



Midmark IQvitals® Zone™:

Connecting Vital Signs Acquisition
Within the Point of Care Ecosystem

Includes Suggestions for Leveraging Improved
BP Measurements to Achieve Quality Metrics



This is part two of the Midmark Point of Care Ecosystem Series that examines how new technologies are creating a fully connected point of care ecosystem in outpatient facilities. The first paper, [“Point of Care Ecosystem: Four Benefits of a Fully Connected Outpatient Experience,”](#) defined the point of care ecosystem and presented the benefits that healthcare organizations can realize from an ecosystem that enhances patient-caregiver interaction.

This second installment focuses on one particular innovation that is helping establish and expand connectivity within the point of care ecosystem: Midmark IQvitals® Zone™ Vital Signs Monitor.

Midmark Zone™ technology can be utilized to minimize connectivity challenges within ambulatory and outpatient facilities by simplifying how caregivers interact with—and connect to—equipment and devices in the exam room.

The Connected Point of Care Ecosystem

As defined in the first paper in this series, a point of care ecosystem goes beyond the direct interaction between patients and caregivers to encompass everything that happens within the practice or clinic, as well as experiences that occur outside of this environment. For most healthcare organizations, the exam room is comprised of disconnected processes, devices and workflows that can prevent seamless, well-coordinated patient experiences. Additionally, isolated processes and disconnected data flows can contribute to inefficiencies, communication breakdowns and human errors.

A fully connected point of care ecosystem is becoming more of a reality as new technologies with greater connectivity are introduced to the industry. A connected ecosystem integrates processes, equipment and caregivers at the point of care to significantly enhance the patient-caregiver experience and improve the quality of ambulatory care. It also helps ensure a more satisfying, seamless patient experience by providing a platform where organizations can leverage new technologies, incorporate best practices and employ greater standardization to improve quality of care and outcomes.

The benefits resulting from a fully connected ecosystem include:

- 1. GREATER VISIBILITY** into a patient's health history is gained through automating vital signs acquisition. Trends and fluctuations in health history are more easily identified when readings are acquired using the same method each visit, rather than reviewing charts that may contain variations in manual techniques.
- 2. STANDARDIZATION** enables organizations to develop clinical protocols that drive optimal outcomes by helping eliminate human variables that can increase the opportunity for human errors and lead to inaccurate diagnoses. For instance, some studies have shown a 17% error rate in manual clinical documentation of vital signs at various locations of care delivery.¹
- 3. GREATER EFFICIENCY** is achieved by allowing healthcare organizations to identify opportunities to enhance and improve processes and workflows. Caregivers and practice administrators can better track the progress and success of initiatives designed to increase efficiencies and cost savings.
- 4. ENHANCED PATIENT-CAREGIVER INTERACTION** is essential for effective clinical interactions and achieving optimal outcomes. By understanding the time patients and staff spend on specific activities within the clinical space, as well as how rooms and equipment are utilized, healthcare organizations can make better decisions and deliver a patient-centered experience at every encounter.

Midmark IQvitals® Zone™ Vital Signs Monitor

Midmark® IQvitals Zone (Figure 1) can minimize connectivity challenges within ambulatory settings as outpatient facilities begin to create a connected ecosystem. This vital signs monitor is the first diagnostic device to feature Midmark Zone™ technology. Zone technology enables the IQvitals Zone monitor to auto-connect to a computer through a secure Bluetooth® Low Energy connection without the need for cables or manual pairing. This helps caregivers effortlessly and securely connect their tablet or laptop to the device when they place it on or near IQvitals Zone to initiate vital signs acquisition.



FIGURE 1. Midmark IQvitals Zone allows caregivers to centralize vital signs acquisition at the point of care. In-room and mobile versions of the diagnostic device provide flexibility and multiple workflow options for caregivers.

IQvitals Zone transforms the traditional vital signs acquisition process by establishing a direct wireless connection between the vital signs monitor and the caregiver's tablet or laptop. IQvitals Zone eliminates the need to manually connect and disconnect by auto-connecting when the caregiver places their laptop on the multi-use work surface or near the diagnostic device—it automatically disconnects when the tablet or laptop is moved away from the device.

When connected, caregivers can capture vital signs measurements, review results and seamlessly import the information into an electronic medical records (EMR) system. Additionally, if the exam room includes a Midmark 626 Barrier-Free® Examination Chair with integrated Digital Scale, caregivers can directly capture weight data from the chair and send it to the EMR. This can all be done through a single pane of glass, allowing caregivers to perform device functions and import data into the EMR within one computer screen, as opposed to interacting with multiple device screens in various locations throughout the room or facility.

