A new rapid molecular test for pathogen detection in pneumonia: first insights into potential antibiotic savings

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BACKGROUND

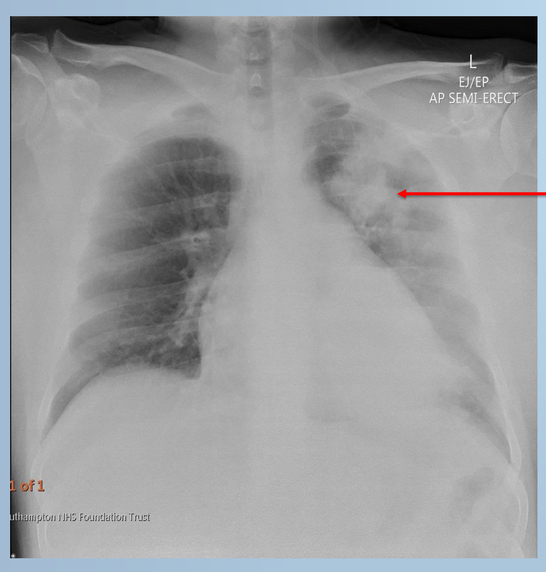
- Lower respiratory tract infections (pneumonia) are mainly caused by bacteria. They are the third most common cause of death worldwide, accounting for an estimated 2.7 million deaths annually[1].
- Administration of appropriate antibiotics within hours of diagnosis is critical for treatment of patients with pneumonia.
- Current diagnostics do not allow us to work out which bacteria have caused the infection within these first few hours. As a result **'broad spectrum' antibiotics** are prescribed as a best guess, which kill a lot of different species of bacteria.
- The use of **these antibiotics drives antimicrobial resistance** and can lead to other serious **complications like *Clostridium difficile*** infection (CDI).
- The current standard diagnostic tests **only detect an organism in 23-40%** of patients with clinically diagnosed pneumonia[2]. This process takes 72 hours minimum therefore often the patient remains on broad spectrum antibiotics even if an organism is eventually detected.

MATERIALS AND METHODS

- The BioFire Filmarray is a multiplexed PCR platform (picture top right). A pneumonia panel was recently licensed for in-vitro diagnostic use on sputum samples. It rapidly detects 33 respiratory pathogens and antibiotic resistance genes with a **turn-around time of 80 minutes**.
- It detects pathogens **in 71% more specimens than routine culture** and is **highly concordant with organisms detected in culture[3].**
- We retrospectively tested 3 sputum samples from patients with pneumonia to see whether a change in antibiotics (e.g. narrowing of spectrum, quicker targeting of antibiotics) could have been facilitated. **In 2 out of 3 cases, antibiotic change could be supported.**

CASE 1 – November 2017

- A 63 year old woman with a background of chronic obstructive pulmonary disease (COPD) was admitted to intensive care with pneumonia. She was empirically treated with co-amoxiclav and azithromycin- a broad spectrum of antibiotic cover.
- Culture results were negative after 72 hours so no change was made in antibiotic therapy.
- The Filmarray detected Haemophilius influenzae. The absence of detection of some atypical organisms **would have facilitated stopping azithromycin, saving 7 antibiotic days.**



CASE 2 – Febuary 2018

- A 47 year male diabetic was admitted with breathlessness and diarrhoea. He was diagnosed with pneumonia (his chest x-ray is shown picture left: arrow to patch of pneumonia)
- He was empirically managed with co-amoxiclav and azithromycin. No sputum culture was performed. On day 3 of his admission blood cultures were positive with **Streptococcus pneumoniae**. Stool sample on admission to ICU was **positive for Clostridium difficile toxin** so additional **metronidazole was started** and isolation precautions put in place.
- The Filmarray detected Streptococcus pneumoniae, Staphylococcus aureus, Escherichia coli and rhinovirus. These results again **would have facilitated stopping azithromycin, saving 7 antibiotic days.** Arguably the result could also have led **to earlier targeted therapy** against S. pneumoniae.

CONCLUSION

- Rapid molecular tests do have the potential to improve antibiotic usage in pneumonia, which is an area of huge consumption globally.
- Our group has recently gained ethical approval for a pragmatic RCT to investigate this impact.

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