

Effects of Enterprise Digital Assistants in Medication Dispensing Operations: Case HUS Hospital Pharmacy Meilahti 2014-2018

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Abstract

Adverse drug effects are a serious problem in hospital patient care [1]. The use of Enterprise Digital Assistants (=EDA) proved successful in HUS hospital pharmacy. The quality of order picking was better with EDAs. In 2018 75% of order rows and over 1 million packages in are picked with EDAs. There is a growing need for more detailed information of the medicines given to each patient. With EDAs this goal can be achieved cost effectively.

Keywords:

Medication Safety, Barcode Technology, Hospital Pharmacy

Introduction

Medication errors are common errors in hospital treatment and care operations [1]. In order to minimize and prevent the number of adverse drug effect to patients hospitals must find out new solutions to ensure cost effective and reliable medication to their patients. New technologies can help to solve these problems. In HUS the cost of adverse drug event attributed to € 1.8 million in additional costs [2]. Hospital pharmacies supply hospital wards with their daily medication needs. The accuracy of medication picking in hospital pharmacy is an important step in hospital medication safety chain. In this research the hospital pharmacy changed the way the medicines were recognized during medicine picking. The traditional way is to print the medicine order into a paper sheet. The personnel would collect the right medicine with the help of this paper. In the paper there is the name of the medicine, the strength of the medicine and the number of packages ordered, the place of the medicine and the code of the medicine and the details of the ordering ward. It is labourous to read and recognize all this by eye. All these hand picked medicines have to be checked by a pharmacist before they can be delivered to the wards. An enterprise digital assistant (EDA) was introduced to the hospital pharmacy in order to recognize the medicine ordered also with the help of a bar code recognition technique, Picture 1. Also there was no longer need for paper lists as all the information of the medicine order could be found in the screen of the EDA with the help of the new pharmacy software program.

Methods

This study was carried out by analysing the times used in order picking in a hospital pharmacy medicine picking in HUS Pharmacy Meilahti in Finland. First the manual order picking

process was analysed by 8843 order lines. Later the order picking of selected hospital wards (n=8) were carried out with the help of EDA equipment in 2014. This sample consisted of 9286 order rows. In 2016 and 2017 a second phase of the pharmacy software program was applied and the EDAs were taken into use to all hospital wards (n = >500 in Meilahti) and all types of orders lines, except the narcotics were the traditional order picking is still in use. In 2018 32000 order rows picked with EDA in Meilahti were analysed.

Results

The number of picking errors before pharmaceutical inspection was smaller with the use of EDAs (0.136%) as compared with the traditional picking, 0.938% in 2014, Table 1 [4].

Table 1 – Comparison of Traditional order picking and EDA picking in 2014

Picking technique, n	Picking speed	Picking errors
Picking with paper, n=8843 order rows	1.4 rows per minute	0.98 %
Picking with EDA, n=9286 order rows	2.29 rows per minute	0.14 %

With the pharmaceutical inspection the picking error rate reported by the hospital pharmacists was 0.131%. In 2017 an analysis of the order picking errors resulted good as the wrong strength and wrong medicine errors diminished with the use of EDAs [3]. Also the speed of order picking was faster with EDAs than with traditional picking in 2014. With traditional order picking the result was 1.4 order rows per minute. With an EDA the order picking rate was faster, 2.29 rows per minute. A secondary check out of the hand picked medicines by a pharmacist was found out unnecessary as the picking result was better with the use of EDAs than with traditional hand picking with pharmaceutical inspection. In 2017 the number of order lines picked with the use of EDAs exceeded 130 000 order rows in HUS Pharmacy Meilahti. In 2018 already 75% of the order rows are now picked with the help of EDAs in HUS Pharmacy Meilahti, Table 2. With the help of the second phase of pharmacy software the amount of medicine packages recognized with the EDAs was raised from 44% to 100%. During 2014 to 2018 the EDAs also developed and the time used for order picking was even faster, 2.1 rows per minute, n=32000. The picking process was also more reliable as in 2014 only one medicine package / order was recognized with the help

of an EDA (57%) but in 2018 all the picked medicine packages were forced to be recognized by the settings of the hospital software program by their bar code (100%) with the help of an EDA. This change in the hospital pharmacy software settings helps in preventing the picking errors very efficiently. Also the EDA equipment developed during 2014-2018 and the third generation of these equipment are faster to work with. With these developments both a faster and a more precise picking process could be achieved.

Table 2 - The development of EDA order picking in Meilahti

Year	Medicine packages recognized with a bar code	% recognized with a bar code	All order rows	Order rows picked with EDA	% of order rows picked with EDA
2014: 4 months	1046	57.75	233725	571	0.24
2015: 12 months	21418	44.17	260698	15394	5.9
2016: 9 months	11469	71.93	262210	5754	2.19
2017: 12 months	5E+05	96.02	251798	1E+05	52.03
2018: 5 months	3E+05	100	113457	86072	75.86

Conclusions

The HUS hospital pharmacy is very satisfied with the new technique of picking medicine packages with the use of EDAs. The number of medicine picking errors is smaller and the rate of order picking is faster with the new EDA models. More pharmaceutical personnel nowadays work at the hospital ward directly with patient medication processes instead of the hospital pharmacy warehouse logistics chain. Therefore HUS hospital pharmacy has now applied this technique of order picking in all their 6 hospital pharmacies during 2016-2018. In year 2018 the number of order lines picked with the help of EDAs in these 6 hospital pharmacies will exceed 1 million order rows. HUS Pharmacy will further develop the process by adding more information into the bar coding of each medicine package as there is a growing need for more detailed information of the medicines given to each patient.

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References

- [1] Institute of Medicine. To Err is Human: Building a Safer Health System. National Academy Press. Washington D.C 2000.
- [2] L. Tyynismaa, S. Isokirmo, M. Saanila-Sotamaa, K. Carlsson, 2+13. Lääkityspoikkeamat HUSin HaiPro-aineistossa 2012. HUS internal documents unpublished 2012.
- [3] E. Ahomäki, Kämmenmikrolaitteiden käyttöönotto HUS-Apteekin keräilyssä. HUS internal document unpublished. 2018.
- [4] S. Palomäki, Effect of Enterprise Digital Assistants in Medication Dispensing Operations – Case Hospital Pharmacy. Master's Thesis. Department of Information and Service Economy, Aalto University 2015.

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