Patient Flow Through Washington’s Trauma System

September, 2010
Washington State Trauma System

**Pre-hospital**
- Response
- Transport

- Private Vehicle or Walk-ins
- Police or Law Enforcement
- Ground Ambulance (Pre-hospital Agency)
- Helicopter (Pre-Hospital Agency)
- Fixed Wing Aircraft (Pre-Hospital Agency)

**Hospital**
- Emergency Department (ED)
- Operation / Procedure Room (OR)
- Ward
- ICU

**Discharge**
- Other Acute Care Facility
- Home
- Skilled Nursing Facility
- Jail (Police Custody)
- Other

**Trauma Patient Flow Chart**
* Direct admissions to the OR, ICU or hospital ward from the field are recorded in the ED section of the Trauma Registry with zero ED duration.

Washington State Department of Health
Trauma Volume Trends by Region

(DOH Criteria, Excluding Transfers-in)

Washington State Department of Health
Transported from Scene

(2007 – 2009, DOH criteria, excluding transfers in)

- **Ground Ambulance**: 68.3%
  - Mean ISS = 11
  - N (annually) = 15,720

- **Helicopter**: 3.4%
  - Mean ISS = 22

- **POV**: 27.5%
  - Mean ISS = 7

- **Other**: 0.7%
  - Mean ISS = 9

Washington State Department of Health
Transported from Referring Hospital
(2007 – 2009, DOH criteria, transfers only)

Ground Ambulance: 66.1%
Mean ISS = 11

Helicopter: 20.5%
Mean ISS = 19

Airplane: 13.2%
Mean ISS = 19

Other: 0.2%
Mean ISS = 9

N (annually) = 4,815
Air Transports from Scene

(2007 – 2009, DOH criteria, excluding transfers in)

ISS1-8 14%
ISS 9-15 24%
ISS16+ 62%

N (annually)=539
Ground Transports from Scene
(2007 – 2009, DOH criteria, excluding transfers in)

ISS16+
23%

ISS1-8
38%

ISS 9-15
39%

N (annually)=11,014

Washington State Department of Health
Time from Injury to 1st Hospital

(2007 – 2009, DOH criteria, no transfers)

- <1Hr: 76.2% (Ground: 46.1%, Air: 30.1%)
- 1-2 Hr: 15.6% (Ground: 12.3%, Air: 3.3%)
- 2-3 Hr: 11.4% (Ground: 2.7%, Air: 8.7%)
- 3+ Hr: 5.5% (Ground: 7.9%, Air: 2.6%)

Washington State Department of Health
Air Transport from Scene: Outcomes
(2007 – 2009, DOH criteria, no transfers)

- 147 patients died (9.2%) (During FY 01-02, 13.6%)
  (37 ED, 9 OR, 101 Floor)
- 291 (18%) to OR from ED (During FY 01-02, 31.7%)
- 774 (47.9%) to ICU (During FY 01-02, 35.9%)
- 93 (5.8%) transfer from ED to another ACF (During FY 01-02, 3.4%)
- 47 (3.2%) transferred after admission (During FY 2001-2002, 2.5%)
- 15 (0.9%) discharged from ED.

Washington State Department of Health
Ground Transport from Scene: Outcomes
(2007 – 2009, DOH criteria, no transfers)

- 1,473 patients died (4.5%) *(During FY 01-02, 6.4%)*
  (60 DOA, 405 ED, 72 OR, 936 Floor)
- 2,929 (9.2%) to OR from ED
- 4,354 (13.5%) to ICU
- 7,202 (22.5%) transfer from ED to another ACF *(During FY 01-02, 22.3%)*
- 622 (2.7%) transferred after admission
- 1,204 (3.8%) discharged home from ED.
846 patients were admitted and subsequently transferred (30% with ISS 16-75)

- 21% (n=173) had a surgery prior to the transfer
- 33% (n=270) had ICU stays without surgery

956 patients had ED stays longer than 6 hours before they were transferred out (16% with ISS 16-75)
HOW TO INTERPRET THE CHARTS: Vertical bars represent individual hospitals. Horizontal orange line shows the average of facility percentages of run-form availability within each level of trauma care. Bars within the blue area show a performance similar to the average. Bars extending above the blue area are worse than the average. Bars extending below the blue area are doing better than the average.
HOW TO INTERPRET THE CHARTS: Vertical bars represent individual hospitals. Horizontal orange line shows the average of facility percentages of run-form availability within each level of trauma care. Bars within the blue area show a performance similar to the average. Bars extending above the blue area are worse than the average. Bars extending below the blue area are doing better than the average.
Hospital Transfers from ED
(2007 – 2009, DOH criteria, ED transfers)

