



Research Article

ISSN 2320-4818

JSIR 2017; 6(3): 91-96

© 2017, All rights reserved

Received: 30-07-2017

Accepted: 29-09-2017

Kiyomi Sadamoto

Department of Clinical Pharmacy,
Yokohama University of Pharmacy,
601 Matanocho, Totsuka,
Yokohama, Kanagawa 245-0066,
Japan

Mikio Murata

Department of Clinical Pharmacy,
Yokohama University of Pharmacy,
601 Matanocho, Totsuka,
Yokohama, Kanagawa 245-0066,
Japan

Shinya Aoki

Olive community nurse station,
790-10, Isshiki, Ninomiyamachi,
Naka-Gun, Kanagawa, 259-0123,
Japan

Takaharu Sadamoto

Sadamoto Clinic, 821-30,
Ninomiya, Ninomiyamachi, Naka-
Gun, Kanagawa, 259-0123, Japan

Hiroimi Matayoshi

Sadamoto Clinic, 821-30,
Ninomiya, Ninomiyamachi, Naka-
Gun, Kanagawa, 259-0123, Japan

Kiyoshi Kubota

Department of Clinical Pharmacy,
Yokohama University of Pharmacy,
601 Matanocho, Totsuka,
Yokohama, Kanagawa 245-0066,
Japan

Correspondence:

Kiyomi Sadamoto

Department of Clinical Pharmacy,
Yokohama University of Pharmacy,
601 Matanocho, Totsuka,
Yokohama, Kanagawa 245-0066,
Japan

The idea of monitoring drug taking and life in the community

*Kiyomi Sadamoto**, Mikio Murata, Shinya Aoki, Takaharu Sadamoto, Hiroimi Matayoshi, Kiyoshi Kubota

Abstract

Rationale, aims, and objectives: We have developed an innovative electronic device for supporting appropriate drug therapy and life. We used the device to monitor life and drug taking by elderly subjects including independent patients and patients who need home care services. The usefulness and usability of the device for monitoring life related subjects and adherence to drug therapy were evaluated. **Methods:** After obtaining informed consent for the study, we monitored 10 elderly subjects using the device for one month. After collecting the data, we analyzed personal daily life using both one-month personal monitoring tables and radar charts. The usefulness and potential of the device were evaluated. **Results:** All subjects finished monitoring without difficulty in handling the device. The subjects evaluated the device for ease of use and usefulness; they assessed that that the device was usable. In addition, cooperating medical staff and families evaluated the analysis of the radar chart highly due to its being understandable at a glance. **Conclusion:** Community based medical care needs practical strategies to cope with supporting the elderly, both independent patients and dependent ones who need home-care. Simple electronic devices have the potential to be used by elderly patients as an affordable tool. The monitoring results could be shared not only by medical staff but also with families and patients who need the information.

Keywords: Life, Adherence, Monitoring, Electronic devices, Community based medical care.

INTRODUCTION

Current statistics shows that the increasing proportion of the elderly is not just an issue for developed countries, but is becoming a serious issue worldwide. Thus, the delivery of appropriate and sustainable medical care is a priority for all countries. In Japan, one-fourth of population is already over 65 with around 70% of the elderly visiting hospital and clinics regularly for the therapy of chronic diseases^[1]. To provide effective medical care and drug therapy for the elderly, it is always necessary to observe patients' background including basic physical condition, mental status, and family status. It means that the appropriate analysis of adherence needs not only to monitor drug taking but also monitor life status in the community setting. However, so far there are no relevant and affordable ways to monitor the elderly life and related factors in the community setting.

To investigate the reality of the elderly life including basic physical condition, everyday life activity, communication and drug taking status in their homes, we used an electronic device, which we have developed as a practical monitoring tool, and monitored twelve life related parameters of the elderly subjects.

