PHILIPS

Lifeline

White Paper

Medido, a smart medication dispensing solution, shows high rates of **medication adherence** and potential to **reduce cost of care**.

A Philips Lifeline White Paper

Tine Smits, Research Scientist, Philips Research
Elderik Kranen, Business Analyst, Philips Innovation Services
Heribert Baldus, Principal Scientist, Philips Research

Summary

Studies have shown that during the treatment of chronic illnesses approximately 50% of patients do not adhere to their physician's long-term therapy recommendations.[1,4] Increasing medication adherence may have a greater impact on health than any improvement in specific medical treatments. Medido, a smart medication dispensing unit, can provide a solution for and support patients in adhering to their medication schedule by dispensing the right combination of medications at the prescribed time.

A retrospective quantitative analysis of the medication compliance rates of over 1,300 patients in the Netherlands has shown that 96% of patients using Medido were compliant to their medication schedule.[6] In addition, the study showed that patients using Medido stayed adherent to long-term therapy even when the number of medication intake moments per day increased.

Medido can be an effective solution for patients requiring in-home support for medication therapy. The use of Medido has been shown to both reduce costs and increase care productivity, thus providing significant economic value in addition to the better patient outcomes resulting from improved adherence to medication therapy.

Key Facts from Study:

881,000 medication moments of 1,379 patients are analyzed in the study.
On average, patients used Medido for 6.7 months and took 3 doses per day.

According to the World Health Organization (WHO), patients are generally considered adherent if their medication adherence rate is greater than 80%.[4,7]

The service data showed that the average medication adherence rate of patients using Medido in the study was 93%.[8]

The service data showed that 96% of patients using Medido had a medication adherence rate over 80% and were therefore considered adherent to their medication schedule.[8]

The data also indicated that for patients who require 2 or more medication doses per day, the average adherence rate remained stable at around 94% when using Medido.

The analysis shows that when Medido is used, the medication adherence remains consistent over time. No significant differences in average adherence rates were observed between the first month of using Medido and use of Medido 11 months later.

Introduction

Successful treatment of disease with prescription medicines requires consistent use of the medicines as prescribed. Yet numerous studies show that often medicines are not used as directed, leading to poor clinical outcomes, higher health care costs and lost productivity. Among patients with chronic illness, approximately 50% do not take medications as prescribed.[1,2] When left untreated, many chronic conditions can lead to complications – including heart attacks, stroke, kidney failure, and diabetic reaction, among others – that decrease patients' quality of life and increase their risk of death. Poor adherence to medication schedules has been estimated to incur costs of approximately $100 billion per year.[3]

The World Health Organization (WHO) defines adherence to long-term therapy as "the extent to which a person's behavior—taking medication, following a diet, and/or executing lifestyle changes—corresponds with agreed recommendations from a health care provider." Patients are generally considered adherent with regard to medication if their adherence percentage, defined as the number of pills absent (and therefore assumed to have been ingested) in a given time period divided by the number of pills prescribed by the physician for that same time period, is greater than 80%. Typically, the adherence rate will decrease over the length of the prescribed period of medication intake. The adherence rate decreases even more among patients with multiple medication intake moments per day, with a mean rate of less than 50% adherence among those with a medication schedule of 4 times a day.[4]

Medido, an automated medication dispensing unit, can help patients adhere to their prescribed medication schedule by dispensing the right combination of medication at the prescribed time.[5] To examine the benefits of this smart medication dispenser, a retrospective quantitative analysis of the medication adherence rates of over 1,300 patients using Medido in the Netherlands was performed. In addition to this retrospective analysis, this paper also includes findings of a previous study on the benefits and economic value of Medido in patients receiving home care support for medication therapy.

Quantitative analysis of medication adherence

Study design and methods

The Medido medication dispenser is configured for each patient with the patient's individual medication schedule and the dispenser records if and when the medication was actually dispensed. To quantify the impact of Medido on medication adherence, we analyzed the service data of patients using Medido in the Netherlands between October 2014 and October 2015. The average Medido user was about 78 years old, and 61% were female. Patients using Medido for less than 30 days were excluded from the analysis.