Midmark IQvitals® Zone™ Technology Benefits

Following is how Midmark Zone™ technology contributes to the four primary benefits of a connected point of care ecosystem.

GREATER VISIBILITY

IQvitals Zone provides caregivers with greater visibility into a patient's health history by offering consistent, reliable measurement and documentation of patient vital signs. This allows caregivers and patients to more easily track important health status and trends of chronic disease conditions—which ultimately leads to better patient care, disease management, treatment decisions and clinical outcomes.

For instance, IQvitals Zone provides caregivers with six automated modes for blood pressure (BP) measurement to help ensure more consistent, accurate readings. Spot mode takes a single noninvasive BP (NIBP) reading. Interval mode acquires a series of NIBP readings at selected intervals until the user elects to finish the monitoring session. Continuous mode achieves continuous BP measurements for five minutes. Averaging mode automates a series of five readings, eliminates the first reading and displays the average of the remaining four readings as the patient's average BP. The SPRINT BP protocol feature adheres to the measurement process outlined in the Systolic Blood Pressure Intervention Trial (SPRINT), allowing for a five-minute rest before taking three measurements (each a minute apart) and then averaging the BP readings. The Custom BP protocol allows the user to customize BP measurement based on the SPRINT BP protocol.

Automated vital signs acquisition can provide the consistency that is key to accuracy, especially for a measurement that is the foundation for so many decisions about a patient's health.

STANDARDIZATION

Currently, many healthcare organizations are working to implement a higher level of standardization into their processes and procedures. Midmark Zone technology introduces automation and connectivity at the point of care that can help ensure a higher level of standardization, minimizing human variables while maximizing consistency and data accuracy.

The automation introduced by IQvitals Zone can assist in facilitating the repeatable adherence to a health system's clinical guidelines for proper BP measurement techniques, helping achieve more accurate, consistent and reliable BP measurement for all patients. This is especially evident when IQvitals Zone is used in conjunction with a connected exam chair that helps position the patient in accordance with [American Medical Association \(AMA\) guidelines](#) for proper BP measurement. Caregivers who use IQvitals Zone are better equipped to achieve more accurate, consistent and comparable BP measurements.

It has also been shown that manual BP readings can produce inconsistent results. One research study found that automated capture tends to produce numbers lower than manually taken readings by as much as -10.8/-3.1 mmHg (systolic/diastolic error).² When the data collection process is automated and standardized, consistency and precision is achieved between care sites, equipment and providers. This means increased confidence in the data collected, which ultimately can lead to better clinical decisions and patient care. This is especially important given the issues created by inaccuracies in BP measurement, which we discuss later in this paper.

The new level of connectivity provided by Midmark Zone™ technology protects the quality of data by virtually eliminating the risk of human errors occurring at the keyboard. IQvitals® Zone™ directly imports patient vital signs data into the EMR, eliminating manual transcription errors and providing greater confidence in data accuracy. As mentioned previously in this paper, studies have shown that manual transcription of data produces a 17% rate of error on average.¹ Assuming a practice sees 20 patients a day, that can equate to approximately 20 avoidable errors each day.³

The standardization enabled by automation and connectivity also establishes a platform that reinforces workflows for existing protocols. Over time, the platform can serve as a mechanism when considering and implementing new workflows that follow industry best practices.

GREATER EFFICIENCY

The vital signs acquisition process hasn't changed significantly in the last 30 years. Today's processes often include multiple stations in a facility to capture vital signs (BP, temperature, pulse and SpO₂), weight and height. Some locations are in semi-public spaces, which can lead to patient discomfort and privacy violations. By establishing a connected point of care ecosystem where all vital signs as well as weight and height can be captured in one location, IQvitals Zone can assist caregivers in creating a more efficient vital signs acquisition process.

Centralizing the vital signs process at the point of care using IQvitals Zone reduces the need to move patients through different stations to capture necessary vital signs data. By automating the process, IQvitals Zone can capture multiple vital signs measurements simultaneously. And by providing a direct, wireless connection between the vital signs monitor and the clinician's tablet or laptop, IQvitals Zone technology eliminates the need for manual data entry and the associated risk of manual transcription errors.

At a most basic level, Midmark Zone technology allows caregivers to easily move from room to room, automatically connecting to and disconnecting from the vital signs monitor as they move in and out of range. (Figure 2) Traditionally when caregivers enter a room, they are required to manually connect their laptop or tablet to the vital signs device. The login can require as many as three to five clicks every time the caregiver enters the room, and that does not include any of the steps necessary to disconnect before leaving the room. This is valuable time that could be better spent focused on the patient.



