Johnson County VNA
MD.2 Pilot

Background and Method

Medication non-compliance is a problem that plagues patients and health care providers alike. The results of medication non-compliance are sometimes vague, and sometimes catastrophic. However, it generally has a negative impact on the health and well being of the patient and is frustrating to providers. Interactive Medical Developments LC (IMD) designed and developed the MD.2 medication dispensing and monitoring system to address these issues. The system consists of a unit that holds and dispenses up to 60 doses of medication over a 10 to 30 day period (depending on the frequency of doses). At the scheduled time the patient gets a series of reminders over a 60 to 90 minute period (flashing light, voice reminders, and then a loud beeping noise). The patient is then expected to push a single button to dispense a pre-filled medication cup. Should the patient fail to push the button the medication is locked away, and the machine calls up to four different caregivers alerting them that the patient has failed to take their medications. On a nightly basis the MD.2 dials into the IMD Support Center and downloads the daily transactional data. The provider or family members can review this data to monitor the patient's status.

Beginning in August 2000 the Johnson County VNA installed twelve MD.2 machines in patient homes. The twelve patients reviewed ranged in age from 33 to 86, nine were female and three were male, and each presented with a variety of diagnoses. Six of the twelve patients had a primary medical diagnosis; five of these had a secondary psychiatric diagnosis (possibly in addition to other medical or psychiatric conditions). The other six patients had a primary psychiatric diagnosis, four of whom had at least one secondary medical diagnosis (possibly in addition to other medical or psychiatric conditions).

The primary diagnoses included:

ICD.9	Diagnosis	Number of Patients
250.01	DM with ketoacidosis	2
295.30	Paranoid schizophrenia	2
295.40	Bipolar affective disorder, manic	1
296.54	Bipolar affective disorder, severe, psychotic behavior	1
300.30	Obsessive compulsive disorder	1
301.83	Borderline personality	1
428.00	Heart failure	1
496.00	Chronic pulmonary obstruction (NEC)	1
724.02	Lumbago	1
805.40	Lumbar fracture, closed	1

All of the patients had a known, or suspected, issue with medication compliance and were referred to the pilot either by the visiting nurse or medical provider. As of this date nine machines are still in place having been in use for an average of six months. Of these nine patients, five have primary medical conditions, four of whom have secondary psychiatric diagnoses. Four have primary psychiatric diagnoses, three with secondary medical diagnoses. The remaining three machines were discontinued due to the following reasons:

· one patient was admitted to a nursing home
· one patient found the MD.2 made them "too nervous"
· one patient died (not related to current medication issues)

Each of the twelve charts was reviewed for the following information:

· frequency and content of nursing care for three months prior to installation of the MD.2 and after installation to the present or discharge

· frequency of home health aide visit for three months prior to installation of the MD.2 and after installation to the present or discharge

· number, route, and frequency of prescribed medications

· observed patient or family reaction to the MD.2

In addition, nine of the twelve patients (eight of whom are still using the MD.2) completed a brief questionnaire (3 questions, Appendix A) regarding their satisfaction with the MD.2 and impression of how it did, or did not, help them manage their medications. A more detailed questionnaire (10 questions, Appendix B) was left for the ten nurses who were involved in the installation and/or maintenance of the MD.2 while in the patient home. To date there have been seven completed nurse questionnaires returned.

Influencing Factors
It should be noted that there were several factors that influenced the ability to gather quantitative data from this pilot.

· Each of the patients selected to use the MD.2 had significant and complicated diagnoses and co-morbidities. For multiple reasons each patient was sufficiently compromised to require numerous agency visits for other than medication compliance issues. Several had already used other methods in an attempt to try and manage their medications. These were primarily "Medi-Sets" with frequent nursing intervention, either to refill the Medi-Set or to measure compliance. In addition, the general aging process further compromised several of the patients with further debilitation or exacerbation of existing conditions.

· During this period the Johnson County VNA was undergoing significant stress and change due to the introduction of Prospective Payment System (PPS), new technology (computerized charting and the MD.2), and relocation. Due to the constraint on resources there was not an opportunity to provide the staff nurses with a thorough introduction and familiarization in the use of the MD.2.

· Specific goals and objectives for the pilot were not defined at the beginning, nor were tools developed to measure baseline and ongoing information. As a result, a retrospective chart review was completed in May 2001.

