Effect of Rapid Identification of Bloodstream Isolates on Antibiotic Management using a Pharmacist-Based Treatment Algorithm

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Background

The use of rapid molecular diagnostic testing to identify microorganisms and resistance markers has great potential to optimize medical care and assist with antimicrobial stewardship. We implemented the Verigene bloodstream infection testing panel along with a pharmacy notification system to clinicians. We retrospectively assessed pharmacy interventions from the Verigene test results to assess the efficacy of the intervention.
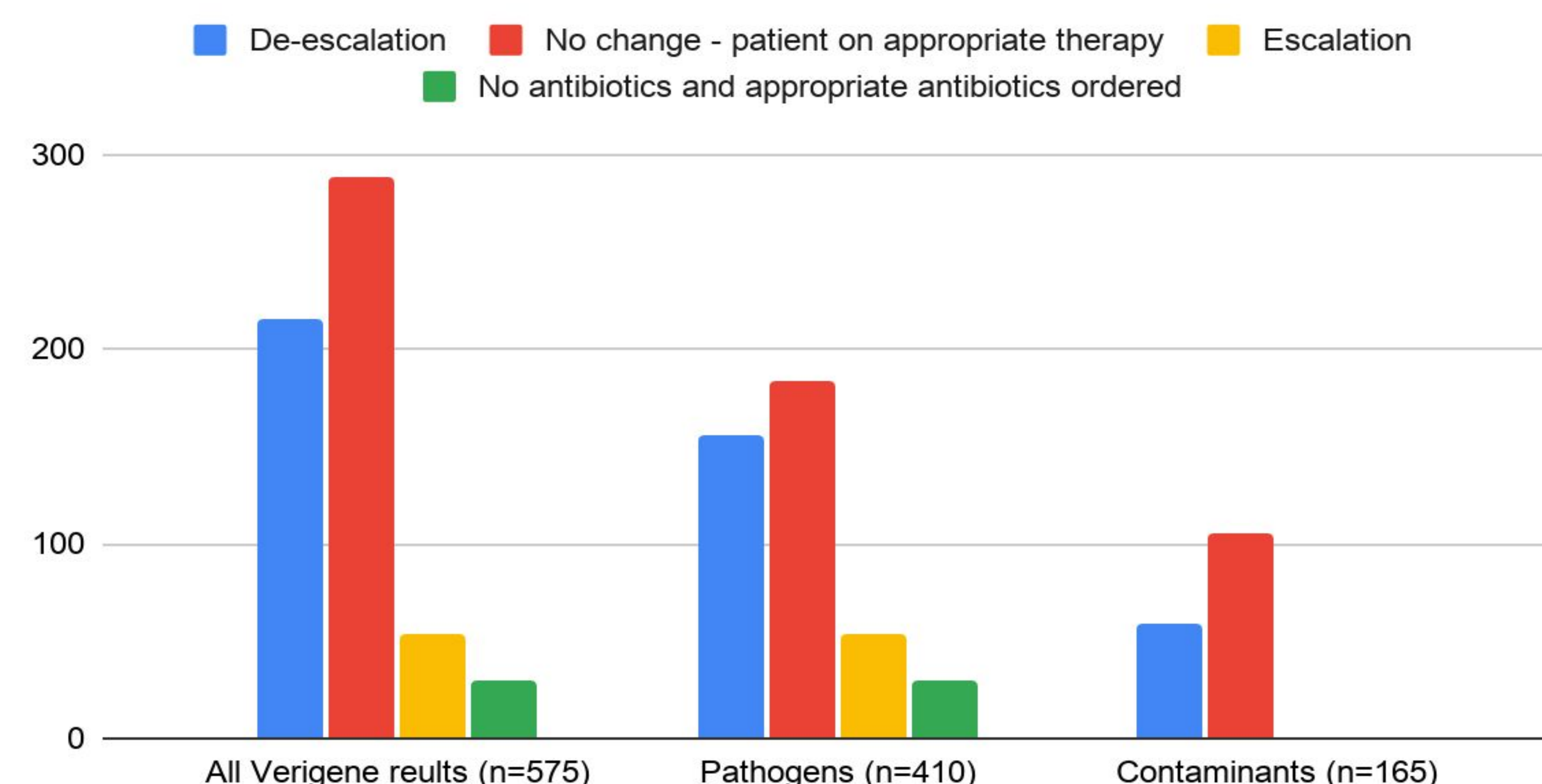
Materials and Methods