MATERIALS AND METHODS

We choose one group of over 75 year olds (5 subjects) who visited outpatient's clinic regularly with some chronic diseases and another over 75 group (5 subjects) using home care service by community nurses and doctors. We selected one control subject, who was able to check the use of the devices for a month with a double check by a partner. After obtaining informed consent for the study from all subjects, we instructed the subjects on use of the electronic Everyday Life Check Card devices, which are push-button type devices (Fig 1). The contents of the cards are divided into 4 categories, ●Basic life: meals, water drinking, evacuation, urination, and sleep ●Vitality: condition of body, mood, activity, bathing ●Adherence to drug therapy: drug taking ●Tendency of dementia or depression: chatting with someone (communication), hanging clothes. At the beginning of the study, we performed the Hasegawa

Dementia Test for all subjects after informed consent. Subjects were asked to use (push once a day) the device for a month, and return it to the clinic staff or community nurse respectively. Table 1 shows the monitoring items and scores (level 1–3), with which we evaluated individual monitoring result. In addition that, subjects had the opportunity to assess the devices for usability and make free comments. After collecting all of the electronic device cards, we reviewed the data and summarized it. The data collected by the devices was transferred to a personal computer using a reader and the results observed as shown in Fig 2.

Statistical analysis

Statistical analysis was performed using Microsoft Excel 2010 (Microsoft Corporation, Redmond, WA, USA). Inter-group analyses were performed using Student's t-test. *P* values less than 0.05 were considered significant.

RESULTS

There were no subjects with significant dementia; all subjects were within normal range based on the scores for the Hasegawa Dementia Test. All subjects successfully used the electronic devices for a month. There was no difficulty in handling of electronic devices. From the data analysis we are able to monitor the elderly subjects' life situation every day for a month. Fig 3 shows the personal monitoring data for a subject for a month. Individual item results can be checked on the display. Fig 4 shows the radar chart for one subject and shows that personal tendencies can be seen at a glance. Fig 5 shows another subject's personal monitoring data for a month. The one-month observation data shows

that this subject was able to resume using the device even after hospitalization. Fig 6 shows the radar chart for a second subject. In the chart, it is can be seen that there were very few baths taken and changes of clothing for this person during the month. In this way, monitoring results and radar charts are able to show understandable personal tendencies at a glance. For other subjects, one subject had very fluctuating appetite, another subject tend to be constipated, one subject had no communication for several days, and another subject tended to skip taking drugs. The comments by the subjects included were many positive opinions such as enjoy using the device and it is good opportunity to observe myself objectively (Table 2). As for the design of the electronic devices, all subjects evaluated that the devices have good shape, color, and reasonable size. There were a few difficulties such as the subject who stopped using the device before the end of the month because the sound when he pushed button was too low for him (difficulty of hearing sound) and this made it difficult for him to confirm that he had definitely pushed the button. In addition, 83% of subjects requested higher sound levels in response to button presses. From the results, there were no significant differences of adherence to drug therapy regimens between independent patients and patients who needed home care. By using devices, we were able to compare monitoring results for the card devices between home care group and outpatient clinic group. The comparison of results using the area of radar charts showed that the total score for the home care group was significantly lower than for the outpatient clinic group (Table 3). However, there was no significant relationship between age and background of subjects. Since the control subject was able to use the using electronic devices for a month, we could confirm that the test devices were reliable.

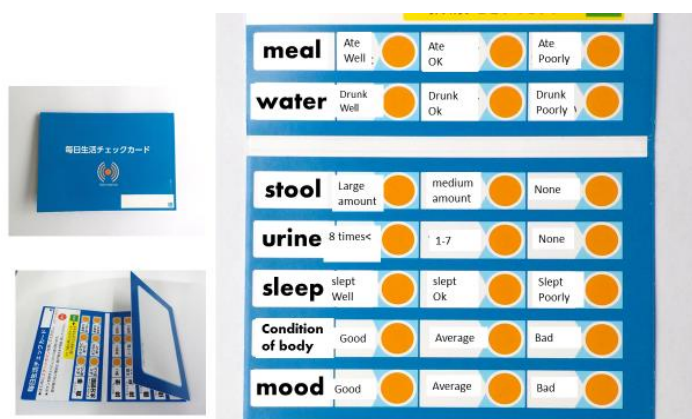


Figure 1: Electronic device card (Everyday Life Check Card For the elderly)