Findings

The number of diagnoses per person ranged from one to four, with the average being three diagnoses per person. The number of medications per person ranged from four to sixteen, with the average being eight different prescriptions. The dosing frequency was evenly split between twice a day and three times a day. Payors included the VA, Medicaid, Medicare, grants and no fee. There were no commercial payors noted. In many cases the VNA nurse would obtain the medications and deliver them to the patient in their home.

There was no change in the frequency of home health aide visits noted for those patients who received these services prior to and after installation of the MD.2.

In one case there was a measurable decrease in nursing visits after the installation of the MD.2. The frequency was reduced to once every two weeks as opposed to once a week prior to the MD.2 being installed.

While there was not a general reduction in frequency of visits with the remaining patients there was a noticeable change in the content of the nursing visits. Review of the documentation supports that once the nurse was comfortable with the MD.2 and the patient's acceptance of it, the MD.2 would be loaded for two weeks to a month as opposed to the once a week "Medi-Set". The net result was that subsequent visits to the patient, until the MD.2 was to be refilled, were focused on issues other than medication maintenance and management. On the non-refill visits the nurses routinely documented that they checked the MD.2 for missed doses and noted any impact on compliance.

Data gathered by the IMD Support Center during this period indicates that this group of patients had an overall dispensing rate of 98.26%. Of 3,737 doses monitored there were 65 "missed doses" where the patient did not access their medications within the 60-90 minute window allotted by the MD.2. There was documentation of unopened cups in only one chart. The frequency of missed doses generally decreased as the patient became more familiar with the MD.2.

During the pilot period (3,737 monitored dispenses between August and March) there were 10 incidents requiring technical support from the IMD Support Center. This ranged from maintenance issues (seven) to removal of jammed cups (three). Had there been an opportunity for more thorough training of the nurses with regard to establishing schedules, set-up and loading, it is believed that these would have been significantly reduced.

User Response

Nine of the twelve users completed a simple 3 question form (Appendix A). The first question asked was "How easy was the MD.2 to use?" The user was asked to circle one of five "sliding scale" answers ranging from "Very Easy" to "Very Difficult". Six users chose "Very Easy" and three chose "Easy". "No Opinion", "Difficult" and "Very Difficult" were not chosen. The three who did not complete the form were the patient who died, the patient who was admitted to a nursing home and a recently added patient who did not respond to the questionnaire. However, chart notes on the recently added patient indicate a measurable decrease in agitation and disorientation with a commensurate increase in compliance since the MD.2 was installed in mid-March.

The second question asked "Did the MD.2 help you manage your medications?". Users were instructed to circle "Yes" or "No". Eight users circled "Yes", one circled "No".

Of the nine users who completed the questionnaire one had the MD.2 removed from their home after a month. This was because the MD.2 "made them nervous" even though they noted it was "Very Easy" to use, that "Yes" it did help them manage their medications, and it made a difference in their home health care plan because "medication was always on time". The individual who chose "No" it didn't help manage medications is still using the MD.2 after eight months.

The last question asked for comments as to how the MD.2 might or might not have made a difference in the health and home health care plan of the user. The replies follow:

·   "Made it a lot easier to control the medications."

·   "Medication was always on time."

·   "My cat helps by letting me know when my med machine goes off."

·   "My memory is very poor. I would not be able to stay at home and live alone without the MD.2."

·   "No longer forget to take meds. Meds dispensed at the same times, everyday. Containers are large enough to hold all the meds. Fortunately no power outages occurred for extended time period so never had any dispensing problems. Once it was understood how to load the unit it was simple to use."

·   "I'm impatient. I had to wait. It is inflexible. I was used to doing my own PRN's. I don't have that anymore."

·   "Helped me remember to take meds on time – very important to me. Assisted in taking meds on a more even schedule making treatment more reliable. Reminder messages (take with food) most helpful. Option to manually program is great for limited time doses. Video was very helpful and explanatory."

·   "I have lots of medications, including insulin, digestive meds, psych meds, etc. Timing and keeping my schedule is very important. It is much easier than having 20 pillboxes in a pile on the table. It has reduced a lot of stress for me – messing around with pills and keeping them straight. I have a lot of medical/health problems – it takes everything I have to take care of myself. The machine is a welcome wonder for me."

·   "100% improvement in compliance."

·   "I take my pills like I'm supposed to now. It was depressing to see all those pills lined up on the counter all the time. This is better for me psychologically."

Visiting Nurse Response

Ten different nurses were involved with the pilot patients, either in the selection and installation process, or in the maintenance process. A 10 item questionnaire (Appendix B) was left for them to complete with a request to fax it back to IMD. To date eight of the ten responses have been received.