FIGURE 2. Caregivers using IQvitals® Zone™ can automatically connect their tablet or laptop to the vital signs monitor. With zero clicks and no cables to connect, the caregiver has more time to focus on the patient.

ENHANCED PATIENT-CAREGIVER INTERACTION

Patient-caregiver interaction in the exam space is a foundational element in the continuum of care. For that reason, every aspect of IQvitals Zone is designed to ensure that interaction at the point of care is improved. For instance, the diagnostic device features a built-in work surface where caregivers can place their laptops. This eliminates the need for a separate computer cart or Mayo stand. With the laptop and vital signs monitor located together, providers can more effectively maintain eye contact with patients, helping improve interaction and intimacy during patient visits.

Also, with vital signs acquisition now streamlined and simplified through automated data transfer and a new level of connectivity, caregivers can spend more time with the patient. Less time clicking and more time listening and engaging the patient can result in a better experience and better care.

For patients, IQvitals Zone technology helps ensure a consistent experience and alleviate concerns they may have regarding potential errors resulting from inaccurate vital signs acquisition or manual data entry. Patient peace of mind and comfort are important factors in driving high patient satisfaction, which is growing in importance in the healthcare industry. When patients and providers are comfortable in their environment and realizing gains in time and accuracy through efficiency and automation, better care and outcomes are possible.

Midmark IQvitals® Zone™ Technology + BP Measurement

As mentioned previously in this paper, IQvitals Zone helps eliminate human variables that increase the likelihood of errors that can contribute to inaccurate diagnoses. Of all the vital signs, BP measurement has perhaps the strongest connection to point of care diagnosis, patient risk stratification and medication dosing. These three critical factors of care management are essential to precise decision-making. Because of its centrality in care, it is essential that BP assessment is as accurate as possible.

In order to properly diagnose and treat hypertension—a major risk factor for coronary heart disease, stroke and renal failure—caregivers need accurate BP measurements, both current and trending. It is also becoming increasingly important to detect small differences in BP readings in the treatment of patients with diabetes and renal diseases, making accurate trending data and standardized protocols even more critical.

Unfortunately, despite the availability of highly accurate automated devices such as IQvitals Zone and equipment that positions the patient in precisely the correct manner, such as the Midmark 626 Barrier-Free® Examination Chair, BP measurement continues to be one of the most inconsistently performed tests in the clinical environment. According to the AHA, numerous surveys have shown that physicians and other healthcare providers rarely follow established guidelines for BP measurement. However, when they do, the readings correlate much more closely with more objective measures of blood pressure than the usual clinic readings taken when not following the guidelines.⁴ As Chart 1 shows, there are a number of factors that can affect the accuracy of BP measurement.

FACTORS AFFECTING ACCURACY OF BLOOD PRESSURE MEASUREMENTS ^{5,6}

Factor	Systolic BP Discrepancy (mmHg)*	Diastolic BP Discrepancy (mmHg)*
Patient talking or active listening	+10 - 15	+10
Arm is above heart level	-2 per inch	
Arm is below heart level	+2 per inch	
Patient's feet not flat on the floor	+5 - 15	
Patient's back not supported	+5 - 15	+6 - 10
Patient's legs crossed	+2 - 8	+2 - 8
Unsupported arm	+6 - 10	+5 - 11
Patient doesn't rest 3-5 minutes	+10 - 20	
White coat syndrome	+11 - 20	

*Factor discrepancies are not cumulative.

CHART 1. A number of factors can cause discrepancies with systolic and diastolic blood pressure measurement.

BP readings can vary when obtained by different members of a care team. Two different caregivers independently acquiring BP measurements using manual methods on the same patient can often obtain two different readings. With IQvitals® Zone™, human variations are minimized by normalizing and automating the BP measurement process.

Because IQvitals Zone automatically transmits patient vital signs data directly to the EMR, errors due to manual transcription are also eliminated. This added functionality allows the care team to use the tools within the IQvitals Zone solution to standardize all stages of the vital signs collection process. In the end, the patient and care team experience a more streamlined and efficient interaction, which ultimately leads to improved satisfaction and quality metrics.

