HCT-CI: Hematopoietic Cell Transplantation-Comorbidity Index ‘Sorror Score’
Dr Bronwen Shaw
Scientific Director, CIBMTR
BMT MD

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Overview

• What is the HCT-CI

• Why is it important

• Which comorbidities are important
  – What to report
  – What not to report
  – Where do we find the data

• How do we combine the data
What is the HCT-CI

- A comorbidity tool suited for recipients of HCT
- Assesses pre-transplant organ impairment
  - Presence
  - Severity
- This information helps to understand the patient prognosis
What is the HCT-CI

- Organ dysfunctions (comorbidities) are associated with the outcome of treatment of a given primary disease and, in particular, cancer
- HCT-CI (2005)
  - Charlson comorbidity index (1987) modified after introducing 3 conceptual changes:
    - laboratory and organ function tests to redefine pulmonary, hepatic, cardiac, and renal comorbidities
    - the inclusion of all comorbidities encountered in a cohort of HCT recipients at a single institution
    - estimation of new adjusted hazard ratios for the associations between comorbidities and nonrelapse mortality
- A SCORE is generated
Why is it important

Sorror Blood 2005
Prospective Validation of the Predictive Power of the Hematopoietic Cell Transplantation Comorbidity Index: A Center for International Blood and Marrow Transplant Research Study

Stratification of probabilities of outcomes by the HCT-CI scores among recipients of allogeneic (A and B) or autologous HCT (C and D).

Mohamed L. Sorror, Brent R. Logan, Xiaochun Zhu, J. Douglas Rizzo, Kenneth R. Cooke, Philip L. McCarthy, Vincent T. Ho, Mary M. Horowitz, Marcelo C. Pasquini
Is the score useful in pediatrics?

A
Non-Relapse Mortality by HCT-CI

B
Overall Survival by HCT-CI

Sorror 2015, only HCT-CI ≥ 3

How do we produce the score?

• Assessment of each important organ

• Landmark Date
  – Anything before day -10 prior to conditioning counts

• Medical Record
  – BMI
  – Medical history (e.g. MI)
  – Medication history (e.g. anti-depressant)
  – Consults (?organ dysfunction)

• Laboratory and organ function tests
Schema for the 3-step methodology for acquisition of comorbidity data from medical records.

### Three-Step Process (15 minutes)

<table>
<thead>
<tr>
<th>Medical Notes 8 min</th>
<th>Labs/Tests 6 min</th>
<th>Final Assessment 1 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>Bilirubin/AST/ALT</td>
<td>Double checking</td>
</tr>
<tr>
<td>H&amp;P</td>
<td>Serum creatinine</td>
<td>Total score</td>
</tr>
<tr>
<td>Review of Data</td>
<td>DLco/FEV1</td>
<td></td>
</tr>
<tr>
<td>Consults</td>
<td>Echo/MUGA</td>
<td></td>
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</tbody>
</table>

Cumulative Data Acquisition Scale (%)

0%  5%  20%  40%  45%  55%  60%  80%  90%  95%  100%

Mohamed L. Sorror Blood 2013;121:2854-2863
Which comorbidities are important

- **Arrhythmia (score 1)**
  - any type of arrhythmia that needed treatment **at any time** in the patient’s past medical history
  - E.g. atrial fibrillation or flutter, sick sinus syndrome, or ventricular arrhythmias

- Do not report:
  - Transient arrhythmia never requiring treatment

- Medical record, EKG
Which comorbidities are important

• **Cardiovascular (score 1)**
  – e.g. coronary artery disease, congestive heart failure, low EF

• Do not report:
  – Syncope

• Medical record, consults, Echo/MUGA
Which comorbidities are important

• *Inflammatory bowel disease (score 1)*
  – E.g. Crohn’s disease or ulcerative colitis, only if treatment has been given

• Do not report:
  – irritable bowel syndrome (IBS); neutropenic colitis

• Medical record, consults, procedures (endoscopy), biopsy, CT
Which comorbidities are important

- **Diabetes (score 1)**
  - diabetes or steroid-induced hyperglycemia requiring continuous treatment with insulin or oral hypoglycemic drugs during the 4 weeks before the landmark date

- Do not report:
  - Diet controlled or no treatment for 4 weeks prior

- Medication chart
Which comorbidities are important

- **Cerebrovascular disease (score 1)**
  - Almost all are important
  - *E.g.* TIA, embolus, thrombosis, hemorrhage

- Do not report:
  - Seizures, syncope

- Medical record, Consults, CT/MRI
Which comorbidities are important

- *Psychiatric disorder (score 1)*
  - mood, anxiety, or other psychiatric disorder requiring *continuous treatment* during the 4 weeks before the landmark date

- Do not report:
  - Not on medication, ‘as needed’ medication, behavioral issues

- Medical record, Consults, medication chart
Which comorbidities are important

• **Hepatic comorbidity (2 levels of severity)**
  – 2 values per test on 2 different days
  – laboratory value closest to the landmark date is used in defining the severity

