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Patient-Safety Improving Medication Information System for Care Workers in Taiwan

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Abstract

In Taiwan, 23% of medical errors come from medication error, however, pharmacists are barely possible to prevent or correct these errors at present. To reduce them, we constructed a computerized drug deliver cart with a drug information system plus drug image and a Web-based intravenous drug incompatibility system to assist first-line care workers practicing medication monitoring such as adverse drug reactions (ADR), educating patients correct medication usage, and reducing medication errors which are preventable. Both of these two systems are passive systems, and we think that maybe we could increase the frequency of using these systems by fixing them become more active, increases the rate of systems usage, and raise the pharmaco-vigilance of care worker in Taiwan.

Keywords:

drug information system, drug image, intravenous drug incompatibility system, care workers, adverse drug reactions, medication monitoring, pharmaco-vigilance

Introduction

Medication error is one important kind of medical errors. In America, at least 4,000 patients died due to medication errors every year, furthermore, 42% of medication errors were caused from anthropogenic source. Same as America, a study made in Japan shows that 16% of care workers had ever administrated drug to wrong patients, as a result, many computerized assistive system are provided, but few of medication administrating.

In Taiwan, especially for hospitalized patients, administrating and monitoring of medication are often executed by nurses. Care workers use paper-based drug administration records and IV solution administration records to insure if medications fit to physician's order sheets or not, which is a complicated but an important job. And the truth is, the currency of medication errors for inpatients is approaching 2%, which is very serious. To reduce this kind of error, we designed a computerized drug deliver cart combined with drug information system which could help checking these looks of drug, and let it be much easier for nurses to identify if adverse drug events occurred.

Another important issue for care workers in Taiwan is language problem, lots of medical and drug information were written in English, whereas information written in traditional Chinese form will be much easier for nurses to comprehend, therefore, to build a traditional Chinese-based drug information system seems to be a requisite.

Last but not the least, intravenous drug incompatibility is an important drug information for care workers in medication administrating, especially when dispensing intravenous mixture, therefore , we constructed an intravenous drug incompatibility system which would provide nurses an easy way to check when mixing different intravenous medicines, it could also reduce the working load of pharmacists.

Materials and methods

In our study, we designed three assisting systems to reach our goal to reduce medication errors caused by care workers, figure 1 shows these three structures of our system.

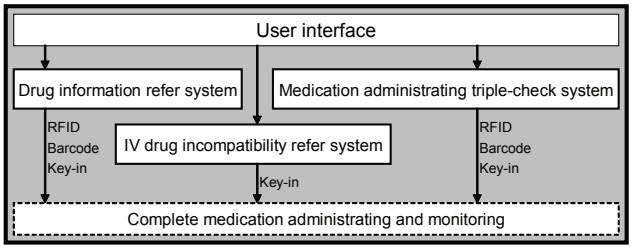

Figure 1 - Flowchart of computerized drug deliver cart

The first part is a drug deliver assisting system with RFID and bar-code devices which could help care workers practicing such as three-read five-right checks. The second part is to construct a drug information system with drug image for care workers. To build an easy-to-use drug information system for care workers in Taiwan, drug information have to be written in Chinese form, drug images is also added, moreover, we use bar-code and RFID query interface. Automatic update process is a necessity for our system, once a hospital changed their brand of a medicine, our system could respond immediately. Language translating is never an easy job, especially when it's in medical specialty, to find the way out, we cooperated with MIMS poc, MIMS poc have a complete drug information database

written in mandarin, it could also provide us accessible up-to-date drug information, and images of Taiwan's currently used medicines.

The last part is to construct an intravenous drug incompatibility system, in this system, we use key-in from touch panel instead of RFID or bar-code devices as input, care workers will choose two to three medicines' generic name by their fingers to check if intravenous incompatibility occurred, then the system will show four kinds of results to present if there is any problem adding them together.

Results

Figure 2 shows the prototype of our computerized drug deliver cart we'd constructed and the information display result of our drug information system with drug image. Ten kinds of drug related issues are chosen to provide care workers adequate drug information, they include brand name, generic name, usage, package, contraindication, precaution, side effects, drug interactions and drug image.

