

Solution Brief

AI Machine Vision
Medicine Recognition



Onyx Identifies Medications for More-Efficient Hospital and Pharmacy Dispensing

A prototype AI Medicine Recognition Device improves identification efficiency and accelerates medication verification to aid in dispensing of medication to patients



“Onyx has developed the Medicine Recognition Device to improve medication administration workflows and reduce the amount of time it takes to check medicines. Our device leverages the Intel® Distribution of OpenVINO™ toolkit to imitate human vision. The toolkit uses a common API to support multiple Intel® architectures and AI accelerators that can help accelerate time to market with optimized kernels and a function library.

“Our engineering design team implemented the toolkit because of the exceptional benefits it offers for high-performance, deep learning deployments, as well as its cross-platform flexibility and scalability. These technologies are integral to the Medicine Recognition Device and its functionality.”

—Bob Wang, CEO, Onyx Healthcare Inc.

Medication errors are a USD 42 billion problem worldwide,¹ and medication administration is a frequent routine task that nurses call “time consuming” and “never end[ing].”² Now, Onyx Healthcare has created the **AI Medicine Recognition Device** to automate accurate identification of medications, including visually similar medicines—in real time—for any quantity or type of medication.

With the new AI Medicine Recognition Device, Onyx makes it possible to dispense medication in a very short time, with a high accuracy rate, so that medical professionals can spend more time caring for patients. The device is currently being trialed in a 300-bed hospital in Taiwan, and Onyx is seeking necessary approvals to market the device in Taiwan and other countries.

The Onyx solution, designed to streamline workflows for nurses and pharmacists while accurately identifying medication and streamlining medication identification, used an accelerated development process enabled by the [Intel® Distribution of OpenVINO™ toolkit](#). The device was built using an Intel® Xeon® E3 processor and Intel® Movidius™ Myriad™ X VPU.

Challenges: Building a trusted, effective medication recognition solution with artificial intelligence

Today, medical staff comment that medication administration is a time-consuming, exacting task that distracts from their ability to focus on patient engagement and care. Medical errors, including prescribing and dispensing errors, kill up to a quarter of a million Americans annually.³

Identifying prescription medications using machine vision and artificial intelligence creates unique challenges because many types of medication appear outwardly similar, especially from some viewing angles. To create a highly accurate solution that improves identification efficiency requires the ability to identify medication with any appearance, in any quantity, viewed from any angle. In order to be adopted by hospitals and pharmacists, any device to recognize medication with artificial intelligence may require local regulatory approval.



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Solution: Real-time medication identification to save lives and boost healthcare productivity

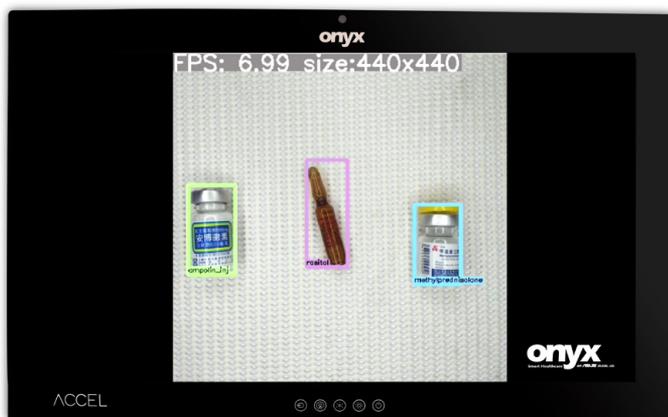
The Onyx AI Medicine Recognition Device automates the “five rights” of medication administration—right patient, right drug, right dose, right route, and right time—into a single-scan workflow that simplifies the duties of nurses and other healthcare providers. The scan identifies the quantity and type of medication as well as the delivery route, and can match it to patients and their dosing schedule. Pharmacists, who today must turn most of their focus to verifying prescription accuracy, can spend more time on the less-routine parts of their job, as the device is intended to allow medication to be delivered directly to the patient without the need for additional verification.

The Onyx solution prototype is intended to help achieve faster medicine administration with reduced involvement of medical personnel. Studies have revealed that typical medication administration error rates when medication is dispensed by a human range from 8 to 25 percent, for an overall human accuracy rate of 75 to 92 percent.⁴

Taiwan's Yeezen General Hospital, a 300-bed hospital serving a patient population of 5 million, is performing a trial with a prototype of the device to help improve identification efficiency, as well as to streamline patient medication workflows for nurses.

Benefits of Onyx Healthcare's AI Medicine Recognition Device include:

- **Reduced personnel needs:** By automating medication recognition with a scan, only one pharmacist needs to confirm medication count, type, and dosage, rather than needing two pharmacists to cross-check each time medication is dispensed.
- **Improve identification efficiency:** With fast, accurate identification of medication¹ and dosage that matches prescription to patient, costly and dangerous mistakes can be avoided.
- **Five rights in one step:** Make sure the right patient is receiving the right medication at the right dosage, via the right route at the right time, all with a single, easy scan that detects medication type and number of doses and matches medication doses to the patient's dosing schedule.