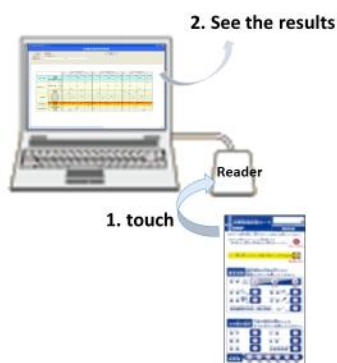


Figure 2: Device, reader and personal computer for observing the results

	Items Date	meal	water	stool	urine	sleep	condition	mood	activity	drug	communicati on	bath	change cloth
1	1-Dec	2	2	2	2	1	2	2	2	1	1	1	1
2	2-Dec	2	2	2	2	2	2	2	2	1	1	1	1
3	3-Dec	2	2	1	2	2	2	2	2	1	1	1	1
4	4-Dec	2	2	1	2	1	1	2	2	1	1	1	1
5	5-Dec	2	2	1	2	1	2	2	2	1	1	1	1
6	6-Dec	2	2	2	2	1	2	2	1	1	1	1	1
7	7-Dec	2	2	2	2	1	2	2	2	1	1	1	1
8	8-Dec	2	2	1	1	2	2	2	2	1	1	1	1
9	9-Dec	2	2	2	2	2	2	2	2	1	1	2	1
10	10-Dec	2	2	1	2	1	2	2	2	1	1	1	1
11	11-Dec	2	2	2	2	1	2	2	2	1	1	1	1
12	12-Dec	2	2	1	2	2	2	2	2	1	1	1	1
13	13-Dec	2	2	2	2	1	2	2	1	1	1	1	1
14	14-Dec	2	2	2	2	1	2	2	1	1	1	1	1
15	15-Dec	2	2	1	2	2	2	2	2	1	1	1	1
16	16-Dec	1	2	1	2	1	2	2	2	1	1	1	1
17	17-Dec	2	2	2	2	2	2	2	1	1	1	1	1
18	18-Dec	2	2	1	2	1	1	2	2	1	1	1	1
19	19-Dec	2	2	2	1	1	2	2	2	1	1	1	1
20	20-Dec	2	2	1	2	1	2	2	1	1	1	1	1
21	21-Dec	2	2	2	2	1	2	2	1	1	1	1	1
22	22-Dec	2	2	2	2	1	1	1	2	1	1	1	1
23	23-Dec	2	2	1	2	1	1	1	2	1	1	1	1
24	24-Dec	2	2	2	2	1	2	2	1	1	1	1	1
25	25-Dec	2	2	2	2	1	2	2	2	2	1	1	1
26	26-Dec	2	2	1	2	1	2	2	2	1	1	1	1
27	27-Dec	2	2	1	2	1	2	2	2	1	1	1	1
28	28-Dec	2	2	2	2	1	2	2	1	1	1	1	1
29	29-Dec	2	2	1	2	1	2	2	2	1	1	1	1
30(Max)	30-Dec												
MEAN		1.97	2.00	1.52	1.93	1.24	1.86	1.93	1.72	1.03	1.00	1.03	1.00
		B	B	A	B	A	B	B	B	A	A	A	A
Mistake of push		0	0	0	0	0	0	0	0	0	0	0	0
Mistake of start		0											

Frequency count	1	1	0	14	2	22	4	2	8	28	29	28	29
	2	28	29	15	27	7	25	27	22	1	0	1	0
	3	0	0	0	0	0	0	0	0	0	0		

