B-230: ADVANCED INSTRUMENT-GUIDED TROUBLESHOOTING FOR FUTURE AUTOMATED ANALYZERS

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BACKGROUND

Current troubleshooting and maintenance methods for automated clinical analyzers are challenging and often require skilled operators to execute them. This can lead to additional system downtime, decreased laboratory throughput, and excessive use of a technologist's time.

A consistent and simplified Help Wizard solution has been created on a prototype* to allow operators to complete these tasks more efficiently on future automated clinical analyzers.

Instrument features, such as hardware sensors, are used to identify analyzer status. For example, during a barcode read failure, the barcode scanner can be polled to determine whether the failure resides with the consumable, or the analyzer. Then, the hardware and software interact to either automatically complete a workflow step, or present relevant Help instructions needed by the operator to manually complete an action. Software is structured to provide a consistent user interface experience for the performance of all Wizards. Workflows are interactive and allow for branching depending on system status or user input

PROBLEM STATEMENT

To perform troubleshooting and maintenance procedures on many current automated analyzers, operators are often required to do the following:

- Reference printed maintenance procedures
- Follow complex troubleshooting guides
- Rely on tribal knowledge
- Perform complex manual tasks
- Assume that they completed the task correctly
- Manually navigate or perform diagnostic routines to return instruments to service
- Stop all other work to focus on and complete the task

METHOD A

Wizards for Automated Analyzers

The first step in creating these wizards, was to create a common framework and build infrastructure for dynamic communication between instrument subsystems, the instrument instructions for use, and the operator. These instrument-guided workflows, are initiated by the operator, but prompted by the analyzer. They direct operators of any skill level through the performance of procedures in a highly structured and consistent way using workflows that are segmented into steps that are performed jointly by the analyzer and the operator.

Wizards are especially useful for highly regimented and complex activities such as troubleshooting, maintenance, or for rare tasks requiring human intervention.

RESULTS A

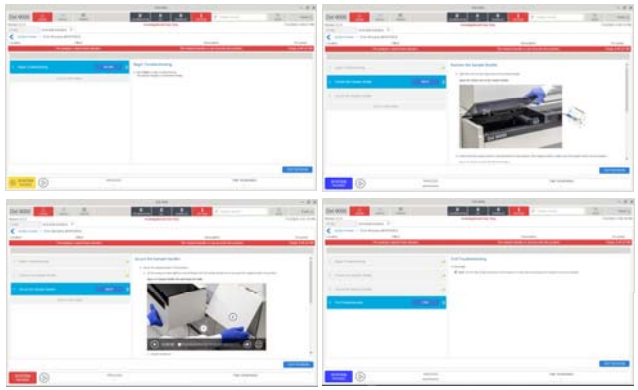

Figure 1 An example of an automated troubleshooting Wizard that consists of four steps. The current step in each frame is highlighted in blue on the left, and the accompanying instructions for that step is visible on the right.

METHODS B

Integration with the Instructions for Use (IFU)

The instructions contained in the wizards are created in conjunction with the content of the IFU to ensure all operator instructions are consistent across multiple formats (printed and electronic versions of the IFU, videos, analyzer System Help, online System Help, and wizard instructions). This also ensures that all operator instructions follow the same process for editing, review, approval, and translation.

RESULTS B

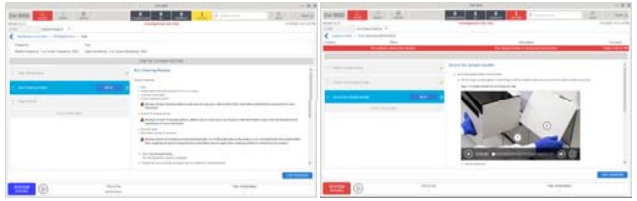

Figure 2 Example of wizard instructions using text.

Figure 3 Example of wizard instructions using video.

METHODS C

Use of Analyzer Hardware

Analyzer hardware and sensors are used to enhance troubleshooting within the wizard to quickly identify root causes. Hardware has also been used to automate transitions between steps.

RESULTS C

Figure 4 Example of a wizard step displaying the actual temperature data of the pertinent subsystem temperature probes, as well as the upper and lower range limits.

Figure 5 Example of a wizard step displaying the actual image as seen by the bar code reader.

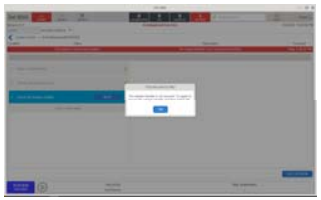

Figure 6 Example of a wizard step confirming a cover has not been closed.

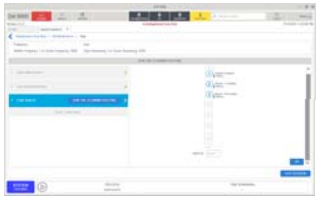

Figure 7 Example of a wizard step providing an in-workflow input location for sample rack information.

Figure 8 Examples of a wizard used for routine maintenance. Wizards can run automated diagnostic and maintenance routines, such as priming or cleaning (left). When maintenance is completed through a wizard, the task completion is automatically recorded in the maintenance log (right).

CONCLUSION

While it is preferable to fully automate all maintenance, error handling, and troubleshooting processes, tasks remain that require human interaction, input, and judgement.

The new advanced instrument-guided troubleshooting workflows improve the customer experience by:

1. Improving uptime by providing troubleshooting instructions more efficiently
2. Reducing the need for advanced training
3. Eliminating the need for printed troubleshooting information and tribal knowledge

References:
Dxl 9000 Access Immunoassay Analyzer *Instructions For Use*, IUO (PN C31970 AC)
Disclaimer:
*The prototype is not cleared or approved for commercial use is any geography.