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Implementation and Effect of a Novel Electronic Medical Record Format for Patient Allergy Information

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Abstract. Adverse drug events (ADEs) are critical. Approximately 10% of fatal ADEs are believed to be allergic reactions. Therefore, sharing patient allergy information is beneficial to medical staff members in avoiding potentially lethal complications. We previously performed a nationwide study of patient allergy information in Japanese hospitals. The report showed that most of the responding hospitals needed a standard format for reporting the information. To establish this, we implemented a novel format for recording patient allergy information into the hospital information system at Tohoku University Hospital; this format was created through vigorous discussion among medical staff members with a variety of specialties, including doctors, nurses, pharmacists, nutritionists, and medical safety managers. In this study, we followed the amount of inputted allergy information and the number of incidents involving medication after implementation. The amount of allergy information inputted increased slightly. Although incidents involving medication also increased slightly, ADEs due to allergy significantly decreased. We believe that our findings will be useful in helping to determine the optimal characteristics of drug allergy information and to improve the dissemination of information regarding potential allergens and subsequent ADEs.

Keywords. Allergy, Patient profile, Adverse drug event, Medical Safety

1. Introduction

The prevention of adverse drug events (ADEs) is important for patient safety.[1,2] We previously performed a questionnaire-based study to describe the current status of data collection for allergy information in the Electronic Medical Record (EMR) and Computerized Physician Order Entry system (CPOE) in 76 large Japanese hospitals. The report demonstrated that most of the responding hospitals claimed that they are either preparing their own versions or still in the discussion phase. A patient profile standard for correctly handling allergy information should be determined. We then implemented a novel format for inputting patient allergy information into the hospital information system at Tohoku University Hospital. This occurred after vigorous discussion among medical staff members with a variety of specialties, including doctors, nurses, pharmacists, and medical safety managers. In this study, we aim to test a new standard format for recording such information.

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2. Methods

2.1. A national survey regarding allergy information

We conducted a nationwide survey that included a 43-item questionnaire regarding the handling of allergy information at 213 hospitals throughout Japan, each with 600 or more beds, between October 2012 and March 2013. These included 50 public university hospitals, 40 private university hospitals, 59 national/public/municipal hospitals, and 64 private hospitals. Of the 213 hospitals, 76 (35.7%) responded to the survey: 29 public university, 11 private university, 18 national/public/municipal, and 18 private hospitals. The mean (± standard deviation) number of beds in the responding hospitals was 796 ± 191. EMR was previously implemented in two-thirds of the hospitals responding to this survey, whereas the others relied upon a computerized provider order entry (CPOE) system with paper-based medical records.

2.2. Implementation of the template of allergy information

Between June 2013 and December 2014, a multi-professional medical team, including five doctors, three nurses, three pharmacists, and two nutritionists, was recruited; the team held discussions to design a practical and informative patient profile that could easily integrated into EMR. The content of the profile was elaborated upon by the main factors that our previous study showed. The profile was easily integrated into the EMR system of the Tohoku University Hospital, and it has been in use in all departments since May 2015.

2.3. Measurements of incidents involving medical error

After the implementation, we tracked the number of incidents involving medication between January 2015 and March 2017. The incidents were measured by the medical safety committee at Tohoku University Hospital. A chi-square test was performed for statistical examinations.

3. Results

3.1. Description of the degree of allergic reaction and alert level in the EMR in our national survey of allergy information

Our previous nationwide survey, which included a 43-item questionnaire, showed the current status of handling patient allergy information in Japan. For example, in most hospitals, the name of drugs related to allergies was not only selected from a list but also inputted directly as text. Medical staff members tended to describe allergy symptoms as accurately and as detailed as possible, even if the provided information contained ambiguity. The level of ADE severity was not documented in 72% of the responding hospitals. Automatic registration of analogous drugs that are the most frequent candidates for allergy reaction, such as penicillin, iodinated contrast media, and aspirin, was not possible in 86% of the responding hospitals. In 70% of the responding hospitals, allergy information was linked to an alert system to prevent errors in prescriptions and

injection orders. Among the other hospitals, 12% ranked the ADE severity in two categories (i.e. heavy or mild) and 15% ranked them in multiple categories (Figure 1a). However, the alert parameters corresponded to the severity of the allergy in only 7% of the responding hospitals (Figure 1b).

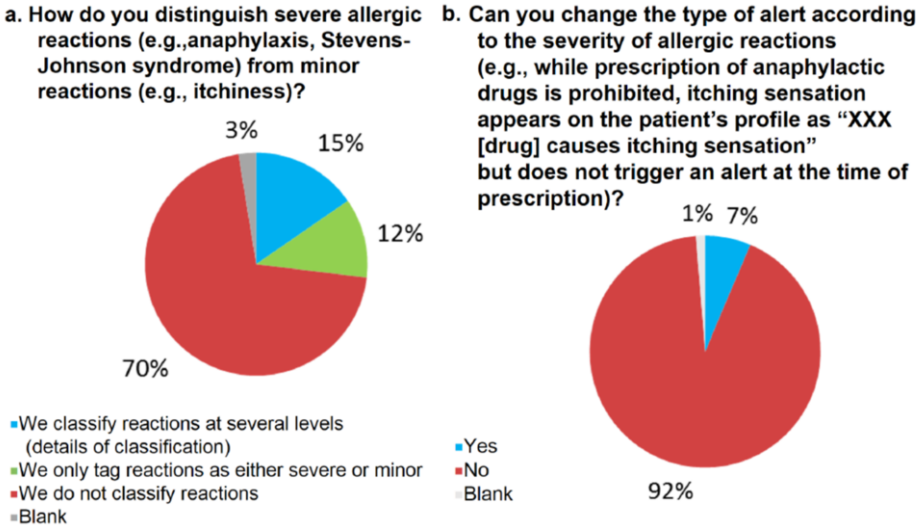

Figure 1. The results of our previous survey regarding connection severity of allergic reactions and alert level.