Medication identification

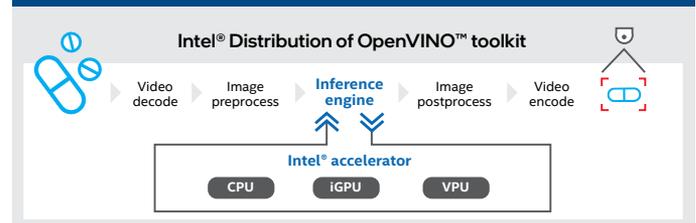
How it works in brief

The Onyx AI Medicine Recognition Device was developed with the Intel Distribution of OpenVINO toolkit, used for rapid development of computer vision applications. The toolkit provided integration and optimization for OpenCL, as well as accelerated optimization for edge hardware.

Onyx chose the toolkit because it could be accessed directly from their Intel® CPUs, eliminating the need for an additional AI processor. The Onyx team found that using the Intel Distribution of OpenVINO toolkit provided higher inference speed and stability. Models were quickly converted from Caffe to OpenVINO using the toolkit.

Using deep learning integrated with Intel Distribution of OpenVINO toolkit, Onyx was able to accelerate the development of its medication recognition solution. This solution can rapidly model visual identification of medication, including medications with a similar appearance. By building its computer vision solution on user-friendly medical PC solutions, Onyx was able to create a solution that is fully IEC 60601-1 certified, making it a feasible choice for the medical field.

Additionally, Onyx used Intel® Vision Accelerator Design products, accelerating their computer vision applications with the Neural Compute Engine included on their Intel® Movidius™ VPUs for fast video analysis. These highly efficient VPUs offer a cost-effective way to speed inference on customized deep neural networks and network layers.



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Conclusion: Simplifying clinical workflows with AI for easier medication administration

Smart dispensing offers hospitals and pharmacies an opportunity to help provide more-effective patient care while maximizing the efficiency of medical staff. With the AI Medicine Recognition Device, Onyx aims to identify and validate medication being given to patients in hospitals to improve identification efficiency.

Using deep learning to make accurate visual inspections with a single scan, the AI Medicine Recognition Device transforms medicine dispensing procedures from time-consuming, error-prone manual tasks to an automated, unified workflow. This IEC 60601-1-certified device, now in use as a prototype, is intended to deliver accurate, consistent, fast results that can help clinicians correctly medicate patients while eliminating tedious, repetitive workflows from healthcare provider shifts.

Learn more

To discover how the Onyx AI Medicine Recognition Device can streamline healthcare workflows and improve identification efficiency, see the system in action in the [video product demo](#).

Intel Distribution of OpenVINO toolkit

The Intel Distribution of OpenVINO toolkit is free software for developers that accelerates performance, deep learning, and computer vision inference from edge to cloud. It supports heterogeneous processing and asynchronous execution across multiple types of Intel® processors.

Introducing Long-Term Support

Developers can now choose between standard support releases or Long-Term Support (LTS) for the Intel Distribution of OpenVINO toolkit. Standard releases provide new versions of the toolkit every quarter, ideal for early-stage projects and developers looking to take advantage of the latest innovations in deep learning. LTS offers long-term maintenance and support, a great choice for later-stage developers focused on leveraging the toolkit's existing features and functionality.

Long-Term Support benefits:

- Focuses on deployment and is designed to be taken into production
- Includes critical bug fixes for one year and security patches for two years, postrelease
- Enables shipping applications with reliability in existing capabilities and compatibility

[Learn more >](#)

Intel® DevCloud for the Edge

Intel DevCloud for the Edge is a cloud-based sandbox that empowers enterprise developers to test, prototype, and benchmark AI edge models across multiple platforms in real time, from nearly anywhere in the world. This makes it easy to identify the best hardware configurations for AI edge applications, accelerating time to market and reducing costs.

[Learn more >](#)



1. <https://www.who.int/news-room/detail/13-09-2019-who-calls-for-urgent-action-to-reduce-patient-harm-in-healthcare>.

2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3968850/>.

3. <https://www.ncbi.nlm.nih.gov/pubmed/28186008>.

4. <https://psnet.ahrq.gov/primer/medication-administration-errors>.

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About Onyx Healthcare

Onyx Healthcare Inc. is a medical IT company that provides innovative, customer-centric medical PC products and services.

Learn more at onyx-healthcare.com.

"Medicine administration is the most tedious, repetitive task in our daily work, as well as being time consuming. However, because errors can have tragic consequences for patients, we needed a solution that created a medical environment with a more efficient workflow. Onyx has developed the AI Medicine Recognition Device, using AI to help us double-check medication before it is administered. The medication that the patient receives is now verified not just by one person, but also by the device, giving patients and nurses alike more peace of mind."

—Elizabeth Chang, nurse, Yeezen General Hospital