

Integration of Remote Blood Glucose Meter Upload Technology into a Clinical Pharmacist Medication Therapy Management Service

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Abstract

A pharmacist-delivered, outpatient-focused medication therapy management (MTM) program is using a remote blood glucose (BG) meter upload device to provide better care and to improve outcomes for its patients with diabetes. Sharing uploaded BG meter data, presented in easily comprehensible graphs and charts, enables patients, caregivers, and the medical team to better understand how the patients' diabetes care is progressing.

Pharmacists are becoming increasingly more active in helping to manage patients' complex medication regimens in an effort to help detect and avoid medication-related problems. Working together with patients and their physicians as part of an interdisciplinary health care team, pharmacists are helping to improve medication outcomes. This article focuses on two case studies highlighting the Diabetes Monitoring Program, one component of the Meridian Pharmacology Institute MTM service, and discusses the clinical application of a unique BG meter upload device.

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Health care delivery systems have been challenged by the Institute of Medicine to provide evidence-based care and use information technologies more effectively to improve quality.¹ Meridian Health has responded to this challenge by establishing the Meridian Pharmacology Institute, an outpatient-focused medication therapy management (MTM) service, leveraging the expertise of the clinical pharmacist and integrating technologies to bring together patients, physicians, and others to help achieve better patient outcomes.

The mission statement of the Meridian Pharmacology Institute is, "to provide innovative, patient-centered, pharmaceutical care services to area residents so they can

achieve optimized MTM and improved health outcomes." This article focuses on one component of our pharmacist-delivered MTM service, the Diabetes Monitoring Program, highlighting the clinical application of a unique blood glucose (BG) meter upload technology, MetrikLink[®] (iMetrikus, Inc., Sunnyvale, CA).

Literature supporting the expanded role of the pharmacist in providing formal MTM services is growing.² The Meridian Pharmacology Institute MTM service, located at Ocean Medical Center in Ocean County, NJ, is focused primarily on identifying polypharmacy and detecting potential medication-related problems that affect elderly patients disproportionately, as seniors are more likely

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Abbreviations: (BG) blood glucose, (DM) diabetes mellitus, (MTM) medication therapy management

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to be taking multiple medications and to have multiple coexisting chronic medical conditions such as diabetes mellitus (DM).

The MetrikLink is a device that is capable of uploading BG data from multiple brands of BG meters and sending that data from a patient's home via a telephone line connection to a centralized secure database maintained by iMetrikus, Inc. The uploaded data are accessible by the pharmacist, patient, and physician. In addition to placing these devices in patients' homes, a clinic version of the device, for use with patients during initial and follow-up MTM consultations at the Pharmacology Institute, is also deployed. This technology-based component of our MTM service is referred to as our Diabetes Monitoring Program. The Meridian Pharmacology Institute sought to determine if this technology could enhance services for our patients and if those patients were able to use the technology easily.

Pharmacist Medication Therapy Management

Medication therapy management is an effective means of helping patients better understand their medications and an important tool to help avoid medication interactions, detect adverse drug reactions, monitor compliance (adherence), and also to ensure medication therapies are appropriate, effective, and safe. Medication nonadherence is prevalent among patients with DM and is associated with adverse clinical outcomes. Medication compliance is important because, in one study, more than one in five patients were not taking their medications for diabetes properly; nonadherence was associated with higher glycated hemoglobin, blood pressure, and low density lipoprotein cholesterol levels; and every 25% increase in medication adherence was associated with reductions in all three measures.³ An assessment of medication nonadherence is an important component of a comprehensive MTM consultation, and it has been recommended to be incorporated into routine clinical practice.³

In our experience, patients may report only "good" values when asked to self-report to a logbook or journal. Some patients start paying attention to diet and medication before an upcoming visit with their physician, so values reported immediately before a physician's office visit will appear acceptable. These potential problems, which may contribute to suboptimal care, can be avoided by reporting all BG data. Data, in their raw form, may not be successful in achieving improved outcomes, unless data are presented in a format that allows the patients

to better understand their condition, leading to more engaged patients.⁴

A comprehensive MTM service will need to consider clinical factors such as lab results, drug levels, vital signs, and patient-reported symptoms to determine how (and if) these relate to the clinical appropriateness of an individual patient's medication regimen and any medication-related problems the patient might report. A focus on diabetes medications alone would not be comprehensive without consideration of renal function and BG levels, particularly highs, lows, and trends.

