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Up Front: It Takes a Team

by Amanda Margolis, PharmD, MS, BCACP

This summer has been interesting, to say the least. While we are navigating the new challenges of traveling again and attending an in-person conference this fall, in my household, we also tried something new: team sports!

My 7-year-old missed out on some opportunities last year due to COVID-19. This year, we thought softball might be safe for her to try; even though her league is unmasked and her age group is not indicated for vaccination, they are outdoors, and the sport is naturally socially distanced. She has only participated in individual extracurriculars so far, so trying something with a team and learning good sportsmanship was the goal.

Somehow, I also ended up as the head coach for her team, the Cyclones. I played softball in high school and figured I could handle a U8 team. It has been a blast to watch the girls improve and, more importantly, work together to attempt to make plays. While they don't always succeed, it is a thrill to watch them work together and to cheer each other on.

In addition to the Cyclones themselves, I also find myself part of the coaching team. Just like a healthcare team, we all have our role managing the Cyclones. This includes myself as head coach, our coach who pitches for the girls, our team parent who helps everyone stay organized, and others. One fun fact about our team: Matt Sorum is one of the assistant coaches (husband of PSW's Executive Vice President, Sarah Sorum). He has had a lot of fun encouraging the girls to work together and to cheer each other on.

Why do I share all of this in *JPSW*? In my role at the University of Wisconsin-Madison School of Pharmacy, I manage an assessment completed on Advanced Pharmacy Practice Experiences called the Individual Teamwork Observation and Feedback Tool (iTOFT). This summer, I have been conducting a project evaluating how preceptors perceive the tool and how they truly use it. While not the original intention of the work, one emerging theme has been the importance pharmacists place on

interprofessional teamwork. While I'm sure many readers see this as well, there have been direct parallels watching the Cyclones grow and work together, watching the coaching team find our groove, what I see and do in practice at the Madison VA, and what others have been sharing in my work evaluating how iTOFT is used.

I will leave you with this: *The Journal* is also a team. We have an editorial team, the Editorial Advisory Committee, contributors, and our peer reviewers. The issue you read today had at least 55 individuals directly contributing in some capacity. If you are looking to join a new team, consider becoming a peer reviewer or joining *The Journal's* team. We look forward to working with you!

- Amanda Margolis, PharmD, MS, BCACP
Pharmacist Editor, *The Journal of the Pharmacy Society of Wisconsin*

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PHARMACIST CE:

Review of Continuous Glucose Monitors: Technology and Beyond

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Abstract

Blood glucose monitoring technology is constantly evolving. The advances have led to the development and enhancement of continuous glucose monitors (CGMs). Currently, two different categories of FDA-approved CGMs are available in the market: real-time CGMs (rtCGMs) and intermittently scanning CGMs (isCGMs). Available literature indicates their efficacy in controlling blood glucose, reducing hypoglycemia, and improving quality of life. The use of these devices is further supported by major guideline recommendations. Pharmacists are vital in providing comprehensive care to patients with diabetes, including assistance with CGMs. As more and more patients embrace CGMs for glucose monitoring, it is imperative for pharmacists to continuously update their knowledge regarding CGMs.

CE FOR **PHARMACISTS**

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Learning Objectives

- List functions of the basic components of continuous glucose monitors.
- Describe different types of continuous glucose monitors available in the US market.
- Compare and contrast the features and capabilities of the available continuous glucose monitors.
- Summarize the evidence for use of continuous glucose monitors in the management of diabetes.
- Identify the role pharmacists play in selection of continuous glucose monitors and provision of education to patients and providers.

Technology is a blessing for managing chronic diseases, such as diabetes, that require significant patient involvement for monitoring and tracking to optimize health outcomes. Blood glucose monitoring devices help ensure patients are receiving the optimal therapy and meeting the blood glucose goals required to minimize the risk of complications secondary to uncontrolled diabetes. The technological advances in monitoring blood glucose at home have been tremendous. In 1925, Benedict's solution was introduced as the first reagent for detecting glucose in the urine at home.[1] The solution showed the patient's glucose level, based on the color change observed. The Ames Company introduced the first blood glucose meter, called the reflectance meter, in the 1970s.[2] It was exclusively used by medical professionals in conjunction with the first blood glucose test strip, the Dextrostix. It was not until 1981 that self-monitoring blood glucose (SMBG) meters were available for at-home use.

Fast-forward to today, and we have revolutionized the technology to monitor blood glucose, allowing for better diabetes management and patient outcomes. There are many devices that allow patients to be

self-empowered in managing their diabetes. According to the Diabetes Forecast, there are about 87 different blood glucose monitoring devices available in the US market.[3,4] Choosing the right device depends on many patient-specific factors: patient preference, cost, accessibility, and ease of use. The frequency of testing blood glucose varies depending on the person, as well as their health status. For example, patients with multiple daily insulin injections (MDI) and those with higher hypoglycemia risk have higher blood glucose testing requirements.[5] Continuous glucose monitors (CGMs) can help make monitoring easier for those requiring rigorous blood glucose monitoring. These devices have allowed individuals with diabetes to better control their glucose swings and overall quality of life by limiting the need for fingerstick blood glucose monitoring.

The purpose of this article is to provide a detailed overview of the available CGMs for patient use, their differences and similarities, their place in therapy and evidence for use, and the role pharmacists play when using this technology for patient care.

Available Devices

Two different categories of CGMs are available in the market for patient use: real-time CGMs (rtCGMs) and intermittently scanned CGMs (isCGMs). The latter are also commonly known as flash glucose monitors (FGMs). Understanding the differences in features and capabilities for each device is important when deciding which CGM is best for the patient. Important key features of these devices are summarized in Table 1.

CGM Technology

Both rtCGMs and isCGMs use an enzyme-coated wire, which measures interstitial glucose through the generation of an electrical current when glucose reacts with the enzyme glucose oxidase.[6] The generated current is proportional to the interstitial glucose level measurement, which is then converted to an estimated glucose level by an algorithm. Sensors for these CGMs measure interstitial glucose every 5 minutes. Basic components of a CGM include a sensor, a transmitter, and a display device, also referred to as a receiver or a reader.[6,7] The sensor is a small wire probe inserted into the skin where it monitors glucose in the interstitial fluid. The transmitter is the wireless component that works with the sensor to communicate glucose data to the display device. The display device is a small device that receives and displays data received from the sensor/transmitter combination. Some manufacturers use their own technology to receive the data from the monitor, while others use third-party app technology that lets the user see the data on their mobile device or and smart watch.[8-12] The sensor/transmitter combination must be removed before the patient undergoes imaging procedures such as MRIs, CT scans, and X-rays, or an electrical heating treatment such as diathermy. Many of the sensors also have limits for water exposure, such as depth and duration; therefore, the user guide of each device should be consulted for these specific requirements. Both rtCGMs and isCGMs require an external source or app to review glucose data; therefore, there is a need for extensive patient education to understand how to use these devices. The biggest difference between rtCGMs and isCGMs is the way patients receive their glucose values. The rtCGMs allow for passive glucose monitoring, where the data shows up on the display device in real time, including any alerts for concerning glucose values. For isCGMs, the data is not automatically transferred; patients have to manually scan the sensor using the reader device in order to receive glucose values. The newest isCGM does include the option to turn on alerts for concerning values.[12]

CGMs and Fingerstick Testing

Traditional CGMs need to be calibrated to relate glucose to the electrical current upon which the glucose measurements are based. The calibration for most CGMs involves corroborating the glucose value with a fingerstick test; however, the frequency and duration of calibration varies per each device. The CGMs monitor interstitial fluid glucose, which is about 5 to 10 minutes behind the actual blood glucose.[13] Therefore, in certain instances, it is necessary to check blood glucose via fingerstick. Some newer CGMs do not require this calibration step; however, fingerstick testing for a CGM user is needed when blood glucose is rapidly changing, such as during hypoglycemia, and when the symptoms of hyper- or hypoglycemia do not match the readings of the CGM.

Real-Time Continuous Glucose Monitors

There are a total of three rtCGM devices currently available in the US market: the Dexcom G6, the Guardian Connect System, and the Eversense sensor. Similar to isCGMs, most of the rtCGMs also include a combination of sensor/transmitter and a display device, but some systems do not have a separate display device; data is directly sent to a smartwatch or a smartphone. The sensor/transmitter automatically transmits glucose data to the display device and does not require the user to actively scan the sensor.[6,7] Patients see continuous and real-time glucose measures, including any alarms or alerts for concerning glucose values. In order for data transmission to occur, the transmitter and display device must be no more than 20-25 feet apart.[4]

Dexcom G6 was FDA approved in 2018 for ages 2 years and older.[8] Readings are updated every 5 minutes, providing glucose levels, trends, and alerts. The system can predict future highs and lows in glucose, so users can alter their behavior to help prevent hyper- or hypoglycemia. Patients who are using Dexcom G6 are able to share their results through a secondary application with up to 10 followers, who often include healthcare providers, family members, or friends. The sensor is approved to be placed on the abdomen for adult users and on the buttock or abdomen for users who are between 2 and 17 years of age. The sensor, however, does not require fingerstick calibration throughout its wear time of 10 days. Standard doses of acetaminophen do not interfere with the sensor, but doses higher than 1 gram every 6 hours may affect the system, and glucose values may be reported higher than the actual glucose values.

The Guardian Connect System is indicated for continuous or periodic monitoring of glucose levels in patients who are between 14 and 75 years of age.[9] The Guardian Connect System includes the Guardian Connect app, Guardian Sensor 3, and the Guardian Connect transmitter. The Sensor 3's wear time is 7 days and requires calibration during the initial sensor placement phase, as well as once every 12 hours. The Guardian Sensor 3 glucose values are not intended to be used directly

TABLE 1. Characteristics of the CGMs Currently Approved for Use in the US Market[8-12]

	rtCGMs			*isCGMs*	
	Dexcom G6	***Eversense***	***Guardian Connect System***	***FreeStyle Libre 14 day***	***FreeStyle Libre 2***
Wear Length	10 days	90 days	7 days	14 days	14 days
Sensor Location	Abdomen or upper posterior arm or upper buttocks[d]	Upper posterior arm[e]	Abdomen or upper posterior arm	Upper posterior arm	Upper posterior arm
Fingerstick Calibration	None	2 per day	2 per day	None	None
Age Approved	2 and older	18 and older	14 to 75	18 and older	4 and older
Warm-up	2 hours	24 hours	2 hours	1 hour	1 hour
High/Low Alarm[a]	Yes	Yes	Yes	No	Yes
Non-Adjunctive Labeling[b]	Yes	Yes	No	Yes	Yes
Display Device[c]	Reader or Smart Device	Smart Device Only	Smart Device Only	Reader or Smart Device	Reader
Drug Interactions	Acetaminophen & Hydroxyurea	Tetracycline	Acetaminophen & Hydroxyurea	Vitamin C & Salicylates	Vitamin C

a The real-time continuous glucose monitors can also predict future highs and lows.
b Allows the CGM to be used for insulin dosing and does not require a fingerstick reading.
c Smart device consists of compatible mobile devices and smart watches.
d Age-based sensor location: 2-17 years old → upper posterior arm, abdomen, or upper buttocks; 18 years and older → on upper posterior arm or abdomen only
e Sensor is implanted subcutaneously and is surrounded by a silicone collar containing 1.75 mg dexamethasone acetate used to reduce inflammation around the sensor.
isCGMs, intermittently scanning continuous glucose monitors; rtCGMs, real-time continuous glucose monitors

for making therapy adjustments. While the system does not include a separate display device, the transmitter directly transmits glucose data to an app on compatible mobile devices. It can predict future highs and lows in glucose and users can receive alerts 10 to 60 minutes before such glucose changes occur. The app stores sensor glucose data and provides a user interface for sensor calibration, entering exercise and meal data, and uploading information to the CareLink, a data management software. These advanced features of the app require users to have sufficient experience with adjusting the mobile devices' auto and notification programming.

The third rtCGM system on the market is the Eversense sensor.[10] This system offers a very unique sensor. The pill-sized sensor is implanted into the skin by a healthcare provider. The sensor is considered ready for monitoring glucose 24 hours after insertion; it can be worn up to 90 days. It requires fingerstick blood glucose calibration with this initial sensor placement period, as well as once every 12 hours. A new transmitter is applied daily, using a gentle adhesive right over the area of skin where the sensor is inserted. The system uses a smartphone as the display device; data is transferred directly to the Eversense Data Management System app on the phone. It allows data to be shared with 5 different individuals. The sensor and transmitter combination vibrates on the arm when glucose values are above preset high or low thresholds, even when the smartphone is not nearby. The system can predict future highs and lows in glucose. It is the only CGM system that is approved for use during an MRI.

Intermittently Scanning Continuous Glucose Monitors

There are two FDA-approved isCGMs available in the US market for patients with Type 1 and Type 2 diabetes mellitus: the FreeStyle Libre 14 day and the FreeStyle Libre 2. These isCGMs include a sensor/transmitter and a stand-alone touch-screen display device (or "reader"). The sensor continuously communicates with the reader, but in order to obtain a reading, it requires the patient to scan the sensor with the reader device from a minimum 1.5 inch distance.[8-12] A compatible mobile device with FreeStyle LibreLink app can also receive real-time sensor data which can be uploaded to LibreView account and shared with healthcare providers. At minimum, the sensor should be scanned once every 8 hours, otherwise the sensor data is lost.[5,11,12] Scanning it more frequently during fasting, post-prandial, and periods of physical activity can provide more information about changing glucose and allow for proactive therapeutic interventions.[8-12] The sensor is worn on the back of the upper arm. The maximum sensor wear time is 14 days, which means patients have to replace the sensor after 14 days. Once the sensor is placed, it is ready in an hour to start capturing data. Fingerstick SMBG is not required for calibration or for making treatment adjustment decisions; however, the reader device has a built-in SMBG glucose monitor for times when patients are required to confirm the readings with the fingerstick method. For example, a magnifying glass with a blood drop symbol may appear on the display device, which means that the patient must check

fingerstick blood glucose in order to make treatment adjustments.

The FreeStyle Libre 14 day system is approved for use in acute and long-term therapy for diabetic patients ages 18 and up.[11] This device does not have alarms to indicate episodes of hyper- and hypoglycemia. There are certain substances that interfere with and alter the FreeStyle Libre sensor readings, including doses of ascorbic acid (Vitamin C) > 500 mg, which may result in falsely elevated sensor readings; and salicylic acid (aspirin) doses > 650 mg, which may result in falsely lower sensor readings. However, according to the manufacturer's data on file, aspirin 81 mg and aspirin 325 mg did not show any interference. If patients are taking such interfering substances, fingerstick SMBG may be required to confirm the glucose readings.

The FreeStyle Libre 2 is the newer of the two FreeStyle Libre systems approved for both acute and long-term use for detection of hyper- and hypoglycemia in diabetic patients ages 4 and up.[12] Compared to its predecessor, it has had several updates and improvements. It is an isCGM with optional capability for providing real-time alerts to patients, as long as the reader is within 20 feet of the sensor. However, unlike most rtCGMs, the alarms will not automatically tell a patient their glucose value. The sensor must be scanned with a reader to display glucose readings. Like the 14-day system, ascorbic acid in doses > 500 mg may produce falsely elevated sensor readings with the Libre 2, but salicylic acid does not interfere.

In addition to these stand-alone CGMs, there are other CGMs available that directly connect to an insulin pump (CSII).[4] When worn in conjunction with an insulin pump, the pump can be programmed to suspend insulin delivery upon receiving an alert for hypoglycemia from the rtCGMs. One example is the Dexcom G6 transmitter, paired with one of two different t:slim pumps by Tandem. The Guardian Sensor 3 of the Guardian Connect System is also compatible with the MiniMed 670G and the MiniMed 630G insulin pumps, but it uses a different transmitter than the one used in the Guardian Connect System.

Evidence for Use

The available studies for CGMs have evaluated their effectiveness, looking at outcomes such as difference in HbA1c, time in range, glycemic variability, and hypoglycemia. Most studies have compared CGMs to traditional fingerstick testing, but some have compared rtCGMs to isCGMs. One randomized controlled trial looked at CGMs' effect on HbA1c as well as diabetes-related emergency visits. Mulianacci and colleagues found that early use of CGM devices in patients with Type 1 diabetes, regardless of the type of insulin delivery, resulted in statistically significant lower HbA1c as well as fewer diabetes-related emergency department visits due to hyper- or hypoglycemia.[14] The sections below further break down the evidence for CGMs based on their types.

Real-time Continuous Glucose Monitors

Four randomized controlled trials (RTCs) of adult patients with Type 1 diabetes on CSII or MDI, comparing rtCGM to conventional fingerstick test monitoring, produced a between-group HbA1c difference.[15-18] This difference, noted across all four trials, was statistically significant and ranged from 0.43% to 0.6%, favoring rtCGM use. Two of the studies also show that higher adherence to sensor wear time was associated with greater improvement in HbA1c.[18,19] Studies including similar patient populations showed significant reduction in hypoglycemia with rtCGM use.[20-22] The use of rtCGM has been particularly valuable in patients with frequent hypoglycemia or hypoglycemia unawareness. A small study comparing rtCGM and isCGM for hypoglycemia found that adult patients using rtCGM spent less time in hypoglycemia compared with patients using isCGM.[23] In the pediatric population with Type 1 diabetes, the data from an RTC show no improvement in HbA1c due to poor sensor wear time adherence,[19] but an observational study in this population demonstrated improved adherence and increased parental satisfaction with CGM use in general.[24]

Two RCTs including patients with Type 2 diabetes taking oral agents, with or without basal insulin, and one RCT including patients with Type 2 diabetes on MDI therapy compared rtCGM use to conventional fingerstick glucose monitoring.[25-27] The between-group HbA1c difference was statistically significant and ranged from 0.8% to 1.1% across these three studies, favoring rtCGM use. The DIAMOND2 trial included patients with Type 2 diabetes on MDI therapy only using rtCGM.[27] When compared to the conventional SMBG monitoring, there was reduction in HbA1c, but no difference in hypoglycemic episodes was found.

Due to increased turnover of red blood cells during pregnancy, HbA1c results are less reliable in pregnancy.[28] Using mean glucose values from CGMs is proven to be more accurate than the estimated HbA1c derived from various methods. In an open-label RCT, a group of pregnant patients with Type 1 diabetes using MDI or CSII were placed on rtCGM monitoring in addition to the standard of care (fingerstick SMBG).[29] When compared to the SMBG group alone, those using rtCGM in addition to fingerstick SMBG spent more time in target glucose range (68% vs. 61%, p=0.0034) and less time in hypoglycemia (27% vs. 32%, p=0.0279). This group of patients also reported decreases in length of hospital stay, and decrease in neonatal outcomes such as macrosomia and neonatal hypoglycemia.

Intermittently Scanning Continuous Glucose Monitors

Evidence in favor of isCGMs is more prevalent in observational studies, compared to RCTs.[5] These observational studies, including children and adults with both types of diabetes, show that isCGMs' use results in lower HbA1c, lower incidences of hypoglycemia, and improved quality of life when compared with fingerstick SMBG. The evidence for reduction in hypoglycemia for patients with Type 1 diabetes at higher risk of hypoglycemia is mixed.[20,30] An RCT of patients with Type 2 diabetes on MDI therapy, using an isCGM, showed statistically significant reduction in HbA1c in the isCGM group versus the conventional SMBG group (0.82% vs. 0.33%, p=0.005).[31] This study did not note increased frequency of hypoglycemic episodes. On the other hand, another RCT in Type 2 diabetes patients on various types of insulin treatments showed no improvement in HbA1c, but time spent in hypoglycemia decreased by 43% with the use of an isCGM (p=0.0006).[32] With varying results from RCTs, there are a few

TABLE 2. Recommendations for CGM Use from Major Practice Guidelines[5,36]

ADA	**Grade A#** • Use of rtCGM in youth and adult patients with MDIs and CSII • Wearing rtCGM devices close to daily for those with MDIs and CSII • Scanning isCGM devices frequently, at least every 8 hours **Grade B^** • Use of isCGM in youth and adult patients with MDIs and CSII to replace SMBG monitoring • Use of CGMs as adjunct to the standard of care, pre- and post-prandial SMBG monitoring, in pregnant patients with diabetes **Grade C&** • Use of either types of CGMs in youth and adults with other forms of insulin therapy
AACE	**Grade A*** • All persons with diabetes treated with intensive insulin therapy (> 3 or more insulin injections per day or CSII use) • CGMs recommended for: » All individuals with problematic hypoglycemia » Children/adolescents with Type 1 diabetes » Pregnant women with Type 1 diabetes and Type 2 diabetes treated with intensive insulin therapy **Grade B§** • CGMs may be recommended for: » Women with gestational diabetes mellitus on insulin therapy » Persons with Type 2 diabetes who are treated with less intensive insulin therapy • rtCGM is recommended over isCGM for those with problematic hypoglycemia

#Clear or supportive evidence from well-conducted adequately powered RCTs, compelling nonexperimental evidence
^Supportive evidence from well-conducted cohort studies
&supportive evidence from poorly controlled or uncontrolled studies
**Evidence from RCTs or meta-analysis of RCTs*
§Evidence from meta-analysis, nonrandomized controlled trial, prospective cohort study, case-control study, cross-sectional study, epidemiological study, open-label extension study, or post-hoc analysis study
CGM, continuous glucose monitors; ADA, American Diabetes Association; rtCGMs, real-time continuous glucose monitors; MDIs, multiple daily insulin injections; CSII; continuous subcutaneous insulin infusion (insulin pumps); isCGMs, intermittently scanning continuous glucose monitors; SMBG, self-monitoring blood glucose; AACE, American Association of Clinical Endocrinologists; RCTs, randomized controlled trials.

systematic reviews evaluating multiple types of trials available for isCGMs. The results of these systematic reviews also vary; however, some reviews suggest that isCGMs might replace the conventional fingerstick SMBG method for monitoring glucose in certain patients, due to their positive impact on HbA1c and hypoglycemia.[33-35]

Recommendations from the Guidelines

The American Diabetes Association (ADA) and the American Association of Clinical Endocrinologists (AACE) have weighed in on the available evidence for the use of CGMs and provided recommendations in their guidelines.[5,36] The summary of their main recommendations can be found in Table 2.