Question 1 asked for the nurse's name and agency. Questions 2 through 4 were "Yes" or "No" with the opportunity to elaborate. Question 2 was "Did the MD.2 help you and your patients better manage medications?" All eight nurses responded "Yes." The comments included:

· "Varies from patient to patient. For C. it helped him to remember and med compliance increased from 50-80% to 100%; E. was reassured with the locked compartment and daily doses that she wasn't overusing meds, it gave her security from overdosing; with S. it helps remind her to take her meds evenly and is a safety measure for her.

· "The patients would not be able to safely set up meds themselves due to vision problems, memory difficulty, etc. Some patients do take meds out of machine as planned but forget to take them. Don't take as negative, machine is a godsend, patients love it."

· "Assured patient and nurse that meds were being given at appropriate time. Not necessarily always taken."

· "Patient willing to take meds if family would set them up for him but he'd forget. This way – one place for meds with audible reminders."

· "Helpful for remembering to take and improves dose times."

· "Schizophrenic patients can't get into them and mess them up."

Question 3 was "Was the MD.2 easy to set up and reload?" Seven nurses answered "Yes" and one nurse answered "No.". The free text answers included:

· "Intuitive."

· "Yes. The people at IMD were wonderful to work with, took you through any problems."

· "Confusing at first as to setting up for more than one week. Many did not understand to stack them."

· "No difficulty with med changes in the middle of week or changing schedules."

· "Help always available by phone."

It is believed that had there been more in-depth training up front that some of the confusion voiced by the nurses would have been eliminated.

Question 4 was "Was the MD.2 easy for patients to use?" All eight nurses responded "Yes" and there were two free text comments:

·   "I currently have one patient who manages the MD.2 by herself and is doing a fine job."

·   "Missed doses only the first 24-48 hours of use – none since."

Question 5 reviewed the nine of the features and benefits of the MD.2. The nurses were asked to choose a number between 1 and 5 as they applied to the nurse. One (1) was "Not Useful" and five (5) was "Extremely useful". The nine features are listed below with the number of responses in italics.

	Not Useful				Extremely Useful
	1	**2**	**3**	**4**	**5**
Voice, text and tone reminder?				*4*	*4*
Lockable side access door?			*1*	*2*	*5*
Medication cup loading tray?				*3*	*5*
Size and volume of medication cups?				*3*	*5*
One-button dispensing?			*1*	*2*	*4*
Calls to caregivers when dose missed?	*2*			*2*	*4*
Dose scheduling flexibility?				*3*	*5*
Battery backup?				*2*	*5*
Non-medication reminders?	*1*		*1*	*1*	*5*

Converting each column to 20% of a 100 point scale indicates that 92% of the responses were at 80% or better. The nurses' comments and reactions to the features indicate significant acceptance of the MD.2 and impression that the unit was helpful to their patients and themselves and improved compliance.

Question 6 asked the nurses to list any additional features or improvements they would find helpful with the M.2. The comments were:

·   "More flexibility for patients who are not homebound; some way for people to access own early dose if they have to leave without notice."

·   "Some sort of holder/dispenser for storage of empty cups and lids."

·   "When checking meds in MD.2 it would be much easier to have complete access to all days at one time instead of going through each day tube by tube."

·   "Perhaps stronger med cups that crush less easily."

Question 7 asked the nurses to describe any other benefits that they or their patients got from using the MD.2. The answers included:

· "Gave E. such a sense of security to not be responsible; has increased compliance and allowed me to decrease visits."

· "Patients seem reluctant at first to change, try a new system. After using it for several days patients love the MD.2. It puts them at ease, is a positive thing in their lives. They appreciate that someone actually cared enough about their needs to make a device like MD.2."

· "Assurance of providing and taking meds appropriately."

· "Ability to lock machine, provided protection from overdose."

· "Review of missed doses."

Question 8 asked the nurses if they would like to have the MD.2 as a regular resource in providing care to patients. There were five "Yes" and two who did not check either yes or no.

Question 9 asked the nurse to describe the patients they felt would most benefit from using the MD.2. Their answers were:

· "Homebound, slightly confused, good hearing."

· "Suicidal patients; very forgetful; able to organize meds with a BID or TID schedule if not homebound."

· "Patient with many meds, taken several times a day. Patient who cannot reliably set up own meds but can take them if reminded. Patient who needs to know if they are compliant with taking meds."

· "Forgetful, lives alone, involved in own care."

· "Those who need to take meds on a regular basis; reminders and voice help increase compliance."

· "Homebound, forgetful patient."