Male 63 years old

Figure 3: Example of Personal Results 1: Data for one month of monitoring

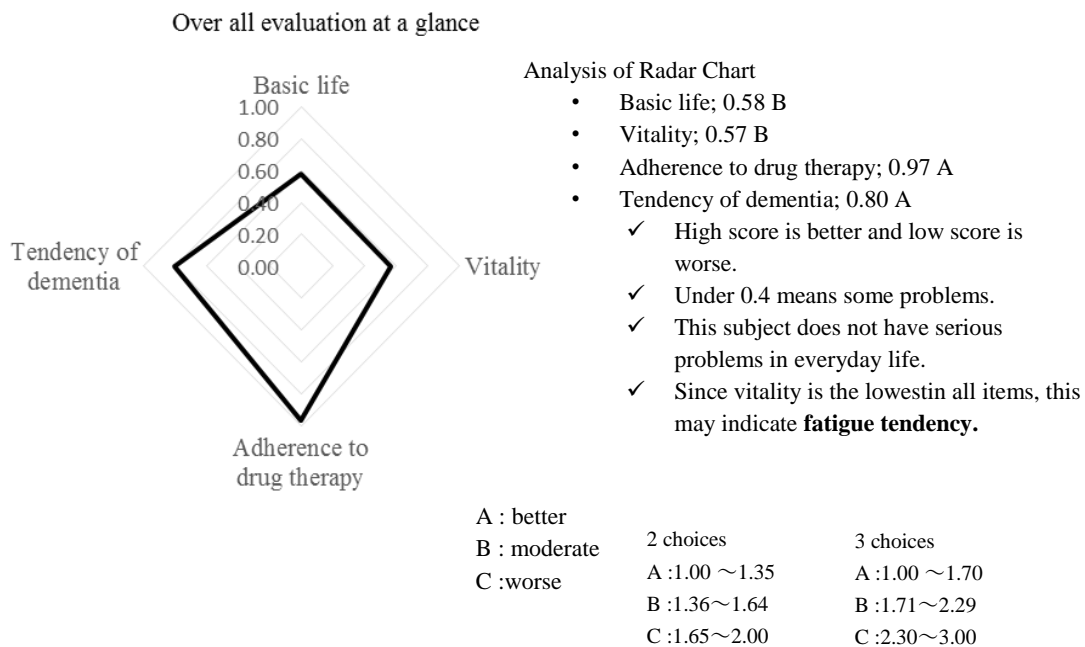


Figure 4: Example of Personal Results 1: Radar chart evaluation

	Items Date	meal	water	stool	urine	sleep	condition	mood	activity	drug	communication	bath	change cloth
1	4-Dec	2	2	1	1	2	2	2	2	1	2	2	2
2	5-Dec	2	2	2	1	3	2	2	2	1	1	2	2
3	6-Dec	2	2	2	2	2	2	2	2	1	2	2	2
4	7-Dec	2	2	2	2	2	2	2	2	1	2	1	1
5	8-Dec	2	2	2	2	3	2	2	2	1	2	2	2
6	9-Dec	2	2	2	2	2	2	2	2	1	2	2	2
7	10-Dec	2	2	2	2	2	2	2	2	1	2	2	2
8	11-Dec												
9	12-Dec	2	2	2	2	2	2	2	2	1	1	2	2
10	13-Dec	2	2	2	2	2	2	2	2	1	1	2	2
11	14-Dec	2	2	2	2	2	2	2	2	1	2	1	1
12	15-Dec	2	2	2	2	2	2	2	2	1	2	2	2
13	16-Dec	2	2	2	2	2	2	2	2	1	2	2	2
14	17-Dec												
15	18-Dec												
16	19-Dec												
17	20-Dec												
18	21-Dec												
19	22-Dec												
20	23-Dec												
21	24-Dec	2	2	2	2	2	2	2	2	1	1	2	2
22	25-Dec	2	2	2	2	2	2	2	2	1	1	1	1
23	26-Dec	2	3	2	2	2	2	2	2	1	1	2	2
24	27-Dec	2	2	2	2	2	2	2	2	1	1	2	2
25	28-Dec	2	2	2	2	2	2	2	2	1	1	1	1
26	29-Dec	2	2	2	2	2	2	2	2	1	2	2	2
27	30-Dec	2	2	2	2	2	2	2	2	1	2	2	2
28	31-Dec	2	2	2	2	2	2	2	2	1	2	2	1
MEAN		2.00	2.05	1.95	1.90	2.10	2.00	2.00	2.00	1.00	1.60	1.80	1.75
B		B	B	B	B	B	B	B	B	A	A	C	C
Mistake of push		0	0	0	0	0	0	0	0	0	0	0	0
Mistake of start		8											

