Managing Infection in Cirrhosis

Paul (Skip) H. Hayashi, MD, MPH

High Impact Hepatology

9:20-9:45 AM

Saturday, Dec 8, 2018
Outline

• Infection, acute on chronic liver failure and mortality
• Changing virulence of bacterial infections in cirrhotic patients
• What can you do now in terms of clinical care

• Hydrothorax and spontaneous bacterial empyema
Acute-on chronic liver failure

Rajiv Jalan¹,*, Pere Gines², Jody C Olson³, Rajeshwar P Mookerjee¹, Richard Moreau⁴, Guadalupe Garcia-Tsao⁵, Vicente Arroyo², Patrick S Kamath³

Journal of Hepatology 2012 vol. 57 | 1336–1348

SIRS: Systemic inflammatory response

CARS: Compensatory anti-inflammatory response
Acute-on-Chronic Liver Failure: Getting Ready for Prime Time?


ACLF-CLIF (via HepCalc)

NACSELD
Infection is a major component of ACLF.
# Acute-on-Chronic Liver Failure: Getting Ready for Prime Time?

<table>
<thead>
<tr>
<th>Words</th>
<th>Word Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>infect</em>, <em>bacteria</em>, <em>fung</em></td>
<td>66</td>
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<tr>
<td><em>renal</em>, <em>kidney</em></td>
<td>23</td>
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<tr>
<td><em>pulm</em>, <em>lung</em>, <em>respir</em></td>
<td>16</td>
</tr>
<tr>
<td><em>circul</em></td>
<td>14</td>
</tr>
<tr>
<td><em>brain</em>, <em>neuro</em>, <em>enceph</em></td>
<td>13</td>
</tr>
</tbody>
</table>
• 14 centers
• Prospectively collected data on hospitalized patients with cirrhosis
• Tested NACSELD-ACLF* in training (1605) and test (1070) sets for 30 day mortality prediction.
  • *NACSELD-ACLF = 2 or more of the following
    • Grade 3 or 4 hepatic encephalopathy
    • Renal replacement therapy
    • Bi-level (+) airway pressure support or mechanical ventilation
    • Shock (pressors, MAP <60 mm Hg, or >40 mm Hg systolic BP decline
NACSELD Acute-on-Chronic Liver Failure (NACSELD-ACLF) Score Predicts 30-Day Survival in Hospitalized Patients with Cirrhosis


HEPATOLOGY, Vol. 67, No. 6, 2018

![Diagram showing 30-Day Survival with and without NACSELD-ACLF infection](image-url)
NACSELD Acute-on-Chronic Liver Failure (NACSELD-ACLF) Score Predicts 30-Day Survival in Hospitalized Patients with Cirrhosis

TABLE 3. Multivariable Logistic Regression Analysis Predicting 30-Day Survival of Admitted Patients With Cirrhosis and an Infection, Without an Infection, and All Together

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>SE</th>
<th>P</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NACSELD-ACLF</td>
<td>-1.739</td>
<td>0.189</td>
<td>&lt;0.0001</td>
<td>0.176 (0.121-0.254)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.048</td>
<td>0.008</td>
<td>&lt;0.0001</td>
<td>0.954 (0.938-0.969)</td>
</tr>
<tr>
<td>WBC</td>
<td>-0.555</td>
<td>0.083</td>
<td>&lt;0.0001</td>
<td>0.574 (0.488-0.676)</td>
</tr>
<tr>
<td>Albumin</td>
<td>0.306</td>
<td>0.118</td>
<td>0.0096</td>
<td>1.357 (1.077-1.710)</td>
</tr>
<tr>
<td>MELD</td>
<td>-0.085</td>
<td>0.011</td>
<td>&lt;0.0001</td>
<td>0.918 (0.900-0.938)</td>
</tr>
<tr>
<td>Had infection</td>
<td>-0.402</td>
<td>0.166</td>
<td>0.0156</td>
<td>0.669 (0.483-0.927)</td>
</tr>
</tbody>
</table>
Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

