Integration of Acute and Chronic Graft-Versus-Host Disease Assessments into the Inpatient Electronic Medical Record

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Disclosures

• The authors have no financial relationships to disclose.
Abstracts

• **117** Integration of Chronic Graft-Versus-Host Disease Assessment into the Inpatient Electronic Medical Record
  – Madhu Ragupathi, MD¹, Jaskiran Kaur, MS¹, Demeree Whitt, LMSW², Abigail Cartagena, RN², Luda Kushner, MD¹, Mostafizur Rahman, MD¹, Alysa Pleiner¹, Ebony Lindsey, RN, MSN, AGNP-C² and Luis Pineiro, MD³

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Electronic Medical Records (EMRs)

ADVANTAGES

• Continuously up-to-date
• Wide access and sharing
• Integrated differentials/diagnostics
• Promote pt safety (e.g., ↓ medical errors - identify drug cross-reactions or over dosing, etc.)
• ↑ privacy and security
• ↓ costs
• ↑ patient outcomes

LIMITATIONS

• Early systems = Paper (scan) banks
• Other systems often too expansive
  – Well-suited for high volume field (i.e., internal medicine and general surgery)
• Varying systems within and between medical centers
  – Limited cross communication
• Centers do not always invest in program-specific EMRs or specialty modules (e.g., hem-onc, transplant, etc.)
Frustration / Poor Compliance
Remain Reliant on Old Technology

"Why does it say paper jam, when there is no paper jam?!!"
Complications Following Allogeneic Transplant

- Bone marrow suppression resulting in:
  - Infections
  - Chemotherapy-related
    - Mucositis
    - Veno-Occlusive Disease of Liver (VOD)
    - Interstitial Pneumonia Syndrome (IPS)
  - Graft-versus-Host Disease (GVHD)
  - Graft Failure

“Your body’s accepting the new organ just fine. So much so, unfortunately, that it’s begun rejecting you.”
Graft-Versus-Host Disease (GVHD)

• Presents with similar signs & symptoms as infection

• Immune cells from donor recognize recipient’s body/cells as foreign, may attack certain organs.

• Types:
  – Acute GVHD (aGVHD)
  – Chronic GVHD (cGVHD)
  – Acute on Chronic GVHD (?)
Staging/Grading of GVHD

• **Diagnosis of Exclusion**
  – Various conditions (e.g., infections, drug reactions, etc.) mimic signs and symptoms
  – Manifest in 1 organ or disseminate across multiple systems

• More severe grades associated with poorer outcomes including ↓ **survival**

• Thorough evaluation essential in GVHD management:
  – **Deficiencies within current EMRs may result in diminished documentation and reporting**
Early Experience at BUMC

- Relied heavily on physician progress notes
- **Advantages:**
  - Completed daily; regular evaluations for day-to-day comparisons
- **Limitations:**
  - Evidence of GVHD spread across progress notes
    - Skin $\rightarrow$ physical exam (PE)
    - GI/Gut $\rightarrow$ vitals signs (daily I’s/O’s), review of symptoms (ROS), PE
    - Liver $\rightarrow$ daily labs
    - Additional organs (cGVHD) $\rightarrow$ ROS, PE
  - Inadequate documentation
    - No staging and/or grading documented
    - Copy forward function resulting repetitive/incongruent observations
    - Findings might not be documented until end of rounding on all patients
Ineffective and Unsustainable for Inpatient Assessment
Aim

• To integrate our assessment tools into the hospital’s EMR system

• To establish a process for capturing the development, exacerbation or resolution of acute and chronic GVHD in allogeneic BMT patients.
Methods

• The BMT data management team worked with the EMR physician informatics team at our hospital to integrate aGVHD and cGVHD assessment notes into AllScripts® (AllScripts Healthcare Solutions, Inc., Chicago, IL).

• Document built within system and launched in mid-June 2017.
Process Workflow for aGVHD

**Apheresis Lab**
- Emails list of previous week’s BMTs

**Research Analyst**
- Identify allo BMTs
- Creates calendar reminders
- Initial at 12-14 days post-BMT
- Cont @ 7-day intervals to d/c

**Advance Practice Providers**
- Initiates acute note & identifies co-signer
- Completes the following:
  - BMT Date
  - Days post-BMT
  - Date of Onset GVHD

**Rounding Transplant Physicians**
- Complete the following:
  - Immuno-suppression
  - Staging:
    - Skin
    - GI/Gut
    - Liver
  - Treatment
  - Sign off on eval
Elements of Acute GVHD Assessment
**Figure 1. Clinical Acute GVHD Assessment.**

(a) PhysDoc data entry screen.

