Impact of a Novel Pharmacy Service on Antimicrobial Utilization and Medication-Related Errors in Immunocompromised Patient Populations

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Background

- Management of patients with immunocompromising conditions is a highly specialized area, often requiring complex treatment
- High incidence of medication-related errors (MRE) discovered in literature and during a medication use evaluation (MUE) at Carolinas Medical Center (CMC) of patients living with HIV (PLWHIV) on antiretrovirals (ART)1,2
- Rapid growth of services at Atrium Health for patients with solid organ transplantation (SOT), hematologic malignancy or hematopoietic stem cell transplantation (HSCT), and human immunodeficiency virus (HIV)
- Increased patient volume resulted in increased utilization of antimicrobials, emphasizing need for antimicrobial stewardship3
- Previous study at CMC showed improved outcomes in patients receiving ART with sepsis versus those not on ART5
- Infectious diseases (ID) pharmacists uniquely suited to improve care and reduce errors in these patient populations1,6

Goals

- Decrease rates of inpatient ART-related medication errors in PLWHIV by 40%; receipt of ART in patients with sepsis
- Decrease antimicrobial utilization (quantified by duration of therapy per 1000 patient days, DOT/1000 PD) in the HSCT programs by 5%
- Increase intervention acceptance rates by 10%

Improvement Process

- Implemented an Immunocompromised ID Pharmacy Service at CMC to collaborate with ID, SOT, HSCT team providers
- Heavily dependent on interdisciplinary teamwork between pharmacists, physicians, and administrative assistant

HIVtreatNow Pilot

- Results from the ART MUE demonstrating high rates of MRE used to justify pharmacist allocation for review of PLWHIV
- Identified patients by ICD-10 code and report generated in Theradoc® for patients on ART
- Medication reconciliation conducted to ensure outpatient regimens continued appropriately
- Profile review conducted to assess for drug interactions, correct product selection, scheduling/dosing, opportunistic infection prophylaxis
- If not on ART, ID physician on call notified to formally consult
- Guidance document created and posted for crushing of ART
- Outcomes evaluated: quasi-experimental study comparing patients admitted between 2/2017 to 4/2018 (pre-intervention) and 5/2018 to 3/2019 (post-intervention)

Immunocompromised ID Rounding Service

- ID pharmacists began rounding with SOT and HSCT ID teams on alternating days
- Chart review performed on all patients daily starting 10/2018
- Attendance at transplant ID meetings to discuss policies and formulary management
- Outcomes evaluated: pre-post-intervention comparison of DOT/1000 PD and rates of C. diffcile infection (CDI) on HSCT unit, intervention acceptance rate for SOT/HSCT/ID teams

Results

Table 1. Receipt of ART and mortality PLWHIV and sepsis in pre- and post-intervention periods at CMC versus non-CMC facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>ART Receipt</th>
<th>Inpatient Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMC (received intervention)</td>
<td>64.5</td>
<td>19.4</td>
</tr>
<tr>
<td>CMC (control group)</td>
<td>84.6</td>
<td>15.4</td>
</tr>
<tr>
<td>Non-CMC Facilities</td>
<td>48.9</td>
<td>57.1</td>
</tr>
<tr>
<td>NS</td>
<td>42.9</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 2. Intervention rates pre- and post-intervention for immunocompromised ID services

<table>
<thead>
<tr>
<th>Category</th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>% Accepted</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Antiretrovirals</td>
<td>204</td>
<td>524</td>
<td>145/204 (71%)</td>
<td>P &lt; 0.01</td>
</tr>
<tr>
<td>Anti-Retrovirals must dosing</td>
<td>22%</td>
<td>49.6</td>
<td>343/524 (83%)</td>
<td></td>
</tr>
<tr>
<td>Anti-Retrovirals incorrect formulation</td>
<td>4.2</td>
<td>0.8</td>
<td>32.8</td>
<td></td>
</tr>
<tr>
<td>Anti-Retrovirals drug-drug interaction</td>
<td>10.9</td>
<td>45.4</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>ID consult recommended</td>
<td>1.7</td>
<td>2.5</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Opportunistic infection prophylaxis added</td>
<td>22.7</td>
<td>4.2</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Added agent to incomplete regimen</td>
<td>22.7</td>
<td>4.2</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Inappropriately scheduled regimen corrected</td>
<td>0.8</td>
<td>0.5</td>
<td>22.7</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. ART review outcomes in pre- versus post-intervention period

Figure 2. Intervention type for ART review (%)

Figure 3. Primary team contacted for ART interventions (%)

Figure 4. Antimicrobial utilization pre- and post-intervention for HSCT patient care unit (4B)

Figure 5. Rates of CDI Pre- and Post-Intervention for HSCT Patient Care Unit (4B)

Discussion/Conclusions

- Intervention was successful in achieving all goals
  - Reduction of ART-associated MRE
  - Decreasing unnecessary antimicrobial utilization and rates of CDI
  - Increasing intervention acceptance rates
- Non-statistically significant improvement in mortality in PLWHIV presenting with sepsis, warrants further study
- Study only captures 5 months post-intervention implementation, continued improvement of goals/metrics expected as services become more established
- Areas for continued growth
  - Increase intervention acceptance rate to >90% for SOT and HSCT teams
  - Participation in institutional guideline and protocol development to promote safety on system level in SOT and HSCT populations
- Expand ART review system-wide (current pilot is at CMC) when additional pharmacy resources available
- Collect and analyze data around other clinical outcomes in the pre- versus post-intervention groups in PLWHIV such as mortality, viral suppression, CD4 counts, ID clinic follow-up
- Plan to submit study to peer reviewed journal for publication

References


Disclosures

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or this presentation.

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