Javier Fernández,1,2 Juan Acevedo,3 Reiner Wiest,4 Thierry GUSTOT,5 Alex Amoros,2 Carme Deulofeu,2 Enric Reverter,1 Javier Martínez,6 Faouzi Saliba,7 Rajiv Jalan,8 Tania Welzel,9 Marco Pavesi,2 María Hernández-Tejero,1 Pere Ginès,1,2 Vicente Arroyo,2
The European Foundation for the Study of Chronic Liver Failure

Gut 2018;67:1870–1880

• Multicenter European Cationic dataset on ACLF
• 407 patients with ACLF and 235 with acute decompensation (AD)
• Description of infection and relationship with ACLF and outcomes.
• ACLF-1 (minimum) diagnosis:
  • Liver failure
  • Renal failure
  • Any one organ failure with renal dysfunction or cerebral dysfunction (HE)
Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

407 ACLF patients

\( (+) \text{ infection at presentation} \)

152 patients

\( (-) \text{ infection at presentation} \)

255 patients

\( (+) \text{ infection within 4 weeks} \)

117 patients

66%

\( \frac{152 + 117}{407} \)

235 AD patients

\( (+) \text{ infection at presentation} \)

59 patients

\( (-) \text{ infection at presentation} \)

176 patients

\( (+) \text{ infection within 4 weeks} \)

32 patients

38%

\( \frac{59 + 32}{235} \)

Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

Nosocomial infection & ACLF is even worse.
Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

407 ACLF patients

- Infection at presentation: 152 patients
- Infection within 4 weeks: 117 patients

66% (152 + 117)/407

235 AD patients

- Infection at presentation: 59 patients
- Infection within 4 weeks: 32 patients

38% (59 + 32)/235

16% (+) infection

19% (-) infection

3% MDRO

3% MDRO

Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

*Gut* 2018;**67**:1870–1880

<table>
<thead>
<tr>
<th>Transplant free mortality</th>
<th>ACLF w/ bacterial infection at presentation N=152</th>
<th>ACLF w/ bacterial infection during follow-up N=117</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inappropriate Abx</td>
<td>Appropriate Abx</td>
</tr>
<tr>
<td>28 day</td>
<td>54%</td>
<td>29%</td>
</tr>
<tr>
<td>90 day</td>
<td>74%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Abx = antibiotics
Abs 283: Nosocomial Infections Negatively Impact Outcomes in Cirrhotic Inpatients and Cannot be Reliably Predicted on Admission
Bajaj JS, et al on behalf the North American Consortium of the Study of End-Stage Liver Disease (NACSELD)

• 14 centers, prospectively gathered dataset
• Nosocomial infection defined as infection after 48 hrs.
• 2864 admitted cirrhosis patients
  • No infection on admission; No nosocomial (1866) (-/-)
  • No infection on admission; Yes nosocomial (228) (-/+)
  • Yes infection on admission; No nosocomial (562) (+/-)
  • Yes infection on admission; Yes nosocomial (208) (+/+)

• Outcome: 30 day mortality
• Multivariate analysis
**Abs 283: Nosocomial Infections Negatively Impact Outcomes in Cirrhotic Inpatients and Cannot be Reliably Predicted on Admission**

Bajaj JS, et al on behalf the North American Consortium of the Study of End-Stage Liver Disease (NACSELD)

<table>
<thead>
<tr>
<th>Variable</th>
<th>30 da. mortality OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.04 (1.03-1.05)</td>
</tr>
<tr>
<td>Rifaximin on admission</td>
<td>0.60 (0.48-0.96)</td>
</tr>
<tr>
<td>Lactulose on admission</td>
<td>1.42 (1.01-2.0)</td>
</tr>
<tr>
<td>Episodes of AKI</td>
<td>2.17 (1.51-3.14)</td>
</tr>
<tr>
<td>MELD</td>
<td>1.07 (1.05-1.09)</td>
</tr>
<tr>
<td>ICU Admission</td>
<td>1.99 (1.38-2.87)</td>
</tr>
<tr>
<td>ACLF</td>
<td>3.34 (2.23-5.01)</td>
</tr>
<tr>
<td><strong>Nosocomial Infection</strong></td>
<td><strong>1.96 (1.37-2.60)</strong></td>
</tr>
</tbody>
</table>