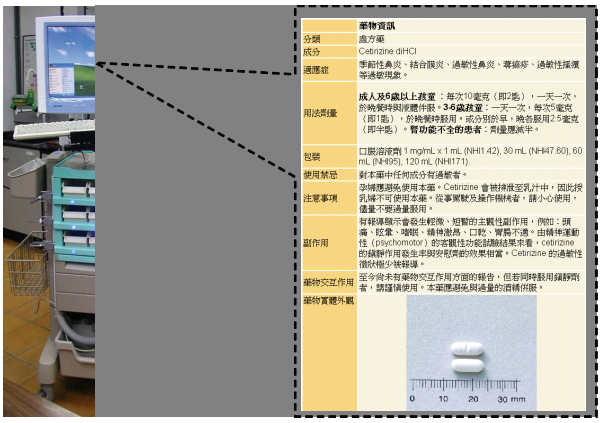

Figure 2 - The prototype of our computerized drug deliver cart and a Chinese translated drug information chart with drug image

Another function of our drug information system is MIMS poc SDK, combined with EMR information, four kinds of Alerts are provided, drug alert could find if any drug prescribed conflict with another, health alert also finds if any disease is contraindicated with those drug prescribed, allergy alert finds drug allergic problems, duplicate alert warns users when any medication is duplicate ordered. Figure 3 shows the drug decision support module.

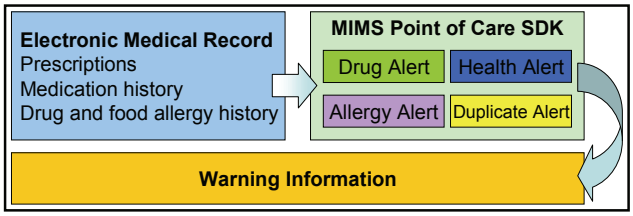

Figure 3 - The drug decision support module, based on patients' information in EMRs, this module could find preventable medication errors

The Web-based intravenous drug incompatibility system could also assist care workers dispensing intravenous mixture, they could simply find the answer by choosing drug's name through touch screen to check if incompatibility occurred. Since draw-down lists are not suitable when using on touch screen, we designed another kind of drug list to make it easier to choose form. Four kinds of answers would be displayed as the result, they are compatible, incompatible, variable results and no result. Nurses could then check the details of the result displayed which is written in traditional Chinese form. This system could also reduce the work burden of clinical pharmacists in Taiwan. Figure 4 shows the drug list we designed and the result of this system.

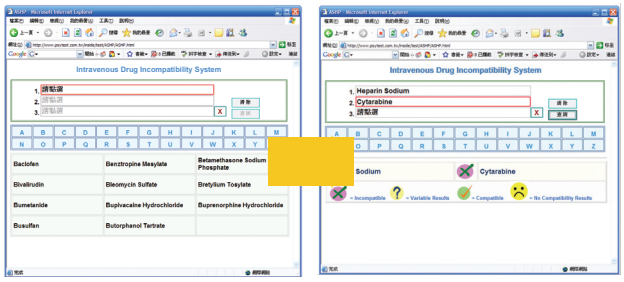

Figure 4 - The drug list of intravenous drug incompatibility system designed for touch panel (left side), larger items could make it much easier to choose by fingers, on the right side is the result displayed of the system, four different icons represent different results

Discussion

The main purpose of our study is to promote patient safety by reducing medication errors caused from care workers, however, nurses in Taiwan seems too busy that the rate of using of our system were lower than our expectation. A key question is that shall we make our system acts from passive to active? Will this

action raise the rate of using, help reducing medication errors or actually nurses would be even bothered? In the other sub-project, they used active way instead of passive one's, somehow nurses think it's too clumsy. To find the threshold that would both reduce medication errors and

with good usability would be an interesting part that we might study in the future.

Another issue is some of workers in the field of medical informatics seem lack of clinical experiences, in this situation the program designed might have low usability, to avoid trapping in the plight, maybe we have to spend more time communicating and observing. The most efficient way is to stay in a unit where we're going to cooperate for a period of time. After increasing the real experience, the design should be far more functional.

Conclusion

Care workers in Taiwan are medication administrators who play important roles in adverse drug reaction (ADR) reports. The adequate and easy-to-get drug information provided to nurses could raise their pharmaco-vigilance. Further more, it improves patient safety. Intravenous drug incompatibility system would also provide nurses an easy way to check when dispensing intravenous drug mixture, and reduce avoidable errors. Both of our programs exists as passive systems, we wonder that if they change to be more active, would the using rate raises or falls. It seems that we need to know clearly from their work and with our own experience, the design of assisting systems would be more acceptable.