Additionally, in March 2020, the FDA expanded the use of certain non-invasive remote monitoring devices, which included CGMs, to monitor patients' blood glucose while they are hospitalized.[37] This allowed for contact-less monitoring of diabetes patients in the time of COVID-19 pandemic.

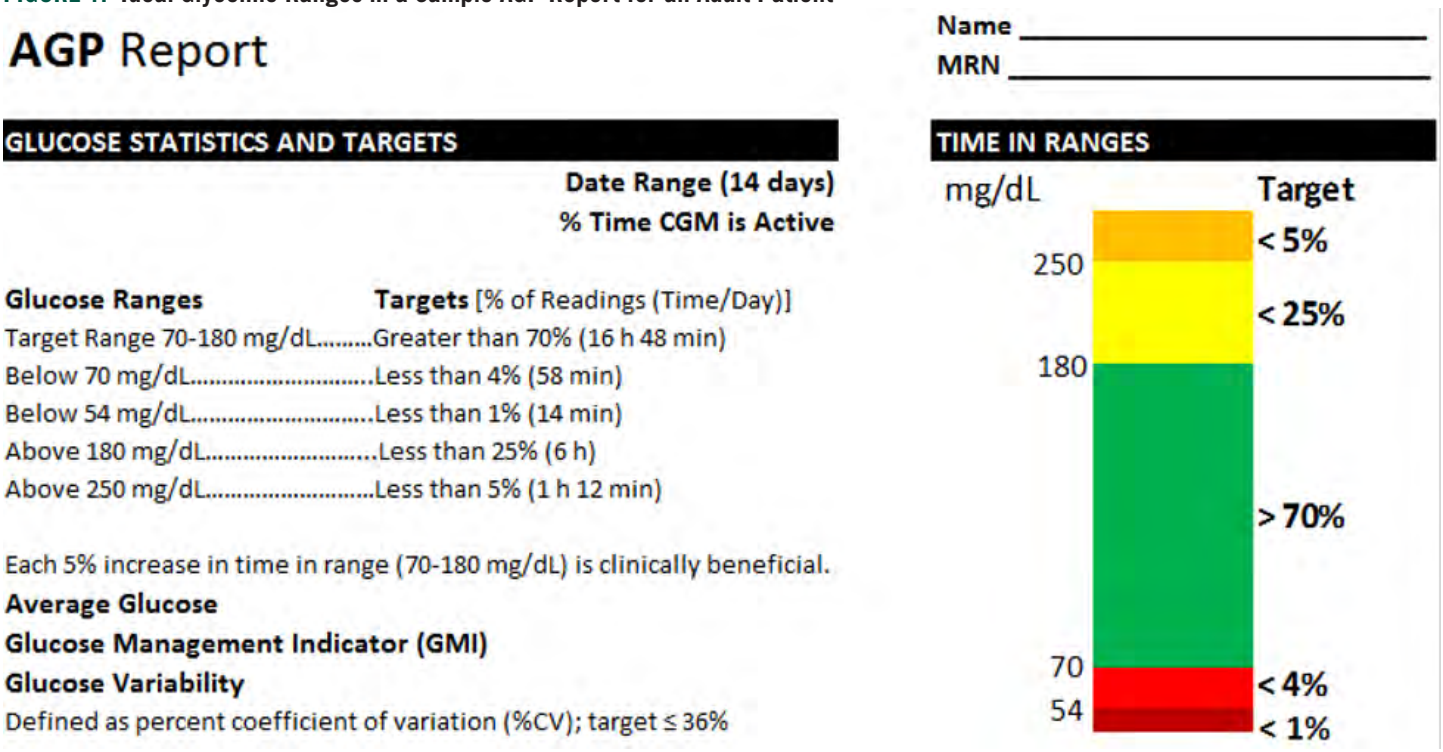
Understanding the CGM Data Output

Literature has recognized HbA1c as the key surrogate marker when assessing for complications relating to long-term diabetes in those with Type 1 and Type 2 diabetes. Unfortunately, HbA1c is unable to detect acute glycemic shifts and is therefore blinded to the resulting complications from hyper- and hypoglycemia.[38] Hemoglobin A1C interpretation can also be ineffective in the settings of anemia, hemoglobinopathies, iron deficiency, and pregnancy.[39] There has also been a report that the HbA1C test can fail periodically and report false mean glucose even in the absence of the aforementioned conditions.[40] Monitoring glycemic control using HbA1c has been the approach for many years. While its utility is certainly noted, it will now serve as a complement to the glycemic data included in the CGM reports.

The Advanced Technologies & Treatments for Diabetes (ATTD) Congress assembled an international panel of clinicians and experts on CGMs to define and standardize the core metrics for assessing the CGM data.[39] Ten of these 14 core metrics are used to produce a standardized CGM report called the Ambulatory Glucose Profile (AGP). Figure 1 shows a sample AGP report for an adult patient with ideal glycemic ranges. The AGP report incorporates targets along with a 14-day composite glucose profile. Therefore, having at least a 14-day wear time is associated with more impactful data. The data generated in this report allows for meaningful conversations with the patient about the fluctuations in glucose levels and what may be contributing to the highs and lows, as well as patient-centered goals. For example, visualizing the impact of diet, exercise and medications on glucose values might be beneficial when the health care provider is collaboratively creating SMART (specific, measurable, attainable, realistic, and timely) goals with the patient.

Although it was agreed that CGM-based glycemic targets need to be personalized to meet the needs of each person with diabetes, the ATTD conceded on recommendations for particular glycemic target ranges: Type 1 and Type 2 diabetes (70-180 mg/dL) and during pregnancy (63-140 mg/dL).[39] With this agreement, the "time in range" (TIR) indicator was developed. The time in range is the percentage of time that a person spends within their target glucose range. As mentioned, even if different people have the same HbA1c, the actual fluctuations in blood glucose day-to-day will be quite unique. Some patients with a goal HbA1c may be experiencing many periods of hyper- and hypoglycemia, which can be correlated with negative health outcomes. There is evidence to suggest that lower TIR is associated with increased risk of microvascular outcomes.[41] Therefore, it is recommended that the TIR be > 70% for patients with Type 1 and Type 2

FIGURE 1. Ideal Glycemic Ranges in a Sample AGP Report for an Adult Patient



Adapted from Battelino et al.

diabetes and during pregnancy.[39] A slightly relaxed TIR, > 50%, is recommended for older patients or patients with high risk for hypoglycemia. The TIRs of > 70% and > 50% are equivalent to HbA1c of < 7% and < 8%, respectively.[42] In addition to TIR, the wear-time of CGM is an important factor to consider. Wearing CGMs over 70% of the time within 14 days is strongly correlated with 3 months of mean glucose, time in ranges, and hyperglycemia metrics.[43,44]

Future Developments

The COVID-19 pandemic has certainly had an impact on diabetes management, by heightening the risk of serious complications in persons with diabetes who contract the virus.[45] New CGM technology is also feeling the effects of the virus, as the pandemic has slowed down research and development, as well as caused delays in FDA review and approval.

Currently approved in Europe for patients ages 4 and up, the FreeStyle Libre 3 is one of the next CGMs in the pipeline for diabetes management in the US.[46] This sensor is still a 14-day sensor with optional alarms; however, the sensor scanning every 8 hours is no longer required. It has an "always-on" feature that sends minute by minute readings directly to its application. The sensor size has been reduced by 70%, allowing for much more discreet wearability for patients. Medtronic is currently in the development stages of the Project Zeus Sensor.[47] The focus of the Project Zeus Sensor is to reduce burden for patients. This sensor has been designed to be a 7-day externally worn sensor that requires less fingerstick calibration. With an expected launch in the second half of 2021, Dexcom G7 will have several new features.[48] As opposed to a 3-month transmitter battery life, this product will have a disposable sensor and transmitter combination. This sensor was announced as a 10-day sensor; however, Dexcom is working on extending its life to 14-15 days. This model is about 60% smaller than Dexcom G6. Approved in Europe for patients 18 years old and up, Eversense XL is the world's first CGM system with a fully implantable sensor that lasts for up to 180 days.[49] The system does not replace fingerstick blood glucose monitoring, but it is used as an adjunctive. Similar to the currently available Eversense sensor, it can also be worn during MRI procedures.

Role of the Pharmacist

Pharmacists play a pivotal role in numerous areas of patient care, and providing guidance on selecting and using appropriate technology for glucose monitoring is no exception. Pharmacists often provide glucometers or CGM components; hear about various patient challenges, including insurance coverage and apprehension about testing blood glucose; and engage in conversations about patients' overall diabetes management.

CGM technology is ever evolving, and many of these CGM supplies, such as the sensors, are now becoming more accessible by being billed through the prescription health plans. Now that these components are finding their way into retail pharmacy and ambulatory settings, it is vital that pharmacists are staying up to date with this ever-changing field of medicine. Pharmacists can assist with device selection, new device counseling, and data interpretation to empower their patients to further understand the benefits of a CGM system.[50] Depending on the pharmacists' state-specific scope of practice, they might also be able to make treatment recommendations or changes.[51]

In order to educate patients regarding CGMs, pharmacists should be aware of:[51]

- How to attach the sensor and transmitter when applicable

- How and where to insert the sensor
- How to secure the sensor-transmitter to the application site
- How to set up the transmitter-receiver connection
- Interfering medication or substances
- How to distinguish between sensor glucose and blood glucose
- How to calibrate devices when applicable
- When to remove the device for select diagnostic tests
- How to interpret CGM data and trends
- What the up and down arrows mean and how to intervene
- How to adjust alarms

Medicare is continuing to update their recommendations to expand coverage of CGM with requirements such as diagnosis of Type 1 or Type 2 diabetes, treatment with multiple insulin doses or infusion, and the need to frequently adjust insulin doses. As the role of the pharmacist in diabetes care continues to be recognized and expanded, there might be opportunities for exclusive billing for the following CPT codes: 95249 (personal CGM training/download), 95250 (professional CGM insertion/download), and CPT 95251 (CGM interpretation).[51] Although the Medicare guidelines restrict CPT 95251 to advanced practice nurses, physician assistants, and physicians, pharmacists might have a cooperative with local clinics or set up collaborative practice agreements.[52]

Pharmacists might need to explore alternatives to optimize care, including when a monitor is not covered by the patient's insurance, contacting the provider for further documentation, and following up with the patient each step of the way. While not within the scope of this article, it is important to mention that patients who do not qualify for their own device many might qualify for a professional device, which is owned by a practice and loaned to the patient.[53-55]

Conclusion

The market for continuous glucose monitoring technology is continuously evolving. Available data in patients with diabetes show that CGMs can assist with reduction in HbA1c and hypoglycemia, as well as improve overall satisfaction and quality of life. Having a proper understanding of the various types of devices, and the evidence behind these devices, is essential when educating patients about these devices. Pharmacists play a key role in identifying patients who might benefit from the use of CGMs, discussing the various CGM options, assisting with troubleshooting, and helping patients understand the CGM data report. As pharmacists continue to play a pivotal role in diabetes management as part of the interprofessional healthcare team, a pharmacist's ability to create billable patient-care services is on the horizon, and in some practices, already a reality.

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PR *This article has been peer-reviewed. The contribution in reviewing is greatly appreciated!*

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Assessment Questions

1. A wire probe inserted into the skin which detects interstitial glucose values is called:
   a. Reader
   b. Sensor
   c. Transmitter
   d. Receiver

2. **True or False:** Continuous glucose monitors completely replace the need for fingerstick glucose monitoring.
   a. True
   b. False

3. The continuous glucose monitor that transmits glucose values in real-time along with alarms and alerts without user input is called:
   a. Intermittently scanned continuous glucose monitor
   b. Real-time continuous glucose monitor
   c. Fingerstick blood glucose monitor
   d. Closed loop insulin pump

4. Which of the following continuous glucose monitors requires the user to scan the sensor using the display device?
   a. FreeStyle Libre 2
   b. Dexcom G6
   c. Guardian Connect System
   d. Eversense sensor

5. Which of the following substances interferes with the FreeStyle Libre 14 day system?
   a. Greater than 1 gram of acetaminophen taken every 6 hours
   b. 500 mg or higher ascorbic acid (vitamin C)
   c. Greater than 81 mg of aspirin
   d. Tetracycline antibiotics

6. Which of the following continuous glucose monitors require users to calibrate the sensor glucose values using fingerstick blood glucose?
   a. FreeStyle Libre 2
   b. FreeStyle Libre 14 day
   c. Dexcom G6
   d. Guardian Connect System

7. Assessing a patient's Ambulatory Glucose Profile included in a continuous glucose monitor report, which of the following is a correct treatment goal for a 45 year-old patient with Type 2 diabetes?
   a. More than 50% of glucose values between 70-180 mg/dL
   b. More than 70% of glucose values between 70-180 mg/dL
   c. More than 50% of glucose values between 80-130 mg/dL
   d. More than 70% of glucose values between 80-130 mg/dL

8. Which of the following statements regarding evidence for use of rtCGMs is correct?
   a. Evidence for reduction of time in hypoglycemic range is consistent throughout all different types of diabetes.
   b. Evidence for reduction in HbA1c is consistent throughout all different types of diabetes.
   c. It has shown to reduce HbA1c only in the patients with Type 1 diabetes.
   d. Use of rtCGM can replace the need for pre- and post-prandial SMBG testing in pregnant patients with diabetes.

9. Which of the following most accurately describes the role a community-based pharmacist can play when assisting a patient using a continuous glucose monitor?
   a. Educating patient how to make sense of various alerts
   b. Troubleshooting when the sensor is not sticking to the application area
   c. Educating patients about drugs that can interfere with sensor glucose values
   d. All of the above

10. Did the activity meet the stated learning objectives? (if you answer no, please email sarahs@pswi.org to explain)
    a. Yes
    b. No

11. On a scale of 1 – 10 (1-no impact; 10-strong impact), please rate how this program will impact the medication therapy management outcomes or safety of your patients.

12. On a scale of 1 – 10 (1-did not enhance; 10-greatly enhanced), please rate how this program enhanced your competence in the clinical areas covered.

13. On a scale of 1 – 10 (1-did not help; 10-great help), please rate how this program helped to build your management and leadership skills.

14. How useful was the educational material?
    a. Very useful
    b. Somewhat useful
    c. Not useful

15. How effective were the learning methods used for this activity?

a. Very effective
b. Somewhat effective
c. Not effective

16. Learning assessment questions were appropriate.
    a. Yes
    b. No

17. Were the authors free from bias?
    a. Yes
    b. No

18. If you answered "no" to question 17, please comment (email info@pswi.org).

19. Please indicate the amount of time it took you to read the article and complete the assessment questions.

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ID CORNER

Lefamulin (Xenleta®) for community-acquired bacterial pneumonia (CABP)

by Stephanie Londre, PharmD

According to the World Health Organization, lower respiratory disease is the fourth leading cause of death worldwide.[1] At the same time, antibiotic resistance has emerged in several common pathogens that cause community-acquired bacterial pneumonia (CABP).[2] The general treatment modalities used for CABP, according to the 2019 CABP Infectious Diseases Society of American (IDSA) guideline, are beta-lactams, doxycycline, macrolides, or fluoroquinolones, depending on CABP severity and setting (outpatient versus inpatient).[3]

Lefamulin belongs to a class of antibiotics called pleuromutilins, which were first developed in the 1950s and have been used in veterinary medicine for more than 30 years.[4] The mechanism of action of lefamulin is unique, in that it binds to the 50S ribosomal subunit of bacteria to prevent peptide transfer. In 2019, the Food and Drug Administration (FDA) granted lefamulin approval for the treatment of CABP. Lefamulin is active against common CABP pathogens, including Streptococcus pneumoniae, Haemophilus influenza, Moraxella catarrhalis, Chlamydophila pneumoniae, Mycoplasma pneumonia, and Legionella pneumophila. Lefamulin also has activity against several antibiotic-resistant bacteria, including methicillin-resistant S. aureus (MRSA), vancomycin-resistant Enterococcus faecium (VRE), and multi-drug-resistant S. pneumoniae. Lefamulin is generally well-tolerated and is available in intravenous (IV) and oral formulations. Infusion site reactions (for the IV formulation), nausea, diarrhea, and increased liver function tests are noted to be the most common side effects of lefamulin.[5] There are several warnings and precautions associated with lefamulin use, including QT prolongation, embryo-fetal toxicity, and Clostridium difficile-associated diarrhea. However, the incidence of QT prolongation and Clostridium difficile-associated diarrhea in patients taking lefamulin is <2%.

CLINICAL QUESTION

Is lefamulin an effective treatment option for community-acquired bacterial pneumonia compared to standard of care?

Literature Review

Literature searches were executed in PubMed using the following search terms: "lefamulin" and "community-acquired bacterial pneumonia." The Lefamulin Evaluation Against Pneumonia (LEAP) 1 trial was a phase 3, double-blind randomized controlled trial (RCT) that evaluated the efficacy of lefamulin versus moxifloxacin for CABP.[6] The RCT included adult patients who had radiographically documented pneumonia, were categorized with a Pneumonia Outcomes Research Team (PORT) Risk Class ≥III, were ill for ≤7 days, had ≥2 vital sign abnormalities, and at least 1 other finding of CABP, and who initially needed IV antibiotics for CABP. For reference, PORT is a clinical prediction tool for morbidity and mortality for CABP. A total of 551 patients were randomized to receive lefamulin 150 mg IV every 12 hours (n=276) or moxifloxacin 400 mg IV every 24 hours (n= 275). After 3 days of IV treatment, patients were converted to oral lefamulin 600 mg every 12 hours, or moxifloxacin 400 mg every 24 hours, once predetermined benchmarks were met. Additionally, if MRSA was suspected, linezolid 600 mg IV every 12 hours was added to the moxifloxacin group.

The LEAP 2 trial was a phase 3, double-blind RCT that compared CABP treatment with lefamulin for 5 days to treatment with moxifloxacin for 7 days.[7] A total of 738 patients were randomized to receive lefamulin 600 mg by mouth every 12 hours for 5 days (n= 370) or moxifloxacin 400 mg by mouth every 24 hours for 7 days (n= 368). The RCT included adult patients who had radiographically documented pneumonia, were categorized with a PORT Risk Class ≥II, were ill ≤7 days, had ≥3 CABP symptoms, and had ≥2 vital sign abnormalities.

In both LEAP 1 and LEAP 2, the FDA primary endpoint was early clinical response (ECR).[2] ECR was defined as an improvement in ≥2 CABP symptoms without any worsening CABP symptoms, and no other antimicrobial use 96 ±24 hours after the first dose of the study treatment. Additionally, the European Medicines Agency (EMA) co-primary endpoints were the investigator assessment of clinical response (IACR) at the test of cure in both the modified intention to treat population (mITT) and the clinically evaluable (CE) populations. IACR was defined as an improvement of CABP without the use of other antimicrobials 5-10 days after the last dose of the study treatment. The mITT population was defined as all randomized patients who received at least one dose of the study drug, and the CE population consisted of patients who met the following criteria: no indeterminate clinical response, completion of at least 48 hours of treatment with the

study drug, and no additional antibiotics received.

In a pooled analysis of both LEAP 1 and LEAP 2, lefamulin was found to be non-inferior for ECR (89.3% vs 90.5%; difference -1.1, 95% confidence interval [CI] -4.4 to 2.2) compared to moxifloxacin.[2] In LEAP 1, the non-inferiority margin for ECR was 12.5%.[6] Compared to moxifloxacin, lefamulin was found to be non-inferior for ECR (87.3% vs 90.2%, respectively; difference -1.9%, 95% confidence interval [CI] -8.5 to 2.8). In both the mITT and CE populations, the non-inferiority margin for IACR at the test of cure was 10%. Lefamulin was found to be non-inferior to moxifloxacin for IACR at the test of cure in the mITT population (81.7% vs 84.2%, respectively; difference -2.6%, 95% CI -8.9 to 3.9) and the CE population (86.9% vs 89.4%, respectively; difference -2.5%, 95% CI -8.4 to 3.4). In LEAP 2, the non-inferiority margin was 10% for both ECR and IACR. Lefamulin was found to be non-inferior to moxifloxacin for ECR (90.8% vs 90.8%, respectively; difference, 0.1%, 1-sided 97.5% CI -4.4% to ∞) and IACR (mITT 87.5% vs 89.1%, respectively; difference -1.6%, 1-sided 97.5% CI -6.3 to ∞; CE 89.7% vs 93.6%, respectively; difference -3.8%, 1-sided 97.5% CI -8.2% to ∞).[7]

A limitation of the LEAP 1 trial was the addition of linezolid IV when MRSA was suspected, because most institutions prefer vancomycin over linezolid for MRSA coverage. Thus, the actual population of patients with CABP and MRSA risk factors may not be accurately represented. The authors of this study concluded that lefamulin monotherapy was as efficacious for CABP as moxifloxacin ± linezolid. Lefamulin showed high response rates for common CABP pathogens and was well tolerated. A limitation of the LEAP 2 trial was its baseline characteristics, because most patients enrolled were white (74.1% in the lefamulin group and 73.4% in the moxifloxacin group). The authors of this study concluded that lefamulin is an effective alternative CABP therapy option.

Evidence-based answer: Lefamulin is non-inferior to moxifloxacin for CABP (Strength of recommendation = A, based on consistent high-quality, patient-oriented evidence from RCTs). Current literature is lacking, however, as moxifloxacin is not the standard of care for outpatients with CABP who do not have comorbidities, according to the 2019 CABP IDSA guideline. Thus, further research comparing lefamulin to amoxicillin, doxycycline, or macrolides is needed to fully answer the clinical inquiry question.