- Nosocomials had more
  - Vanc resistant enterococcus
  - Drug resistant organisms overall
  - Gram (+)
  - Fungal infection

- Nosocomial infection sites
  1. Urinary
  2. Respiratory
  3. SBP
Gram positives and MDRO’s in SBP.
Management of Nosocomial Spontaneous Bacterial Peritonitis: A Complex and Moving Target

Amy G. Ogurick, M.D.,* and Nicolas M. Intagliata, M.D.

<table>
<thead>
<tr>
<th>TABLE 1. STUDIES IN NOSOCOMIAL SPONTANEOUS BACTERIAL PERITONITIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Author (publication year)</td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td>Bert et al. (2003)8</td>
</tr>
<tr>
<td>Song et al. (2006)9</td>
</tr>
<tr>
<td>Cheong et al. (2009)7</td>
</tr>
<tr>
<td>Ungeller et al. (2009)1</td>
</tr>
<tr>
<td>Ariza et al. (2012)2</td>
</tr>
<tr>
<td>Kim et al. (2012)6</td>
</tr>
<tr>
<td>Chaulk et al. (2014)13</td>
</tr>
<tr>
<td>Chon et al. (2014)10</td>
</tr>
<tr>
<td>Plano et al. (2016)12</td>
</tr>
</tbody>
</table>
Retrospective review of all SBP cases, single center, 2008-11

- 152 cases
  - 47 culture positive
    - 66% hospital/healthcare associated*
    - 15% on SBP prophylaxis
  - 55% GPC
  - 47% third generation cephalosporin resistant
  - 19% MDR

* Dx after 48 hours or hospitalized ≥ 2 days in the last 180 days
Bloodstream infections in patients with liver cirrhosis

Michele Bartoletti, Maddalena Giannella, Russell Edward Lewis, and Pierluigi Viale
Infectious Diseases Unit, Department of Medical and Surgical Sciences, Sant’Orsola Hospital, University of Bologna, Bologna, Italy

INCREASING RISK FOR MULTIDRUG-RESISTANT PATHOGENS

1990s
- Gram negative accounted for 70-80% of bacterial infections
  - Improvement of cirrhosis management and increase of invasive procedures
  - Extended use of norfloxacin for prophylaxis

Early 2000s
- Gram positive accounted for more than 50% of bacterial infections
  - Quinolone resistance and ESBL production has emerged in Enterobacteriaceae

Late 2000s
- Quinolone resistance and ESBL production has emerged in Enterobacteriaceae
  - Dramatic spread of MDR/XDR and PDR pathogens
  - Emergence of yeasts

2010s
- Loss of efficacy of quinolone prophylaxis
  - Progressive overuse to extended spectrum antimicrobials
Watch that kidney function.
Bacterial and fungal infections in acute-on-chronic liver failure: prevalence, characteristics and impact on prognosis

*Gut 2018;67:1870–1880.*

### Table 5  Predictors of 90-day mortality in the univariate and multivariate analysis in patients with ACLF-1 and ACLF-2

