Assessing the impact of the meningitis/encephalitis diagnostic panel on antimicrobial stewardship

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INTRODUCTION

- The multiplex polymerase chain reaction (PCR) assay for meningitis/encephalitis (ME) is available to detect 14 pathogens from the cerebral spinal fluid (CSF) in less than 2 hours
- Common practice for meningitis is to empirically initiate patients on antimicrobials which can sterilize cultures, however PCR should not be affected
- PCR technology has the potential to be useful to help curb antimicrobials (e.g., antibiotics, antivirals) and to promote antimicrobial stewardship whether positive or negative

STUDY OBJECTIVES

- To assess whether patient care is improved after PCR implementation with oversight from the antimicrobial stewardship program (ASP) team
  - Time to de-escalation of empiric therapy (e.g., negative and positive PCR)
  - Total days of therapy of antimicrobials
  - Hospital length of stay, attributable mortality rate, and readmission rate

METHODS

- Conducted an IRB-approved, single center retrospective cohort study
- Random sample of patients between 7/2015 to 12/2018 where the intervention group included those with a ME panel result whereas control group without ME result were matched to seasonality
- Data was collected using electronic medical records (e.g., demographics, culture & PCR results, antimicrobials administered, occurrence of adverse events, length of stay (LOS), mortality)

Inclusion criteria
- Subjects suspected to have meningitis or encephalitis, aged 18 years of age and above with cerebral spinal fluid sent for analysis

Exclusion criteria
- Subjects that did not receive any antimicrobial therapy

Statistical analysis
- Frequency and percent of patient characteristics were calculated and differences between PCR and no PCR groups were assessed using Fisher's exact test
- Median and interquartile range of continuous variables were calculated and assessed using the Mann Whitney Rank Sum test

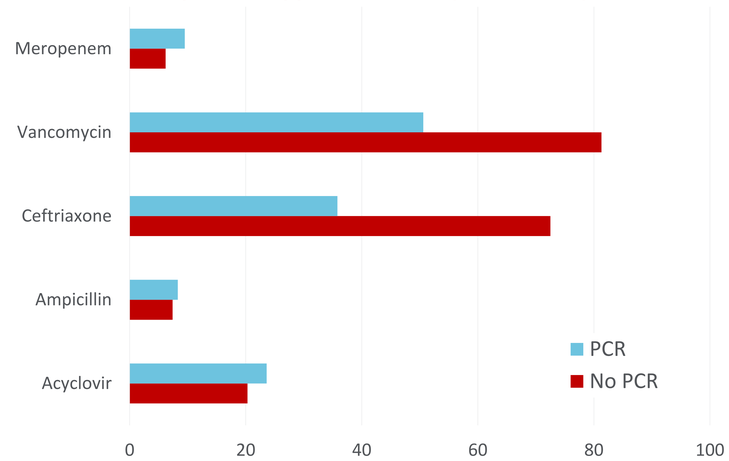
RESULTS

Baseline Characteristics N = 242	**No PCR, n = 80** n (%)	**PCR, n = 162** n (%)
Sex		
Male	38 (47.5)	82 (50.6)
Age		
Range in years	18 – 89	18 – 99
Mean in years	45.7	54.9
Race		
African American	30 (37.5)	55 (34.0)
Caucasian	14 (17.5)	49 (30.2)
Asian	13 (16.2)	32 (19.8)
Other	23 (28.8)	26 (16.0)
Comorbidities		
HIV	7 (8.8)	6 (3.7)
Chronic Kidney Disease	6 (7.5)	17 (10.5)
Immunosuppression	8 (10.0)	10 (6.1)
Diabetes	17 (21.3)	44 (27.2)
Malignancy	4 (5.0)	15 (9.3)

Diagnostics and Treatment	**No PCR, n = 80** n (%)	**PCR, n = 162** n (%)
Etiology of meningitis identified	2 (2.5)	17 (10.5)
Prior antibiotic used in past 2 weeks	15 (18.8)	17 (10.5)
Antibiotics given prior to lumbar puncture	48 (60.0)	95 (58.6)

Primary Outcomes – Results N = 242	**No PCR** n = 80	**PCR** n = 162	***P-value***
Time to de-escalation in hrs [IQR]	26.5 [5 – 51]	8 [1 – 19]	P < 0.001
Total days of therapy of antimicrobials [IQR]	2 [1 – 4]	4 [1 – 7]	P = 0.121
Median hospital length of stay in days [IQR]	5.5 [3 – 8.5]	9 [6 – 15]	P < 0.001
# of patients readmitted (%)	13 (16.3)	23 (14.2)	P = 0.673
# of Mortality (%)	3 (3.8)	14 (8.6)	P = 0.161

Empiric Therapy Administered (% of Patients)



STUDY LIMITATIONS

- Standard group (non-PCR) only provides a historical, rather than contemporaneous control
- Some events of interest were not frequent, therefore we were not able to adjust for known risk factors that may influence them
- Time for de-escalation analysis was performed only in those that survived

CONCLUSIONS

- The ME PCR in conjunction with ASP efforts were associated with earlier time to de-escalation of antimicrobials
- There was a higher rate of pathogen diagnosed in the PCR group which could explain the longer median length of stay
- Earlier de-escalation has the potential to decrease costs associated with broad-spectrum antimicrobials use as well as a potential decrease incidence of adverse drug events (e.g., *Clostridioides difficile* infections, nephrotoxicity)