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Wisconsin Pharmacy Workforce Study Final Report - 2020

by Brianne K. Bakken, PharmD, MHA, Aaron N. Winn, PhD, Megan Ose, PharmD, MHA, David A. Mott, PhD, Erin Walcheske, MS

Editors Note:

The full report can be found on the PSW website here: https://www.pswi.org/Resources/Resources-for-Your-Practice/Wisconsin-Pharmacy-Workforce-Reports

Pharmacists are integral practitioners in assuring safe, effective and affordable medication therapy for millions of patients in the U.S. They are able to provide expertise to patients, providers, payers and policymakers. As the healthcare system evolves toward value-based payments and greater care coordination across the providers and settings, pharmacists are being asked to develop and deliver new services, even as their practice settings evolve. As pharmacists take on new, expanded services, the roles and responsibilities of pharmacy technicians have also started to evolve. Pharmacy technicians are taking on more operational responsibilities, participating in expanded "tech-check-tech" activities, and are being integrated into new patient care services. While this evolving pharmacy landscape is creating new opportunities for both pharmacists and technicians, it also may have challenges such as stress, burnout and job turnover.

Given this dynamic situation, it is vital to assess the demographics, workplace characteristics, work activities, and quality of work life of both pharmacists and technicians. There is a history of conducting national pharmacist workforce studies, which have been conducted in 2000, 2004, 2009, 2014, and 2019 by the Midwest Pharmacy Workforce Research Consortium (MPWRC). This work, supported by the Pharmacy Workforce Center (previously the Pharmacy Manpower Project), is the only national systematic workforce study focused on licensed pharmacists. A focused Wisconsin Workforce Survey will allow for focused questions that are specific to pharmacy practice characteristics, trends and issues specific to the state of Wisconsin. Given the recent unprecedented pandemic of COVID-19, the Wisconsin Workforce

FIGURE 1. Pharmacist & Technician Age, Gender, and Race/Ethnicity

	Pharmacists		Technicians		Total	
Age Category	***n***	***Column %***	***n***	***Column %***	***n***	***Column %***
<30	84	20.4	42	31.8	126	23.2
31-35	56	13.6	24	18.2	80	14.7
36-40	53	12.9	13	9.8	66	12.1
41-45	48	11.7	20	15.2	68	12.5
46-50	39	9.5	9	6.8	48	8.8
51-55	37	9.0	9	6.8	46	8.5
56-60	25	6.1	7	5.3	32	5.9
61-65	22	5.3	8	6.1	30	5.5
66-70	33	8.0	0	0.0	33	6.1
>70	15	3.6	0	0.0	15	2.8
Total	**412**		**132**		**544**	
Gender Identity	***n***	***Column %***	***n***	***Column %***	***n***	***Column %***
Male	171	41.5	19	14.4	190	34.9
Female	241	58.5	112	84.8	353	64.9
Non-Binary	0	0.0	1	0.8	1	0.2
Total	**412**		**132**		**544**	
Race/Ethnicity	***n***	***Column %***	***n***	***Column %***	***n***	***Column %***
American Indian	5	1.2	1	0.8	6	1.1
Asian	17	4.1	5	3.8	22	4.0
Black	9	2.2	7	5.3	16	2.9
White	372	90.3	108	81.8	480	88.2
Other	9	2.2	11	8.3	20	3.7
Total	**412**		**132**		**544**	
Hispanic, Spanish or Latino/ Latina	3	0.7	10	7.6	13	2.4

FIGURE 2. Pharmacists' Employment Status By Age, Gender Identity, and Race/Ethnicity

	Practicing Pharmacist	Not Practicing Pharmacy	Unemployed	Retired	Total	
Age	**Column %**				**n**	**Column %**
<30	21.3	0.0	0.0	0.0	68	19.3
31-35	14.1	16.7	14.3	0.0	47	13.4
36-40	14.7	16.7	28.6	0.0	50	14.2
41-45	13.1	0.0	14.3	0.0	43	12.2
46-50	11.3	0.0	14.3	0.0	37	10.5
51-55	8.4	50.0	0.0	0.0	30	8.5
56-60	5.3	16.7	14.3	10.5	21	6.0
61-65	5.3	0.0	14.3	21.1	22	6.3
66-70	4.4	0.0	0.0	42.1	22	6.3
>70	2.2	0.0	0.0	26.3	12	3.4
Total (n)	**320**	**6**	**7**	**19**	**352**	
Gender Identity	**Column %**				**n**	**Col %**
Male	35.9	50.0	28.6	94.7	138	39.2
Female	64.1	50.0	71.4	5.3	214	60.8
Non-Binary	0.0	0.0	0.0	0.0	0	0.0
Total (n)	**320**	**6**	**7**	**19**	**352**	
Race/Ethnicity	**Column %**				**n**	**Col %**
American Indian	0.9	0.0	0.0	0.0	3	0.9
Asian	4.1	0.0	0.0	0.0	13	3.7
Black	2.2	0.0	0.0	0.0	7	2.0
White	91.3	100.0	100.0	100.0	324	92.0
Other	1.6	0.0	0.0	0.0	5	1.4
Total (n)	**320**	**6**	**7**	**19**	**352**	
Hispanic, Spanish or Latino/Latina	0.9	0.0	0.0	0.0	352	0.9

survey will also ask questions to explore the impact of COVID-19 on pharmacists and technicians and their work environments.

Objectives

The purpose of this study was to conduct a Wisconsin Pharmacy Workforce Survey using a study design similar to the 2019 National Pharmacist Workforce Survey. The Wisconsin iteration was distributed to both pharmacists and technicians and will include new survey questions designed to measure relevant workforce demographics and practice characteristics for the profession of pharmacy in Wisconsin.

Methods

An online, cross-sectional, descriptive survey design was used to collect and analyze data obtained from pharmacists and technicians in the state of Wisconsin. Data was collected using an online Qualtrics survey (Qualtrics, Provo, UT, USA).

Survey Questionnaire

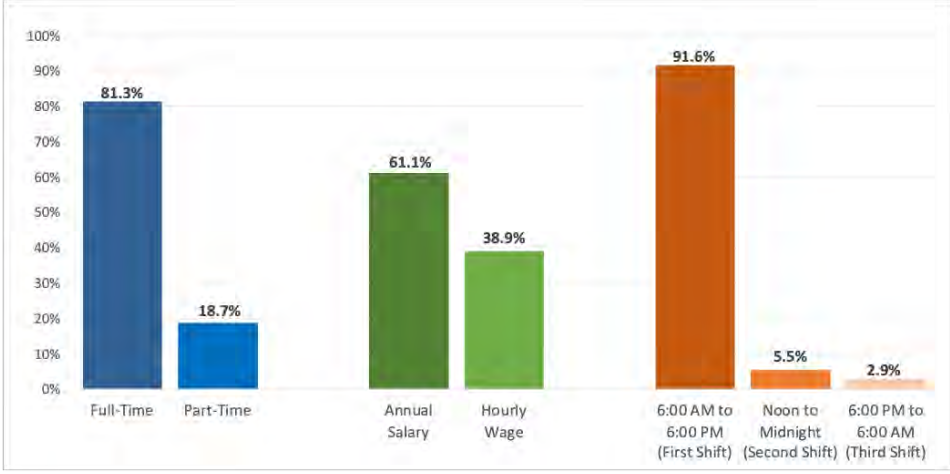
Questions comprising each section of the survey were primarily based on questions used in previous iterations of the National Pharmacy Workforce Survey and from other published work. New questions were created to assess the impact of the COVID-19 pandemic on the pharmacy workforce, as no previously validated or published questions were available.

The survey questionnaire included the following topic areas: (1) Demographics, (2) Education and Training, (3) Employment Status and Work Environment, (4) Supply and Demand, (5) Technician Regulations, and (6) Impact of COVID-19. Survey respondents were required to select their role as a Pharmacist or Technician, but were otherwise allowed to skip any of the other questions if they did not wish to answer or disclose the information requested.

Survey Administration

The email addresses of licensed pharmacists living in the state of Wisconsin were obtained from the Wisconsin Department of Health and Professional

FIGURE 3. Practicing Pharmacists' Employment Characteristics



Note: Pharmacists were classified as working part-time if they worked 30 hours or less per week in their primary employment.

FIGURE 4. Pharmacists' Age, Gender Identity & Race/Ethnicity By Practice Setting

	Community	Hospital	Ambulatory Care	Other
Age Category	**Column %**			
<30	17.8	20.5	28.1	23.9
31-35	15.0	15.2	15.6	8.7
36-40	8.4	21.2	6.3	15.2
41-45	14.0	15.2	3.1	13.0
46-50	11.2	12.9	18.8	0.0
51-55	11.2	4.5	9.4	15.2
56-60	7.5	4.5	3.1	4.3
61-65	7.5	3.8	12.5	0.0
66-70	6.5	0.8	3.1	10.9
>70	0.9	1.5	0.0	8.7
Total (n)	**107**	**132**	**32**	**46**
Gender Identity	**Column %**			
Male	42.1	34.1	25.0	37.0
Female	57.9	65.9	75.0	63.0
Non-Binary	0.0	0.0	0.0	0.0
Total (n)	**107**	**132**	**32**	**46**
Race/Ethnicity	**Column %**			
American Indian	1.9	0.0	0.0	2.2
Asian	3.7	3.0	3.1	6.5
Black	4.7	0.8	0.0	2.2
White	88.8	93.9	93.8	89.1
Other	0.9	2.3	3.1	0.0
Total (n)	**107**	**132**	**32**	**46**
Hispanic, Spanish or Latino/Latina	1.9	0.0	3.1	0.0

Note: Other included less common practice settings with less than 10% of pharmacists respondents, including nursing home/long-term care, academia, industry, mail order, managed care/PBMs, home health, and "other".

Services (WDHPS) database of in-state pharmacy licenses. Pharmacists with email addresses available in the database received three emails containing a hyperlink to the online survey. Pharmacists were asked to click on the survey link to access the survey. The three email prompts to pharmacists were distributed on the following dates: (1) August 25, 2020 (2) September 8, 2020 and (3) September 22, 2020.

Given there is no centralized organization that maintains a database of pharmacy technicians in Wisconsin, they were recruited using an alternative process. The email addresses of pharmacy license holders were obtained from the Wisconsin Department of Health and Professional Services (WDHPS) database. Pharmacy license holders received three emails informing them of the survey and asking their willingness to participate in the research study. Pharmacy license holders were asked to report the total number of technicians employed at their organization and were asked to send the hyperlink to those technicians. The three email prompts to pharmacy license holders were distributed on the following dates: (1) August 25, 2020 (2) September 8, 2020 and (3) September 22, 2020.

Data Analysis

Submitted surveys were available to researchers at the Medical College of Wisconsin through their Qualtrics account. On October 17, 2020 the survey data files were downloaded from Qualtrics and uploaded to SPSS Statistics Software (IBM Corp., Armonk, NY, USA) and Stata MP 15.0 (Stata Corp., College Station, TX, USA) for further analysis.

Results

Response Rate

The list of Wisconsin licensed pharmacists was obtained from WDPHS on July 23, 2020. The list included a total of 6,651 individuals of which 1,347 (20.3%) had email addresses provided. During survey distribution, 47 email addresses were determined to be faulty and were not able to be reached. A total of 1,300 pharmacists ultimately received the email containing the survey link.

The list of in-state pharmacies was also obtained from WDHS on July 23, 2020. The list included a total of 1,036

FIGURE 5. Pharmacists' License, Degrees & Residency Training By Practice Setting

	Community	Hospital	Ambulatory Care	Other
Year of First License	***Column %***			
1961 to 1970	0.0	0.0	0.0	4.3
1971 to 1980	11.2	3.0	6.3	8.7
1981 to 1990	15.9	7.6	15.6	10.9
1991 to 2000	20.6	21.2	21.9	17.4
2001 to 2010	12.1	25.8	18.8	19.6
2011 to 2020	38.3	40.2	37.5	34.8
Total (n)	**107**	**132**	**32**	**46**
Degrees Obtained	***Column %***			
BS Pharm	48.6	28.8	40.6	43.5
PharmD	55.1	80.3	68.8	65.2
Master's Degree (e.g. MS, MBA, MHA, MPH)	0.0	0.0	0.0	0.0
PhD	0.0	12.1	3.1	15.2
Total (n)	**107**	**132**	**32**	**46**
Residency Training	***Column %***			
PGY1	5.6	46.2	31.3	15.2
Pharmacy Practice	0.0	41.7	21.9	10.9
Community	5.6	4.5	9.4	4.3
Managed Care	0.0	0.0	0.0	0.0
PGY1/PGY2	0.0	8.3	0.0	0.0
Health-System Pharmacy Administration	0.0	5.3	0.0	0.0
Pharmacotherapy	0.0	2.3	0.0	0.0
Specialty Pharmacy Administration	0.0	0.8	0.0	0.0
PGY2	0.0	9.8	12.5	21.7
Ambulatory Care	0.0	0.0	9.4	6.5
Critical Care	0.0	3.0	0.0	0.0
Health-System Pharmacy Administration	0.0	2.3	0.0	0.0
Infectious Diseases	0.0	0.0	0.0	2.2
Internal Medicine	0.0	0.8	0.0	0.0
Oncology	0.0	0.8	3.1	0.0
Pediatric Pharmacy	0.0	3.0	0.0	2.2
Psychiatric Pharmacy	0.0	0.0	0.0	10.9
Board Certification	***Column %***			
BPS Board Certification (Any Kind)	4.7	36.4	28.1	32.6
Total (n)	**107**	**132**	**32**	**46**

Note: Other included less common practice settings with less than 10% of pharmacists respondents, including nursing home/long-term care, academia, industry, mail order, managed care/PBMs, home health, and "other".

in-state pharmacy licenses of which 579 (55.9%) had email addresses provided. After removing duplicate email addresses and email addresses determine to be faulty, 252 license holders were in the sample that received emails regarding the survey. A total of 360 technicians ultimately received the email containing the survey link from the license holder at their organization.

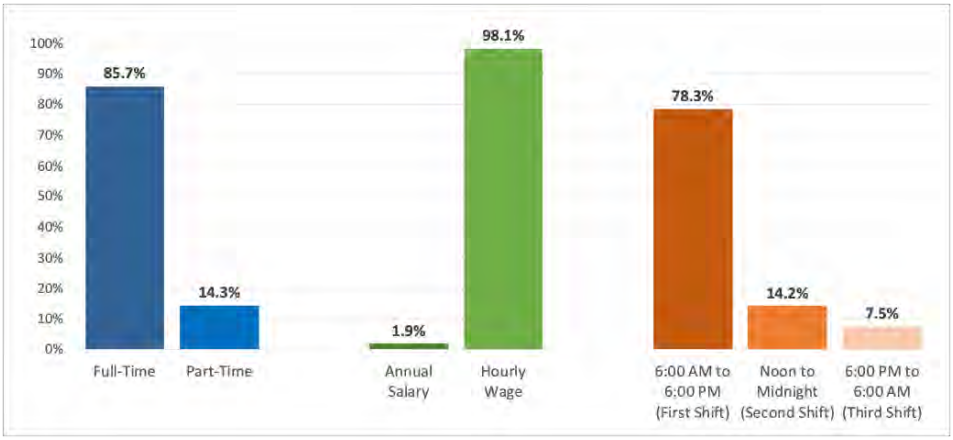
Three separate recruitment emails were sent on (1) August 25, 2020, (2) September 8, 2020, and (3) September 22, 2020. A total of 439 pharmacist responses and 142 technicians responses were received, resulting in an overall response rate of 35% (33.8% pharmacists, 39.4% technicians). Pharmacists and technicians were included in the sample for analysis if they provided responses to demographic questions for age, race, and gender. The resulting sample included 412 pharmacists (31.7%) and 132 technicians (36.7%), which are summarized in Figure 1 by age, gender identify, and race/ethnicity.

Pharmacists

By gender in 2020, 58.5% of licensed pharmacists responding to the survey identified as female, 41.5% identified as male and 0% identified as non-binary. By race in 2020, 90.3% of pharmacists were white, 4.1% were Asian, 2.2% Black, 1.2% American Indian, and 2.2% "Other". The racial diversity of licensed pharmacists in Wisconsin underrepresents the racial diversity of the general population in the United States.

Figure 2 contains a summary of Wisconsin licensed pharmacists based on their employment status. Overall, 90.9% of licensed pharmacists responding to the survey in 2020 were practicing as a pharmacist or working in a pharmacy-related field. The remaining 9.1% of pharmacists responding in 2020 included 5.4% retired pharmacists, 2.0% unemployed pharmacists, and 1.7% pharmacists working in fields other than pharmacy. By age in 2020, 50% of practicing pharmacists were age 40 years or younger, and 50% of practicing pharmacists were age 41 years or older. Furthermore, 11.9% of practicing pharmacists were age 61 years or older. In 2020, 66.7% of pharmacists practicing in fields other than pharmacy or healthcare were age 41 years or older. The number of unemployed

FIGURE 6. Pharmacy Technicians' Employment Characteristics



Note: Technicians were classified as working part-time if they worked 30 hours or less per week in their primary employment.

pharmacists responding in 2020 was low (n=7) and the age of unemployed pharmacists was variable. Of the 5.4% of retired pharmacists that responded in 2020, 89.5% of retired pharmacists were age 61 years or older. By gender in 2020, 64.1% of practicing pharmacists identified as female, 35.9% identified as male, and 0% identified as non-binary. Of the pharmacists that indicated they were unemployed in 2020, 71.4% identified as female and 28.6% identified as male. Of the pharmacists that indicated they were retired in 2020, 94.7% identified as male and 5.3% identified as female. Unemployed pharmacists responding in 2020 were 100% White. Retired pharmacists responding in 2020 were 100% White.

Practicing Pharmacists: Figure 3 shows the employment characteristics for practicing pharmacists. In 2020, 81.3% of practicing pharmacists were working full-time and 18.7% were working part-time (<30 hours per week). The payment structure for practicing pharmacists in 2020 included annual salaries (61.1%) and hourly wages (38.9%). In 2020, 91.6% of practicing pharmacists were primary working during first shift (between 6:00 AM to 6:00 PM). Only 5.5% of practicing pharmacists were primarily working second shift (between noon and midnight) and 2.9% were primarily working third shift (between 6:00 PM to 6:00 AM).

Figure 4 provides a demographic summary of actively practicing pharmacists in 2020 by practice setting. Of the pharmacists actively practicing in 2020, 41.6% reported employment in hospital/health-system practice settings (e.g. government and non-government hospitals and health-systems), 33.8% reported employment in community practice settings (e.g. independent, chain, supermarket), and 10.1% reported employment in ambulatory care practice settings (e.g. outpatient clinics, primary care clinics).

By education in 2020, 63.8% of practicing pharmacists had obtained a PharmD degree and 36.2% had obtained a BS Pharm degree (Figure 5). In community settings, 55.1% of pharmacists obtained a PharmD degree, 5.6% completed a PGY1 residency (any kind), 0% completed a PGY2 residency (any kind), and 4.7% completed BPS Board Certification (any kind). In hospital/health-system settings, 80.3% obtained a PharmD degree, 46.2% completed a PGY1 residency (any kind), 9.8% completed a PGY2 residency (any kind), 8.3% completed a PGY1/PGY2 residency (any kind), and 36.4% completed BPS Board Certification (any kind).

Technicians

In 2020, 85.7% of pharmacy technicians were working full-time and 14.3% were working part-time. (Figure 6) The payment structure for pharmacy technicians in 2020 included primarily hourly wages (98.1%) and very few with annual salaries (1.9%). In 2020, 78.3% of pharmacy technicians were primary working during first shift (between 6:00 AM to 6:00 PM), while 14.2% of pharmacy technicians were primarily working second shift (between noon and midnight) and 7.5% were primarily working third shift (between 6:00 PM to 6:00 AM).

In 2020, 84.3% of pharmacy technicians responding to the survey reported employment in hospital/health-system practice settings (e.g. government and non-government hospitals), 9.3% reported employment in community practice settings (e.g. independent, chain, supermarket), and 6.5% reported employment in other practice settings.

Figure 7 shows the breakdown of pharmacy technicians' age, gender, and race/ethnicity by practice setting. In 2020, 60.2% of pharmacy technicians were age 40 years or younger, and 39.8% of pharmacy technicians were age 41 years or older. Furthermore, only 5.6% of pharmacy technicians were age 61 years or older. In community settings, 70% of pharmacy technicians were under the age of 40 years. In hospital and health-system settings, 59.3% of pharmacy technicians were under age 40 years. By gender in 2020, 86.1% of pharmacy technicians identified as female, 13.0% identified as male, and 0.9% identified as non-binary. By race in 2020, pharmacy technicians self-identified as 81.5% White, 10.0% "Other", 3.7% Asian, 3.7% Black, and 0.9% American Indian or Alaska Native. Overall, 7.4% of pharmacy technicians identified as Hispanic.

Figure 8 provides a summary of the pharmacy technicians' education and training by practice setting. Overall in 2020, 60.2% of pharmacy technicians had received a high school diploma and 10.2% had completed a GED. Furthermore, 35.2% had completed some college, 23.1% received an Associate Degree, 16.7% received a Bachelor's Degree, and 2.8% received a Master's Degree. Overall, 24.1% of pharmacy technicians had completed a technician training program, 69.4% had completed basic technicians certification, and 10% had completed advanced Pharmacy Technician Certification Board (PTCB) certification.

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Manager for Assessment & Analytics at the Medical College of Wisconsin School of Pharmacy in Milwaukee, WI.