IQvitals Zone has achieved the level of precision necessary for clinically accurate point of care BP measurement. Supporting validation studies at a leading independent laboratory demonstrating consistent top tier performance by IQvitals Zone were reviewed by Dr. Bruce Alpert, a renowned expert in BP measurement:

MIDMARK IQVITALS ZONE: BLOOD PRESSURE ACCURACY VALIDATION REVIEW BRUCE S. ALPERT, MD

For the past 40 years, the American National Standard, a document that describes the protocol necessary to demonstrate accuracy of an automated BP device, has been written by a committee named by the Association of the Advancement of Medical Instrumentation (AAMI). In the past decade, this committee has joined forces with the International Organization of Standards (ISO) to produce one world-wide standard for BP accuracy testing, the ANSI/AAMI/ISO 81060-2:2019 Standard.⁷ Passing the accuracy requirements of this standard is the ultimate validation test for an automated BP device.

The Standard requires testing on at least 85 subjects whose systolic BP measurements range from ≤ 100 mmHg to ≥ 160 mmHg. The required diastolic BP range is from ≤ 60 mmHg to ≥ 100 mmHg. There are additional requirements related to arm size and gender. Two statistical targets must be achieved for both systolic BP and diastolic BP: Criterion 1 requires that the mean of the BP values, when compared to traditional two-observer auscultation, be ≤ 5 mmHg with a standard deviation (SD) of ≤ 8 mmHg. Criterion 2 is more complex, where the mean \pm SD required to pass changes as the amount the device BP means differ from the manual by more than zero. To pass both criteria, thereby validating the automated BP device, requires an algorithm of exceptional precision.

The Midmark IQvitals® Zone™ was tested, using a Midmark 626 Barrier-Free® Examination Chair for proper patient positioning, at an independent research site well known for doing BP validation studies. The results of that testing are impressive, with each Standard criterion reaching a “passing grade” for the device’s default step deflation algorithm. The Criterion 1 mean \pm SD values and Criterion 2 SD values (Chart 2) were well within the allowed differences between the device and manual auscultation. Thus, the IQvitals Zone device passed every requirement of the Standard for complete validation.

ANSI/AAMI/ISO 81060-2:2019 Criteria	Step Deflation (device minus manual BP readings/differences)	
	SBP differences (mmHg)	DBP differences (mmHg)
Criterion 1 (mean ± SD)	1.22 ± 6.3	-1.67 ± 6.09
Criterion 2 (SD)	5.06	4.98

SBP, systolic blood pressure; DBP, diastolic blood pressure; SD, standard deviation

The IQvitals Zone device is part of a novel integrated technology system when used in conjunction with the Midmark® 626 exam chair, which provides proper patient positioning capability for more accurate BP readings. This system reduces variations in accuracy due to failure to comply with American Heart Association and American College of Cardiology patient positioning recommendations during BP assessment. Using the Midmark IQvitals Zone device with the Midmark 626 examination chair should improve the quality of care for all patients.

Dr. Alpert is a pediatric cardiologist who practiced for nearly 50 years. He is the former physician chair of the AAMI Sphygmomanometer Committee and represented the USA on the International Organization for Standardization (ISO) Technical Committee, ISO/TC 121/SC 3 "Respiratory devices and related equipment used for patient care", for the update to the current ANSI/AAMI/ISO 81060-2:2019 standard.

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- ² Wahi MW, Parks DV, Skeate RC, Goldin SB. Reducing errors from the electronic transcription of data collected on paper forms: a research data case study. *JAMA* 2008 May 1; 15(3): 386–389. PMID:18308994
- ³ Error rate equation: (20 patients)(6 vital signs per patient)(17 percent errors)=20.4 errors per day
- ⁴ T. Pickering, J. Hall, L. Appel, B. Falkner, J. Graves, M. Hill, D. Jones, T. Kurtz, S. Sheps, E. Roccella. Recommendations for blood pressure measurement in humans and experimental animals: Part 1: Blood pressure measurement in humans: A statement for professionals from the subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Journal of Hypertension* (2005) 45:142-161. PMID:15611362
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- ⁶ J. Long, J. Lynch, N. Machiran, S. Thomas, K. Malinow. The effects of status on blood pressure during verbal communication. *Journal of Behavioral Medicine* (1982) 5:165. PMID:7131540
- ⁷ ANSI/AAMI/ISO 81060-2:2019. Non-invasive sphygmomanometers - Part 2: Clinical investigation of intermittent automated measurement type. <https://www.iso.org/obp/ui/#iso:std:iso:81060:-2:ed-3:v1:en>



Midmark IQvitals[®] Zone[™] can be a significant step forward in the effort to establish a fully connected point of care ecosystem. By further integrating vital signs acquisition and caregiver mobile computing into the point of care, IQvitals Zone improves clinical workflow and accuracy, EMR connectivity and patient care efficiency, while providing a platform for future capabilities to further advance quality of care and clinical outcomes.



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