A Medicine Dispenser System for Elderly Patient

Ridhi Bardoloi

ECE Department, GIMT, Guwahati, India

Abstract: **Now a day's people forget many things in day to day life due to their busy schedule. The patients especially aged people forget to take prescribed medication at the required time. It is difficult for caregiver to monitor patients at every instant of time. In order to avoid these problems, a medicine monitoring and dispensary system is needed. The system benefits the patient as well as caretaker.**

In this paper we introduce different technology of medication dispenser system which is currently used for improving this situation through paper reviewing.

Keywords: **RFID, Medication Error, RMAIS.**

I. INTRODUCTION

A medication error can be defined as a failure in the treatment process that leads to or has the potential to lead to harm to the patient. However, it is important to detect medication errors, whether important or not, since doing so may reveal a failure in the treatment process that could on another occasion lead to harm. There is also evidence that the death rate from medication errors is increasing. As we have seen that the population increases day by day and simultaneously chronic disease increases a lot. The treatment of chronic disease need long term pharmacotherapy. Although these medications reduce the effect of diseases but it is not possible for the patient to remember their prescribed medication. Medication errors occur as a result of failure in prescribing, dispensing, monitoring and administration. They lead to many hundred thousands of serious adverse drug events, thousands of deaths and billions of dollars in hospital cost each year [1].

Common causes of these errors include: a)irregular medicine in-takes due to the patient's busy schedule, b) complicated in-take schedules due to the large number of medicines taken by the patient, c) adverse drug reactions caused by un-reconciled prescriptions obtained from different sources, d) lack of knowledge about proper use of medicines.

On the other hand, family members are responsible for the care and management of the old. In the modern age it is difficult for family members to be available all the time to support the aged. Today, in our society most families are nuclear[2]. Elderly would prefer to remain independent and their desire for independenceis natural, but it is a worry for their children [2]. Sometimes despite their best effort, the aged fail to remember to take their medication on time because of dementia. This can result in unnecessary disease progression, complications, lower quality of life, and even mortality.

In critical care environments such as the ICU's, SICU's and ANCU's it is impossible to keep a tab on every patient throughout the day. So, a new method is required in this field to help the doctors and the nursing staff to monitor the patients.

Therefore an in- home healthcare devices and technologies are urgently required in order to provide patients with an automatic electronic tool so that they can manage their own medicine regularly. However, there is a lack of research and applications for practical and economical in- home medication self-management systems [1].The medicine dispenser system is capable of generating schedules for multiple patients, dispense drugs automatically, and have multiple techniques to remind users. The system can work on a preconfigured schedule. By using this system, patients are now reminded regularly to take medicine. The system alerts the patient according to its prescribed medication schedule.

II. LITERATURE SURVEY

There is a large variety of medicine monitoring devices in market which are used for non-professional users.

A. Most of them are manual. Some devices are available with multiple compartments called pill trays. The pill tray has a number of compartments where we can store medicine. Each compartment can hold different combination of medicines. The user is required to take the medicine from each tray.

B. The Electronic Medication Management System, (EMMA) [18] is FDA-cleared medical device for remotely delivering and monitoring a patient's medication therapy and adherence in an outpatient setting. It can automatically dispense right amount of pills and alert the patient when it is time to take them. The interaction between device and patient is through an integrated touch screen computer.The system can be remotely reconfigured using web based application. Using hardware, software and wireless communication it is possible to provide hospital-style care in a patient's home.

C. The system presented in [13] and [15] developed a system using scale and RFID technology. Each time the patient receives a new medicine, a uniquely RFID tag is attached to the medicine's container. Automatically it alerts the patient to take the correct dosage. The scale is used to check that the correct dosage is taken.

D. RMAIS system uses microcontroller, RFID reader, scale and motorized rotation platform. The patient put medicine bottles onto the scale-top plane one at a time. Once a bottle is placed on the scale-top plane, the RFID reader automatically

read the bottle's tag data, save the medicine information into memory, and then rotates the spoke to empty the scale-top plane for the next medicine. This user-friendly operation removes the burden of manually inputting all medicine information into the system.