<table>
<thead>
<tr>
<th>Date of BMT:</th>
<th>Days Since Transplant:</th>
<th>KPS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date of Onset of Acute GVHD:  

- SKIN --- Stage
  - no rash (0)
  - maculopapular rash, <25% of body surface (1)
  - maculopapular rash, 25-50% of body surface (2)
  - generalized erythoderma, on >50% BSA (3)
  - generalized erythoderma with bullae formation and desquamation (4)

- SKIN --- Differential Diagnosis
  - GVHD
  - Drug Rxn
  - Cond Reg
  - Infection
  - Other

- % body rash

- Body Surface Area
  - Body Area Percentage Total
    - Each Arm: 9% 18%
    - Each Leg: 18% 36%
    - Chest/Abd: 18% 18%
    - Back: 18% 18%
    - Head: 9% 9%

- GI/Gut (Diarrhea) --- Stage
  - none (0)
  - > 500 mL/day (1)
  - > 1000 mL/day (2)
  - > 1500 mL/day (3) volume
  - severe abdominal pain with or without ileus, or stool with frank blood or melena (4)

- GI/Gut (Diarrhea) --- Differential Diagnosis
  - GVHD
  - Drug Rxn
  - Cond Reg
  - TPN
  - Infection
  - Other

- LIVER (Billirubin) --- Stage
  - < 2.0 mg/dl (0)
  - 2.0 - 3.0 mg/dl (1)
  - 3.1 - 6.0 mg/dl (2)
  - 6.1 - 15.0 mg/dl (3)
  - > 15.0 mg/dl (4) max billirubin

- LIVER --- Differential Diagnosis
  - GVHD
  - Drug Rxn
  - Cond Reg
  - TPN
  - Infection
  - VOD
  - Other

- TREATMENT
  - Prograf
  - Steroids
  - Cellcept
  - Other
Clinical Acute GVHD Assessment

Date of BMT: _____ Days Since Transplant: ___, Date of Onset of Acute GVHD: ___, On Immunosuppressants, yes

SKIN — Stage
no rash (0)

GI/Gut (Diarrhea) — Stage
severe abdominal pain with or without ileus, or stool with frank blood or melena (4)

LIVER (Bilirubin) — Stage
< 2.0 mg/dl (0)

Prograf Steroids

Electronic Signatures:

Co-Signer: B&M Transplant Acute GVHD Assessment Note

Author: B&M Transplant Acute GVHD Assessment Note

Last Updated: ______________________
## Results

<table>
<thead>
<tr>
<th>Month (2017)</th>
<th>Total # ALLOs</th>
<th>1\textsuperscript{st}/2\textsuperscript{nd} Wk Post-BMT Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>July</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>August</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>September</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>October</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>November</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>December</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>27 (46.6%)</td>
</tr>
</tbody>
</table>
Results

• **58 allo BMTs** performed b/w Jun-Dec 2017
  – 1\textsuperscript{st} scheduled aGVHD assessment completed for **23 patients**
  – **4 patients** received 1\textsuperscript{st} assessment 1 wk later
    • 2\textsuperscript{nd} projected evaluation date
  – 1\textsuperscript{st} GVHD eval captured at 1\textsuperscript{st} outpt visit: **25**

• Captured GVHD data for 89.7% of these BMTs through combined IP/OP processes
Troubleshooting

• A few patients were initially d/c prior to 1\textsuperscript{st} potential assessment date
  – Scheduled for Day +14 \textbf{\rightarrow reduced to Day +12}

• \textbf{Group of “Other”:} failed to have an inpatient assessment
  – 1 patient d/c for 1 wk prior to readmission & death (non-GVHD)
  – 1 patient had a HLA-matched twin (syngeneic) donor
  – 1 patient had no assessments completed - no evidence of GVHD documented within follow-up notes
  – 3 patients had GVHD assessments completed 4-6 weeks after BMT (no evidence of GVHD)

• Holiday schedules
Process Workflow for cGVHD

• APP initiates assessment when post-transplant patient initially readmitted
• Chronic assessment started by APP if the patient’s symptoms worsen or improve at any time during hospitalization
• APP designates rounding transplant physician as a co-signer on each note
• “Deficiency” appears in the rounding physician’s profile until assessments are edited and completed
Elements of Chronic GVHD Assessment
Figure 1. Clinical Chronic GVHD Assessment.

(a) PhysDoc data entry screen.

