Reducing Time to High Dose Methotrexate Administration on an Inpatient Oncology Ward.

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University of Virginia
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Institutional Overview

- 612-bed tertiary academic medical center in Charlottesville, VA
  - Inpatient hematology/oncology unit: 35 beds
- UVA Cancer Center
  - NCI-designated cancer center
Team Members

Daniel Reed, MD  
Team Leader

Hannah Samley, RN  
Core Team Member

Eric Pierce, MD  
Core Team Member

Jeremy Sen, PharmD  
Other Team Member

Holly Mellot, RN  
Other Team Member

Camilo Fadul, MD  
Other Team Member

Michael Keng, MD  
QTP Coach

ASCO Quality Training Program
All patients who receive high dose methotrexate at the University of Virginia from 5/2017-5/2018 experienced a median 8 hour delay resulting in increased length of stay, increased cost of care, and decreased patient satisfaction.
Delay in MTX

- Patient
  - Late for appointment
  - Not meeting parameters
  - Delay in making chemo
  - Review of con meds
  - Delay in release of MTX

- Physician
  - Delay in signing orders
  - Not following re-admission instructions
  - Behind in clinic
  - Check in
  - Lab orders
  - Scheduling

- Pharmacy
  - Not meeting parameters

- Clinic
  - Lab orders
  - Scheduling

- Nursing
  - No standard way of calculating average urine output
  - No standard time set for notifying LIP when pre-treatment parameters not met
  - Delay in starting chemotherapy due to high patient volume/acuity

- Waiting room
Measures

- Measures:
  - Process measure: Time to HD MTX administration, time to urine output, time to urine pH >7.0
  - Outcome Measure: Length of Stay (lagging indicator)

- Patient population: Patients receiving systemic high dose methotrexate
  - Excluded: Neuro oncology patients

- Calculation methodology
  - Numerator: number of times a delay occurred
  - Denominator: total number of delays

- Data source: EPIC chart review

- Data collection frequency: One Year

- Data quality (any limitations): Retrospective collection of data, sample bias
Baseline Data

- 157 total charts reviewed from 5/2017-5/2018
  - 61 neuro oncology patients excluded
  - 86 hematology/oncology patients examined
- Median time to high dose methotrexate: 8 h
- Median time to urine output >125 cc/hr: 9.13
- Median time to pH >7.0: 6.94
## Baseline Data

<table>
<thead>
<tr>
<th>Chemotherapy Regimen</th>
<th># of Patients</th>
<th>Median Time to Methotrexate</th>
<th>Median Time to pH 7</th>
<th>Median time to UOP &gt;125 cc/hr</th>
<th>Median Length of Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 g/m2</td>
<td>12</td>
<td>8.25</td>
<td>19.42</td>
<td>20.3</td>
<td>4.03</td>
</tr>
<tr>
<td>3.5 g/m2</td>
<td>50</td>
<td>9.73</td>
<td>6.87</td>
<td>11.02</td>
<td>4.04</td>
</tr>
<tr>
<td>6 g/m2</td>
<td>1</td>
<td>14.90</td>
<td>4.72</td>
<td>14.9</td>
<td>4.22</td>
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<tr>
<td>8 g/m2</td>
<td>1</td>
<td>7.53</td>
<td>4.28</td>
<td>8.85</td>
<td>3.07</td>
</tr>
<tr>
<td>COG AALL0034</td>
<td>14</td>
<td>8.80</td>
<td>6.03</td>
<td>7.84</td>
<td>4.03</td>
</tr>
<tr>
<td>HyperCVAD</td>
<td>17</td>
<td>8.87</td>
<td>9.30</td>
<td>6.12</td>
<td>4.06</td>
</tr>
<tr>
<td>SMILE</td>
<td>1</td>
<td>20.9</td>
<td>211.8</td>
<td>14.7</td>
<td>15</td>
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</tbody>
</table>
### Diagnostic Data: Tally Chart

<table>
<thead>
<tr>
<th>Reason For Delay</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine output parameter not met</td>
<td>42</td>
</tr>
<tr>
<td>Urine pH parameter not met</td>
<td>24</td>
</tr>
<tr>
<td>Lack of standard process</td>
<td>16</td>
</tr>
<tr>
<td>Labs not ordered</td>
<td>10</td>
</tr>
<tr>
<td>Delay in release of MTX</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
</tr>
</tbody>
</table>
Diagnostic Data: Pareto Chart

- Urine output parameter not met
- Urine ph parameter not met
- Lack of standardization
- Labs not ordered
- Pharmacy delay release
By January 2019, leukemia and lymphoma patients receiving high dose methotrexate inpatient will have a 25% reduction in treatment start time from baseline.
Prioritized List of Changes (Priority/Pay-Off Matrix)

<table>
<thead>
<tr>
<th>High Impact</th>
<th>Prescribing oral alkalization prior to admission</th>
<th>Give Methotrexate Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Impact</td>
<td>UA in outpatient clinic before patient is admitted</td>
<td>Nurses standardizing urine output&lt;br&gt;Nursing standardizing urine pH method</td>
</tr>
</tbody>
</table>
# PDSA Plan (Test of Change)

<table>
<thead>
<tr>
<th>Date of PDSA Cycle</th>
<th>Description of Intervention</th>
<th>Results</th>
<th>Action Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/1/2018</td>
<td>Oral and IV prehydration</td>
<td>Ongoing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- All patients provided education regarding prehydration with 64 fluid ounces of fluid day prior to admission
- Patients seen in clinic on day of admission and sent to infusion for 1 liter bolus for prehydration
- Select patients provided prescriptions for oral bicarbonate and acetazolamide
3 Process Control Chart Time to Methotexate

- Change Data
- Mean
- UCL 3σ
- LCL 3σ

PDSA Cycle 1: oral alkalization
PDSA Cycle 2: Prehydration
Resolution

ASCO Quality Training Program
Problems Encountered

• Patient factors: compliance; education from nursing staff

• Unit acuity/time

• Lack of standardization among nursing staff
Conclusions

• Too early to examine PDSA Cycle
• Education opportunity for nursing and clinical staff
• Goal is to decrease time to methotrexate to hopefully decrease length of stay and improve patient experience
Next Steps/Plan for Sustainability

• Monthly meetings with Nurse coordinators to ensure compliance with pre hydration protocol
• Weekly collection of data for MTX patients admitted