Levels of Care:
- Level I
- Level II
- Level III
- Level IV
- Level V

Percent of Transfers:
- Transferred from ED
- Not Transferred from ED

<table>
<thead>
<tr>
<th>Level</th>
<th>Transferred from ED</th>
<th>Not Transferred from ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td>1%</td>
<td>99%</td>
</tr>
<tr>
<td>Level II</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>Level III</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Level IV</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>Level V</td>
<td>85%</td>
<td>15%</td>
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</tbody>
</table>
Hospital Transfers from ED
(2007 – 2009, DOH criteria, ED transfers)

<table>
<thead>
<tr>
<th>Level</th>
<th>Not Transferred from ED</th>
<th>Transferred from ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level II</td>
<td>5,157</td>
<td>12,067</td>
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<tr>
<td>Level III</td>
<td>5,859</td>
<td>7,784</td>
</tr>
<tr>
<td>Level IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level V</td>
<td></td>
<td>846</td>
</tr>
<tr>
<td></td>
<td></td>
<td>149</td>
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</tbody>
</table>

ED Volume

Washington State Department of Health
Transfers from ED to What Level? (2007 – 2009, DOH criteria, ED transfers)

<table>
<thead>
<tr>
<th>Sending Hospital</th>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
<th>Level IV</th>
<th>Level V</th>
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</thead>
<tbody>
<tr>
<td>Level II</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Level III</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Level IV</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Level V</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Level V
- Level IV
- Level III
- Level II
- Level I

Washington State Department of Health
Transfers to Lower Level?

(2007 – 2009, DOH criteria, ED transfers)

- From Level II:  \( N=2 \)
- From Level III:  \( N=27 \)
- From Level IV:  \( N=1 \)
ISS<9 Transfers from ED
(2007 – 2009, DOH criteria, ED transfers)

<table>
<thead>
<tr>
<th>Level</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Level II</td>
<td>38.0%</td>
</tr>
<tr>
<td>Level III</td>
<td>35.0%</td>
</tr>
<tr>
<td>Level IV</td>
<td>47.7%</td>
</tr>
<tr>
<td>Level V</td>
<td>54.6%</td>
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ISS<9 Transfers from ED
(2007 – 2009, DOH criteria, ED transfers)

<table>
<thead>
<tr>
<th>Sending Facility</th>
<th>Level II</th>
<th>Level III</th>
<th>Level IV</th>
<th>Level V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving Facility</td>
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<tr>
<td>Level V</td>
<td>105</td>
<td>158</td>
<td>468</td>
<td>128</td>
</tr>
<tr>
<td>Level IV</td>
<td>1126</td>
<td></td>
<td>318</td>
<td></td>
</tr>
<tr>
<td>Level III</td>
<td>1253</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level II</td>
<td>28</td>
<td>236</td>
<td></td>
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</tr>
</tbody>
</table>

Washington State Department of Health
ED Transfers by Payer Status
(2007 – 2009, DOH criteria, ED transfers, Primary Payer)

- Medicare (1): 32%
- Medicaid (2): 12%
- Other Insurance (5): 12%
- HMO (4): 8%
- (L&I) (3): 4%
- Medicaid (2): 12%
- Self Pay (8): 7%
- Other sponsored (12): 3%
- Health care service contractor (11): 6%
- Commercial insurance (10): 12%
- Charity care (13): 2%
- None (0): 2%
Age Trends of Trauma Patients
(2007 – 2009, DOH criteria, Excluding Transfers)

Medicare-age trauma cases have risen since 2002

Elderly (Age 65+)
Adults (Age 15-64)
Children (Age <=14)
Falls are the major cause of trauma among the elderly.