Remote Monitoring

Some elderly patients have limited ability to travel and often have home care services delivered by visiting nurses. The Pharmacology Institute receives patient referrals from Meridian At Home nurses when the home care nurse has identified a patient with diabetes who has BG control issues and whom the nurse believes would benefit from clinical pharmacist oversight of their patients' home BG testing results and additional education. After referral by the nurse, the clinical pharmacist calls the patient, determines patient interest in the program, and obtains consent for participation. Once enrolled, the pharmacist meets with the patient to demonstrate the use of the upload device and determine a schedule for meter connection, upload, and review of data. We have found that use of the MetrikLink allows the pharmacist to show the patient, in graphic form, how their medications affect their BG levels. This helps underscore the importance of adherence to their physician-prescribed diabetes medication regimen. Our Diabetes Monitoring Program requests enrolled patients to upload their stored BG data weekly. These data are reported to the patient's physician, as needed, to provide unbiased information that can lead to improved care.

Case Reports

Case#1

An 83-year-old male was referred by home care nurses. With a 20-year history of DM, he recently had undergone surgery. For the 3-month period prior to surgery, uploaded BG results documented an average BG of 122 mg/dl while on metformin, glipizide, and Avandia (rosiglitazone, GlaxoSmithKline, Middlesex, United Kingdom). During his hospital stay, the metformin dose had been decreased, and on discharge, Januvia® (sitagliptin, Merck & Co., Inc., Whitehouse Station, NJ) 100 mg daily was started. The patient reported that due to the cost of Januvia, and

his belief that it was not helping, he stopped taking the Januvia. The pharmacist determined that the patient had stopped taking his prescribed dose after 17 days of therapy. **Figure 1**, a graph obtained from upload of stored home BG meter data shows the effects of both starting and stopping the Januvia on his blood sugar levels. The pharmacist provided a printout of this graph to the patient, and the patient could easily see the effects of starting and stopping the medication and understood that the medication had, in fact, made a difference in his blood sugar control. After the consultation, the graph clearly shows that when the patient resumed his therapy, his blood sugar values once again returned to desired levels.

Case #2

A 76-year-old female has multiple medical problems, including type 2 DM, stage IV chronic kidney disease, anemia, neuropathy, hyperkalemia, arthritis, retinopathy, spinal stenosis, hyperparathyroidism, and glaucoma, and was taking 27 different medications daily. Potential medication-related problems included erratic blood sugar control and the recent addition of Symmlin (pramlintide, Amylin Pharmaceuticals Inc., San Diego, CA). She enrolled in the diabetes monitoring program and received a remote upload device with instructions to upload BG meter readings weekly. At the initial data upload, BG readings during the previous 3 weeks averaged 181 mg/dl (**Figure 2**). Over the next several months, average BG readings decreased to 138 mg/dl. Subsequently, over a 2-week period, the average BG spiked to 192 mg/dl, prompting the pharmacist to investigate potential causes. The patient reported that she had recently started a new home remedy for arthritis that included drinking 8 ounces of grape juice mixed with 2 tablespoons of Certo (gelatin) several times a day. This represented an additional 40 grams of carbohydrate per dose, which could account for the increased BG levels. After the pharmacist informed the patient, the patient discontinued the remedy, and subsequent blood sugar levels began to decrease to an average BG of 166 mg/dl (**Figure 3**).