FIGURE 7. Technicians' Age, Gender Identity & Race/Ethnicity By Practice Setting

	Community	Hospital	Other
Age Category	***Column %***		
<30	0.0	36.3	28.6
31-35	30.0	15.4	28.6
36-40	40.0	7.7	0.0
41-45	10.0	14.3	14.3
46-50	10.0	6.6	0.0
51-55	10.0	7.7	0.0
56-60	0.0	6.6	14.3
61-65	0.0	5.5	14.3
66-70	0.0	0.0	0.0
>70	0.0	0.0	0.0
Total (n)	**10**	**91**	**7**
Gender Identity	***Column %***		
Male	10.0	14.3	0.0
Female	90.0	84.6	100.0
Non-Binary	0.0	1.1	0.0
Total (n)	**10**	**91**	**7**
Race/Ethnicity	***Column %***		
American Indian	0.0	1.1	0.0
Asian	0.0	4.4	0.0
Black	10.0	3.3	0.0
White	90.0	81.3	71.4
Other	0.0	9.9	28.6
Total (n)	**10**	**91**	**7**
Hispanic, Spanish or Latino/Latina	10.0	7.7	0.0

FIGURE 8. Technicians' Education, Training & Certification By Practice Setting

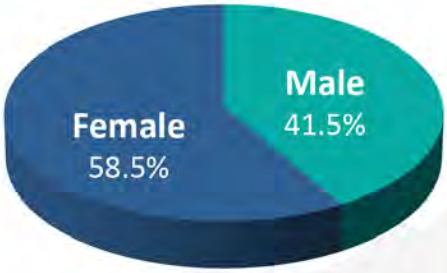
	Community	Hospital	Other
Education	***Column %***		
High School Diploma	40.0	61.5	71.4
GED	0.0	5.5	85.7
Some College, No Degree	40.0	35.2	28.6
Associate Degree	40.0	20.9	28.6
Bachelor's Degree	20.0	16.5	14.3
Master's Degree	0.0	3.3	0.0
Total (n)	**10**	**91**	**7**
Technician Training	***Column %***		
College-Based Technician Training Program	10.0	13.2	14
ASHP-Accredited Technician Training Program	0.0	6.6	0.0
Online Technician Training Program	20.0	4.4	0.0
Total (n)	**10**	**91**	**7**
Technician Certification	***Column %***		
National Healthcareer Association Certification	0.0	4.4	0.0
Pharmacy Technician Certification Board (PTCB) Certification	80.0	60.4	28.6
Other	10.0	5.5	0.0
Total (n)	**10**	**91**	**7**
Advanced Technician Certification	***Column %***		
PTCB Certified Compounded Sterile Preparation Technician	0.0	3.3	0.0
PTCB Advanced Certified Pharmacy Technician	0.0	0.0	0.0
PTCB Medication History Certificate	0.0	1.1	0.0
PTCB Technician Product Verification Certificate	30.0	2.2	0.0
PTCB Hazardous Drug Management Certificate	0.0	1.1	0.0
PTCB Billing and Reimbursement Certificate	10.0	0.0	0.0
Total (n)	**10**	**91**	**7**

The Wisconsin Pharmacy Workforce

Pharmacists

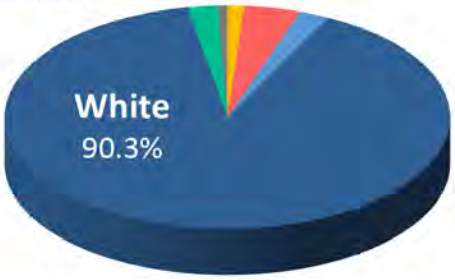
2020

Pharmacists' Gender



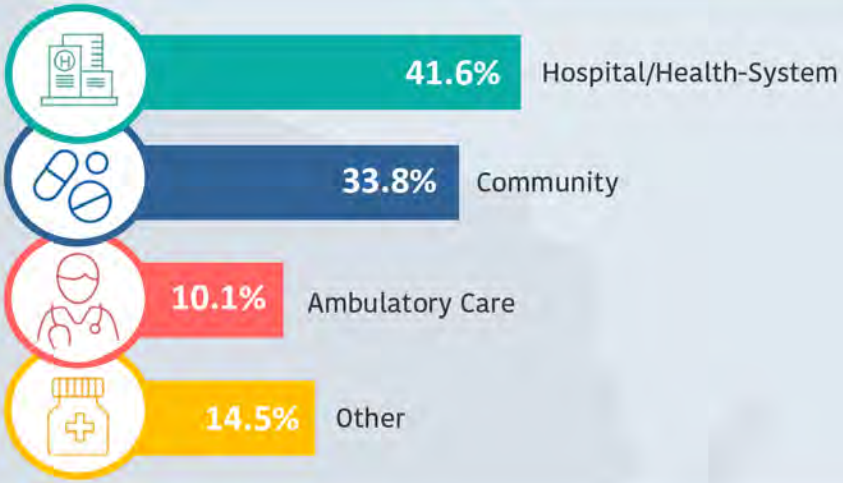
Pharmacists' Race/Ethnicity

- American Indian / Alaska Native
- Asian
- Black
- White
- Other
- Hispanic



PharmD = 63.8%

BS Pharm = 36.2%



81.3% of practicing pharmacists were working full-time (>30 hours per week)

61.1% of pharmacists were paid by annual salaries and 38.9% by hourly wages

91.6% of practicing pharmacists were working during first shift (6:00 AM to 6:00 PM)

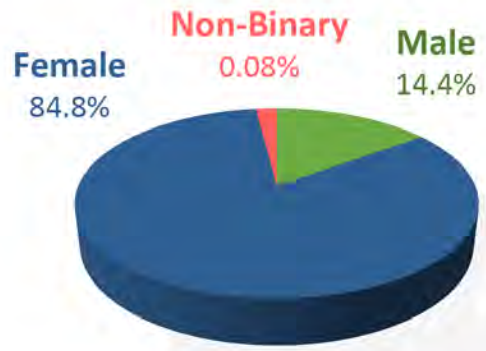
$135,271 Avg. student loan debt at graduation for recent graduates (2011-2020)

Brianne Bakken, PharmD, MHA

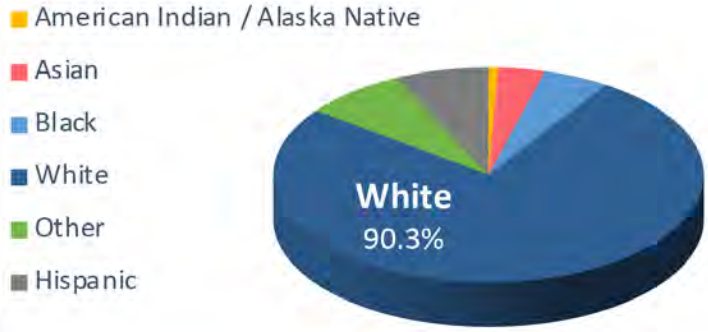
The Wisconsin Pharmacy Workforce 2020

Technicians

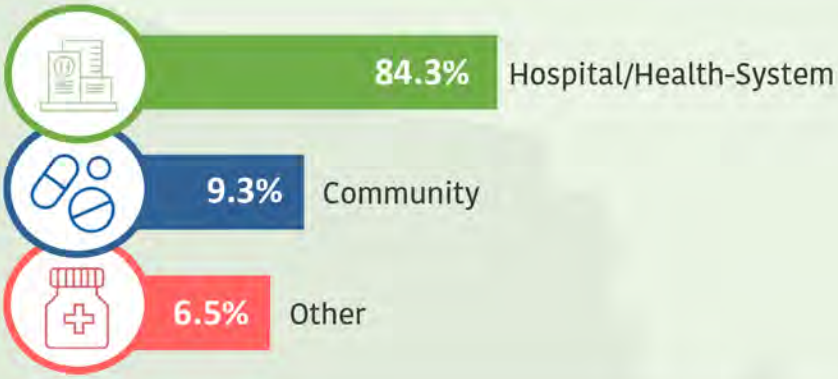
Technicians' Gender



Technicians' Race/Ethnicity



Technician Certification



85.7% of technicians were working full-time (>30 hours per week)

98.1% of technicians were paid by hourly wages and 1.9% by annual salaries

78.3% of technicians were working **first** shift (6:00 AM to 6:00 PM)

7.5% of technicians were working **third** shift (6:00 PM to 6:00 AM)

14.2% of technicians were working **second** shift

4.08 Overall demand rating, which indicates "moderate demand" for technicians

Brianne Bakken, PharmD, MHA

Original Work

Application of Dissemination Science to Implement Interprofessional Telehealth Visits for Veterans

by Edward Portillo, PharmD, Molly Lehmann, PharmD, Britney Youngchild, 2021 PharmD Candidate, Peter Roth, 2021 PharmD Candidate, Caleb Ballweg, 2021 PharmD Candidate

Abstract

VA Video Connect (VVC) is a national initiative by the Department of Veterans Affairs (VA), developed to improve access to care for veterans, using a video-based telehealth modality. This initiative is crucial for providing access to high-quality care for veterans living in rural communities with long drive times to VA facilities, and is even more important in light of the COVID-19 pandemic. Despite the benefits of the initiative, site-specific challenges to VVC implementation exist. This evaluation uses core tenets of dissemination and implementation (D&I) science, specifically the Replicating Effective Programs (REP) model, to determine barriers to and facilitators of VVC implementation at a VA clinic in Madison, Wisconsin. Through analysis of VVC implementation, the evaluating authors designed a training package for clinicians, aimed at increasing VVC use during care transitions for veterans. Knowledge gained from expanding VVC has the potential to be applied to other sites across the VA and the private sector to design training aimed at addressing local challenges to telehealth implementation. With the COVID-19 pandemic impacting the way care is delivered, this evaluation provides a case example of how dissemination science can be used to promote adoption of telehealth best practices.

Telemedicine presents an opportunity to increase access to care for patients, especially rural Americans who are on average older, sicker, and poorer than their urban counterparts.[1,2] Among the nation's aging Veteran population, two in five Veterans Affairs (VA) health care enrollees currently reside in rural areas, and on average 45% of Veterans living in areas classified as "highly rural" travel more than an hour to get to their nearest VA facility.[3] As the largest integrated health care system in the United States, the VA provides care to at least 2.7 million rural Veterans, and telemedicine can offer unique advantages to further enhance care provided to Veterans across the country.

VA Video Connect (VVC) is a national initiative that has been developed to promote video-to-home telemedicine.[4] Veterans enrolled in VVC use a personal computer, tablet, or smartphone from their home to connect with VA care teams over a secure, live video session using the VVC application. The VVC telehealth initiative was designed for Veterans with geographical limitations to healthcare access, those who lack time to regularly attend in-person appointments, or those who do not require hands-on physical examination.[4]

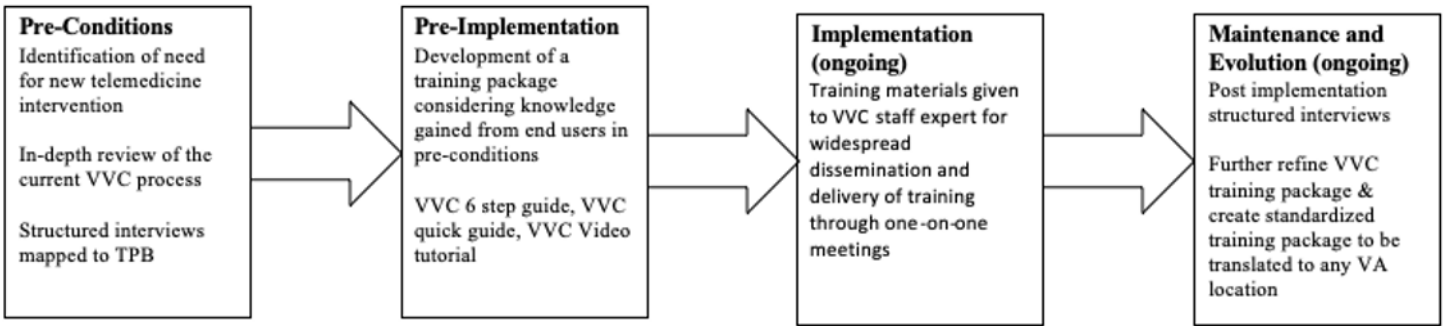
On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak as a pandemic. In response, healthcare systems needed to explore alternative strategies for providing care, to help reduce the risk of transmission of the virus. For healthcare systems without integrated telemedicine, the COVID-19 pandemic is a call to action to adopt the necessary framework to support adoption of telemedicine modalities.[5]

In Wisconsin, there are currently 38 VA outpatient clinics that serve 700,000 Veterans receiving care across the state.[6] This evaluation identifies some unique challenges and opportunities for VVC implementation at one VA outpatient clinic in Wisconsin, with the goal of developing a training package to address challenges that affect VVC use. This clinic location serves on average 11,400 Veterans annually, presenting an opportunity to positively impact care for a large Veteran population locally.[7]

While VVC holds great promise to improve Veteran access to care, opportunities exist to improve Veteran enrollment in the program. Authors used core tenets of Dissemination and Implementation (D&I) science, which is defined by the National Institutes of Health as "the effective delivery of proven clinical interventions within clinical practice."[8] D&I science has emerged over the past 25 years as a growing field of study that examines the process by which scientific evidence is adopted, implemented, and sustained in a setting.[9] VVC expansion is an ideal initiative wherein to incorporate D&I science principles. This evaluation applied the Replicating Effective Programs (REP) framework, which is a D&I science framework initially adopted by the Centers for Disease Control and Prevention (CDC) for human immunodeficiency virus (HIV)-related interventions.[10]

On average, it takes 17 years for best practices to be translated into interventions that benefit patients.[11,12] This research-to-practice gap illustrates the challenges that exist in spreading best practices, and arguably, a similar gap exists for expansion of telemedicine services across the United States. It has been demonstrated that D&I

FIGURE 1. This figure outlines the Replicating Effective Programs (REP) process as it can be applied to health care interventions for expanding VA Video Connect (VVC) utilization



science, which promotes systematic uptake of research findings into routine practice, plays a crucial role in supporting these efforts.[12] The VVC process outlined in this manuscript is a quality improvement initiative, demonstrating how principles from D&I science can be leveraged to (1) identify barriers to and opportunities for VVC expansion and (2) design a training package that best meets the needs of VVC end users. Such an approach can be replicated at other medical centers across the VA and private sector to incorporate best practices into routine clinical care.

Methods

The REP framework includes four specific components: (1) pre-conditions, (2) pre-implementation, (3) implementation, and (4) maintenance/evolution (Figure 1). The pre-conditions phase aims to identify the needs of the project by completing an in-depth review of current VVC processes, and interviews to identify key barriers and effective interventions that can be used to implement this best practice. Pre-implementation incorporates the knowledge gained from the pre-conditions phase to develop a training package to fit the local setting where the intervention will occur. The implementation phase is where training and materials are distributed to support the desirable practice change. The final phase of the REP framework, maintenance/evolution, is designed to better understand the effectiveness of the training program, as well as how future training can be modified for future implementation work. This evaluation specifically considers the first two components of the REP framework (pre-conditions and pre-implementation) as an approach to develop, implement, and evaluate a training package for interprofessional clinicians who are tasked with adopting VVC. Using the REP framework in training design is intended to keep in mind specific barriers learners have identified, and serves as a case-study example for how D&I science can be applied to incorporate best practices.

Pre-Conditions: Identify barriers to and interventions for VVC expansion

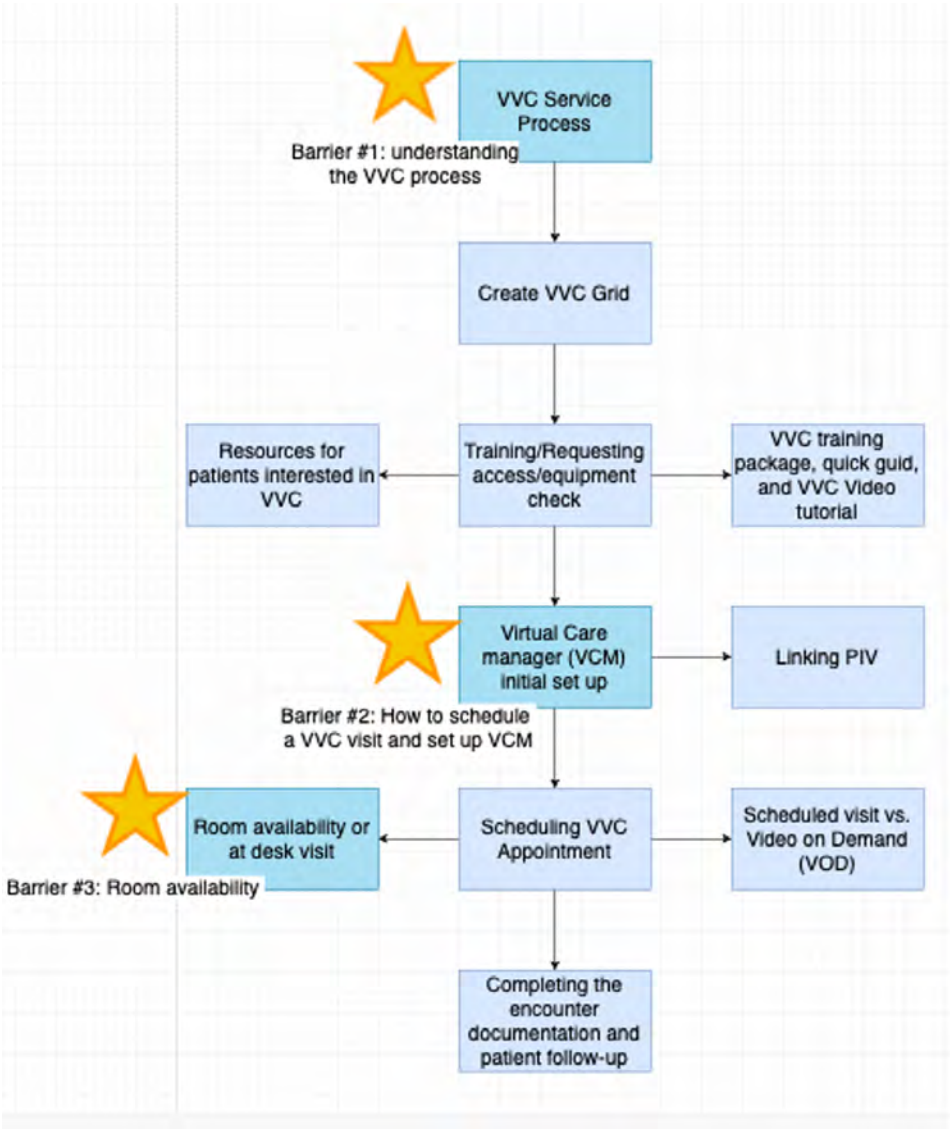
During the pre-conditions phase, the authors first considered barriers and facilitators to VVC expansion within the local setting where the intervention will occur. The authors used a mixed-methods approach, including direct-observation, mapping of the VVC process, structured interviews with clinic staff, and a brief pre-conditions questionnaire. These questionnaires were used to obtain staff input on further VVC incorporation and ideas for quality improvement initiatives. Structured discussions consisted of individual meetings with nurse care managers (RNCM) and clinical pharmacy specialists (CPS) practicing in the clinic. Staff members provided an in-depth explanation of the current VVC process and access to resources for VVC use.

The Theory of Planned Behavior (TPB) was used to guide the design of six questions on the pre-conditions questionnaire (Table 1), aimed at better understanding clinicians' perspectives on VVC.[13] The questionnaire included six fixed-choice items where clinicians ranked their confidence performing elements of the VVC process, using a seven-point Likert scale. In addition, clinicians were asked three free-response questions. The authors used the TPB

TABLE 1. 6-item questionnaire mapped to the Theory of Planned Behavior (TPB). Clinicians ranked their confidence performing elements of the VA Video Connect (VVC) process using a seven-point Likert scale. (1=Very low confidence, 7= Very high confidence) The TPB elements are shown in italics.

Structured Interview Question mapped to TPB Element	*Mean*	*Median*
I am confident that I can easily complete all steps necessary to coordinate a VVC visit *(Perceived behavioral control)*	4.47	5
Many of us at the clinic are having difficulty increasing VVC utilization *(Subjective norm)*	4.94	6
My team and colleagues are supportive of me completing VVC visits *(Subjective norm)*	6.25	7
I intend to increase VVC visit utilization over the next 6 months despite potential challenges *(Intention)*	5.06	6
I will be just as effective serving Veterans during VVC visits as during face to face encounters *(Attitude)*	5.59	6
Our Veterans would benefit from receiving care using VVC *(Attitude)*	5.94	6

FIGURE 2. Process map designed to gain clear understanding of VA Video Connect (VVC).



Stars indicating the top three barriers to implementation and facilitation. This process map was simplified for the purpose of widespread dissemination.

because it focuses on respondents' attitudes, confidence, and beliefs. Three evaluation team members reviewed notes from discussions and reconciled discrepancies to determine the final, overarching themes clinicians had described. These themes, which focused on the barriers and facilitators to the VVC process, were then added to the developed process map to gain a clearer understanding of where challenges and opportunities might occur during training development (Figure 2).

Pre-Implementation: design a training package that best meets the needs of VVC end users

The second phase of the REP framework, pre-implementation, involved the development of a training package designed to address the barriers and facilitators detailed in the first phase. This training package was shared with CPSs and RNCMs at the clinic for feedback.

Expert Recommendations for Implementing Change (ERIC) strategies were also considered, to ensure that dissemination science approaches were being used to guide training package design.[14] ERIC strategies are "methods or techniques used to enhance the adoption, implementation, and sustainability of a clinical program or practice." The ERIC strategies that were heavily emphasized include (1) make training dynamic (2) identify early adopters and (3) shadow other clinicians.[14] These ERIC strategies helped develop a training that is informed by the clinician team and enjoyable to view.