III. DISCUSSION

Most of the commercial products are low cost, manual operating devices. The problem with the devices is that users must input medicine into these devices and then program their operation. It cannot be used by general patient.

Manual operating device is impossible for the aged people to operate. The pill tray does not provide any alarm to indicate the time of taking the medicine

INRange Systems has two major problems: 1). All pills need to be loaded individually in hard-paper board, that can only be done by manufacturers. So it increases total cost of the system and hence the general people cannot afford the system. 2). It is not suitable for liquid medicine. So, these are some limitation of the system and the only remedy to this situation is to use RFID technology.

The in-home medication system in [13] and [15] uses scale and RFID technology. Since the patient is required to put all medicine bottles on top of the scale, so it is not suitable if the patient is prescribed to take many medicines. Also the system measures all of the bottles' weight together, requires an expensive high-capacity scale. In addition to this the patient manually picks up the right bottle from the cluster of bottles on top of the scale. The system is of no use if the wrong bottle is chosen. .So It may be lacks the ability to separate an individual container from the medicine inventory, and the ability to alert a caregiver if dosages are not taken correctly. Without these features, the most critical interactions with the system would likely have to be done by an able caregiver, thus making it unsuitable for independently living patient.

RMAIS system is achieving its criteria by providing a reminder to forgetful patients. Also the patient need not to assign RFID tags to the containers manually.After purchasing a new medicine, it is to be placed on the top of scale plane. Once the RFID reads the tag data RMAIS will automatically save it into the system. But the common people may not be familiar with the operation of electronic equipment. It may also happen that the patient places their bottle on another section of the system other than scale top. In this system all these things are taken into considered while designing the prototype of the systems. But there is one disadvantage in this system is that there is no provision of sending information of the patient's dosage taken to his relatives. The system has one more indication like LED glows for the user about the availability of medicine in the system. Then it is helpful for physically disable people also.

From the above discussion it has been seen that electronic medication dispensing system is very essential for improving medication adherence. Also the medication error can be minimized to greater extent. In most of the system the overdose and under dose of the medication is controlled by a weighing scale. Hence it will help the patient to take correct amount of doses. Again from patient's perspective; it should be portable so that patient can carry the system wherever they go and a reminder can be sent to patients when they are not at home. If an expensive weighing scale is used, the cost of the system will be higher. Then general people cannot afford to buy the product. Also it is necessary to send information to patient's relatives. If the patient's relatives receive daily notification of the dosage taken through email or sms, the system would ensure medication safety and reduce the risk of error. Therefore the following key points can be carried out from the above discussion and finally, we can suggest the requirements of the system as follows:

- The system should be cheaper.
- The system should be user friendly, portable.
- Complicated design should be avoided so that any people can operate it easily.
- It should be easily repairable.

IV. CONCLUSION

It is well known that patients, who take prescribed medications, should take such medications at pre-determined dosage time intervals. If the patient forget to follow instructions this may result in serious adverse effects such as overdose risks or reduction in the concentration of medication in the body. The problem can be entirely solved by a medication dispenser system which can provide hospital care at home. An additional feature can be incorporated in the existing systems which can help not only the patient but also his relatives. The wireless technology like Zigbee, GSM can work in this matter. If wireless technology is used the system can send messages or email to inform family members. Therefore if the patients do not take their medicine at prescribed time, the system directly alert their family members by sending notification.

