A retrospective review of test utilization in a large children’s hospital

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BACKGROUND

Rapid and sensitive diagnostic methods can reduce the use of broad-spectrum antibiotics with timely diagnosis. Until recently, most rapid methods have focused on single or limited panel pathogen identification by PCR. Newer tests that utilize cell-free plasma DNA next generation sequencing (pNGS) technology to identify over a thousand pathogens are promising. However, it is unclear if pNGS offers additional diagnostic value, improves sensitivity, or reduces time to detection when testing is completed in the same time frame as conventional testing. Understanding where in the diagnostic workup these costly tests add value is important to diagnostic stewardship initiatives.

METHODS

• Retrospective chart review of all patients with pNGS testing as part of clinical care at Texas Children’s Hospital (TCH) from 4/1/2019-6/30/2019 was performed.
• Details about pNGS were recorded: results, specimen collection time, result time in the electronic medical record (EMR), and turnaround time (TAT).
• The same information was obtained for conventional testing (culture, serology, PCR, and histopathology) 1 week before and after pNGS testing.
• Positive and negative agreement between pNGS and conventional testing was assessed.
• Electronic records of patients with discordant results were reviewed to determine whether antimicrobials were added or changed based on the discordant pNGS result.

RESULTS

- Sixty patients reviewed with average age of 8.9 years. Majority were immunosuppressed (62%). Primary indication for testing was to evaluate lesions (e.g. lung nodule) seen on imaging (40%).
- Of these 60 patients, 22 had no organisms identified, 22 had one organism identified (14 bacteria, 7 viruses, 1 yeast) and 16 had two or more organisms identified
- For concordant results, conventional tests were collected 39.5 (CI 7.8, 70.9) hours earlier than pNGS and results were reported 84.0 (CI 44.0, 124) hours earlier for conventional testing compared to pNGS
- In 73% of patients with concordant results, the organism identification was known by conventional testing prior to the pNGS result and in 45% of cases the organism identification was known prior to pNGS collection.
- In 24% of cases in which pNGS identified a unique organism antimicrobials were changed.

REFERENCES


CONCLUSION

Results were known earlier and in a timelier fashion by conventional testing compared to pNGS. In many cases little additional value was gained when the pNGS was ordered in the same time frame as conventional testing. This underscores the importance of implementing lab stewardship to optimize the diagnostic utility of pNGS for each patient. We advocate for ordering restrictions to identify patients that would benefit most from pNGS and to avoid unnecessary testing. Further investigation to define the clinical scenarios in which pNGS offers greatest utility is needed.