Results

Pre-Conditions

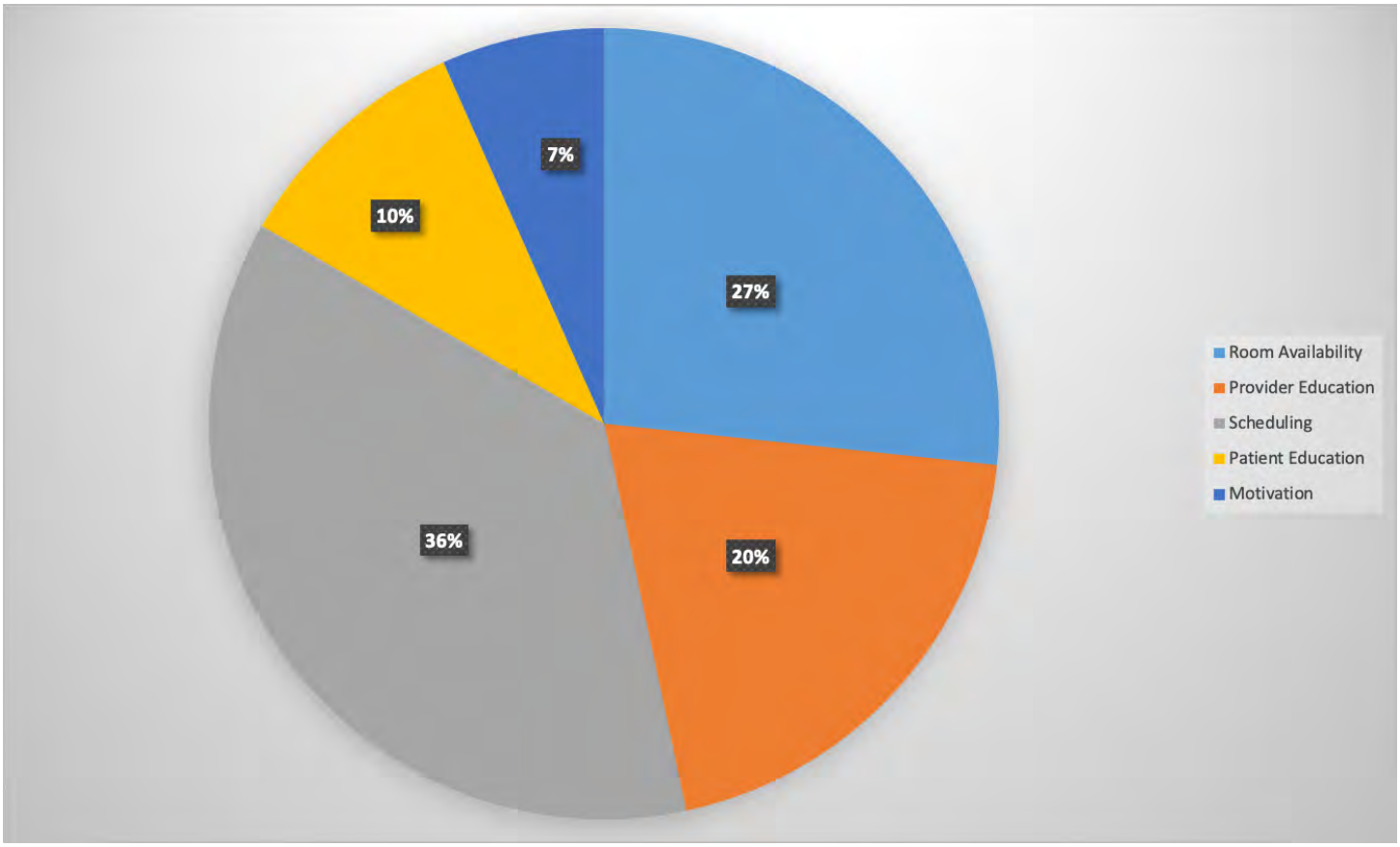
Seventeen clinicians, including both CPSs and RNCMs, were available to discuss the VVC process and completed the pre-conditions questionnaire. Clinicians had on average 13.5 years of practice experience and had variable experience completing VVC visits. The top barriers to VVC use identified through survey analysis is shown in Figure 3, and included: visit scheduling (36% of the respondents); space for visit completion (27% of respondents); and complexity of the current VVC process (20% of respondents). Clinicians who had completed prior VVC visits indicated that their largest use of VVC was for diabetic care (33%), followed by medication management (20%) and hypertension management (20%).

Results from the pre-conditions questionnaire showed an average of 0.35 VVC visits for every 10 patients seen in-clinic, per clinician. Clinicians, however, believe that on average 2.3 of every 10 patients would benefit from a VVC visit. On the Likert scale, providers responded with the least confidence to "I am confident that I can easily complete all steps necessary to coordinate a VVC visit." This question had a wide range of responses, with an average score of 4.47 out of 7. The highest Likert scale item, where providers felt most confident, was "My team and colleagues are supportive of me completing VVC visits," with an average score of 6.24 out of 7.

Pre-Implementation

Using information from the first phases, the authors created training materials: (1) VVC Quick Guide, (2) VVC Step-by-Step Guide, and (3) VVC Video Tutorial. Materials were reviewed and approved by key clinician stakeholders. The VVC Quick Guide is an accessible quick reference, detailing how to access training documents, troubleshooting resources, a brief overview of the VVC visit, and help desk support information (Box 1). The VVC Step-by-Step Guide is a compilation of all VVC training information. It includes information on requesting access to equipment, scheduling

FIGURE 3. Current VA Barriers for Providing VVC. Pie graph depicting provider-identified barriers (n=17) for VA Video Connect (VVC) utilization.



an appointment, successfully completing a visit, and troubleshooting resources. Lastly, the 10-minute VVC Video Tutorial is a visual version of the information in the Step-by-Step Guide.

There were varying viewpoints among clinicians, in that some felt comfortable providing VVC visits from their desks, while others felt this could be distracting due to background noise. The team proposed encouraging and allowing VVC visits to be completed at clinician's desks, to help reduce the need for clinic room availability (one barrier to VVC use). In addition, the authors developed a new workflow for requesting room access when scheduling a VVC visit, for those clinicians who still wish to use a clinic room.

Discussion

This case study presents an example of how D&I science can be leveraged to identify barriers to and opportunities for the expansion of a best practice, with the design of a training package to best meet the needs of VVC end users. Using the REP model as a guide, we found that the key barriers to implementing VVC were scheduling, room availability, and understanding the VVC process. Training package development was guided by addressing each of these barriers.

VVC Process Understanding

It was clear from clinician feedback that the process of scheduling a VVC visit can be complex. Through discussions with early adopters of VVC, the authors discovered which current processes are successful, and where issues needed to be addressed. The different modalities of training materials (guides and video) were intended to fit the varying learning styles of clinicians just beginning the VVC process. Box 1 outlines the six step process for VVC scheduling"

The authors found that clinicians were motivated, and wanted to use VVC. In the preconditions survey, providers thought there was much more value that patients could get out of VVC delivery than what was currently being delivered.

The need for VVC and telemedicine has been amplified during the COVID-19 pandemic. VVC and telemedicine tools require proper training, and without this, it is difficult to get buy-in from staff. D&I science helps identify evidence-based interventions that can be successfully adopted, implemented, and maintained in a health care setting with the ultimate goal of caring for patients. This same approach can be replicated at other medical centers across the VA and private sector to increase the spread of this best practice.

Limitations

One clinic location was selected for this evaluation, rather than multiple, to help better understand the unique challenges and opportunities that exist in implementing VVC, with the goal of tailoring a training package to address this clinic's specific work processes. It is not currently known whether the training materials created during this study would fully translate to other locations. Due to the fact that VVC

is part of a national mandate currently being implemented by the VA, some of the developed training materials might be applicable at other VA facilities. Without an understanding of the differences in workflow, staff behavior, and VVC processes at different VA locations, it remains unclear how this training might need to be adapted to fit other settings.

This evaluation was completed during one academic school year. The exact amount of time spent in the pre-conditions and pre-implementation phases was not collected by the authors. Limited time and/or personnel to complete similar initiatives could be potential barriers to widespread dissemination.

Future Directions

Implementation, Maintenance & Evolution

With the effort to expand care to Veterans who are living in rural settings, the training materials were provided to VA staff for widespread dissemination, via one-on-one meetings with CPSs, RNCMs, medical scheduling assistants, and other clinicians. One-on-one training allows for a deep dive into the VVC process, addresses the individual concerns of the trainee, and makes space for technical assistance.

Pre-conditions & Pre-Implementation

Using a well-established telemedicine modality will continue to be a best practice moving forward. The D&I science framework can be applied at other medical centers across the VA and private sector to better understand barriers and facilitators that exist at that location. For future expansion to other outpatient clinics within the VA, a similar process should be considered, since it is likely that unique barriers might exist at each clinic location; retrospective analysis of multiple locations could lead to the creation of one single training package within a health system.

Conclusions

The REP framework can be used to design and evaluate user-centered training for expansion of the VVC telemedicine services within the Department of Veterans Affairs. The knowledge gained from this evaluation, as well as the approach taken by the authors to expand patient reach using telemedicine, has the potential to be applied to other areas of practice to expand telemedicine opportunities. Opportunities exist to further explore the application of D&I science to spread innovative telemedicine services across VA facilities.

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PR *This article has been peer-reviewed. The contribution in reviewing is greatly appreciated!*

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BOX 1: VA VIDEO CONNECT (VVC)

VA Video Connect (VVC) quick guide outlines the six step process for VVC scheduling:
https://qrco.de/bbT6MN

Review Article

The Role of a Pharmacist in Breaking Down Barriers to Improve Continuous Glucose Monitoring Use

by Erin Newkirk, PharmD, CDCES, BCPS, Sushma Dey, PharmD

Continuous glucose monitoring (CGM) systems are wearable devices that are inserted into the skin to measure interstitial glucose levels every 1-5 minutes throughout the day. CGM allows patients and clinicians to view glucose data trends, and the majority of systems are approved by the U.S. Food and Drug Administration (FDA) to be used for diabetes treatment decision making (Table 1). CGM use has been increasing and can be beneficial for patients who require self-monitoring of glucose. CGM systems can be prescribed for personal and professional use. "Personal" use refers to prescribing a CGM for the patient to use and view the transmitted data. The two types of personal CGMs on the market are real-time CGMs (rtCGMs) and intermittently scanned CGMs (isCGMs).[1] The major difference between the two is that rtCGMs automatically transmit a continuous stream of glucose data to a receiver, while isCGMs require the patient to scan the sensor to obtain glucose information.

Alternatively, professional-use CGM systems (Table 2) are purchased by the clinic and worn intermittently by patients, as a useful patient-teaching tool. They can provide important data for pattern identification and insulin dose adjustments. Professional CGMs can be set up in "blinded" or "unblinded" modes. Unblinded CGM allows patients to see glucose data in real time, while blinded CGM captures glucose data without influencing the patient's behavior in the moment.[6]

CGM has been shown to help people with diabetes improve their day-to-day management of diabetes and achieve positive long-term outcomes.[7] Studies have shown that, irrespective of insulin delivery, A1c reductions are greater with the use of CGM.[8] CGM use across the entire spectrum of people with diabetes is recommended by most experts. In previous guidelines, CGM was only proposed for people who did not meet glucose targets, had hypoglycemia unawareness, or experienced hypoglycemia.[9] The CGM selection criteria have been expanded to include everyone using a rapid-acting insulin. The 2021 American Diabetes Association (ADA) Standard of Medical Care guidelines now state that CGM is recommended for all patients who use multiple daily injections of insulin or pump therapy.[10]

TABLE 1. CGM Systems[2-5]

	Dexcom G6	FreeStyle Libre 14 day/FreeStyle Libre 2	Guardian 3	Eversense
CGM Type	rtCGM	isCGM	rtCGM	rtCGM
Calibration with fingerstick BG required?	No	No	Yes, at the minimum every 12 hours	Yes, at the minimum twice daily spaced 10-14 hours apart
FDA approved for treatment decisions?	Yes	Yes	No	Yes
Duration of Sensor Wear	10 days	14 days	7 days	90 days
Transmitter Information	Replace after 3 months	No transmitter	Rechargeable Replace after 122 uses or 1 year, whichever comes first	Rechargeable Replace Yearly

BG = blood glucose; CGM = continuous glucose monitor; isCGM = intermittently scanned CGM; rtCGM = real-time CGM

TABLE 2. Professional CGM Systems[2-5]

	Dexcom G6 Pro	FreeStyle Libre Pro	Medtronic iPro2
Blinding Options	Blinded or unblinded	Blinded	Blinded
Calibration with fingerstick BG required?	No	No	Yes, at the minimum four times a day
Duration of Sensor Wear	10 days	14 days	6 days

BG = blood glucose; CGM = continuous glucose monitor

Barriers to obtaining and successfully using CGM systems include misunderstanding of eligibility requirements; lack of knowledge about CGM systems and how to utilize the data; and the cost of obtaining and using the system. Pharmacists are in a key position to break down some of these barriers.

Insurance Coverage for CGM

Historically, the majority of insurance companies limited personal CGM coverage to patients with a diagnosis of type 1

diabetes. Medicare expanded coverage of therapeutic CGMs that are FDA-approved for making diabetes treatment decisions for patients with either type 1 or type 2 diabetes as long as multiple requirements are met (Table 3).

Medicare currently provides coverage for Dexcom, FreeStyle Libre and Eversense CGM systems, which are all approved for non-adjunctive use.[2-5] In other words, these CGM systems can be used as the primary device to make diabetes treatment decisions. At this time, some Wisconsin Medicaid plans cover CGM only for patients with type 1 diabetes. Wisconsin Medicaid will rarely cover personal FreeStyle Libre CGM, with some plans only covering personal Dexcom G6 CGM if the patient is being followed within an endocrine practice and a Dexcom G6 Professional session has been completed. Some plans require the patient to provide a 30- or 60-day glucose log demonstrating glucose testing of four or more times per day, and documentation of a recent provider visit. Depending on the insurance type, coverage may be through medical or pharmacy benefits. Most commercial insurance plans cover Dexcom and FreeStyle Libre through the pharmacy benefit. The process for everyone involved is much smoother when patients are able to receive their CGM through the pharmacy benefit; however, the majority of Medicare and Medicaid plans require CGM to go through as durable medical equipment (DME), which can add additional time and steps to complete before a person with diabetes can receive the CGM system.

As guidelines continue to recommend CGM use, systems have become more affordable and accessible. Despite advancements, the cost of personal-use CGM systems is still a barrier to their use, even with expanded insurance coverage. Personal-use CGM systems should be considered for all patients using insulin therapy. Professional-use CGM is an ideal option for those who cannot afford a personal device, as most persons with diabetes have coverage for professional-use CGM. It also serves as an opportunity for persons with diabetes to learn about how CGM works, experience what it is like to wear a device prior to considering personal-use CGM, and learn how daily lifestyle factors impact glucose control.

Pharmacists have a vital role in identifying potential candidates, guiding device selection, teaching patients how to use the device, and helping patients understand their data. There are also unique billing opportunities, using CPT codes 95249 (personal CGM training/download), 95250 (professional CGM insertion/download), and CPT 95251 (CGM interpretation).[11] Services associated with CPT codes 95249 and 95250 may be completed by a pharmacist in a face-to-face format with the requirement of 72 hours of data collection to be billed. CGM interpretation associated with CPT code 95251 can be completed in a non-face-to-face format. The CPT code 95251 provides reimbursement for interpretation and analysis of CGM data and is only billable by a physician or licensed non-physician provider with potential opportunities for pharmacist involvement with this service through a collaborative practice agreement.[12]

TABLE 3. Medicare Criteria for CGM Use[11]

Patient has diabetes
Evidence of SMBG ≥ 4 times per day
Patient is insulin-treated with ≥ 3 daily insulin injections or using an insulin pump
Insulin regimen requires frequent adjustments on basis of glucose readings
Follow-up with the treating healthcare provider a minimum of every six months to assess diabetes treatment

CGM = continuous glucose monitor; SMBG = self-monitoring blood glucose

The Importance of CGM Data Use and Interpretation

To ensure optimal use, the ADA recommends that patients receiving CGM systems obtain robust diabetes education, training and support, and medication management based on data from the CGM reports.[13] Patients benefit from education on numerous aspects of using CGM. When patients initially use CGM, a common reaction is to chase the glucose readings, which can often result in hypoglycemia followed by hyperglycemia, or a "roller coaster" glucose pattern.

Pharmacists understand the pharmacokinetics of insulin therapy and are in a key position to discuss the onset, peak, and duration of action of insulin to avoid insulin stacking and over-treating high/low glucose readings. Patients can benefit from discussing glucose patterns with pharmacists who can provide insight into how factors like dose-timing, dietary intake, and exercise are impacting insulin action and glucose levels.

Retrospectively reviewing data with patients requires both patients and healthcare providers to understand the steps for sharing CGM data. Each CGM system allows healthcare providers and caregivers to have access to glucose data, but there can be multiple barriers to uploading CGM data without proper education and equipment. The clinic or pharmacy staff need to understand which platform can be used to upload data for each CGM device. If patients are using smartphones as their display device, patients can be invited to automatically share their data to the company's platform option(s) for the diabetes team to review the data. If the patient is using a reader or receiver as the display device, patients can be invited to share their data with the use of a computer and USB cord to upload the data. Data management systems used to sync patient blood glucose meters, such as Glooko and Tidepool, can also be used to manage data from select CGM systems. Table 4 provides information about data sharing for commonly used CGM systems.

Some patients might feel overwhelmed by having access to all the CGM data, or lack the diabetes skills to process the information. It is crucial that patients are actively involved in the CGM review. Pharmacists and other healthcare providers are the coaches in the background, who know the evidence and have the experience, but treatment decisions need to take into account patient lifestyle and preferences. As a coach, it is important to always find something going well before discussing any areas of opportunity to improve glucose control.

Depending on the CGM device, a report

TABLE 4. CGM Data Sharing Applications, Sharing Options, and Display Options[4,14-16]

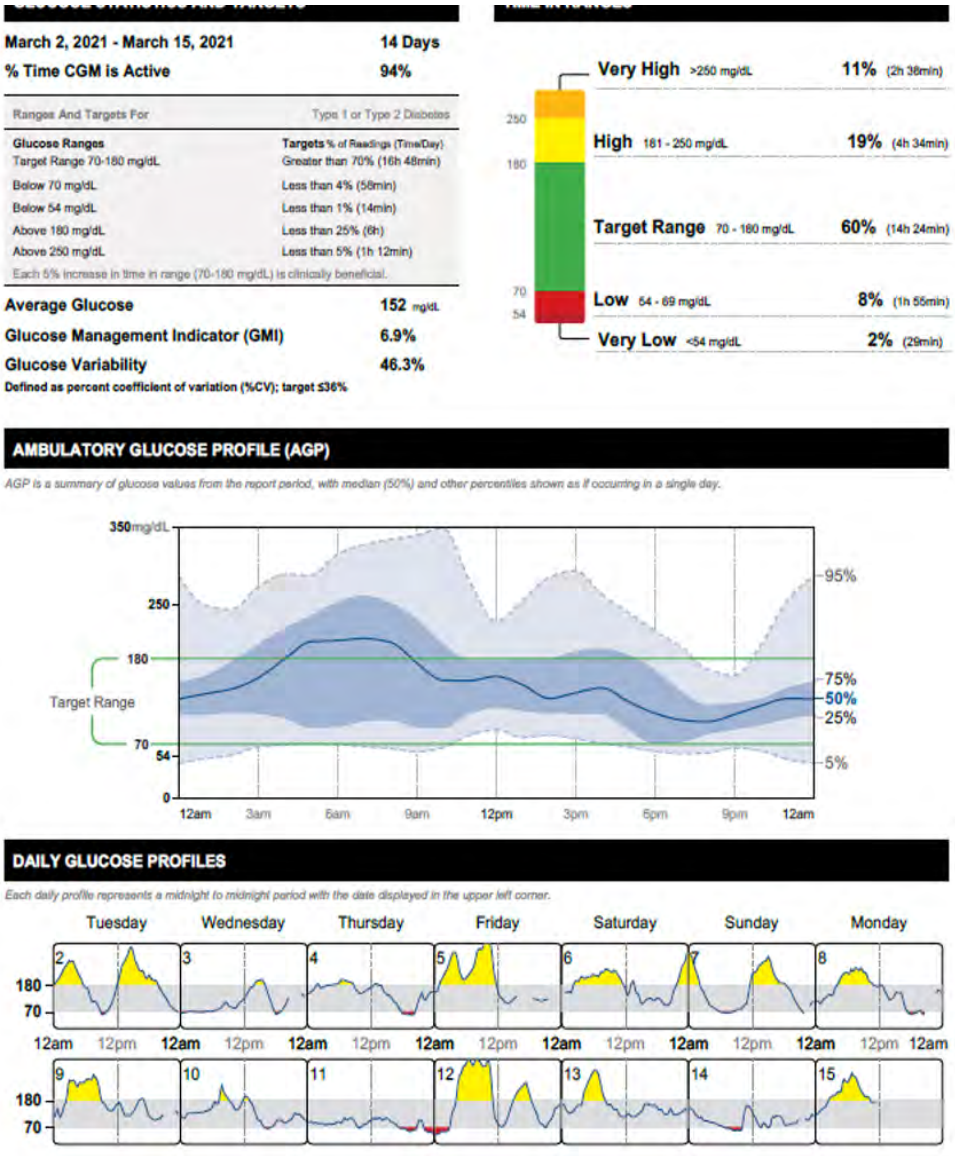
CGM System	Data Sharing Methods	Share With	Display Options	Notes
Dexcom G6	**Dexcom CLARITY:** cloud-based software to view glucose trends on computer or app **Dexcom G6 app**[a]**:** smartphone app for patient to view glucose data **Dexcom Follow:** smartphone app for caregivers to view glucose data if patient is using mobile device	• Healthcare professionals via Dexcom CLARITY after accepting to share data via sharing code provided by clinic/ pharmacy • Caregivers via Dexcom Follow app (up to 10 followers)	• Receiver • Android™ or iOS smartphone • Apple watch® and Android watch OS display screens (with paired compatible smartphone) • T:slim X2® (Tandem) insulin pump • Compatible with Glooko and Tidepool	• Smartphone and reader display device options • Display device must be within 20 feet of Dexcom transmitter for glucose readings • Receiver stores 120 glucose readings, important to upload receiver to Clarity at least every 30 days to ensure data is not lost • Mobile device automatically uploads to Dexcom CLARITY every 3 hours
FreeStyle Libre Systems	**FreeStyle Libre 14 day** **FreeStyle LibreView:** cloud-based software to view glucose trends on computer **LibreLink**[a]**:** smartphone app for patient to view glucose data **LibreLinkUp**[a]**:** smartphone app for caregivers to view glucose data	• Healthcare professionals via LibreView • Caregivers via LibreLinkUp app (up to 20 followers)	• Reader • Android™ or iOS smartphone • FreeStyle Libre Reader is compatible with Tidepool	• Smartphone and reader display device options • Patients must scan at least every 8 hours for glucose readings • Reader stores up to 90 days of glucose data that can be viewed for historic trends • Automatic data upload to LibreView each time sensor is scanned
	FreeStyle Libre 2 **FreeStyle LibreView:** cloud-based software to view glucose trends on computer No smartphone app available yet	• Healthcare professionals via LibreView • FreeStyle Libre 2 users cannot share data with caregivers at this time	• Reader only • FreeStyle Libre 2 is compatible with Tidepool	• Reader display option • Patients must scan at least every 8 hours for glucose readings • Reader stores up to 90 days of glucose data that can be viewed for historic trends • No automatic data upload at this time
Medtronic Guardian™ Connect	**CareLink:** cloud-based software to view glucose trends on computer **Guardian™: Connect US**[a] smartphone app for patient and caregivers to view glucose data **Sugar IQTM Diabetes Assistant**[b] - companion app that identifies glucose patterns & activities affecting them	• Healthcare professionals via CareLink • Medtronic Guardian Connect cannot share data with caregivers	• Android™ or iOS smartphone • iPad® (with compatible iPhone) • compatible with InPen™ (Medtronic) smart insulin pen app	• Unable to use GuardianTMConnect if patient is using insulin pump (670G) integration • Smartphone is the only way to view/ upload data, no separate display device available
Eversense	**Eversense DMS:** software to view glucose trends on computer **Eversense mobile app**[a]**:** smartphone app for patient to view glucose data **Eversense Now app:** smartphone app for caregivers to view glucose data	• Healthcare professionals via Eversense DMS • Caregivers via Eversense Now app (up to 5 followers)	• Android™ or iOS smartphone • Apple watch® and iPad® (with paired compatible iPhone)	• Smartphone is the only way to view/ upload data, no separate display device available

CGM = continuous glucose monitor; DMS = data management system
a Application available on Android and iPhone smartphones
b Application available on iPhone smartphones only

could include up to 35 pages of data, which can make it overwhelming to identify which reports are most useful to optimize the time spent during the visit. The International Diabetes Center created a format for a standardized, single-page report that includes glucose statistics, glucose patterns, and glucose trends (Figure 1) called the Ambulatory Glucose Profile (AGP).[17,18] The AGP is the gold standard of presentation data of CGM devices, analogous to the electrocardiogram (EKG). AGP should be as familiar and easily interpreted as an EKG record. Any clinician looking at an EKG doesn't need to ask about which device is being used, but about how the heart is doing. The AGP report is a one-page report that allows clinicians to look visually and quickly at the glucose data, regardless of which CGM device is being used.