Question 10 asked the nurses to provide any other comments regarding the MD.2. Those answers were:

· "Has not helped people who cannot organize a routine schedule, some psych

7

patients of course need routine, but can't or won't manage their lives, then MD.2 doesn't work; better to set up so they can take their meds weekly with them."

·   "The Call Center was most helpful. When I have called have always gotten help – wonderful!"

·   "VNA is involved in med management because family can't or won't do it. Having the system call caregiver about missed doses just makes them irritated, they ask to be taken off the list."

Discussion and Summary

Given the inhibitors to the pilot listed above the data collected is primarily anecdotal. However, in reviewing both the user and the nurse comments the reaction to the MD.2 was significantly positive. As stated previously a more formal, rigorous introduction and training would have been of benefit to the nursing staff. Allowing for all of the other changes occurring at the same time the issue of "overload" and "ability to accept and integrate change" may have been factors influencing when and how often the MD.2 was placed in patient homes.

It appeared to take from two to four weeks for patients to become comfortable with the MD.2. Review of the dispensing data supports that the frequency of missed doses was higher immediately after the MD.2 was placed and decreased steadily the longer the patient used the MD.2. Coupling that data with chart notes that reflected improvement, or stabilization, of the patients status supports the theory that improving medication compliance is critical. The MD.2 appeared to be a useful tool in improving compliance.

Nurse acceptance of the MD.2 varied from immediate to reluctant as interpreted by how long it took for them to decide to implement the MD.2. This was further supported by how quickly the nurse was willing to load the unit for more than a week at a time (which could also have been due to other factors) and let the MD.2 manage the dispensing and reporting issues. Once acceptance was achieved the nursing notes clearly reflected loading the MD.2 for extended periods (two to four weeks) and using their visit time for tasks other than medication compliance.

Each of the patients involved in the pilot had multiple challenges. Review of the chart notes supports the nursing comments regarding acceptance of the technology into the care plan and a measurable improvement in compliance, and in many cases, stabilization or improvement of symptoms. It would be most beneficial to establish another pilot, or study, with concrete patient selection criteria, as well as study objectives. The ability to measure other impacts of compliance, such as primary, secondary and tertiary utilization of other health care resources would be helpful in further documenting the impact of medication compliance on health care costs and health care planning.

Appendix A
User Questionnaire

*Patient Name:*_____

MD.2 User Satisfaction Questions

1.   **How easy was the MD.2 to use (circle one)?**

Very Easy   **Easy**   **No Opinion**   **Difficult**   **Very Difficult**

2.   **Did the MD.2 help you manage your medications (circle one)?**

                        Yes   **No**

3.   **If applicable, please state how the MD.2 made a difference in your health and your home health care plan:**

_____

Appendix B
Visiting Nurse Questionnaire

Home Health Agency Questionnaire (Post Study): HHA Visiting Nurse

1. Nurse name/agency:_____/_____

2. Did the MD.2 help you and your patients better manage medications? ❑ Yes ❑ No
   Why or why not?_____

   _____

   _____

3. Was the MD-2 easy to **set up and reload**? ❑ Yes ❑ No
   Why or why not?_____

   _____

4. Was the MD-2 easy **for the patient to use**? ❑ Yes ❑ No
   Why or why not?_____

   _____

5. Using a scale of 1 to 5 (1-not useful, 5-extremely useful), please rate MD.2 features as they **apply to YOU**:

	Not useful				Extremely useful
a. Voice, text and tone reminders?	1	2	3	4	5
b. Lockable side access door?	1	2	3	4	5
c. Medication cup loading tray?	1	2	3	4	5
d. Size & volume of medication cups?	1	2	3	4	5
e. One-button dispensing?	1	2	3	4	5
f. Calls to caregivers when dose missed?	1	2	3	4	5
g. Dose scheduling flexibility? (ability to vary number and time of dispensed cups each day)	1	2	3	4	5
h. Battery backup?	1	2	3	4	5
i. Non-medication reminders? (i.e. "take w/ food"?)	1	2	3	4	5

6. Please list and/or explain any additional features or improvements you would find helpful on MD.2?

_____

_____

_____

7. Please describe any other benefits that you or your patient got from using the MD.2.

_____

_____

_____

_____

8. Would you like to have the MD.2 as a regular resource in providing care to patients?

❏ Yes   ❏ No

9. Describe the patient you feel would benefit most from using the MD.2.

_____

_____

_____

_____

10. Please provide any other comments regarding the MD.2.

_____

_____

_____

_____