**MILD HEPATIC COMORBIDITY (SCORE 1):**

  – elevated total bilirubin up to 1.5 times the ULN
  – elevated values of ALT or AST up to 2.5 times the ULN
  – prior diagnosis of an infection with hepatitis B or C at any time in the patient’s past medical history (this would not go into infection unless it was recently diagnosed and actively being treated)
Which comorbidities are important

**MODERATE TO SEVERE HEPATIC COMORBIDITY (SCORE 3):**

– elevated total bilirubin >1.5 times the ULN
– elevated values of ALT or AST > 2.5 times the ULN
– prior diagnosis of cirrhosis at any time in the patient’s past medical history

• Remember AST is also collected on the 2000 (different reasons, but validations are done)
• Laboratory tests, IDMs, biopsy
Which comorbidities are important

• **Obesity (score 1)**
  – $BMI > 35$, $>95$ percentile for $<18$ yo

• Do not report:
  – Anything else
  – Remember this also refers to the immediate pre-HCT period
Which comorbidities are important

• *Infection (score 1)*
  – Any of these
    • a documented infection (eg, by culture or biopsy)
    • fever of unknown origin
    • pulmonary nodules suspicious for fungal pneumonia
    • positive PPD test requiring prophylaxis against tuberculosis
  – AND started a specific antimicrobial treatment with a recommendation to continue the same antimicrobial therapy up to and beyond day 0 of HCT

• Multiple infections do NOT increase the score (no need to add to ‘specify’)
• Medical record, Consult, medication chart
Which comorbidities are important

• Rheumatologic comorbidity (score 2)
  – required a specific treatment at any time in the patient’s past medical history
  – E.g. SLE, RA, Sarcoid, polymyalgia

• Do not report:
  – Osteoarthritis; osteoporosis

• Medical record, Consults, Labs, Xray, Meds
Which comorbidities are important

- **Peptic ulcer (score 2)**
  - the presence of a prior *endoscopic* or *radiologic* diagnosis of gastric or duodenal ulcer at any point in the patient’s past medical history

- Do not report:
  - Gastritis, heartburn

- Medical record, procedures (EGD), biopsy
Which comorbidities are important

- **Renal comorbidity (score 2)**
  - elevated values of serum creatinine to > 2 mg/dL (or more than 176.8 μmol/L)
  - chronic renal disease requiring weekly dialysis within 4 weeks before the landmark date
  - a prior history of renal transplantation at any point

- Remember creatinine is also collected on the 2000 (different reasons, but validations are done)

- Medical record, Consults, Lab reports, medication
Which comorbidities are important

- **Pulmonary comorbidity (2 levels of severity)**
  - should **exclusively rely** on PFT results, and in particular corrected DLco and FEV1 percentages
  - Measured DLco values should be corrected for Hb value using the Dinakara equation

*Moderate Pulmonary Comorbidity (Score 2)*
- DLco 66% to 80%
- FEV1 66% to 80%
- shortness of breath on slight activity that is attributed to a pulmonary disease and cannot be corrected by blood transfusion for a noticeable anemia, within the immediate period of 2 weeks before the landmark date
Which comorbidities are important

**SEVERE PULMONARY COMORBIDITY (SCORE 3)**

- DLco < 65%
- FEV1 < 65%
- shortness of breath at rest that is attributed to a pulmonary disease and cannot be corrected by blood transfusion for a noticeable anemia, within the immediate period of 2 weeks before the landmark date
- the need for intermittent or continuous oxygen supplementation during the immediate period of 4 weeks before the landmark date

• Medical record, PFT, most recent clinical assessment
Which comorbidities are important

- **Prior malignancy (score 3)**
  - any malignancy that required receiving a specific treatment at any point in the patient’s past medical history, regardless of the type of treatment (surgery, radiotherapy, and/or drug therapy)

- **Do not report:**
  - Benign tumors, if no treatment required, Skin: Basal cell carcinoma; squamous cell carcinoma. NB: we ask for these on the form, but they do not contribute to the score

- **Medical record**
Which comorbidities are important

• **Heart valve disease (score 3)**
  – moderate or severe degree of valve stenosis or insufficiency, as determined by echocardiogram
  – prosthetic mitral or aortic valve
  – symptomatic mitral valve prolapse

• Do not report:
  – Asymptomatic mitral valve prolapse

• Echo
How do we combine the data

- Add up the points from each organ
- Overall HCT-CI score is assigned
- Online calculators are available:
  - [http://www.hctci.org/Home/Calculator](http://www.hctci.org/Home/Calculator)
What about other comorbidities?

- We do ask about some others, but they do not contribute to the score.
- Prior to 2008 we asked for co-morbidities in a ‘general’ manner, not all of these are relevant to, or can be used for the score.
- It is not necessary to report anything in the ‘other specify field’ and it is difficult to analyze as there is no denominator.
- Things associated with the disease should not be reported here e.g. MDS in an AML patient; inherited disorder in MDS/SAA patient.
Conclusions

• HCT-CI is a clinically meaningful predictive tool for transplant patients

• The score is easy to calculate
  – Getting the score right is very important

• Data for the score is relatively easy to obtain
  – Good medical records and history

• Resources:
  – [https://www.cibmtr.org/manuals/](https://www.cibmtr.org/manuals/) Appendix M