The AGP report defaults to data from the last 14 days, as that period has been found to correlate well with 3 months of CGM data. It is important to have at least 10 days or ~70% of the data on the report in order to make sure there is a reliable representation of the patient's usual

FIGURE 1. Ambulatory Glucose Profile Report[17]



Printed with permission from the International Diabetes Center. The Ambulatory Glucose Profile was developed by International Diabetes Center, HealthPartners Institute, Minneapolis, MN.

routine.[19] The AGP report is organized into 3 sections.

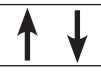
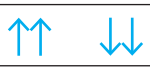
The top section of the AGP includes glucose statistics and time in range targets, which provide information on whether any action needs to be taken. Information on glucose exposure includes the average glucose over the time range of collected data (usually 14 days); and the glucose management indicator (GMI). GMI was formerly called "estimated A1c"; however, it was confusing to patients, as it did not match their lab A1c value. GMI is calculated directly from the average glucose value from the CGM device, which provides a more direct and accurate measure of glucose levels that can be calculated for a shorter period of time. Since GMI is not determined by how much sugar is attached to hemoglobin molecules on red blood cells, it eliminates common misinterpretations of the variance in A1c, caused by a number of factors including kidney disease, iron deficiency, sickle cell disease, the use of certain medications, and differences between racial and ethnic groups.[20]

The time in range targets on the AGP report are considered as important as A1c. Like A1c, patient and disease factors are used to determine optimal time in range (TIR) for each individual patient. The 2019 International Consensus report on Time in Range recommends that patients have a TIR goal of more than 70% of the time within the target range of 70-180 mg/dl, less than 4% of time spent below 70 mg/dl, and less than 25% of the time spent above 180 mg/dl. Since most patients do not break down their day by percent of time, it can be helpful to highlight that 70% is just under 17 hours of the day, 4% is around 1 hour of the day, and 25% is 6 hours of the day. It has been estimated that for every 10% (roughly 2.5 hours/day) increase in TIR, there is a 0.5%-0.8% A1c reduction.[17] A truly landmark observation associating TIR with the development or progression of retinopathy, and the development of microalbuminuria, using the Diabetes Control and Complications Trial (DCCT) data validated the use of TIR as an outcome measure for clinical trials.[7] The 2021 ADA guidelines state that time in range (TIR) can be used for assessment of glycemic control, has been shown to be associated with microvascular complications, and is an acceptable study end point for clinical trials.[10]

The last section of the glucose metrics focuses on glycemic variability. Standard deviation (SD) is one way to evaluate variability; however, there is not a specific target as the SD is highly influenced by the mean glucose. Most experts prefer to evaluate glucose variability by evaluating the coefficient of variation (CV), which is calculated by taking the standard deviation divided by the mean times 100%. This division helps "correct" and normalize glucose variability, allowing a single variability goal of < 36%.[21] The CV best correlates with the relative risk of hypoglycemia. The higher the CV, the more variable the glucose is and the more problematic it is for the patient to live their normal life.

If the glucose metrics discussed above are not at goal, the next step is to move on to evaluate the graphical sections of the AGP report. The graphical sections of the AGP report help identify what action should take place.[18] The middle portion of the report includes a profile graph that provides a visual snapshot of glucose trends and patterns derived from the period of data acquisition. This graph gives the big picture and helps quickly identify any trouble spots. Having patients share their story when evaluating the graphs can identify lifestyle

TABLE 5. CGM System Arrows and Interpretation for Select Systems[2-5]

Arrow Direction	Interpretation for Glucose Trend			
	Dexcom G6	FreeStyle Libre 2	Guardian 3	Eversense
→			N/A	
	Increasing/decreasing <1 mg/dL/min			
↗↘				
	Increase/decrease 30-60 mg/dL in 30 min	Increase/decrease 1- 2 mg/dL/min	Increase/decrease 1 mg/dL/min	Increase/decrease 1- 2 mg/dL/min
↑↓				
	Increase/decrease 60-90 mg/dL in 30 min	Increase/decrease > 2 mg/dL/min	Increase/decrease 2 mg/dL/min	Increase/decrease > 2 mg/dL/min
↑↑↓↓		N/A		N/A
	Increase/decrease > than 90 mg/dL in 30 min		Increase/decrease 3 mg/dL/min	

CGM = continuous glucose monitor; dL = deciliter; mg = milligram; min = minute; N/A = not applicable

factors that might be impacting glucose control. It can be helpful to mark up the graph with key events during a typical day, such as awakening, meal times, medication timing, bedtime, exercise, etc. The goal for this profile graph is flat, narrow, and in range. Some helpful questions include the following:

- What do you think is causing this pattern of glucose?
- What do you think would help improve your glucose control?

The bottom of the AGP report shows the daily glucose profile, which allows for verification of patterns spelled out in a calendar format. Looking at the daily patterns with patients helps identify behavioral changes needed to do better in real time, day-to-day management. Once any troubled area is identified, an actionable item should be identified with the patient. Of course, the No. 1 patient safety priority would be to eliminate any hypoglycemia.

In the end, both patients and providers have access to the one-page AGP report, which shows a big-picture view to help develop a diabetes management plan. When looking at the retrospective CGM data, healthcare providers need to involve their patients, and review the AGP report together. Patients using CGM data in real time is the way to get the most out of the technology on the path to successful diabetes management.

CGM Trend Arrows and Alarms

CGM trend arrows are one of the most useful components of CGM systems, as they can help prevent real-time hypoglycemia and hyperglycemia. Each CGM device has trend arrows, which can inform a patient if the glucose trend is rising, falling, or staying relatively steady. (Table 5). It is important to educate the patient on how to respond to the arrows, to avoid overtreatment of glucose levels. An important consideration is that the arrow direction is determined by the past 10 to 20 minutes of glucose values, and patients should evaluate trend arrows and keep in mind that the arrow predicts what glucose levels will likely be in the next 20 to 30 minutes. If a patient is having issues with receiving glucose trends, ensure that the patient is keeping the CGM display device within the distance specified by the manufacturer of the transmitter (i.e. 20 feet).

All CGM devices besides the FreeStyle Libre 14 day have CGM alarms, which can be one of the most useful components to help prevent hypoglycemia and prolonged hyperglycemia. However, alarms can be incredibly bothersome if not set correctly. It is important to work with each patient to identify the glucose level threshold—at what level is glucose considered out of range for that patient, and the alarm should sound? Pharmacists can help patients identify the best alarm settings so the alerts are helpful, versus causing alarm fatigue.

Solutions to CGM Sensor Placement Issues

CGM sensor placement and skin issues can be a challenge for some patients. Some patients may experience allergic reactions or contact dermatitis. Some reactions can be prevented by placing the sensor on thoroughly dry, clean, oil-free skin; rotating sites to preserve skin integrity; and avoiding areas of the skin that are already compromised. Placing the sensor in an area that avoids friction, such as the waistline, is also helpful. Patients who still experience skin reactions can use a skin protection barrier film or a barrier patch under the sensor. Some CGM manufacturers provide barrier patches at no cost to patients; patients can call customer service for help with sensor placement. There are also a variety of over-the-counter options for skin protection (Tables 6, 7).

Careful sensor removal techniques or the use of products to help with removal is also important. Diphenhydramine, hydrocortisone, or polysporin/bacitracin ointments can be used for acute skin treatment if needed.[22] Patients can also

TABLE 6. Options for Patients with Adhesive- Allergy/Skin Reactions[22,24-25]

Product Type	Product	Notes
Non-adhesive wraps: • Coban • Ace	Elastic wraps should be wrapped loosely and removed during sleep to avoid excessive tissue compression	Provides extra support to keep CGM in place during activity
Benadryl Antihistamine Spray®	Creates a thin barrier on skin	Useful to prevent reactions to CGM adhesives
Fluticasone Nasal Spray (Paret, M, 2020)	Can be sprayed onto skin as a topical steroid to prevent skin irritation/inflammation[24]	• Useful to prevent reaction to CGM adhesives • Spray should not decrease adhesive properties of CGM

CGM = continuous glucose monitor

TABLE 7. Adhesive/Barrier Product Options to Improve CGM Wear[22, 24-25]

Product Type	Product	Properties	Notes
Liquid Adhesives	Skin Tac™	• Barrier protection • Latex-free and hypoallergenic	• Available in wipes and liquid • May require removal product (TacAway™)
	Mastisol® Liquid Adhesive	Strongest liquid adhesive	• Available in liquid, swabs, and single-use vials • May require removal agent (Detachol®)
	SKIN-PREP®	• Barrier protection • Weakest liquid adhesive	Available in wipes and liquid
Transparent films	• IV3000 • Tegaderm HP™ (holding power)	• Physical barrier between skin and adhesive patch • Hypoallergenic	• Film may peel with sweating and water exposure • Thin film can be cut to fit specific CGM device/ customized to wearer preference
Adhesive Patches	• GrifGrips® • RockaDex • Simpatch™	• Cloth-like patches • Flexible, breathable, water resistant	• All listed products have pre-cut patches customized to fit Dexcom, Libre, and Guardian CGM systems. • Several colors and designs available
Adhesive Tape	**Clear plastic tapes:** • BlendtermTM • TransporeTM **Surgical Tape** **Kinesiology tape:** • RockTape® • KT Tape	Kinesiology tapes are cloth-like and water-resistant	Best suited to be used in addition to adhesive patches

CGM = continuous glucose monitor

consider using a different site; there has been no observed difference in sensor accuracy between upper arm and abdominal sites.[23] In areas where there is scar tissue from insulin injections, there can be sensor accuracy concerns, so patients should avoid those areas.

Some people have difficulty keeping the device in place for the full wear duration. Pharmacists are in a key position to help advise patients on liquid adhesive agents, adhesive patches, or tapes that can help keep the sensor in place for the indicated time (Table 7). Liquid adhesives can be used to create an additional line of adhesive on the skin where the device will be applied. Liquid adhesives should be applied as a ring around where the device will be placed, to avoid placing the adhesive in the exact spot where the CGM sensor is inserted. Several liquid adhesives also provide barrier protection that may help to reduce skin irritation from device placement. For patients who continue to have issues with displacement of CGM after trying liquid adhesives, transparent films and adhesive patches can be used to help hold the transmitter in place. Patients who are athletes, swimmers, or spend time outdoors will benefit from using adhesive patches and tapes that are breathable to protect the CGM from being removed due to sweat and/or excess water exposure.

Conclusion

With improved accuracy and affordability, CGM has quickly become a mainstay of diabetes management. It is important that patients know that CGM is not simply a replacement for fingerstick blood glucose monitoring, but a diabetes tool to help optimize glucose control. With CGM, patients have access to continuous glucose data to help identify glucose trends, adjust lifestyle factors, make informed treatment decisions, reduce the risk of hypoglycemia, and augment insulin delivery in automated insulin dosing (AID) systems. It is important to emphasize to a person with diabetes that they will get the most out of CGM by using both individual, real-time focused interventions to assess glucose status or the potential of hypoglycemia, and evaluating the "big picture" that comes from retrospective review of daily patterns. CGM technology can facilitate patient-centered discussions in clinical decision making and empower behavioral change. Pharmacists can incorporate CGM into diabetes management practices to help optimize therapy and be involved with a service that allows pharmacists to work at the top of their license that benefits patients.

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PR *This article has been peer-reviewed. The contribution in reviewing is greatly appreciated!*

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"MORTAR & PENCIL" CONCORDIA UNIVERSITY WISCONSIN SCHOOL OF PHARMACY STUDENT WRITING CLUB:

Prescription Discount Cards: What Pharmacists Need to Know

by LaNea E. Bartel, 2023 PharmD Candidate, Elizabeth M. Soter, 2024 PharmD Candidate, Sara A. Witt, 2022 PharmD Candidate

Abstract

The use of prescription discount cards is becoming popular as patients are concerned with rising drug costs. The benefits of these cards are widely advertised, and many patients use them to reduce out-of-pocket costs. Some aspects of the cards are not commonly known, such as the effects on pharmacy reimbursement and workflow; whether the cards can be combined with insurance; or what patient data are required to use them. It is important for pharmacists to be informed about the cards when recommending them to patients as the use of prescription discount cards continues to grow.

The cost of prescription drugs is an increasing concern for patients. While there are continuous discussions regarding the best strategies to reduce the burden of medical costs, one potential solution was created by pharmacy discount card companies. A popular example, GoodRx, was founded in 2011,[1] and it is becoming increasingly popular with consumers. In the third quarter of 2020, GoodRx reported 4.9 million active users.[2] These cards are designed to lower the out-of-pocket costs of prescription drugs for consumers. Typically, an advertisement for a discount card depicts the patient simply showing the pharmacist their smartphone screen, with the lowest drug price to be applied to the prescription. However, the process is often much more complicated. For example, discount cards may disrupt the profits and workflow of the pharmacy, and they may not lower patient costs enough. Therefore, it is important to understand how pharmacy discount services work and their effects on both the patient and the pharmacy.

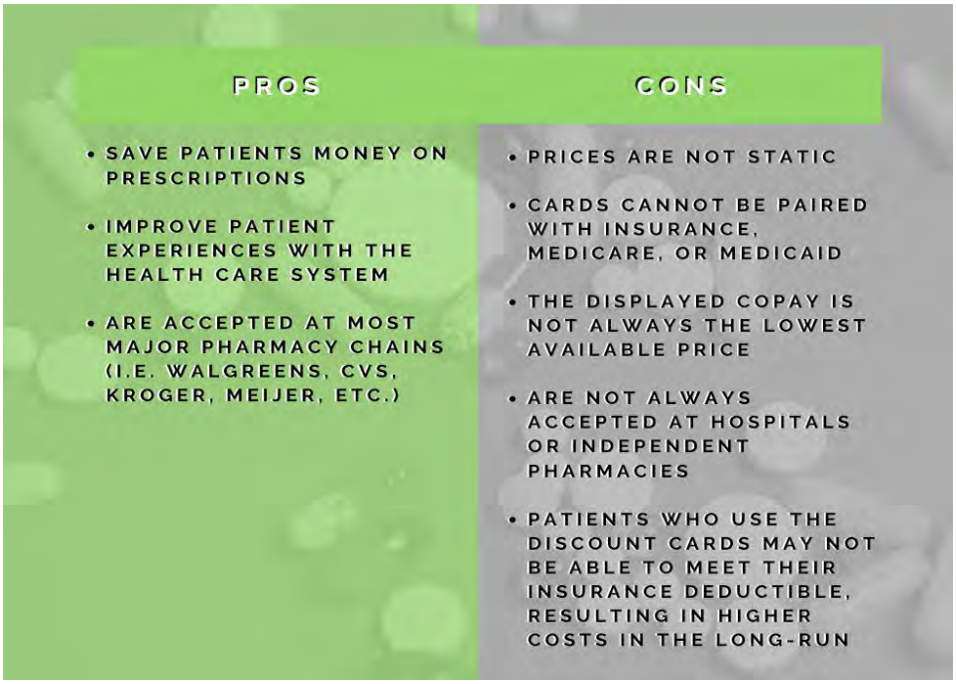
The Business Model of Private Pharmacy Discount Cards

The simple business model of private pharmacy discount card companies is to reduce the out-of-pocket price for the patient when they purchase medications. Patients typically access these services by visiting a website, which provides coupons for medications that can be saved or printed. There are also physical coupons that can be mailed, provided at health care facilities, or found in advertisements.[3-7] To activate the discount, the pharmacist runs the card, similar to an insurance card. The card information includes an identification, prescription group, bank identification number (BIN), and processor control number (PCN) (Source Pharmacist at Hometown Pharmacy, phone call, December 18, 2020).

Patient-facing prices for medications are set in a few different ways. Some companies, such as GoodRx, are independent organizations that partner with multiple pharmaceutical benefit managers (PBMs) to display a price based on PBM data. They can also show prices based on manufacturer coupon cards and health savings companies.[8] Other discount companies are PBMs that negotiate prices directly with

FIGURE 1. Summary of How a Discount Card Company Makes a Profit[19]

FIGURE 2. Pros and Cons of Discount Card Companies[34]



pharmacies they are contracted with, such as SingleCare or Optum Perks.[9,10]

Generally, these discount card companies advertise themselves as free services. If this is true, how do they make money? There are three main strategies used for creating revenue: offering special services to patients; charging transaction or referral fees; and third-party advertising. We found several examples of the first strategy. GoodRx has a program called GoodRx Gold where members pay a monthly rate of $5.99 for a single person. This program claims to offer larger discounts up to 90% on prescriptions; prescription purchase tracking; and an option to request prescription transfers to participating pharmacies on the GoodRx Gold website.[11,12] SingleCare has a similar program, offering higher discounts on prices and bonus savings earned through every prescription purchase.[9] Another company is BlinkHealth, which acts as both a discount card company and a pharmacy. Their program, Blink Pharmacy Plus, is a mail-order pharmacy that delivers prescriptions and offers discounted prices.[13] (Many discount card companies also offer services like telehealth visits and laboratory testing.)[14-16]

The second revenue-generating strategy is prescription transaction fees, which the pharmacy pays whenever a discount card is applied to prescriptions. According to 2020 third-quarter data from GoodRx, these fees accounted for $124.4 million of revenue, of the company's $140.5 million of total revenue.[2,17] Many users aren't aware of the fee.

Discount card companies also generate revenue via third-party advertisements on websites and apps.[18] The next section of this article discusses how discount card companies collect and use patient data.

The Security and Use of Patient Data

The security of patient data is an important concern in healthcare, especially since many parties, like doctors, pharmacies, and insurance have access to it through the healthcare system. Discount card companies are no exception. Some companies, like Optum Perks and BlinkHealth, are Health Information Portability and Accountability Act (HIPAA) covered entities and must comply with its regulations. However, some of the more popular discount companies, like GoodRx and SingleCare, aren't HIPAA-covered.[20,21] Instead, they comply with the Business Associate Obligations under HIPAA, since they handle patient data to help HIPAA-covered entities carry out their functions. This means that the HIPAA Privacy Rule does not apply to them, but they need to draw up contracts with covered entities that will prevent improper use of the data.[22] The companies receive prescription data whenever a patient uses a discount card in the pharmacy. If a customer signs up for an account with a discount company, the company will have access to more patient data, as well as a list of the medications purchased. Most membership programs require the patient's name, date of birth, address, phone number, and credit card number. Other data can be collected through personal use of the companies' apps or websites, including website traffic, demographics information, IP address, the device's location, and cookies. Non-identifiable patient information can be used for marketing and advertising purposes or for statistical analysis. It might also be used by third-party companies for similar purposes.[23-26] Despite the limitations on discount card companies by business associate contracts, the safety of patient data is still a concern. In February 2020, Consumer Reports published an article discussing some of the ways patient data was used by GoodRx. Researchers discovered that Facebook, Google, and Braze received the names of medications users were researching, along with other information that could be directly linked to the patient.[27] Since the article was published, GoodRx published a statement addressing the concerns and implemented changes to further protect patient data.[21] However, this story raises questions about how discount card companies handle private data and how users can be guaranteed the privacy of their data.

A Pharmacist's Perspective of Discount Cards

To gain an in-depth understanding of the impacts of discount cards in the pharmacy, we interviewed two pharmacists. One was a manager of outpatient pharmacies within a healthcare system. The other was a pharmacy manager at a retail pharmacy chain. Both pharmacists wished to remain anonymous; we've summarized their comments here.

