Extended IPU Rule
Set: Theorie (EPU versus GFHC)

Sysmex user meeting
Temse
06 oktober 2016

Jan Van den Bossche
UZ Antwerpen
CBC Diff

• Automatisatie dmv analyser

• Ifv resultaat analyser: evt opvolgacties
  – Acties/Reflex testing
  – Smear review: *Slide scan/review/man diff*
Lab productivity

• Laboratory productivity and the rate of manual peripheral blood smear
  • CAP Q-probes study of 95141 CBC’s performed in 263 institutions
  • D Novis et al. Arch Pathol Lab Med 2006;130:596-601

• Smear review overview:
  • 10th %: 0,8 tot 9,9
  • 50th %: 9,1 tot 26,7
  • 90th %: 23,6 tot 50,0
  – Frequenteste oorzaak voor review (100%)
    • Wbc flag: 36,7% ; Immat cell flag: 25,5%
  – New info from smear:
    • 35,7% YES (subjectief)

• Smear review
  – brede spreiding met grote verschillen
  – ? nood aan“standardisatie” (ISLH)
The International Consensus Group for Hematology Review: Suggested Criteria for Action Following Automated CBC and WBC Differential Analysis

P. W. Barnes, S. L. McFadden, S. J. Machin, E. Simson

Clinical Hematology, Department of Laboratories, Barnes-Jewish Hospital, St. Louis, Missouri, USA; McFadden Laboratory Consulting, Columbus, Ohio, USA; Department of Haematology, University College London Hospital, London, UK; Center for Clinical Laboratories, Department of Pathology, The Mount Sinai Medical Center, New York, NY, USA

Received April 5, 2005; accepted April 6, 2005

Initiatief start 2002 B Houwen ISLH, publicatie 2005
• Diagnosis from the blood smear (Review)
  • (“eminence based”)
  • (“physician initiated”)

• The international consensus group for hematology review: suggested criteria for action following automated CBC and WBC differential analysis
  • PW Barnes et al. Lab Hem 2005; 11:83-90
  • www.islh.org
  • (“laboratory initiated”)
Automatisatie “action/review” proces

• Op Toestel / in LIS:
  • Rule based processing of the CD4000, CD3200 and CD Sapphire analyer output using the Cerner Discern Expert Module

• Middleware:
  • Sysmex SIS (Standaard rules)
  • Comparison of technical validation before an after implementation of the work area manager SIS 2.0 with standar rule package
Vergelijking ISLH vs SIS

- **Sysmex X Class User meeting 04/10/2012**
  - C Matthijs en JVdB

- Goede tot zeer goede cover tussen ISLH rules en SIS rules
  - Enkele niet gecovered
    - ISLH 1: Neonaat (praktijk?)
    - ISLH 17: Neutropenie (noodzaak?)
    - ISLH 10: MCV grenzen (overlap vs blinde zones)
  - Bij sommige rules “gevoel” van “blinde zones”
• Purpose and Criteria for Blood Smear Scan, Blood Smear Examination, and Blood Smear Review
  – Gullati G et al.
  – Ann Lab Med 2013; 33:1
  • (Criteria for Blood Smear Review
  • Lab Med 2002; 5: 33)
• Validation and Optimization of Criteria for Manual Smear Review Following Automated Blood Cell Analysis in a Large University Hospital
  • B Pratumvinit et al.
  • Arch Pathol Lab Med 2013; 137 : 408-414
    – Nagaan: False neg < 5% !
• Are the review criteria for automated complete blood counts of the ISLH suitable for all hematology laboratories?
  • Comar SR et al.
  • Rev Bras Hematol Hemoter 2014;36(3):213-252
• Historical data decrease complete blood count reflex blood smear review rates without missing patients with acute leukemia
  • Rabizeh E et al
  • JCP 2013; 00:1-3

– *Impact van delta* (check)
  • *ISLH*: wel vermelding, geen criteria
    – *SIS*: wel criteria voor delta gedefinieerd
Smear microscopy revision: propositions by the GFHC

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for the Francophone Group of Cell Haematology
Vergelijking GFHC vs EPU M&M

• criteria GFHC versus EPU rules
  – “Naar best vermogen” (…met zekere reserve)
  – M Metsers (ASO UZA), JVdB

• “cover” tussen beide “inschatten”
  – 1 rule GFHC = 1 rule EPU
  – 1 GFHC door meerdere EPU: volledige cover?
  – 1 EPU voor meerdere GFHC: volledige cover?

• Kijk Uit!
  – ISLH: acties versus GFHC: “smear review”
GFHC Definities

• “Initial situation” (versus follow-up)
  – Geen voorgaand resultaat
  – Geen abnormaliteit in voorgaande CBC
  – Voorgaande “smear review”
    • > 90d Adult
    • > 30d Child

• Adult:
  – >15 jaar

• EPU = OK
GFHC Opbouw

• Recommendations obv:
  – Patient information (Table 1)
  – Cell Count (Table 2)
  – WBC Differential (Table 3)

• Echter:
  – *Bijkomende elementen id tekst (niet id Tabel)*
Table 1: Indications for smear review regarding patient information.