3.2. Implementation of the template of allergy information

Figure 2 depicts a screenshot of the information in the hospital information system. We implemented a practical and informative patient profile that was easily integrated into EMR. The content of the profile was improved using the main factors that our previous study showed. In this profile format, the severity of reaction can be selected from the list: mild, moderate, and severe. An alert level can be selected to prevent prescription and injection errors. The alert level parameters (limitations) are allergy severity, which is graded as "prohibited," "alert," or "suspended." An order for a drug linked to "prohibited" is basically impossible to obtain, but this can be overridden in cases where the medical benefit outweighs the risk or there is a procedure to reduce the severity of ADE, such as steroid therapy for iodinated contrast dye allergy.

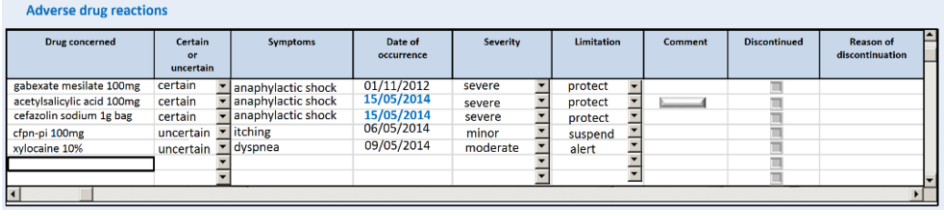

Figure 2. A screen shot of patient allergy information on EMR.

3.3. Change in the number of input data occurrences and incidents of medical error after implementation

Figure 3 showed the number of input data occurrences for allergy information after implementation. The average number of input occurrences gradually increased despite the fact that the number of items pertaining to allergy information were greater than before. Information regarding severity and alert level were also maintained. In figure 4, the number of incidents were measured in Fiscal year (FY) 2015 (April 2015 to March 2016) and FY2016. Although incidents pertaining to medication also slightly increased, ADEs due to allergy significantly decreased.

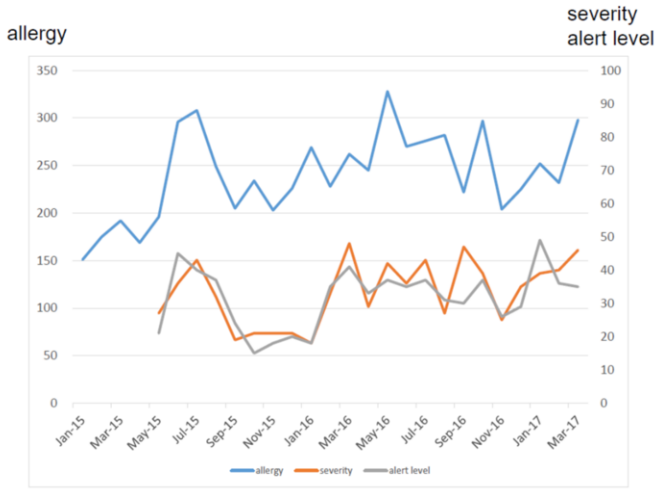

Figure 3. The number of input occurrences for allergy information.

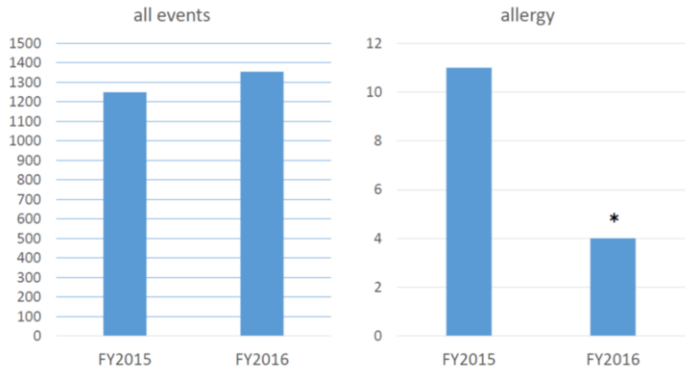

Figure 4. The number of incidents involving medicine and those due to allergy between FY 2015 and FY 2016.

4. Discussion

The present study explained a format for recording allergy information that we developed in EMR with the collaboration of a multi-professional medical team and system engineers and the consequent results of the number of input data occurrences and incidents regarding medication. The new format has been accepted among medical staff members, and this seemed to be effective in decreasing incidents of ADE due to allergy.

A format for allergy information with an effective alert system is needed for patient safety in the EHR era. Computerized decision support system alerts that warn against the incorrect administration of inappropriate drugs is expected to decrease the risk of ADEs.[3] However, these alerts are often overridden despite their potential benefits.[4,5] One of the reasons is an excess of alerts with low predictive value for true drug allergies; these alerts occur due to incorrect data entry.[6,7] Previous studies have identified poor medical record documentation as the basis of ADEs[8,9] despite that fact that the inclusion of allergy information in EHRs was reported at 64.4%.[10] In a previous study, most hospitals showed that information about adverse drug reactions and contraindicated medicine were recorded in the same form. However, the former informs about events that have happened in the patient in the past, and the latter is information that does not pertain to events that have happened to the patient, but reports those that may possibly occur because of disease or other medications. Since we think that the frequent override of alerts in EMR performed by doctors results in unreliable information, we separated them. In addition, we added information about certainty and severity to ensure reliability of information.

In conclusion, we developed a format for allergy information that allows medical professionals to include detailed information for effective alerts regarding incorrect medication. We hope this proposal will be helpful in establishing a standard format for allergy information that is useful in preventing allergy-related medication errors.

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