Discussion

There were several limitations to our project. Our goal was to place remote monitoring devices with seniors who had poorly controlled diabetes or a strong interest in better managing their disease. Despite interactive displays at senior health fairs and presentations for community groups, this is a very hard group to identify and educate regarding the need and benefits for this service. This is new technology (for them) and as such,

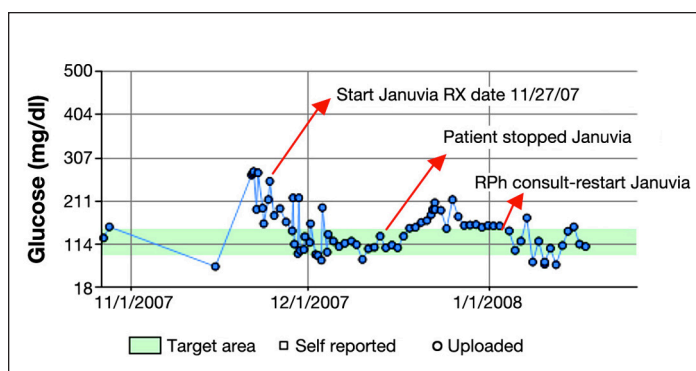


Figure 1. Case #1 BG data for Januvia compliance.

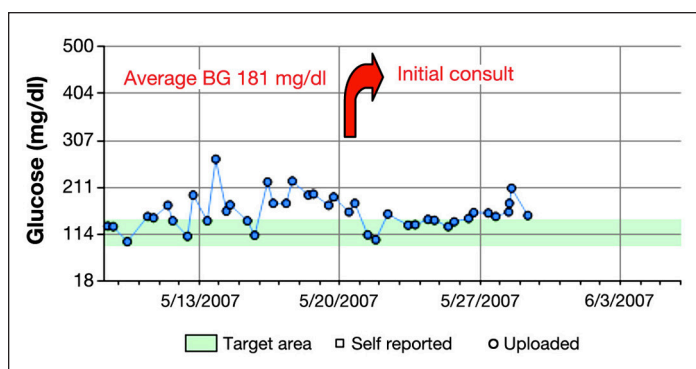


Figure 2. Case #2 average BG data following initial pharmacist consult.

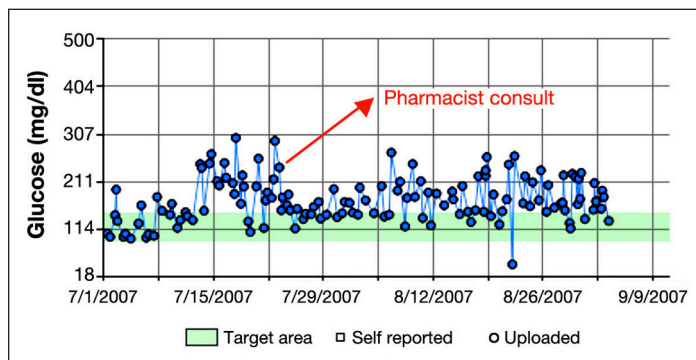


Figure 3. Case #2 BG data after discontinuation of home remedy.

they seem cautious regarding enrolling in the program. It took longer than expected for our first 70 patients to enroll despite the offer of a free service. Now that grant funding has expired, it is even harder to get seniors to pay out-of-pocket for a service that is of unknown value to them. Insurers, including Medicare, currently have no reimbursement mechanism for a remote monitoring service. There may be potential benefit marketing directly to insurers as a quality initiative delivered by the health system or as a program to help hospitals decrease unnecessary readmissions. Recruiting physician champions

to “prescribe” remote monitoring may also help patient enrollment. Another issue limited initial enrollment; patients needed to have analog phone service because the Metriklinks did not work with digital phone service. This has since been remedied, but we were unable to upload data for several patients after enrolling them.

Conclusion

Technologies, which are able to help patients upload their stored BG data from home or used in a clinic as part of a MTM service, can be used effectively by a clinical pharmacist, an integral part of a patient’s health care team.⁵ Information can lead to identification and correction of medication-related problems including DM medication dosage effectiveness or potential medication noncompliance. Using the expertise of the clinical pharmacist to educate patients with DM, particularly seniors, can be facilitated because of regular pharmacist-patient contact and the use of remote monitoring technologies.

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