Frequency count	1	0	0	0	2	0	0	0	0	20	8	4	5
	2	20	19	20	18	18	20	20	20	0	12	16	15
	3	0	1	0	0	2	0	0	0	0	0		

Male 86 years old

Figure 5: Example of Personal Results 2: Data for one month of monitoring

Over all evaluation at a glance

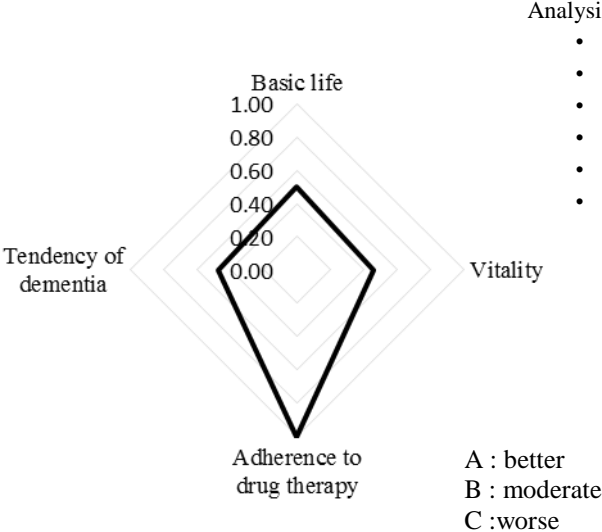


Figure 6: Example of Personal Results 2: Radar chart evaluation

Table 1: Monitoring items and scores

Item of monitoring and their score			
Evaluation level	1	2	3
meal	Atewell	Ateaverage	Atelittle
water	Drankwell	Drankaverage	Dranklittle
stool	Large amount	Average	None
urine	8 times<	1-7 times	Very few or none
sleep	Slept well	Sleptaverage	Sleptlittle or none
Condition of body	Good	Average	Poor
mood	Good	Average	Poor
activity	Moved a lot	Mostly sitting down	Mostly in bed
drug	Took all	Sometimes not taken	Mostly not taken
communication	Spoke a lot	Spoke a little	Spoke very little or not at all
bath	Took a bath	Did not take a bath	
change clothes	Changed	Not changed	

Table 2: Comments by patients

Patient Comments		
Positive	Good opportunity to know myself	4
	Simple and easy	5
	Data may be used to monitor diseases	2
	Appropriate card size	6
	Good impression of color	6
Negative	Louder sound better when pushing	4
	Alarm function desirable	1
	Want to see the data	1
	Touch tool could be useful	1
	Want to monitor more detailed things	1

Table 3: Comparison of total monitoring results between home care group and outpatient clinic group

	Home care patients		Outpatient Clinic patients	
	No.	Total score	No.	Total score
1		0.943	11	0.947
2		1.053	12	0.966
3		0.797	13	1.124
4		1.035	14	1.193
5		0.692	15	0.886
6		0.755	16	1.002
7		0.555	17	1.004
8		0.698	18	0.694
9		1.453 missing data	19	0.700 missing data
10		0.597	(0)	For reference1.062
MEAN		0.792		0.977
S.D.				0.151
Student's t-test	P = 0.037; P values less than 0.05			