Whenever a discount card is processed at a pharmacy, a referral fee is charged. The logic behind the fee is that the pharmacy should reimburse the discount card company for directing the customer to the pharmacy (i.e., without the discount card, the patient might not have visited the pharmacy). These fees can have a large

impact on pharmacy profits. Fees can leave the pharmacy with a marginal profit, or even a loss, on the prescription. In fact, the discount card price might not be the best deal available for the patient, so both the patient and the pharmacy are losing on the transaction. Historically, gag clauses had prevented pharmacists from telling patients that a cash price for a prescription would be cheaper without insurance, and this also applied to discount cards, since many are owned by PBMs. Since national legislation passed in 2018 no longer allows gag clauses to restrict pharmacists, they can now tell patients that a prescription might be cheaper without the coupon.[28,29]

Lots of patient data is exchanged when a coupon is used.[30] The cards are processed like insurance, so all the information about the prescription is transmitted to PBMs and the discount card companies. Additional data is collected through the use of the websites and apps. There is information about what data is collected in most companies' privacy policies, but patients may not take the time to read through them. The information about the prescriber can also be used by the companies. A prescriber might recommend discount cards to patients, to try to help those who have trouble affording medication, without fully understanding the process. If the companies see that a prescriber is often directing patients to use discount cards, they can then make those providers the targets of more advertising.[28,30]

Using the cards is also frustrating for the pharmacy because of the disruptions it causes to the workflow. When a patient comes into the pharmacy with a discount card, the insurance claim on the prescription needs to be reversed and run again with the coupon card.[28] A 2020 study in the Journal of Managed Care and Specialty Pharmacy found that pharmacies spend an average of 75 minutes per day processing card claims.[31] This lost time slows down every person at the pharmacy, including patients, and the process takes much longer than what is depicted in commercials.

Advantages and Disadvantages for Patients

Despite the concerns, discount cards have some upsides for patients. They can be good resources for patients who are looking to save money on their prescriptions, are having trouble affording them, or are uninsured. It can improve patients' experiences with the healthcare system, especially since most of the cards are free. The idea of discount cards is sound, but in practice, their value is overstated.

There are downsides to the cards, too. Drug prices via the cards are not static, and the cards cannot be paired with insurance, Medicare, or Medicaid. Most of Wisconsin's patient population is under-insured, rather than uninsured.[30] For those patients, using discount cards and coupons might mean they don't meet their insurance deductible, leading to higher costs in the long run. Also, the displayed copay is not always the lowest price available. The companies often advertise their coupons with savings up to 80% on prescriptions, but there are many prices that do not receive such high savings.[28] The patient may also be unhappy if the price of the prescription changes from month to month.

There are also limits on where the cards can be used. They are typically accepted at major pharmacy chains that the companies are contracted with (including CVS, Walgreens, Meijer, or Kroger).[32,33] For patients, the lowest coupon price might not always be available at their usual pharmacy; or, they might miss out on valuable pharmacy services elsewhere if they are committed to following the lowest price. And in rural or underserved areas, there might be limited or no access to the pharmacy chains that accept discount cards.

How can these downsides be mitigated? Solutions might include providing discount cards directly through the pharmacy, or matching the coupon price with cash. Pharmacies' own discount cards could offer similar prices to the large discount companies, while eliminating the need for third-party communication and info-sharing. They would also eliminate the dispensing fee, resulting in more revenue for the pharmacy while still helping patients.[28]

Conclusion

With the goal of lowering prescription drug costs for consumers, pharmacy discount card companies base their business model on offering special services, charging transaction or referral fees, and third-party advertising. These companies may have access to a wide variety of patient data, including the patient's name, birth date, address, credit card number, and location. Additionally, not all companies are required to follow the HIPAA Privacy Rule, which could raise further questions about the management of patient data and privacy. Discount cards have a big impact on pharmacies, too, including the pharmacy's requirement to reimburse the discount card company, potentially leading to a monetary loss from the prescription sale for the pharmacy. It is also important to note that drug discount card prices can fluctuate, and they cannot be combined with insurance for an additional cost benefit. Furthermore, the use of a discount card may also disrupt the typical pharmacy workflow. This is one reason some pharmacies choose not to accept discount cards. Regardless, there are potential advantages for patients, including cost savings, particularly for those that are uninsured, and improved patient healthcare experiences. Patients and providers have a wide range of opinions on the value of discount cards.

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"MORTAR & PENCIL" CONCORDIA UNIVERSITY WISCONSIN SCHOOL OF PHARMACY STUDENT WRITING CLUB:

Business Member Spotlight: Evergreen Pharmacy

by Analeah N. Schwind, 2024 PharmD Candidate, Noor M. Lababidi, 2024 PharmD Candidate

As a co-owner of an independent community specialty pharmacy, community leader, and role model, Andrew Hochradel, PharmD has practiced in independent community pharmacy since 2012. Originally from Toledo, Ohio, Dr. Hochradel discovered his passion for community pharmacy while on an Advanced Pharmacy Practice Experience (APPE) rotation at an independent community pharmacy in Augusta, Georgia, where he eventually practiced as a pharmacist for two years. After moving back to the Midwest, Hochradel harnessed his passion and made it into his own business. Evergreen Pharmacy has been serving patients in the metro Milwaukee area since 2014.

Day-to-Day Practice

Evergreen Pharmacy is an independent community specialty pharmacy located in West Allis, Wisconsin. Evergreen Pharmacy strives to increase provider and medication accessibility for patient populations in the behavioral health and rheumatology communities. The pharmacy works to establish strong pharmacy-provider relationships through collaborative practice agreements and to deliver excellent patient care.

While his day-to-day role changes based on the needs of the practice, Hochradel focuses his work on leading the team. Hochradel says, "We have really great team members and I am thankful to be surrounded by smart and caring individuals." In total, the team at Evergreen Pharmacy is comprised of five pharmacists and nine pharmacy technicians. The pharmacy operates in a professional closed-door setting with all medication dispensing done via delivery to patient homes. Patients only come in to the pharmacy by appointment for their injections or for new onboarding with their medication synchronization (MedSync) program.

Patients who choose to fill their whole profile of medications with Evergreen Pharmacy have the option to synchronize their prescriptions using the MedSync program. By doing this, the patient will receive all of their medication refills on the same day each month. This creates convenience for the patient, as it decreases the number of trips to the pharmacy, and their medications are delivered right to their door.

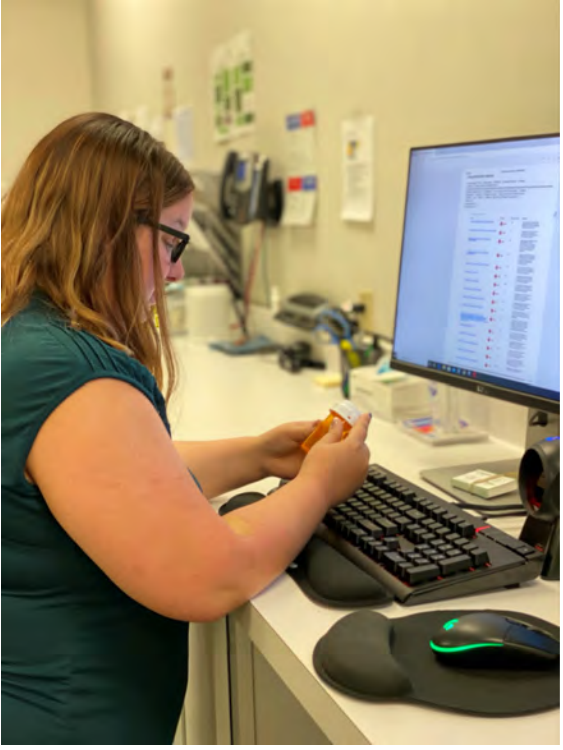
Clinical pharmacists at Evergreen Pharmacy see patients at behavioral health and rheumatology clinics. The pharmacists at telepsychiatry clinics hold independent injection appointments for their patients. These appointments serve to increase patient access to long-acting injectable medications for patients who have issues with adherence or compliance. Pharmacists are also assessing patient medication regimens for efficacy and safety, performing comprehensive medication reviews, and working collaboratively with clinic providers.

Evergreen Pharmacy has developed strong partnerships with allied health professionals. Its focus is on collaborating with specialty providers, such as rheumatologists, dermatologists, gastroenterologists, and psychiatrists. In doing so, they are always finding new ways to collaborate, including embracing digital and telehealth platforms. Evergreen Pharmacy has greatly improved communication with one of their longstanding rheumatology office partners by integrating their digital platform, thereby allowing expanded access to information and improved communication and patient care.

As president and cofounder, Hochradel fosters a work environment that encourages teamwork and community involvement. In addition to being medication experts, Evergreen Pharmacy also gives back to its community through the pharmacy's Green Team. The Green Team is responsible for engaging all Evergreen staff members in community service events. Every year, Evergreen Pharmacy has a team that participates in a walk and provides monetary donations for the Arthritis Foundation. In the past, Evergreen has collected winter clothing items, toys, and other items that are then donated to adult and youth shelters in the Milwaukee area. The team also volunteered their time preparing meals with a local organization and at soup kitchens.

Raising the Bar

The mission at Evergreen Pharmacy is to improve the lives of patients by continuously redefining conventional practices. When asked what makes Evergreen Pharmacy unique, Hochradel states, "We really stay focused on what we do. We are very good with rheumatology, and we are very good with behavioral health, as well as some other disease states. By staying focused and specializing, we can set ourselves apart from other pharmacies, which are typically generalists." All Evergreen pharmacists receive special



training to administer non-vaccine injections.

Evergreen Pharmacy also sets itself apart by hosting a PGY1 community residency program. Their program is unique from others as it is heavily influenced by the resident's interests and passions. Hochradel explains that he uses the residency program as a catalyst for pilot-based programs by giving the resident autonomy. He sees the resident's project as a source of new ventures and he does his best to marry the needs of the pharmacy and its patients with the desires of his residents. By allowing residents to take charge and follow their passions, Hochradel has seen more success come from the program throughout the four years it has been in place.

One success story is Evergreen's 2019-2020 PGY1 resident, Taylor Page, PharmD. Dr. Page worked to expand the collaborative relationship with a partner rheumatology office, and she created a new and ongoing pharmacist role on the clinic team. Evergreen is currently in the process of further expanding Page's position to provide enhanced patient care services similar to those performed at their behavioral health clinics.

Bumps in the Road

Evergreen Pharmacy is not immune to the effects of the COVID-19 pandemic and has had to adapt its practice to overcome those challenges. With the help of modern technology, a majority of the staff has the ability to work remotely. The Evergreen team has continued to serve their patients throughout the pandemic, keeping their focus on patient and employee safety. Now, more than ever, the pharmacy team is there to support their patients. They are educating employees and patients about COVID-19 symptoms and serving as a resource for patients with questions regarding the virus. The pharmacy has also implemented proactive measures to ensure patient safety, including strict handwashing policies, thorough daily cleaning and disinfecting in the pharmacy, continuing to make hand sanitizer available, strictly adhering to the state-wide mask mandate, and taking personal responsibility in minimizing the spread of coronavirus. While it has taken a few months to adjust, Hochradel states that his team has done a great job adapting to the sudden environment change.

Aside from COVID-19, one of the most notable challenges Evergreen Pharmacy has overcome is the implementation of a long-acting intramuscular (IM) medication injection service for their patients. Finding a documentation method for Evergreen's injection service that is compliant with regulations and also convenient for employees has been difficult. Evergreen needs to communicate to the provider exactly what happens during each appointment with a patient. Vital information that must be relayed to the physician includes medication name, dose, strength, administration site, lot number, and expiration date. Pharmacist interventions also need to be documented and relayed to the physician in a SOAP note format. Initially, Hochradel and his team started with a paper process to capture the appropriate documentation. Learning through trial and error, they went through five different documentation processes until they finally found one that worked. The challenge now is making the process more efficient. Paperwork can pile up, take up a lot of space, and be difficult to rummage through when looking for answers. Because of this, the pharmacy is now looking to transition their documentation process to an electronic one.

Implementing practice advancement is difficult. Hochradel reflects on the early phases of Evergreen's injection service and shares that his biggest fear was ensuring his employees did not feel left behind. With every change that is made, staff need to be informed and retrained on the new process. Hochradel says, "We didn't want to miss a small step that could cause an issue, and we didn't want to leave any staff members behind." While there can be uncertainty and fear during the implementation process, it was important for Hochradel and his team at Evergreen to stay focused on their driving force: serving gaps in their community. Evergreen Pharmacy has always made it a priority to set themselves apart from other pharmacies—they want to be niche-focused and specialized. That is why in 2016, when pharmacists were able to administer IM injections with an order in Wisconsin, Hochradel saw this as an opportunity to specialize in this area. Hochradel knew his team could accomplish this goal successfully and quickly. Four years later, Evergreen Pharmacy now has a successful injection

clinic that serves patients throughout the state, seeing anywhere from three to 10 patients in a given day.

Moving Forward

Driven by its mission to improve the lives of its patients by continuously redefining conventional practices, Evergreen Pharmacy is continually looking for new ways to serve patients. One way they plan to do this is through the expansion of their MedSync program. This is done by enrolling current patients who receive injections at the pharmacy, and through partnerships with pharmacy schools in the area. By using these partnerships, Evergreen receives help in working up patients and performing medication reconciliations. After this is completed, staff can then coordinate for oral medications to be delivered to patients at the time of their injection appointment or to their home.

Aside from improving things within his own business, Hochradel aspires to expand opportunities for patients in his community and other professionals in the pharmacy community. He encourages other pharmacists and pharmacies to not only be involved in pharmacy organizations, but to join other allied health professional organizations. For example, Evergreen Pharmacy has strong interests in rheumatology. In an effort to become more involved in rheumatology practices, Evergreen Pharmacy team members attend the Wisconsin Rheumatology Association Annual Meeting. At this event, Evergreen Pharmacy team members partake in education programs to expand their knowledge about rheumatology, to ultimately improve the care they provide for their patients. To his colleagues looking to implement something new in their practice, Hochradel recommends building a resident program and hosting APPE students.

For those aspiring to obtain a career in pharmacy, Hochradel encourages trying as many different practice sites as possible. He advises, "In pharmacy there are many different opportunities to practice in many different settings. With so many routes you can choose, be sure to explore your options, keep an open mind, and above all, make sure you enjoy it!"

Analeah Schwind and Noor Lababidi are 2nd Year Doctor of Pharmacy Candidates at Concordia University Wisconsin School of Pharmacy in Mequon, WI.

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Spotlight

PSW Leadership Spotlight: Sirr Grice

by Madeline Gallo, 2022 PharmD Candidate, Jessica Vander Koy, 2022 PharmD Candidate

Madeline Gallo and Jessica Vander Koy are 4th Year Doctor of Pharmacy Candidates at the University of Wisconsin-Madison School of Pharmacy in Madison, WI.

A Leader in Pharmacy

"Lead by example." This is the motto that Dr. Sirr Grice follows, not only in his personal life, but in his professional life as a pharmacist. Born and raised in Milwaukee, Wis., Dr. Grice pursued pharmacy due to his passion for helping others and his relatable nature. He graduated with dual PharmD and MBA degrees from Concordia University. Grice first started his pharmacy career at Walgreens as a technician, where he discovered his passion for serving others. Because leadership has always been natural for Grice, he was drawn into a leadership role immediately after earning his PharmD. Post-graduation, he accepted a position at Walgreens as a pharmacy manager. Currently, Grice is the pharmacy supervisor at Aurora West Allis outpatient pharmacy, where he manages a small team of pharmacists and technicians. Throughout the COVID-19 pandemic, Grice implemented curbside delivery to help better serve his community. Additionally, he is a member of the PSW Diversity, Equity, and Inclusion Team, which was recently initiated in June 2020. The PSW Diversity, Equity, and Inclusion Team focuses on bridging equity gaps based on race, income, or other social/economic factors . His mission as a member of this team is to engage pharmacists throughout Wisconsin in meaningful conversations about equity and inclusion, and to enhance diversity in the pharmacy profession.

As a leader in pharmacy, Grice prides himself on having impactful patient relationships and supporting others to reach their goals. His leadership style is to lead by positive example and to sacrifice himself to support others' goals. As a mentor and preceptor, Grice strives to be an example of how hard work and effort get you places. The importance of his mentors at Walgreens, Concordia, and in his personal life has motivated him to incorporate mentorship into his leadership style.

Words of Wisdom

Throughout Grice's own journey in pharmacy, he realized that it is unfair for educators and leaders to tell students that it is acceptable to not have a plan for the future. Instead, Grice encourages his students to understand the field they pursue so they can be better prepared. Looking back on his own career, Grice would have only changed one thing: discovering his passion for pharmacy sooner, so he could have been better prepared to serve the underserved earlier in his career, which is his true passion. The best advice that Grice has for pharmacy students today is to work hard, and to not burn any bridges along the way. He notes that impressions you make in the pharmacy community are lasting, because pharmacy is a small world. Grice adopted the philosophy that, to create lasting impressions, it is not what you say to people, but how you say it.

Future of Pharmacy

When discussing one's future, Grice advises early-career pharmacists and students to have an end goal, so you can be more prepared in the long-term. Pharmacy is an evolving field of practice right now. Therefore, it is crucial to be a pharmacy advocate by attesting to the skill set and the roles that pharmacists can fill. In an ideal setting, Grice envisions the profession of pharmacy shifting from a dispensing role into a clinical role over the next 10 years. Pharmacists are positioned well through their doctoral education to manage patient medication regimes while simultaneously reducing healthcare costs through appropriate medication use. Throughout his pharmacy career, he has been supported by various mentors, including professors, supervisors, and colleagues. Grice is truly an outstanding leader in pharmacy who finds the greatest sense of achievement though supporting both his patients and colleagues to succeed.

Meeting Recap

PSW Educational Conference 2021: Working Together While Apart

by Brianna Groen, 2022 PharmD Candidate

Pharmacy Society of Wisconsin (PSW) members continued to embody the PSW mission of working together while apart, as they gathered virtually for the annual PSW Educational Conference in April of this year. PSW held the conference virtually for the second year due to continued concerns surrounding the COVID-19 pandemic. Although unable to gather in person, 306 pharmacists, residents, technicians, and student pharmacists from around the state were able to engage in a variety of content that included live programming, On-demand content, and virtual networking sessions. Organizers and attendees used the PSW app and a virtual platform to produce and view conference programming. Attendees were able to use their smartphones, tablets, laptops, or desktop devices to engage in conference programming.

The Wisconsin Pharmacy Residency Conference (WPRC) was held concurrently with this year's Educational Conference once again. Both conferences had full agendas for the two days of programming, on April 14 and April 15. During the WPRC, residents had the opportunity to deliver a virtual platform presentation that was incorporated into the conference programming. There were 130 resident presentations given during 43 sessions via Zoom. Conference attendees had the opportunity to send feedback to resident presenters via the PSW app. Regarding the virtual WPRC, Dr. Sarah Sorum, Executive Vice President and PSW CEO, shares, "It is always so energizing to see residents from across the state share their year-long residency project work with colleagues."

Attendees of the PSW Educational Conference had access to 10 on-demand presentations, in addition to live programming. These presentations included a wide variety of topics, ranging from artificial intelligence to updates on gout therapeutics. The PSW Educational Conference live sessions, on-demand content, and WPRC materials all provided attendees with an opportunity to claim continuing education (CE) hours. In total, 21 hours of CE were available for pharmacists, and 15 hours of CE were available for pharmacy technicians; attendees had 60 days to claim CE from the live sessions. As with previous virtual conferences, attendees are able to access the content from this year's Educational Conference and claim CE from on-demand content within the next three years.

The Educational Conference began with the first live session, "Pharmacists Leading the Way: Public Health and Pandemic Response," led by Dean Coppola and Scott Giberson. Dean Coppola is the Client Executive of Public Health Disaster Management and COVID-19 Testing and Vaccinations at AMI Expeditionary Healthcare, and Scott Giberson is the Executive Director of Corporate Affairs at AMI Expeditionary Healthcare. This session highlighted the important role pharmacists have as leaders in public health, and how pharmacists have responded to the COVID-19 pandemic with an emphasis on the important role pharmacists play in mass vaccination efforts.

The second live session continued to discuss the role of the pharmacist during the COVID-19 pandemic. Pharmacists have been part of the framework for the distribution of COVID-19 therapeutics and vaccines. During this session, "Building an Ethical Framework for Managing Scare Resources," Alyson Capp, Paul Kelleher, Mo Kharbat, and Liz Laubach explored the role of the state's Disaster Medical Advisory Subcommittee for Therapeutics, and how different health systems managed the distribution of COVID-19 therapeutics and vaccines.

Following these two live sessions, conference programming included two exhibit theaters over the lunch hour, with exhibits from AstraZeneca and DocStation. An exhibit session followed the exhibit theater presentations and was hosted using the LecturePanda exhibit platform. Conference attendees were able to log in to the exhibit hall and connect with industry sponsors in virtual meeting rooms.

The virtual poster session was held following the exhibit session. The PSW poster session included 98 posters that featured pharmacy research topics, including clinical and specialty pharmacy practice; ambulatory and community pharmacy practice; novel topics in pharmacy; informatics and technology; and education and research. Poster presenters and attendees were invited to join a Zoom session with breakout rooms. Presenters then took turns presenting their posters and answering questions from attendees. This was a unique opportunity for student pharmacists, residents, and pharmacists to refine their presentation skills while sharing how their research is impacting future directions of pharmacy practice.

During the evening of the first day of the conference, attendees had the opportunity to choose from four different networking sessions. These networking sessions included Ambulatory Care Networking; Building Leadership Skills During a Pandemic; Incorporating the Values of Diversity, Equity, and Inclusion in Practice; and the Agenda-Free Happy Hour.

On the second day of the conference, early risers were able to get energized prior to the first live session by attending the Smart Start with PSW yoga session or sharing on the PSW app other ways they were starting their morning. After an invigorating start to the day, attendees joined the first live session, "Structural Racism and Health: Conceptual Framework, Strategies and Recommended Actions." Leonard Egede, a general internist and health services researcher, and Professor of Medicine and Chief of the Division of General Internal Medicine at the Medical College of Wisconsin, discussed

the historical basis for structural racism, definitions, and policies that perpetuate structural racism. Dr. Egede also discussed how structural racism impacts health outcomes, and he provided strategies for changing the negative effects that structural racism has on health outcomes.