<table>
<thead>
<tr>
<th>Age</th>
<th>Adult</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No impact</td>
<td>&lt;8 days, initial situation; &lt; 12 months, specialised paediatric ward and initial situation</td>
</tr>
<tr>
<td>Prescriber or hospital service</td>
<td>Adult</td>
<td>No impact</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>Onco-haematology paediatric ward, first analysis</td>
</tr>
<tr>
<td>Patient information</td>
<td>Adult/Children</td>
<td>Permanent reference (e.g. known cryoglobulins, known leukoagglutination, etc.)</td>
</tr>
<tr>
<td>Specific prescription</td>
<td>Adult/Children</td>
<td>Specific prescription of smear review Prescription associated with myelogram or immunophenotyping Searching for schizocytes: mode-specific for each laboratory</td>
</tr>
</tbody>
</table>
**Table 2: Indications for a smear review in terms of the cell count.**

<table>
<thead>
<tr>
<th>WBC (x 10⁹ cells/L)</th>
<th>Adults/Children</th>
<th>Patients with blood malignancies, aplastic recovery (leukocytes ≥ 1.0 in the actual result and &lt; 1.0 in the previous one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLT (x 10⁹ cells/L)</td>
<td>Adults</td>
<td>&lt; 100, in an initial situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 450, in an initial situation</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>&lt; 150, in an initial situation</td>
</tr>
<tr>
<td>MPV (fL)</td>
<td>Adults/Children</td>
<td>&lt; 7, in an initial situation with PLT &lt; 150 x 10⁹ cells/L, upper limit (supplier), in an initial situation with PLT &lt; 150 x 10⁹ cells/L</td>
</tr>
<tr>
<td>HGB (g/dL)</td>
<td>Adults</td>
<td>&lt; 8, in an initial situation with reticulocyte count &gt; 120 x 10⁹ cells/L, in an initial situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 10, in an initial situation</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>&lt; 9, in an initial situation</td>
</tr>
<tr>
<td>MCV (fL)</td>
<td>Adults</td>
<td>&gt; 105, in an initial situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 75, in an initial situation</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>&gt; 85 (six months to two years), &gt; 95 (two to 15 years), in an initial situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 70 (six months to two years), &lt; 72 (two to six years), &lt; 75 (from six years onwards), in an initial situation</td>
</tr>
<tr>
<td>MCHC (g/dL)</td>
<td>Adults/Children</td>
<td>&gt; normal upper limit, when there is no interference</td>
</tr>
<tr>
<td>RDW-CV (CV %)</td>
<td>Adults/Children</td>
<td>&gt; 22%, in an initial situation, from a known RBC transfusion setting</td>
</tr>
<tr>
<td>Reticulocytes (x 10⁹ cells/L)</td>
<td>Adults/Children</td>
<td>&gt; 120, in an initial situation</td>
</tr>
</tbody>
</table>
Cell Count: extra

- **PLT:**
  - Delta check: 50%

- **HB:**
  - Delta check: 25%

- **Flags:**
  - Fragment
  - RBC lysis resistance (*cfr MCHC*)
**Table 3: Indications for smear review in terms of the results of the WBC differential.**

<table>
<thead>
<tr>
<th>Former result</th>
<th>Adults/children</th>
<th>Adults/children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of malignant cells, as observed with the former result</td>
<td>Presence of NRBC, as observed with the former result (if they are not counted automatically by an analyser)</td>
<td>NRBC have been detected by the analyser, in an initial situation or every time if they are not counted automatically by the analyser</td>
</tr>
<tr>
<td>NRBC</td>
<td>Adults/children</td>
<td>$&lt; 1.5 \times 10^9$ cells/L, in an initial situation</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>Adults/children</td>
<td>$&gt; 1.5 \times 10^9$ cells/L, in an initial situation</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>Adults/children</td>
<td>$&gt; 0.3 \times 10^9$ cells/L and/or $&gt; 3%$, in an initial situation</td>
</tr>
<tr>
<td>Basophils</td>
<td>Adults/children</td>
<td></td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>Adults</td>
<td>$&gt; 5 \times 10^9$ cells/L, in an initial situation</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td>$&gt; 9 \times 10^9$ cells/L (two to six years), $&gt; 6 \times 10^9$ cells/L (six to 12 years), $&gt; 4 \times 10^9$ cells/L (&gt; 12 years), in an initial situation</td>
</tr>
<tr>
<td>Monocytes</td>
<td>Adults/children</td>
<td>$&gt; 1.5 \times 10^9$ cells/L, in an initial situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$&gt; 1.5 \times 10^9$ cells/L, if persistent for more than 30 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$&gt; a$ threshold, which is to be defined for each laboratory when monocytosis occurs during hospitalisation</td>
</tr>
</tbody>
</table>
WBC Differential: extra

- Incl Flags:
  - Left Shift
  - IG’s
  - Blast and Abnormal Lymphocytes
  - Abnormal Graphic without Flag (Dysplasia Rule)
Overzicht GFHC vs EPU

• Patient Info (Tabel 1): verschil
  – Neonaat

• Cell Count (Tabel 2 + extra): verschil
  – Plt > 450
  – MPV > upper limit analyser

• WBC Diff (Tabel 3 + extra): geen verschil
Reflectie

- GFHC + ISLH: “trimmen” / “shoppen”
  - Vb Monocyten (Tabel 3)
    - GFHC: Adult/Child: $1.5 \times 10^{9}$/l
    - ISLH: Child: $3.0 \times 10^{9}$/l

- …

- ICSH recommendations for the standardization of nomenclature and grading of peripheral blood cell morphological features 2015
Reflectie

- GFHC + ISLH: “trimmen” / “shoppen”
  - Vb Monocyten (Tabel 3)
    - GFHC: Adult/Child: $1.5 \times 10^{9}/l$
    - ISLH: Child: $3.0 \times 10^{9}/l$

- …

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- Dank U !