DISCUSSION

Constructing affordable community care systems and care strategies for the elderly is a major issue in health care worldwide including Japan. Appropriate drug therapy and life support are important subjects. In a previous study, we monitored drug taking with a different type electronic device that is able to monitor time and date when patients take out tablets from a device using paper packages. There were many patients who missed drug taking or take drugs at times different than scheduled^[2]. We know that these adherence problems are related to individual lifestyle and mental status of the patients: this is a serious issue in many studies^[3-6]. Given that everyday life and drug therapy are closely related for the elderly, this means that adherence data is not an independent matter. However, there is no simple way to monitor the basic life situation for patients. Thus, it is difficult to assess the relationship between life and adherence in the community setting^[7, 8]. In this study, we have successfully monitoring the life of elderly subjects and adherence with a simple electronic device (Fig1, 2). Since all monitoring items are essential physical and mental assessments, the subjects understood them well (Table1). In addition, all medical staff (nurse: 4, doctor: 2, pharmacists: 2) participating in this study found that knowing the basic physical condition of patients from simple results (radar chart) was extremely useful for checking the recent condition of patients during busy work in the community (Fig 4)^[9]. Grouping of monitoring parameters by category, we are able to see the results at a glance (Fig 4, 6). For community nurses, it is extremely useful to know about patient life, since their visiting opportunities are limited; it is always difficult to understand the situation and problems at home^[10, 11]. So using this device has the potential for providing patient daily life activity information in the home^[12]. In addition, it is useful to study relationship between physical parameters and adherence, or some parameters and mental status if we need to conduct a personal analysis.

Ten subjects including 5 independent elderly and 5 patients who needed home care completed one month monitoring with electronic devices without significant handling difficulties. If there are no missing usage days, the device are able to collect one month of personal condition information (Fig 3, 4, 5, 6) Also, one patient who needed hospitalization during monitoring period was able to resume using the device without problems (Fig. 5). Since, there was no difficult handling or inputting data with the devices, it means that there is likely that most elderly patients can use it^[13, 14].

There were both positive and negative assessments by the subjects (Table 2). Positive comments included the impression that users enjoy using the devices and had favorable opinions of the design. Furthermore, they also suggested other uses from the patients' point of view, such as monitoring urine status, food taking and disease status^[15]. As for negative comments, 80% wanted louder sounds when pushing the buttons of the devices. This could be an important aspect that needs modification for the devices. Other suggestions including adding an alarm function and a special touch tool when users push button are very practical ones that can be developed for future devices.

We were able to compare scores of home care group and outpatient clinic group by using devices, (Table 3). The total score of independent patients was better than home care patients. Since there is no significant relationship between ages, it is accepted that independent status is important for total score, what we call Quality of Life and Ability of Daily Living. Since the results data of study were shared with medical personnel, community nurses were able to identify points for the next visit to patients. Given the importance of independent activity for the elderly that affects their life including adherence, it is difficult to

compare with objective data between patients with different living status. By using data collected by these devices, objective comparison of individual parameter is possible. Using this data, we were able to determine whether it was necessary to check or provide support for patients. In addition, there is a possibility to perform comparison study of items depend on our needs or interest. Since the parameters checked by the devices can be easily changed by revising the paper overlay sheet on the devices, it is possible to create personal monitoring parameters. This means that the devices can be used not only for feedback from individual patients but also as a simple study tool for various clinical research.

When considering therapy and care for the elderly, we always need to look at their background. Since community based medical care is a key focus in all countries due to the increasing number of the elderly, there is increasing need for methods for monitoring their life and medication status. In addition, medical staff needs to communicate with other medical personnel^[16-18] and extended family members^[19]. Simple electronic devices with low cost tools have the potential to support extended community based medicine.

CONCLUSION

Community based medical care needs practical strategies to cope with supporting the elderly, both independent patients and dependent ones who need home-care. Simple electronic devices have the potential to be used by elderly patients as an affordable tool. The monitoring results could be shared not only by medical staff but also with families and patients who need the information.

