind Hospital. *Srinagarind Med J* 2009;24(3):224-230. (in Thai)
12. Chobpradit C. The alleviation and prevention of repeated drug allergy in Samutsakhon province. *Food Drug J* 2004;11:16-20. (in Thai)
13. Department of Health Service Support. Patient safety goals: SIMPLE Thailand 2018. (Accessed on Oct. 12, 2020, https://mrd-hss.moph.go.th/mrd1_hss/?p=402) (in Thai)
14. Lertvipapath P, Rerkvaleekul S, Pudchakan P, Veerapong C, Pratoom Nuanming. Incidence study of re-prescribing allergic drugs before and after the implementation of the project to prevent the re-exposure to allergic drugs. *Thai J Hosp Pharm* 2018;28(1):11-26. (in Thai)
15. Rogers E, Griffin E, Carnie W, Melucci J, Weber RJ. A just culture approach to managing medication errors. *Hosp Pharm* 2017;52(4):308-315.