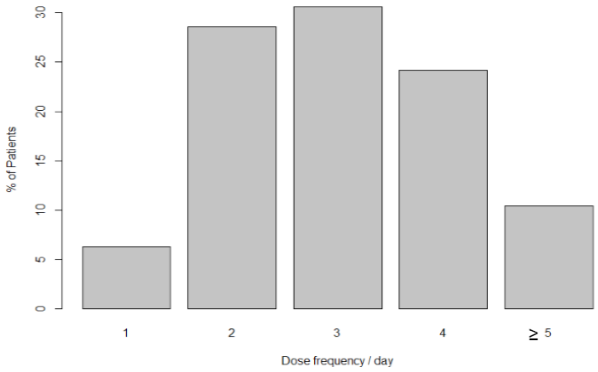

Figure 1: % of patients by medication intake moments per day

In total, over 881,000 medication moments of 1,379 patients were analyzed. On average, these patients used Medido for 6.7 months in the study time frame. Figure 1 shows the distribution of patients by medication intake moments per day. On average patients were prescribed 3 medication doses per day.

Medido dispenses medications in a pouch. A pouch can contain multiple medications that need to be taken at the same time. In this analysis, a pouch that was removed from the Medido dispenser within 75 minutes before or after the prescribed medication time is considered to have been taken in time. The medication adherence rate can then be defined as:

$$\text{Adherence rate} = \frac{\text{Number of times a pouch was dispensed within 75 minutes after or before dosage time}}{} * 100$$

Consistent with literature, a patient is considered adherent when his or her adherence rate ≥ 80%.[4]

Occasionally, patients leave their home for a longer time (e.g., for a vacation) and need to take their medication with them. To accommodate the user, the medication pouches can be dispensed ahead of time. On average, only 9% of medications were dispensed early (more than 75 minutes before the time prescribed) and 50% of patients had less than 3.5% of medications dispensed in advance. When medications were dispensed early, no information was available on when the medication was actually taken and these events were therefore excluded from the calculation of the medication adherence rate.

96% of patients were adherent to their medication schedule

The service data from the study showed that the average medication adherence rate of patients using Medido was 93%[1*]. Figure 2 presents the distribution of the adherence rate across patients. 96% of patients in the study had a medication adherence rate over 80% and were therefore considered adherent to their medication schedule when using Medido.

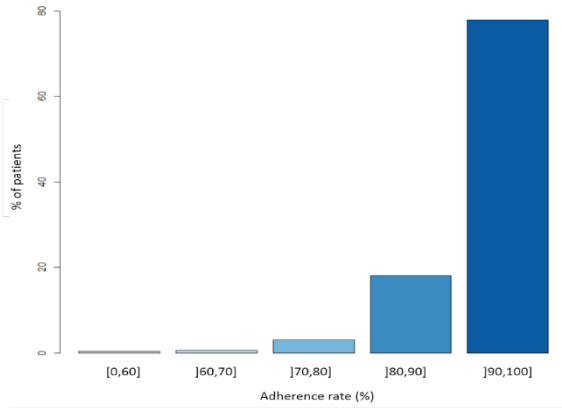

Figure 2: % of patients by adherence rate

Medication adherence by dose frequency

The adherence rate typically drops when the number of medication intake moments per day increases.[4] Figures 3a and 3b present the average adherence rate and the percentage of patients considered adherent by dose frequency per day when using Medido. The lowest adherence rate – an average of 86% – was found with patients prescribed one dose per day. When two to five or more medication doses per day were prescribed, the average adherence rate remained stable at around 94% when using Medido.