Date of BMT: [ ] Days Since Transplant [ ] KPS [ ]

Date/Year of Onset of cGVHD: [ ] On Immunosuppressants [ ] yes [ ] no

GVHD Treatment:

☐ Steroids ☐ Prograf ☐ CellCept ☐ Other [ ]

cGVHD Staging and Grading:

☐ None: no organ involvement.

☐ Limited: localized skin involvement resembling localized scleroderma with or without liver involvement; no other organ involvement.

☐ Extensive: generalized skin and/or multiple organ involvement
If Extensive, please check if any of the following symptoms are attributed to chronic GVHD:

☐ Generalized skin involvement and/or liver dysfunction

☐ Liver histology showing chronic aggressive hepatitis, bridging necrosis, or cirrhosis

☐ Involvement of the eye

☐ Involvement of the salivary glands or oral mucous membranes

Involvement of any other target organ: [ ]
(b) Completed assessment note.

Clinical Chronic GVHD Assessment

Date of BMT: [redacted] Days Since Transplant: [redacted], Date/Year of Onset of cGVHD: [redacted], On Immunosuppressants, no

If Extensive, please check if any of the following symptoms are attributed to chronic GVHD:

- Generalized skin involvement and/or liver dysfunction

Electronic Signatures:

- [redacted] (Signed [redacted])
  Authored: B&M Transplant Chronic GVHD Assessment Note

- [redacted] (Signed [redacted])
  Co-Signer: B&M Transplant Chronic GVHD Assessment Note

Last Updated: [redacted]
## Results

<table>
<thead>
<tr>
<th>Pt</th>
<th>Re-Admission</th>
<th>Severity of GVHD</th>
<th>Presentation of GVHD</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>June 2017</td>
<td>Extensive</td>
<td>Generalized skin and/or multiple organ involvement</td>
<td>Steroids</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Involvement of any other target organ: neuropathy</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>June 2017</td>
<td>Extensive</td>
<td>Generalized skin and/or multiple organ involvement</td>
<td>Steroids, Prograf, CellCept</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Involvement of the salivary glands or oral mucous membranes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Involvement of any other target organ: muscles/joint/eyes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>July 2017</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>July 2017</td>
<td>None</td>
<td>None</td>
<td>On Immunosuppressant Prophylaxis</td>
</tr>
<tr>
<td>5</td>
<td>August 2017</td>
<td>Extensive</td>
<td>Generalized skin involvement and/or liver dysfunction</td>
<td>Steroids, Other (Sirolimus, Jakafi)</td>
</tr>
<tr>
<td>6</td>
<td>August 2017</td>
<td>Extensive</td>
<td>Generalized skin involvement and/or liver dysfunction</td>
<td>None (presence of stable disease)</td>
</tr>
<tr>
<td>7</td>
<td>November 2017</td>
<td>Extensive</td>
<td>Generalized skin involvement and/or liver dysfunction</td>
<td>Steroids, Prograf, Other (Ibrutinib)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Involvement of the eye</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Involvement of the salivary glands or oral mucous membranes</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>November 2017</td>
<td>Limited</td>
<td>Localized skin involvement resembling localized scleroderma with or without liver involvement</td>
<td>Prograf, CellCept</td>
</tr>
</tbody>
</table>
Our Imperfect Process

Benefits

• Definitive staging and grading
• Dedicated weekly assessment
  – Attempt to ensure establishment of baseline presence/absence of GVHD
• Form consistency between inpatient hospital system and outpatient clinical practice

Limitations

• Process with potential for errors at multiple points
  – Calendar alerts at data analyst level
  – NP initiates/creates note
  – Physician must review/complete

Have instituted some “fixes” to improve 1\textsuperscript{st} assessment completion rate, including (1) creating GVHD alerts for 1 week at a time, and (2) requiring a weekly e-mail with names of patients for whom forms were created.
Future Considerations

• Form not as extensive as CIBMTR forms
• Dedicated APP to complete GVHD assessments
• Incidence of late acute GVHD (acute on chronic)
  – Updated assessment note combining elements of both aGVHD and cGVHD
• Hospital switching to another dedicated EMR
  – Will have to re-establish current process
  – Adapt process to available resources in new system
• Continued physician education (↑ compliance)
Conclusions

• 90% of patients had an initial GVHD assessment performed through a combined IP/OP approach

• We believe these accomplishments in documentation will facilitate improved post-transplant outcomes

• Integrating assessments into our hospital’s EMR and involving an advanced practice provider has increased our ability to report more thorough and accurate data regarding GVHD
Thank You

Special thanks to Ebony Lindsey and Leah Josey for all their work with setting up and carrying out our inpatient and outpatient GVHD processes.