In November 2019, we implemented the Verigene gram positive and gram negative panels for patients with positive blood cultures. Our antimicrobial stewardship committee developed a recommended treatment algorithm for pharmacists to use when notified of Verigene results. The first positive bottle per patients and per admission was tested. Subsequent positive bottles were not tested on the Verigene unless a different morphology was noted on the gram stain. A gram stain was performed on all positive cultures and this result was called to the patient's nurse (if inpatient) and the covering physician was notified of result. After the Verigene result was available, an assigned pharmacist was notified of the results (organism identification and resistance markers if identified). Pharmacists notified covering physicians of the test results and the recommended antibiotic management. Pharmacists documented the frequency that the test result changed the antibiotic management, including escalation, de-escalation or no change in therapy. The data from the first six months was summarized.

Example of Verigene Algorithm for a Gram Negative organism

Gram-Negative Rod: Fermenters				
Organism	**Resistance Marker**	**Action Plan**	**Drug of Choice (DOC)**	**Alternate Drug and Comments**
Escherichia Coli *Proteus* spp. *Klebsiella pneumoniae* *Klebsiella oxytoca*	-CTX-M	Notify physician/provider, de-escalate to DOC if possible	Ceftriaxone IV q24h 1g for pts < 80 kg 2g for pts ≥ 80 kg	For cephalosporin allergic patients: Zosyn 4.5g IV Q8h For cephalosporin and penicillin allergic patients: Meropenem 500 mg IV q6h Mandatory ID consult
	+CTX-M	ESBL-producer	Notify physician/provider to change antimicrobial	Meropenem 500 mg IV q6h Mandatory ID consult	For meropenem allergic patients: Contact ID
Citrobacter spp.	-CTX-M		Notify physician/provider, de-escalate to DOC if possible	Cefepime 1g IV q6h Mandatory ID consult	For Cephalosporin allergic patients: Meropenem 500 mg IV q6h Mandatory ID consult
	+CTX-M	ESBL-producer	Notify physician/provider to change antimicrobial	Meropenem 500 mg IV q6h Mandatory ID consult	For meropenem allergic patients: Contact ID
Enterobacter spp.	-CTX-M		Notify physician/provider, de-escalate to DOC if possible	Cefepime 1g IV q6h Mandatory ID consult	For Cephalosporin allergic patients: Meropenem 500 mg IV q6h Mandatory ID consult
	+CTX-M	ESBL-producer	Notify physician/provider to change antimicrobial	Meropenem 500 mg IV q6h Mandatory ID consult	For meropenem allergic patients: Contact ID

Results

Total Verigene results (n=575)

- **De-escalation**
- **No change - patient on appropriate therapy**
- **Escalation**
- **No antibiotics and appropriate antibiotics ordered**

Results Summary

- 6 month time frame 11/19/2019 - 5/18/2020
- 575 test results analyzed (average 3.2/day)
  - ➤ 410 pathogens
    - ❖ 156 de-escalation
    - ❖ 53 escalation (mostly due to presence of resistance markers)
    - ❖ 30 were not on antibiotics and appropriate antibiotics were started
    - ❖ 183 were on appropriate therapy therefore there were no changes
  - ➤ 165 were likely contaminants
    - ❖ 59 de-escalation
    - ❖ 106 had no change in therapy

Discussion

Overall, antibiotic management changed in 298/575 (51.8%) of isolates run by Verigene in our institution including 215 (37.4%) de-escalations. The most frequent antibiotics that were stopped included vancomycin (142) and cefepime (53).

Conclusions

Our pharmacist-based algorithm for notification and treatment recommendation based on Verigene results was highly successful in optimizing antibiotic management and improving antimicrobial stewardship in our institution.