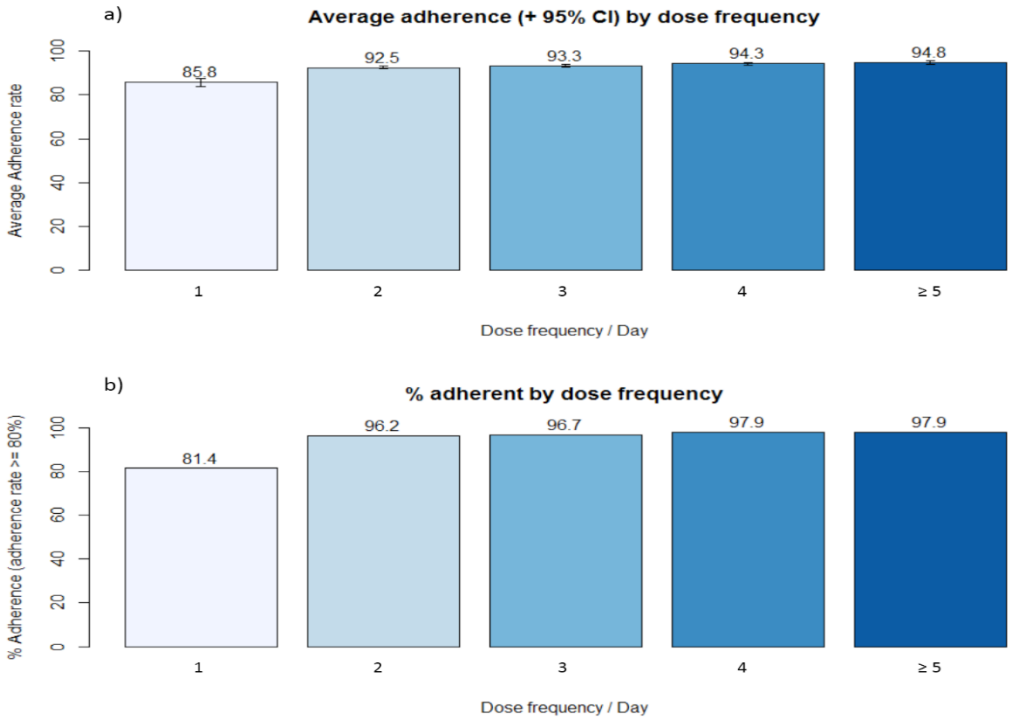

Figure 3: Average adherence rate (a) and percentage of patients adherent (b) by medication intake moments per day

Medication adherence over time

Another challenge when managing medication intake is keeping patients adherent when drugs are prescribed for use over a longer period of time. Medication adherence typically decreases with an increase in the length of time during which the medication is prescribed.[4] Figures 4a and 4b show the adherence rate of patients using Medido over time. Only patients who started using the service in the given data time frame were included in the analysis. Analysis of the data showed that when Medido was used, medication adherence remained consistent over time. No significant difference in average adherence rates were observed between the first month of using Medido and 11 months later.