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Univariate analysis</th>
<th>Multivariate analysis*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR (CI 95%)</td>
<td>p Value</td>
</tr>
<tr>
<td>Infection (at ACLF diagnosis or during follow-up)</td>
<td>1.65 (1.05 to 2.60)</td>
<td>0.031</td>
</tr>
<tr>
<td>Age (years)</td>
<td>1.01 (0.99 to 1.03)</td>
<td>0.147</td>
</tr>
<tr>
<td>Encephalopathy (%)†</td>
<td>1.56 (1.03 to 2.37)</td>
<td>0.036</td>
</tr>
<tr>
<td>Leukocytes (&lt;109/L)†</td>
<td>1.07 (1.04 to 1.11)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bilirubin (mg/dL)†</td>
<td>1.02 (1.01 to 1.04)</td>
<td>0.007</td>
</tr>
<tr>
<td>INR†</td>
<td>1.11 (0.91 to 1.36)</td>
<td>0.299</td>
</tr>
<tr>
<td>Creatinine (mg/dL)†</td>
<td>1.12 (0.98 to 1.28)</td>
<td>0.098</td>
</tr>
<tr>
<td>Heart rate (bpm)†</td>
<td>1.02 (1.01 to 1.03)</td>
<td>0.001</td>
</tr>
<tr>
<td>Mechanical ventilation†</td>
<td>2.55 (1.62 to 4.01)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renal replacement therapy†</td>
<td>2.32 (1.51 to 3.57)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Cirrhosis survival:
No HRS vs Type 2 HRS vs Type 1 HRS

- Type 1 HRS = doubling of Cr to >2.5 in 2 weeks.
# Diagnosis and management of acute kidney injury in patients with cirrhosis: Revised consensus recommendations of the International Club of Ascites®

*Journal of Hepatology 2015 vol. 62 | 968–974*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Baseline sCr</td>
<td>A value of sCr obtained in the previous 3 months, when available, can be used as baseline sCr. In patients with more than one value within the previous 3 months, the value closest to the admission time to the hospital should be used. In patients without a previous sCr value, the sCr on admission should be used as baseline.</td>
</tr>
</tbody>
</table>

**Definition of AKI**

- Increase in sCr ≥0.3 mg/dl (≥26.5 μmol/L) within 48 hours; or,
- A percentage increase in sCr ≥50% from baseline which is known, or presumed, to have occurred within the prior 7 days.

**Staging of AKI**

- **Stage 1:** increase in sCr ≥0.3 mg/dl (26.5 μmol/L) or an increase in sCr ≥1.5-fold to 2-fold from baseline
- **Stage 2:** increase in sCr >2-fold to 3-fold from baseline
- **Stage 3:** increase of sCr >3-fold from baseline or sCr ≥4.0 mg/dl (353.6 μmol/L) with an acute increase ≥0.3 mg/dl (26.5 μmol/L) or initiation of renal replacement therapy

**Progression of AKI**

- Progression of AKI to a higher stage and/or need for RRT

**Response to treatment**

- **No response**
  - No regression of AKI
- **Partial response**
  - Regression of AKI stage with a reduction of sCr to ≥0.3 mg/dl (26.5 μmol/L) above the baseline value
- **Full response**
  - Return of sCr to a value within 0.3 mg/dl (26.5 μmol/L) of the baseline value
Infection & Acute Kidney Injury

• Notice those seemingly mild rises in Cr in cirrhosis patients
Why worry about all this infection when mortality in sepsis is improving overall?
• Prospective collected dataset from 90% of ICU admissions
• 1,037,115 patients
• Severe sepsis & septic shock
  • 24 hrs of admission
  • Apache III diagnosis of sepsis or septic shock
  • Apache III infection + at last one organ failure by SOFA
Mortality Related to Severe Sepsis and Septic Shock Among Critically Ill Patients in Australia and New Zealand, 2000-2012

Kirsti-Maija Kaukonen, MD, PhD, EDIC; Michael Bailey, PhD; Satoshi Suzuki, MD; David Pilcher, FCICM; Rinaldo Bellomo, MD, PhD