The next live session was led by Jessica Bonham-Werling and Kate Rotzenberg. Jessica Bonham-Werling is the Director of the Neighborhood Health Partnerships Program and the Associate Director of Research Operations at the Health Innovation Program within the University of Wisconsin-Madison. Kate Rotzenburg is an Associate Faculty Associate at the University of Wisconsin-Madison School of Pharmacy. This session educated attendees about the sources of health data for the Neighborhood Health Partnerships Program, and how that data can be obtained. The presenters also identified causes of varied health outcomes in neighborhoods that are adjacent, and proposed how neighborhood health data could be applied in one's own practice setting.

Nicole Schreiner, Vice President and Co-Owner of Streu's Pharmacy, presented during the third live session on the second day of the conference. Dr. Schreiner defined direct and indirect remuneration (DIR) fees, their origin, and how DIR fees affect pharmacy business. In this session, she also explained why some DIR fees are different from other Pharmacy Benefit Manager (PBM) DIR fees.

There were two exhibit theaters over the lunch hour on the second day, hosted by Janssen and Kit Pharma. Following the exhibit theaters, pharmacists and researchers presented on safe opioid use in Wisconsin. The session, "Home Grown Research: Supporting Safe Opioid Use in Rural Wisconsin," was led by James Ford, Kevin Look, Sarah Pagenkopf, Tyler Prickette, and Kate Rotzenberg. During this session, they described the rationale for safe opioid use efforts in rural Wisconsin, current pharmacy-led research projects, and the importance of engagement from stakeholders in designing opioid interventions.

To help pharmacists navigate the challenge of medication adherence during the pandemic, Julia Barnes, Julie Cable, Ellen Maxwell, Erin McCreary, Philip Nguyen, Eileen Romasanta, Jen Slaughter, and Sarah Uluc led a session that explained the importance of promoting medication adherence in the pharmacy workplace, especially during the COVID-19 pandemic. Their session, "Let's Chat: Navigating Medication Adherence in the COVID-19 Pandemic," outlined strategies to improve access to medications and medication adherence by understanding determinants of health and the various resources needed to manage adherence programs.

The final live session of the conference summarized the benefits and barriers of telehealth. The use of telehealth technology has expanded for most pharmacists during the COVID-19 pandemic. During this session, Matthew Huppert, Catherine Kuecker, Mackenzie McCauley, and Helene McDowell explained how telehealth can be incorporated into the workflow differently, depending on the pharmacy setting.

It was exciting to see how PSW continues to adapt and change conference delivery to rise above the challenges presented by the COVID-19 pandemic. PSW provided another successful Educational Conference that facilitated the delivery of new and stimulating information. Although held virtually, the conference was enhanced by the multitude of opportunities for attendees to learn about and discuss pharmacy practice advancements. Regarding this year's Educational Conference, Dr. Sarah Sorum, Executive Vice President, and PSW CEO, says, "As we evolve as an organization to meet this moment, building community and connecting members have been identified by the PSW Board of Directors as a strategic priority. Leveraging technology and providing forums, even if they are virtual, to interact with colleagues is critical."

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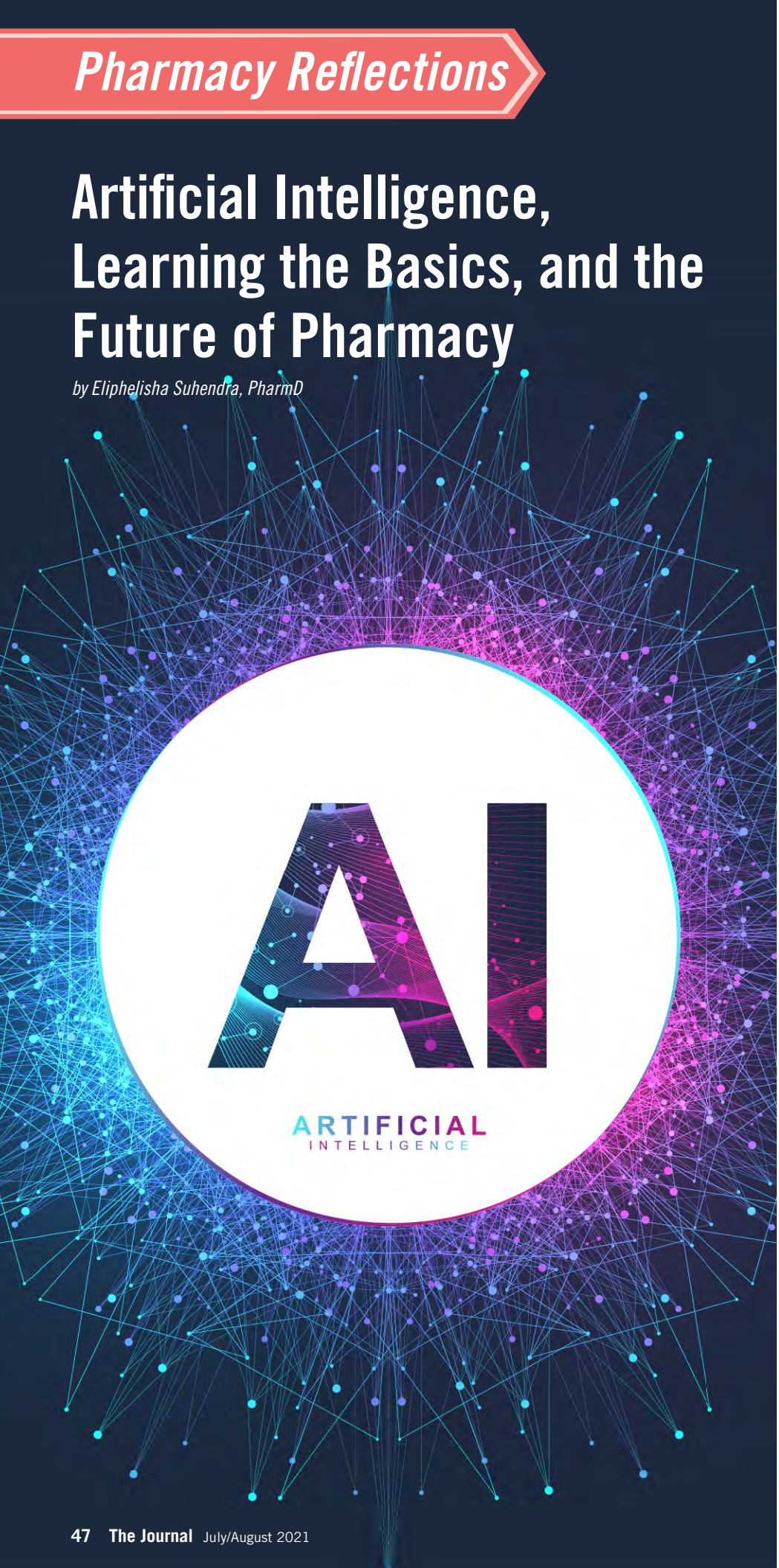
Artificial Intelligence, Learning the Basics, and the Future of Pharmacy

by Eliphelisha Suhendra, PharmD



What do you think is the future of pharmacy? is a question that many pharmacists are asking. One area of study that's gaining more prominence in the healthcare space is artificial intelligence (AI) and machine learning (ML). Navigating the world of complex algorithms and increasingly complicated theoretical data models can be a challenge for pharmacists and pharmacy students, unless they know where to look for guidance and are open to struggling through difficult concepts. The objective of this article is to introduce pharmacy professionals to helpful resources where they can learn about AI; to share my experience as a student going through these resources; and to highlight a few potential limitations of AI in the future of pharmacy.

Artificial intelligence (AI) is a broad term for any computer system that can mimic human intelligence, and is a particular area of interest in medicine. A tool often used in AI is "machine learning," another broad term that describes a computer algorithm that can be trained and tested by a set of data to predict, sort, or identify the data in a way that is desired by researchers. In my last rotation as a pharmacy student, I learned about AI and ML terminology, and compiled some resources to learn more about this area of study. The two articles that helped me the most to construct the framework for understanding AI were "Demystifying artificial intelligence in pharmacy" by Dr. Scott Nelson and "Using artificial intelligence in health-system pharmacy practice: Finding new patterns that matter" by Dr. Allen Flynn, both in the American *Journal of Health System Pharmacy*.[1,2]

These articles do a great job of breaking down the concepts of AI in the medication-use process by using simple diagrams and outlining examples of each use case.

Another resource that I found particularly informative was a podcast by Dr. Dalton Fabian that discusses important applications of ML in his own practice as a pharmacist and data scientist.[3] The relationship between AI and healthcare often involves data science, the study of data organization and analysis. This area of study isn't usually on the radar of the

average pharmacy student or practicing pharmacist, but can be a useful area to explore for those who want to know more about the intersection of healthcare and technology. Dr. Dalton Fabian's blog, The Data Science Pharmacist, goes into detail about what being a data scientist and a pharmacist looks like, complete with guides for learning programming and data science, and navigating related career paths.[4]

The next useful resource is Kaggle.com.[5] While the resources suggested so far provide a great framework for how data science fits into pharmacy, how do pharmacists learn these skills? Kaggle has free courses on data science, and thousands of data sets to create whatever you'd like to explore. Some potentially important skills for pharmacists who are interested in this field are SQL, a programming language that allows data analysts to pull specific health information out of electronic health records, and R, a programming language for statistical analysis that allows analysts to identify trends and patterns in data. These resources can help pharmacists implement technology to improve patient care.

Getting Familiar with the Concepts

In my experience, an effective way to approach learning complex and difficult concepts is with growth, resilience, integrity, and tenacity (GRIT).[6] This mindset has been shown to be closely correlated with academic and professional success, especially in the medical field. It is important to keep in mind that no one becomes familiar with ML algorithms in a few days, so when I look back at what I have learned so far, I can also look forward, certain that there is only more learning ahead. Reading scientific literature about AI or ML can be overwhelming, full of obscure concepts that are difficult to understand. One concept that continues to be tricky for me to understand is the pseudo R2 value, a very common statistical measure, of how likely an ML algorithm is to predict an outcome correctly. With concepts like this, I need to employ the GRIT mindset, which helps me to appreciate the overwhelming knowledge gaps I have and stay motivated to learn more.

Having the right mindset is one thing, but tackling subjects that experts have spent decades mastering is another. In this case, what is important to master is self-directed learning.[7] Setting goals, having a structure, and creating a timeline really helped me learn difficult material. My first struggle in learning AI concepts was understanding terminology. So my first goal was to understand the field's vocabulary. Seeking out resources for novices was done with help from preceptors and friends, and long hours of browsing internet tutorials, articles, and learning modules.

The Current Status of Machine Learning

Many pharmacists have some anxiety about AI taking their place as medication experts. The thinking goes, "Why trust a human, who can make errors, when an AI program can perfectly manage patient medications?" In my opinion, AI is nowhere near capable of replacing a well-trained pharmacist. Based on my research, it seems the scope of ML is infinitely broad, but its potential is still severely limited.

As pharmacists, we are expected to know which medications will best fit a patient's health needs. If this task is replaced by AI, the expectation is that ML algorithms will be able to predict the effect of every possible medication on a given patient, and determine which one will be the most safe and effective. This idea is often referred to as "precision medicine," a field that factors in a patient's individual characteristics, such as genetics, behaviors, past medical history, and other biomarkers, and then selects therapies and predicts health outcomes.[8] One area where ML and precision medicine are of increasing interest is in psychology, where the selection of therapy is often trial-and-error, and what seems to work is as unique as the patients themselves.

The most recent scoping review and meta-analysis (SRMA) in the field of psychiatry and ML is a 2018 study from the University of Toronto, where researchers assessed 20 studies using ML models, using various patient factors to predict health outcomes in depression.[9] They categorized the predictive factors used by each study into: neuroimaging, phenomenological, genetic, and combined factors. Then, they assessed the accuracy of each ML model in predicting the response to antidepressant therapy. The combined accuracy of all the studies to be 82%, with ML models using combined factors the most accurate, reaching 97% accuracy. Though promising, the adoption of ML algorithms to model a disease like depression, or any complex disease state, is problematic, due to the lack of foreseen benefit and the disproportionate consequence of failure. To elaborate, there is nothing to compare ML to when it comes to predicting therapeutic outcomes in current practice, outside of provider experience and expert consensus.

To date, there is no baseline for accuracy for providers predicting health outcomes for their patients when choosing therapy, so, in essence, there is no baseline to compare to ML that would show whether it is more or less effective. Additionally, the liability of treatment or diagnosis failure falls to no single entity, making AI algorithms risky to health institutions despite the promisingly low error rates. Prescribers have well-established national organizations that protect the public from malpractice and protect prescribers from malpractice claims, while AI algorithms do not have these protections. Protecting patients from malpractice from AI integration is a serious concern that is difficult to address when proposing AI-integrated initiatives. These limitations, among others, make ML far from being integrated into the medical field. However, I have only mentioned a single application of ML in medicine, and there are infinitely more possible applications in areas like clinical decision support, disease screening, diagnostic tools, and health outcome management. In all these cases, nonetheless, I believe that AI-integrated technologies are not a replacement for a highly-trained healthcare worker, but rather a specialized tool that can be used to implement quality patient care.

The future of AI in pharmacy is a certainty, as healthcare becomes increasingly reliant on technology with improving quality patient care in mind. I also believe it is a certainty that pharmacists will someday be required to understand and help implement AI-integrated practices, as AI-based technologies gain more trust from institutions, patients, and providers. New pharmacist jobs that focus on maintaining and utilizing AI-integrated health programs are more likely in the next few years. For now, I believe it is important for all pharmacists to keep an eye on the future,

and to understand the limitations and opportunities AI presents.

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MEDICAL COLLEGE OF WISCONSIN SCHOOL OF PHARMACY STUDENT WRITING CLUB:

How the Coronavirus Pandemic Altered Learning Experiences: Perspectives from MCW-Pharmacy Students

by Hannahpatrice Gilbert, BBA, 2022 PharmD Candidate, Duc Nguyen, 2021 PharmD Candidate, Kaitlin Ledvina, 2023 PharmD Candidate

The coronavirus (COVID-19) pandemic has affected the whole world, impacting every institutional learning experience. Pharmacy students, in particular, have been doing much of their education this year via virtual learning. The Medical College of Wisconsin-School of Pharmacy (MCW-SOP) has faced these challenges head on. During a more typical year, MCW-SOP students enjoyed a robust curriculum and many interpersonal collaborations. It was through these interactions that students cultivated relationships, created their own learning style, and grew as pharmacists of the future. It was also key for MCW-SOP faculty to accommodate diverse learning styles.

The transition from in-person to virtual learning has been difficult for many MCW-SOP students, and their ability to adapt has been crucial.

Adjusting to Virtual Learning

Entering any graduate program requires a new level of discipline and rigor. Different classes of students at MCW-SOP had different experiences with virtual learning. For example, the class of 2023 (didactic coursework) began in-person instruction in July 2020, while strictly observing social distancing and other safety protocols. As the pandemic worsened in the fall, this class transitioned to a hybrid model, with virtual lectures; only certain skills labs were completed in person.

In contrast, the class of 2022 has been using a virtual model for most of the pandemic, from March 2020 through spring 2021 (except for certain skills labs requirements).

Many students found the conversion to virtual learning to be very difficult. Their biggest challenge was the lack of in-person contact and collaboration with other pharmacy students, professionals, and professors. Students expressed feeling less motivated as virtual learning continued. However, while virtual learning led to significant challenges, it also provided an opportunity for self-assessment and new routines. In-person lectures offer structure, while the virtual environment required better time-management skills and more individual motivation. The discipline required for virtual learning will likely benefit MCW-SOP students in the future.

Impact on Rotations

When students began their first APPEs during the pandemic, they had physically been away from any type of on-site learning for over three months. The change was abrupt, leaving a lot of the students feeling under-prepared. APPEs are touted as one of the most important experiences of the pharmacy curriculum, and many students felt anxious about meeting high expectations.

Generally, the responsibilities of students on rotations were restricted due to COVID-19. Sites did not want to increase the risk of their students contracting or spreading the virus, a sentiment echoed by MCW-SOP. Many pharmacists were in a similar predicament, where face-to-face patient interactions were either stopped or substantially decreased. This was true for most inpatient and ambulatory settings. Retail and community settings, on the other hand, still required in-person interactions with patients, now including face masks, Plexi-glass barriers, and six-feet social distancing requirements. Even though students were on-site for rotations, a lot of their learning and tasks were virtual (i.e., telehealth). Student conferences and presentations were completed via virtual meeting platforms. Patient interactions, if applicable, were also often done via phone or virtually. For students who did see patients in person, face shields and/or goggles were an addition to the personal protective equipment (PPE) requirements.

Unsurprisingly, much of the year's education was geared toward keeping up with new developments in COVID-19 treatment. Of particular interest to pharmacy, medications and vaccines were common discussion topics among preceptors and students. Pharmacy students were expected to be knowledgeable about treatments, including the use of existing medications such as dexamethasone or baricitinib; new vaccines manufactured by Pfizer or Moderna; or new drugs such as bamlanivimab or casirivimab-imdevimab. Many students found this rewarding, as they became trusted sources of information, both during rotation and at home with their friends and family.

For Introductory Pharmacy Practice Experience (IPPE) rotations during the pandemic, there was uncertainty. MCW's clinical partnerships have been a driving force for the progression of clinically trained pharmacists. Unfortunately, during the early response to the pandemic, many clinical sites limited or temporarily halted on-site rotations for the safety of workers and patients. Many of these scheduled hospital rotations throughout Wisconsin were converted to virtual rotations.

Many students expressed feelings of being put at a potential disadvantage, without the opportunity to participate in a hospital rotation, and missing out on the ability to gain clinical experience and networking opportunities. On the other hand, students who remained in in-person rotations during the initial phase of the pandemic expressed fear of contracting the

virus. Many students were initially hesitant to attend their scheduled rotations due to the uncertainty about virus containment. Those who expressed initial feelings of apprehension while attending their rotations have felt more comfortable as safety protocols have proved effective over time.

Although the initial hesitancy of many students to participate in rotations came from a fear of putting themselves or their families in a compromised health position, the pandemic provided new opportunities for the pharmacy profession as a whole. The pandemic has highlighted the importance of having high-quality interprofessional healthcare providers, including pharmacists, on the patient care team. This pandemic has created unique educational experiences for student pharmacists to learn, grow, and become better healthcare providers.

Maintaining Mental Health and Self-Care

Like most people of their generation, student pharmacists are typically active on social media, where they observed their peers' perceptions of the COVID-19 pandemic. Many student pharmacists were outraged to see that, as COVID-19 cases increased, concern from the public decreased. Especially as students on clinical rotations see firsthand the effects of COVID-19, it is jarring to watch friends, family, or peers dismiss COVID-19 safety measures or even the virus itself. This, along with the upheaval of normal routines and having to worry about residency or job applications, has added a lot of pressure to an already stressful time for pharmacy students. There has been a recent societal push for mental health care—this is even more relevant during an ongoing pandemic. People are often sharing advice online on how to cope. A common recommendation among the third-year pharmacy students is the importance of maintaining relationships. Since it has mostly been irresponsible to meet face-to-face, people found alternative avenues to satisfy their need for social interactions. This manifested in many ways: calling or texting loved ones daily; periodic meetups with friends through virtual platforms such as Discord or Skype; or sending care packages full of snacks.

Being able to maintain daily routines, maintain self-care daily regimens, and spend time with friends and family are all things pharmacy students have become accustomed to this year. Many students expressed a decline in their mental health as the pandemic progressed, and as their normal routines—preparing for class, commuting to campus, and so on—were upended. Where it previously took an hour and a half to prepare for a lecture, it now takes less than 30 minutes. Students have expressed that their daily self-care routines have been sacrificed, and replaced by increased hours of sleep.

Furthermore, group study sessions have been harder to initiate virtually. Many students have expressed the difficulty of not seeing classmates in person. Before the pandemic, incorporating and maintaining a schedule was heavily recommended for students to help balance school and other parts of life. It is becoming increasingly evident that, as virtual sessions continue, students should try to incorporate schedules to maintain and preserve their own mental health.

An important note: There are many non-COVID-19 factors that play a role in first-year pharmacy students' mental health. Starting a graduate program at a new level of difficulty comes with its own set of challenges. Prior to the pandemic, the primary method for maintaining self-care as a first-year pharmacy student in an accelerated pharmacy program seemed to be activity. Even something like going for a brief walk was enough of a break to recharge. If not physical activity, then taking the time to read a book, watch an episode of a show, or do something non-school related was valuable. For students, there tends to be a constant sense of always having the next thing to do on a never-ending to-do list. This can negatively impact mental health, as it does not allow for the time to reflect on and take pride in what has already been accomplished. This challenge has been amplified by COVID-19.

Conclusion

Despite the challenges, the COVID-19 pandemic has also created new opportunities of growth for student pharmacists and the pharmacy profession. More than ever, healthcare is in need of vaccine champions, and pharmacists are in the ideal position to make the most change in this area. The access patients have to pharmacists will hopefully keep COVID-19 vaccination numbers up during widespread vaccination. In addition, many of the COVID-19 vaccine clinics have been and will be run by pharmacy students and pharmacists. Fortunately, pharmacists are not only trained to vaccinate, but are also experienced in having important conversations about the importance of getting vaccinated, and addressing patient concerns. MCW-SOP students will continue to play an important role as the pandemic progresses. Skills honed during the pandemic, such as mindfulness and resilience, will be critical for students as they continue to pursue their pharmacy careers.

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Sterile Compounding	Available	?
Pharmacists License Defense Coverage	$250,000 per occurrence / $250,000 aggregate	$25,000
Board of Pharmacy Imposed Fees	$2,500 sublimit	?
HIPAA Claim Defense Coverage	$50,000	$25,000
Assault Coverage	$25,000	$25,000
Sexual and Physical Abuse Coverage	$50,000	$25,000 sublimit
Loss of Income	$1,500 per day / $50,000 per occurrence	1,000 per day / $25,000 aggregate
Legal fees – Respond to Subpoena	$50,000 limit	$10,000 aggregate

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