Starting with year 2000, elderly trauma patients have had longer ED stays than adult patients.
Multiple Patient Transfers, 2006-2008

- 70 Patients with Probable Multiple Transfers (2+)
- 51,209 Patients with a Unique ID
- 61,756 Records
Multiple Transfers: Patient Characteristics

Total N = 70 during 2006-2008

- 6 Deaths
- All blunt injuries
- Min. Age=3 Years
- Max Age=91 Years
- Median Age= 43

Yearly Distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of multiple transfers</th>
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<tbody>
<tr>
<td>2006</td>
<td>26</td>
</tr>
<tr>
<td>2007</td>
<td>23</td>
</tr>
<tr>
<td>2008</td>
<td>21</td>
</tr>
</tbody>
</table>

Washington State Department of Health
Multiple Transfers: Patient Characteristics

Total Number = 70 during 2006-2008

Gender

- Female: 21%
- Male: 79%

Mechanism

- Falls, 22
- MV Occupant, 23
- MV Pedestrian, 1
- Struck By/Against, 2
- Other, 3
- Transport, other, 7
- Fire/Flame/Heat, 3
- Firearm, 2
- Motorcyclist, 7

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Multiple Transfers: Patient Characteristics

Total Number = 70 during 2006-2008

Injury Severity Score
- ISS9-15: 33%
- ISS25-34: 16%
- ISS35-44: 10%
- ISS45+: 1%
- ISS0-8: 26%
- ISS16-24: 14%

Age Groups
- Adult: 80%
- Child: 9%
- Elderly: 11%
Multiple Transfers: Patient Characteristics

Total Number = 70 during 2006-2008

Injury Region

Number of Multiple Transfers

North Central  20
East          17
South Central 13
West          8
Northwest     6
Missing       5

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Multiple Transfer Case Studies: South Central

(Gender) Male

(Age) 40

(Injury Cause) MV Occupant

(Injury Region) South Central

(ISS16-24) Hospital 2
Level III
(7/15/06-7/15/06)

(ISS missing) Hospital 1
Level IV
(7/15/06-7/15/06)

Fixed Wing

Ground

(ISS35-44) Hospital 3
Level I
(7/15/06-7/18/06)

(Outcome) Died

Hospital 1
Level IV
(7/15/06-7/15/06)

Hospital 2
Level III
(7/15/06-7/15/06)

Hospital 3
Level I
(7/15/06-7/18/06)

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Multiple Transfer Case Studies: East Region

(Gender) Female

(Age) 47

(Injury Cause) MV-Motorcycle Crash

(Injury Region) East

(ISS9-15) Hospital 1 Level IV
(4/14/08-4/14/08)

(ISS9-15) Hospital 4 Level I
(4/16/08-4/21/08)

(Outcome) Alive
GCS at Discharge=15

Ground

Helicopter

Fixed Wing
Multiple Transfer Case Studies: West Region

(Gender) Male

(Age) 7

(Injury Cause) MV Occupant

(Injury Region) West

(ISS16-24) Hospital 1 Level III (3/8/08-3/8/08)

(ISS16-24) Hospital 2 Pediatric Level II (3/8/08-3/8/08)

(ISS16-24) Hospital 3 Pediatric Level I (3/8/08-3/8/08)

(Outcome) Alive
GCS at Discharge=15

Washington State Department of Health
Multiple Transfer Case Studies: North Central

(Gender) Male

(Age) 21

(Injury Cause) Struck by/Against

(Injury Region) North Central

(ISSo-8) Hospital 2
Level II
(10/21/06-10/21/06)

(ISSo-8) Hospital 1
Level IV
(10/21/06-10/21/06)

(ISSo-8) Hospital 3
Level I
(10/21/06-10/23/06)

(Ground)

(Helicopter)

(Outcome)
Alive
GCS at Discharge=15

Hospital 1
Level IV
(10/21/06-10/21/06)

Hospital 2
Level II
(10/21/06-10/21/06)

Hospital 3
Level I
(10/21/06-10/23/06)
Multiple Transfer Case Studies: Northwest Region

(Gender) Male

(Age) 53

(Injury Cause) Fall

(Injury Region) Northwest

(ISS9-15) Hospital 1
   Level IV
   (11/3/06-11/4/06)

(ISS16-24) Hospital 2
   Level III
   (11/4/06-11/4/06)

(Injury Region) Northwest

(ISS16-24) Hospital 3
   Level I
   (11/4/06-11/13/06)

(Outcome) Alive
  GCS at Discharge=15

Washington State Department of Health
Thanks so Much!

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