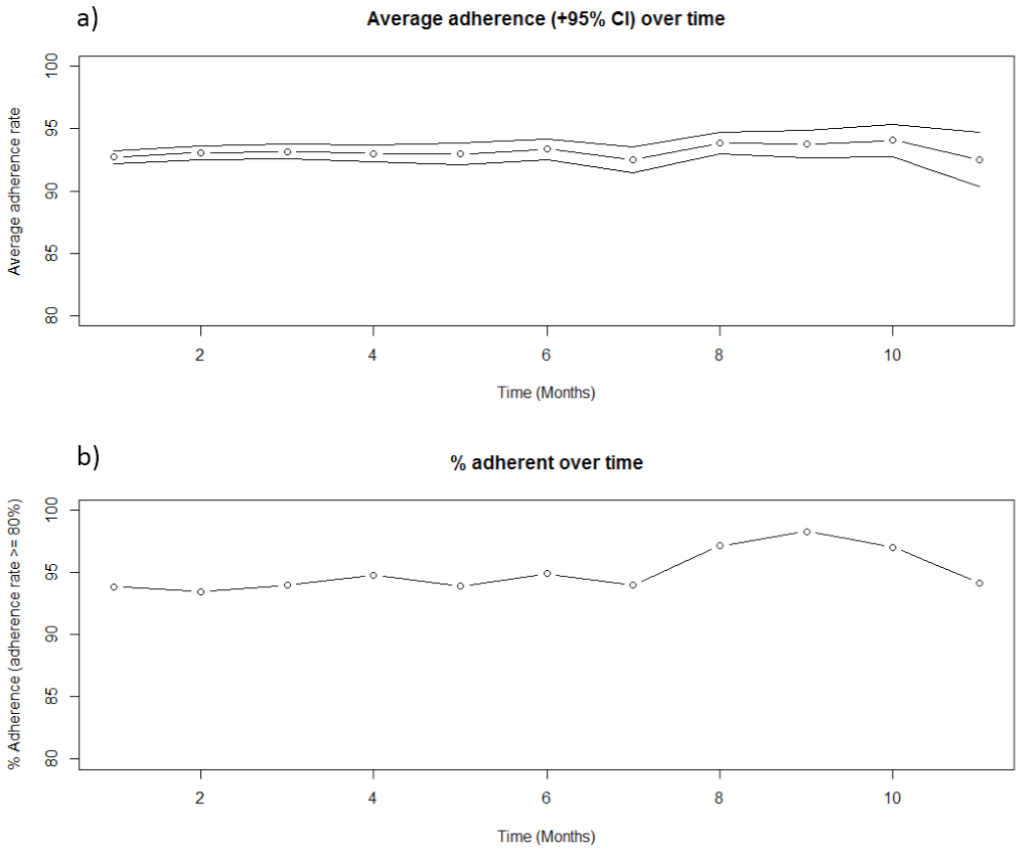

Figure 4: (a) Average adherence rate and 5% confidence interval, when using Medido over time (b) Percentage of patients adherent, when using Medido over time

Conclusion

Patients rely on their medications to keep them healthy, but complex medication schedules can lead to mistakes: missing doses, taking incorrect amounts, or taking medicines at the wrong time. The quantitative retrospective analysis of Medido service data shows that 96% of patients who used the Medido medication dispensing unit were adherent to their medication schedule. In addition, the analysis indicates that patients remained adherent to long-term therapy, including when medication requirements became more complex or the number of medication intake moments per day increased.

Medido benefits for home care

Many patients receive support from professional caregivers to ensure the timely intake of medication. This responsibility increases the demand on caregivers and their organization, which in turn leads to higher costs per patient. Furthermore, since precise timing is often required for taking medication, this results in peak times when care has to be delivered. This can further complicate an organization's planning and put pressure on the capacity of its employees (2).

A 2010 paper evaluated the use of Medido in a multi-partner study in the Netherlands initiated by ZZG zorggroep (ZZG Care Group) in collaboration with Innospense and a pharmacist.[5] The study included 60 patients who were receiving medication assistance from a home-care provider. All patients started using Medido at the start of the study and were followed for a time period of 1–20 months. Medido's effect on patients' medication adherence, the cost of care, and care productivity were assessed and findings are summarized below:

Medication adherence

No drop in medication adherence was observed when patients switched from receiving medication assistance provided by home care to using Medido. In fact, for 70% of patients, Medido improved adherence to the prescribed medication therapy. By continuously monitoring and logging the dispensed medication, Medido also made it easier to accurately track therapy adherence, which was appreciated by both the care organization and the pharmacist. The increased transparency also facilitated the personalization of the medication plan to best fit the patient's schedule and needs. One obvious point to note is that a medication dispenser does not ensure the actual ingestion of the medication. In the case of patients who may not be willing to take the medication, Medido is not an option. In this study, this variable was accounted for by the inclusion procedure, as well as periodic patient assessment.[5]

Costs of care

The use of Medido resulted in a reduction in the direct cost of care by decreasing the care required at home. A distinction was made between two groups of patients:

Patients receiving home care only for medication assistance

Once the Medido start-up program was completed, these patients no longer needed care at home. The start-up program took 2 to 6 weeks and included installation of the dispenser, assistance in use, and control visits. At the end of the start-up period, all direct home-care costs were eliminated. The only required visits were periodic evaluation moments and assistance in the case of medication errors or alarms that could not be solved by telephone.

Patients receiving home care for multiple reasons, of which one is medication assistance

Among these patients, there were usually 2 combined-care visits, one in the morning and one in the evening. Additionally, these patients often required one or more visits for medication assistance alone. The main reduction in the cost of care came from eliminating the need for medication-only visits.