Acknowledgments

We deeply appreciate the cooperation of all patients who participate in this study and their families.

REFERENCES

1. Annual Health, Labour and Welfare Report. Ministry of Health, Labor and Welfare, Japan; 2016. <http://www.mhlw.go.jp/wp/hakusyo/kousei/16/dl/all.pdf> (28 July 2017).
2. KiyomiSadamoto, Hiroko Takamori, TakaharuSadamoto, Kiyoshi Kubota. Impact of push-through-packages with electric devices for accurate drug taking. *Journal of Scientific & Innovative research*. 2014;3(3):1-7.
3. Gellad WF, Grenard JL, Marcum ZA. A systematic review of barriers to medication adherence in the elderly: looking beyond cost and regimen complexity. *Am J GeriatrPharmacother*. 2011;9(1):11-23.
4. Lourenço LB, Rodrigues RC, Ciol MA, *et al*. A randomized controlled trial of the effectiveness of planning strategies in the adherence to medication for coronary artery disease. *J AdvNurs*. 2014;70(7):1616-1628.
5. Vik SA, Maxwell CJ, Hogan DB. Measurement, correlates, and health outcomes of medication adherence among seniors. *Ann Pharmacother*. 2004;38:303-312.
6. Gray SL, Mahoney JE, Blough DK. Medication adherence in elderly patients receiving home health services following hospital discharge. *Ann Pharmacother*. 2001;35:539-545.
7. KiyomiSadamoto, Hiroko Takamori, Kiyoshi Kubota. Study of drug adherence in a large Japanese population with Rheumatoid Arthritis: Epidemiological study focused on patient background. *International Journal of Pharamacy&PharamaceuticalReserch*. 2015;4(4):206-212.
8. Suzanne Graham, John Brookey. Do Patients Understand? *Perm J*. 2008;12(3):67-69.
9. Ashish Atreja, NareshBellam, SusanR Levy. Strategies to Enhance Patient Adherence: Making it Simple *MedGenMed*. 2005;7(1):4.
10. Roy PC Kessels. Patients' memory for medical information *J R Soc Med*. 2003;96(5):219-222.

11. Gail Powell-Cope, Audrey L Nelson. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Chapter 50 Patient Care Technology and Safety, NCBI Bookshelf, p. 207-220.
12. Problem Reports: ECRI problem reporting system. *Health Devices*. 2002; 31:37-38.
13. Nelson AL, Powell-Cope G, Gavin-Dreschnack D, *et al*. Technology to promote safe mobility in elderly. *NursClin North Am*. 2004;39:649-671.
14. Bewley A, Burrage DM, Ersser SJ, Hansen M, Ward C. Identifying individual psychosocial and adherence support needs in patients with psoriasis: a multinational two-stage qualitative and quantitative study. *J EurAcadDermatolVenereol*. 2014;28(6):763-770.
15. Detmar SB, Aaronson NK, Wever LD, Muller M, Schornagel JH: How are you feeling? Who wants to know? Patients' and oncologists' preferences for discussing health-related quality-of-life issues *J ClinOncol*. 2000; 15-18(18):3295-3301.
16. Wanzer MB, Booth-Butterfield M, Gruber K. Perceptions of health care providers' communication: Relationships between patient-centered communication and satisfaction. *Health Care Communication*. 2004;16(3):363-384.
17. Duffy FD, Gordon GH, Whelan G, Cole-Kelly K, Frankel R. Assessing competence in communication and interpersonal skills: The Kalamazoo II report. *Academic Medicine*. 2004;79:495-507.
18. Institute of Medicine. Health professions education: A bridge to quality. National Academies Press: Washington, D.C., 2003.
19. LalehLoghmani, FaribaBorhani, Abbas Abbaszadeh: Factors Affecting the Nurse-Patients' Family Communication in Intensive Care Unit of Kerman: a Qualitative Study *J Caring Sci*. 2014; 3(1):67-82.