Figure 1. Mean Annual Mortality in Patients With Severe Sepsis

<table>
<thead>
<tr>
<th>Year of ICU Admission</th>
<th>No. of Patients</th>
<th>No. of Events</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sepsis</td>
<td>No Sepsis</td>
</tr>
<tr>
<td>2000</td>
<td>2708</td>
<td>35014</td>
</tr>
<tr>
<td>2001</td>
<td>3783</td>
<td>45000</td>
</tr>
<tr>
<td>2002</td>
<td>4668</td>
<td>51972</td>
</tr>
<tr>
<td>2003</td>
<td>5221</td>
<td>58393</td>
</tr>
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<td>2004</td>
<td>6375</td>
<td>65292</td>
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<tr>
<td>2005</td>
<td>6987</td>
<td>72220</td>
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<td>2006</td>
<td>7627</td>
<td>75926</td>
</tr>
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<td>2007</td>
<td>8529</td>
<td>78297</td>
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<td>2008</td>
<td>8797</td>
<td>77379</td>
</tr>
<tr>
<td>2009</td>
<td>10277</td>
<td>84842</td>
</tr>
<tr>
<td>2010</td>
<td>11367</td>
<td>93385</td>
</tr>
<tr>
<td>2011</td>
<td>12213</td>
<td>98045</td>
</tr>
<tr>
<td>2012</td>
<td>12512</td>
<td>100286</td>
</tr>
</tbody>
</table>

Adjusted Odds Ratio (95% CI):
Decreasing Mortality Among Patients Hospitalized With Cirrhosis in the United States From 2002 Through 2010

Monica L. Schmidt,1 A. Sidney Barritt,2 Eric S. Orman,3 and Paul H. Hayashi2

1University of North Carolina Liver Center and Gillings School of Global Public Health, 2Division of Gastroenterology and Hepatology, University of North Carolina, Chapel Hill, North Carolina; 3Division of Gastroenterology and Hepatology, Indiana University, Indianapolis, Indiana

Gastroenterology 2015;148:967–977
What I have shown you so far.

- Infection and ACLF are often linked

  - Infection with ACLF is associated with significantly increased mortality

- Nosocomial (MDRO, XDR), Gram positives on the rise
  - Associated with increased mortality

- While overall survival for sepsis is improving, this may not be true for the cirrhotic (ACLF) patient.
What can I do now to help protect and treat my cirrhotic patient in the hospital?
Identifying early sepsis?

A Glasgow coma scale score of 15 requires all the following: Spontaneous eye opening, accurate orientation to person, place and time, and appropriate motor response to commands.

Management of Sepsis and Septic Shock

- Antibiotics: broad and quick (<1 hr)
- Source control: remove lines, drain abscesses, etc.
- Fluids for hypoperfusion: 30 ml/kg IV crystalloid within 3 hours.
- Vasopressors: norepinephrine as first choice
- Resuscitation target: MAP of 65 mm Hg
- Antibiotic stewardship: Assess daily for de-escalation.
- Ventilation: Tidal volume 6 ml/kg and plateau pressure of <30 cm H2O
• 4 academic, transplant centers in the NACSELD
• 864 patients
• Admission neutrophil-to-lymphocyte ratio (NLR) = primary independent variable
• Primary outcome: 1 year mortality
• Secondary outcome:
  • 90 day mortality
<table>
<thead>
<tr>
<th>90 day mortality</th>
<th>Hazard ratio (95% CI) Multivariate analysis*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLR value range (quartile)</td>
<td></td>
</tr>
<tr>
<td>&lt;3 (first)</td>
<td>1.0</td>
</tr>
<tr>
<td>3-5 (second)</td>
<td>1.47 (0.65-3.31)</td>
</tr>
<tr>
<td>5-9 (third)</td>
<td>3.61 (1.74-7.51)</td>
</tr>
<tr>
<td>&gt;9 (fourth)</td>
<td>3.78 (1.80-7.83)</td>
</tr>
</tbody>
</table>

* covariates included multi-organ failure by NACESLD ACLF, MELD, cirrhosis stage
What can we do now?

• Be familiar with ACLF criteria---recognize it and educate your hospitalist/intensivist.

• Assessing for infection
  • Tap that ascites!
  • Gram (+)’s on the rise in SBP
  • Prior hospitalizations particularly in the last 28 days—Think MDROs.
  • Prior antibiotic prophylaxis or short term exposures—Think MDROs.