Care productivity

The study data indicate that eliminating isolated visits for medication assistance saved an average of 7.5 minutes of direct care per visit. For combined-care visits, it is estimated that 2.5 minutes of direct care can be saved. For a standard patient with two combined-care visits and one separate medication support-only visit, an average of 12.5 minutes of direct home care per patient per day was saved by the utilization of Medido. In addition, indirect benefits such as reduced travel times, decreased planning complexity, and improved availability of home-care personnel can be expected.

Besides the observed benefits, the study describes a business case with detailed cost analysis and expected savings by using Medido in home-care patients receiving medication assistance. For a patient receiving two combined-care visits and one medication-assistance-only visit a day, it is estimated that a cost saving up to 40% could be achieved by introducing Medido, depending on the number of interventions needed when medication is not taken in time (follow-up of medication alarm) (2).[9]

Conclusions

The smart medication dispensing solution Medido can support patients in taking their medication on time. Quantitative analysis of over 1300 patients has shown that 96% were adherent to their medication schedule when using Medido. In addition to these high rates of overall adherence, the study indicated that Medido also helped patients stay adherent to long-term therapy and showed that the adherence rate of Medido users remained stable when the number of medication intake moments per day increased.

Increased medication adherence not only provides better patient outcomes, but also offers significant economic value. Patients who cannot reliably take medication at the prescribed times on their own often receive support from professional caregivers. The use of Medido by patients receiving home-care support can reduce costs of care and can also help to increase the productivity of care delivery. In addition, users who are able to manage medications by using Medido may feel more secure and independent, which can help them feel confident about aging in the comfort of their own home.

References

1. Sabaté E, et al. Adherence to Long-Term Therapies: Evidence for Action. Geneva, Switzerland: World Health Organization 2003. Adherence defined as "the extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider."

2. Lee JK, Grace KA, Taylor AJ. Effect of a pharmacy care program on medication adherence and persistence, blood pressure, and low-density lipoprotein cholesterol: a randomized controlled trial. JAMA 2006; 296(21):2563-2571.

3. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med 2005; 353(5):487-497.

4. Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clinic Proceedings 2011; 86 (4): 304-314.

5. Health@Home BV ism projectgroep Medido. Pilot Medido Eindevaluatie fase 1. ZZG zorggroep 2010.

6. "Compliance" is defined by measuring that Medido dispensed all pills within 75 minutes of time prescribed by Physician. Dispensing measured that the Medido logged a pill pouch as dispensed; no interviews were conducted with patients to ask whether any or all pills were ingested; it was assumed that all pills in the pouch dispensed were promptly and fully ingested.

7. "Adherence" is defined as the number of pills absent in a given time period ("X"), divided by the number of pills prescribed by the physician in that same time period, is greater than 80%

8. Adherence for this study calculated by assuming that all pills dispensed in the pouch were consumed; and all pills were consumed within the 75 minutes after notification for taking the pills.

9. The 40% calculation on cost savings using Medido was calculated using the following definition. Assumptions were made that a typical patient received medication assistance 3X daily, once in the morning, once in the evening and one separate moment. Time savings were calculated assuming 2.5 minutes saved per moment for the morning and evening routine as a social worker is typically with the patient at that time. A time savings of 7.5 minutes was calculated for the additional moment. The additional time necessary is based on the assumption that a social worker is not normally present at this time and the extra time is necessary specifically for medication adherence.

   The calculation assumed a 30 day month, calculating 375 minutes per month, with an hourly labor rate of 44.45 euro per hour. Costs were calculated comparing the hourly labor rate with costs for the Medido and time savings were factored comparing by performing the service with and without the Medido device. Three scenarios, outlined below, were defined to calculate the time savings, compared to the costs of using the Medido monthly (€220 total, €135.00 direct and €85.00 variable costs.)

   Scenario 1 – €174.78 monthly w/ Medido, no social worker involvement. 45% cost savings

   Scenario 2 – €221.41 monthly w/ Medido, 90 min social worker support. 20% cost savings

   Scenario 3 – Beak even with 189 minutes per month for social worker, 0% cost savings

   Additional costs savings / wider benefits using Medido including fuel, travel and admin costs on planning and scheduling for support were not captured in this analysis.