REFERENCES

[1]. "Smart Medication Dispenser: Design, Architecture and Implementation" P. H. Tsai, C. Y. Yu, C. S. Shih and J. W. S. Liu, Shih,Systems Journal, IEEE , Vol:5 ,2011, Pg 99 - 110

[2]. "Design of Automatic Medication Dispenser" S. Mukund and N.K.Srinath , Natarajan Meghanathan, et al. (Eds): SIPM, FCST, ITCA, WSE, ACSIT, CS & IT 06, pp. 251–257, 2012. © CS & IT-CSCP 2012

[3]. "A Smart Medication System Using Wireless Sensor Network Technologies" Wen-Wei Changa, Tung-Jung Sungb, Heng-Wei Huanga, Wei-Chih Hsua, Chi-Wei Kuoa, Jhe-Jhao Changb, Yi-Ting Houb, Yi-Chung Lana, Wen-Cheng Kuoc, Yu-Yen Lina and Yao-Joe Yanga

[4]. "Embedded System Based Automatic Ticket Vending Machine for Modern Transport System", M.Bhuvaneswari, S.Sukhumar, N.Divya, S.Kalpanadevi, N.SuthanthiraVanitha5, International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 11, November 2013

[5]. "Wedjat: A Mobile Phone Based Medicine In-take Reminder and Monitor" Mei-Ying Wang, John K. Zao,P.H. Tsai, Ninth IEEE International Conference on Bioinformatics and Bioengineering, 2009

[6]. "UbiMeds: a mobile application to improve accessibility and support medication adherence", Silva JM, Mouttham A, El Saddik A. Proceedings of the 1st ACM SIGMM International Workshop on Media Studies and Implementations that Help Improving Access to Disabled Users (MSIADU '09); October 2009; pp. 71–78.

[7]. "Construction of a Medication Reminder Synchronization System Based on Data Synchronization"Kee Hyun Parkand Seung Hyeon Lim,International Journal of Bio-Science and Bio-Technology, December, 2012,Vol 4

[8]. "Point-of-Care Support for Error-Free Medication Process" J. W. S. Liu, C. S. Shih, P. H. Tsai, H. C. Yeh, P. C. Hsiu, C. Y. Yu, and W. H. Chang, Institute of Information Science, Academia Sinica

[9]. "RFID-based smart medicine drawer for assistive environments," Becker E, Metsis V, Arora R, Vinjumur J, Xu Y, Makedon F. Smartdrawer, Proceedings of the 2nd International Conference on Pervasive Technologies Related to Assistive Environments (PETRA '09); June 2009; pp. 1–8

[10]. "RMAIS: RFID-based Medication Adherence Intelligence System" Corey McCall, Branden Maynes, Cliff C. Zou and Ning J. Zhang, 32nd Annual International Conference of the IEEE EMBS Buenos Aires, September 4, 2010 ,Pg 3768 – 3771

[11]. "Low Cost Robotic Medicine Dispenser" Mohammad Auzi Ahadani, Liyanage C.De Silva,Iskandar Petra,Mohammad Faisal A. Hameed, Teck Sion Wong,International Symposium on Robotics and Intelligent Sensors 2012 (IRIS 2012) Volume 41, Pages 202–209

[12]. "An Automatic Medication Management System for Independently Living Healthcare Patient", Corey McCall, Branden Maynes, Cliff C. Zou and Ning J. Zhang

[13]. "A prototype on RFID and sensor networks for elderly health care," M. Moh, L. Ho, Z. Walker, and T. Moh.

[14]. "An Automatic Medication Self-Management and Monitoring System for Independently Living Patients" Corey McCall, Branden Maynes, Cliff C. Zou, and Ning J. Zhang

[15]. "A Flexible, Low-Overhead Ubiquitous System for Medication Monitoring," K. Fishkin and M. Wang,

[16]. "Construction of a Smart Medication Dispenser with High Degree of Scalability and Remote Manageability", JuGeon Pak and KeeHyun Park, Journal of Biomedicine and Biotechnology,Jul 26, 2012.

[17]. "Smart mote-based wireless medication management system for persons with dementia**",** V. F. S. Fook, A. A. P. Wai, M. Jayachandran, B. Jit, P. H. Lee, and P. Y. L. Kiat, International Journal of Assistive Robotics and Mechatronics,2008**, vol. 9**, pp. 27–35,

[18]. "INRange Systems, Inc. (2010) Understanding EMMA. [Online]"