• Antibiotics early and broad (GPC and ?MDRO coverage)

• Be diligent in watching for acute kidney injury (AKI)

• Prevent secondary infections
  • “De-line” patients (foley’s out)
  • Incentive spirometer & out of bed/physical therapy
  • Lower threshold to re-tap the ascites and re-culture elsewhere.
Hydrothorax & Spontaneous Bacterial Empyema

Is it a Hydrothorax?
• Hepatologist:
  • try the SAAG (or SPAG)
• Hospitalist/CT surgeon
  • Light’s criteria

Is there Spontaneous Bacterial Empyema?
• Hepatologist
  • Look at PMN or WBC count
• Hospitalist/CT Surgeon
  • Light’s criteria
• Retrospective study 2001-8
  • 975 consecutive thoracentesis
    • 41 patients with hepatic hydrothorax
      • 8 with infected fluid
Some patients had a low SAAG
Two patients met minimum Light’s criteria
Pleural Fluid Analysis and Radiographic, Sonographic, and Echocardiographic Characteristics of Hepatic Hydrothorax

Puncho Gurung, MBBS; Mark Goldblatt, DO; John T. Huggins, MD; Peter Doelken, MD, FCCP; Paul J. Nierer, PhD; and Steven A. Sahn, MD, FCCP

• Retrospective study 2001-8
  • 975 consecutive thoracentesis
  • 41 cases of hydrothorax
    • 8 cases of infected hydrothorax
      • Two met Light’s Criteria

<table>
<thead>
<tr>
<th>Protein, g/dL</th>
<th>LDH IU/L</th>
<th>Glucose, mg/dL</th>
<th>TNC, /μL</th>
<th>ANC, /μL</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>Protein Ratio²</td>
<td>LDH Ratio²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>1.00 (0.20)</td>
<td>49 (0.20)</td>
<td>N/A</td>
<td>952</td>
</tr>
<tr>
<td>7.48</td>
<td>2.30 (0.38)</td>
<td>120 (0.50)</td>
<td>276</td>
<td>2,802</td>
</tr>
<tr>
<td>7.43</td>
<td>2.70 (0.50)</td>
<td>67 (0.28)</td>
<td>177</td>
<td>2,959</td>
</tr>
<tr>
<td>7.36</td>
<td>0.37 (0.08)</td>
<td>63 (0.26)</td>
<td>103</td>
<td>1,761</td>
</tr>
<tr>
<td>7.52</td>
<td>1.10 (0.19)</td>
<td>94 (0.39)</td>
<td>106</td>
<td>1,669</td>
</tr>
<tr>
<td>N/A</td>
<td>1.70 (0.34)</td>
<td>190 (0.79)</td>
<td>137</td>
<td>2,923</td>
</tr>
<tr>
<td>7.34</td>
<td>1.70 (0.33)</td>
<td>840 (3.50)</td>
<td>83</td>
<td>22,421</td>
</tr>
<tr>
<td>7.39</td>
<td>1.00 (0.16)</td>
<td>32 (0.13)</td>
<td>104</td>
<td>1,118</td>
</tr>
</tbody>
</table>

CHEST 2011; 140(2):448–453
Hydrothorax & Spontaneous Bacterial Empyema

Is it a Hydrothorax?
- SAAG used but less reliable
  - Diuretics can lower it.
- Lights criteria may have reasonable negative predictive value for “empyema”

Is there Spontaneous Bacterial Bacterial Pleuritis?
- Light’s criteria not reliable and implies wrong therapy
- Gross examination of fluid
  - No pus > no chest tube
- ANC > 250 & (+) culture
- ANC > 500 & (-) culture
- Radiographic studies

Antibiotics and close follow-up
What can we do now?

• Be familiar with ACLF criteria---recognize it.
• Assessing for infection
  • WBC over baseline
  • NLM?
  • Gram (+)’s
  • Prior hospitalizations particularly in the last 28 days.
  • Prior antibiotic prophylaxis or short term exposure.
• Antibiotics early and broad
• Prevent secondary infections
  • De-line patients (foley’s out)
  • Incentive spirometer & out of bed/physical therapy
  • Lower threshold to re-tap our SBP patients
• Answer both questions, think spontaneous bacterial peritonitis and...
  • resist chest tube suggestion