

---

## Chapter 7 Injury Severity Scores

---

This section contains

Executive Comment	109
Background to Injury Severity Scores	110
ISS stratified: Liverpool, Urban, Rural	111
Injury Severity Scores for Body Regions: Each hospital	112
ISS 16 to 75: Number of patients to each hospital annually	114
Survival Outcome: Less serious (ISS 1-15) and More serious injuries (ISS 16-75)	115
Survival Outcome: Urban and Rural Hospitals	116
Urban and Rural Deaths: Body Region Injuries Sustained	117

### EXECUTIVE SUMMARY

The pattern of injury severity score has remained unchanged at Liverpool Hospital between 1997 and 1999.

- Injuries to the head and lower extremities are the most common body parts to be injuries, followed by the face and then thorax and upper extremities.
- Survival for seriously injured trauma patients with ISS 16 or greater has increased significantly in 1999.
- Bankstown Hospital saw an increased number of seriously injured patients in 1999.

## BACKGROUND TO INJURY SEVERITY SCORES

Each of the injuries sustained by all patients in the Major category injury data base is coded and scored according to the 1990 version of the Abbreviated Injury Scale (AIS-90). This scale was originally developed by the Association for the Advancement of Automotive Medicine (AAAM) to be used by crash investigators to standardize data on the frequency and severity of motor vehicle related injuries. The AIS is a consensus derived, anatomically based system that classifies individual injuries by body region on a 6-point ordinal severity scale ranging from AIS 1 (minor) to AIS 6 (currently untreatable). The AIS scores injuries and not the consequences of injuries. Therefore it is a measure of the severity of the injury itself and not a measure of impairments or disabilities that result from the injury.

The Injury Severity Score (ISS) is the sum of the squares of the highest AIS score in each of the three most seriously injured body regions. The six body regions of injuries used in the ISS are: Head or Neck, Face, Chest, Abdominal or Pelvic contents, Extremities or Pelvic girdle, and External. ISS scores range from 1 to 75. A score of 75 results in one of two ways, either with three AIS 5 injuries, or with at least one AIS 6 injury. A limitation of the AIS is that it does not assess the combined effects of multiply injured patients inasmuch as multiple injuries to one body region will only be scored once for the highest score to that region. Below are two typical examples of how an ISS is calculated. Patient A has an ISS of 22. Patient B has an ISS of 16.

### Patient A

AIS Body Region	Injury Description	AIS Code	AIS Score	Highest AIS	AIS <sup>2</sup>
Face	Facial abrasions	210202.1	1	1	
Chest	Diaphragm rupture	440604.3	3	3	9
	Rib fracture	450212.1	1		
Abdo/Pelvic contents	Liver laceration minor	541822.2	2	2	4
Extremities	Radius fractured open	752804.3	3		
	Femur fractured shaft	851814.3	3	3	9
<b>ISS</b>					<b>22</b>

### Patient B

AIS Body Region	Injury Description	AIS Code	AIS Score	Highest AIS	AIS <sup>2</sup>
Head/Neck	Cerebrum Subdural haematoma small	140652.4	4	4	16
	Cerebrum multiple contusions	140614.3	3		
	Skull fracture undisplaced	150402.2	2		
	Cervical spine odontoid dislocation	650206.3	3		
<b>ISS</b>					<b>16</b>

### Stratified ISS for Admissions to Each Hospital During 1999

ISS	Liverpool n=833 %	Bankstown n=243 %	Campbell't'n n=226 %	Fairfield n=104 %	Bowral n=121 %	Camden n=22 %	Total n=1549 %
1 to 15	40	14	13	6	7	1	82
16-24	7	1	1	0	0	0	9
25-75	7	1	1	0	0	0	9
Total	54	16	15	7	8	1	100

## INJURY SEVERITY SCORES

The following tables represent a summary of the severity of injury for patients admitted to Liverpool Hospital (Major Trauma Service), the Urban Trauma Services (Bankstown, Campbelltown, Fairfield and Camden Hospitals) and the Rural Trauma Service (Bowral Hospital).

### Liverpool Hospital (Major Trauma Service)

ISS	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Minor 1 - 4	170	4.5	172	5	161	4.2	161	4.2	159	4.2	823	22
Minor 5 - 8	102	3.7	112	3	114	3	134	3.5	124	3.3	586	15
Moderate 9-15	240	6.3	259	7	256	6.8	322	8.5	332	8.8	1409	37
Serious 16-24	72	1.9	90	2	96	2.5	99	2.6	105	2.8	462	12
Severe 25-49	68	1.8	92	2	94	2.5	93	2.5	101	2.7	448	12
Critical 50-74	5	0.1	8	0	10	0.3	7	0.2	8	0.2	38	1
Maximum 75	7	0.2	6	0	6	0.2	5	0.1	4	0.1	28	0.7
Total	664	18	739	20	737	19	821	22	833	22	3794	100

### Urban Trauma Services

ISS	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Minor 1 - 4	138	5.7	147	6	281	12	208	8.6	225	9.3	999	41
Minor 5 - 8	37	1.5	34	1	78	3.2	77	3.2	69	2.8	295	12
Moderate 9-15	114	4.7	108	5	199	8.2	273	11	248	10	942	39
Serious 16-24	17	0.7	18	1	16	0.7	33	1.4	30	1.2	114	4.7
Severe 25-49	9	0.4	9	0	14	0.6	13	0.5	23	0.9	68	2.8
Critical 50-74	1	0	1	0	0	0	0	0	0	0	2	0.1
Maximum 75	0	0	2	0	1	0	1	0	0	0	4	0.2
Total	316	13	319	13	589	24	605	25	595	25	2424	100

### Bowral Hospital (Rural Trauma Service)

ISS	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Minor 1 - 4	27	6.2	19	4.4	31	7.2	33	7.6	43	9.9	153	35.3
Minor 5 - 8	12	2.8	4	0.9	13	3.0	17	3.9	14	3.2	60	13.9
Moderate 9-15	18	4.2	8	1.8	35	8.1	48	11.1	57	13.2	166	38.3
Serious 16-24	11	2.5	4	0.9	7	1.6	8	1.8	5	1.2	35	8.1
Severe 25-49	4	0.9	0	0.0	7	1.6	6	1.4	2	0.5	19	4.4
Critical 50-74	0	0	0	0	0	0	0	0	0	0	0	0
Maximum 75	0	0	0	0	0	0	0	0	0	0	0	0
Total	72	16.6	35	8.1	93	21.5	112	25.9	121	27.9	433	100

## INJURY SCORES FOR BODY REGIONS

The injuries for each patient are coded with the Abbreviated Injury Scale developed by the Association for the Advancement of Automotive Medicine 1990 version (AIS-90). This scale was developed as a standardized system for categorizing injury type and severity. Each injury is given a separate coded score that ranges in severity from 1 (minor) to 6 (maximum). Many patients have multiple injuries. The tables below represent a summary of the scores for injuries to each body region. Each hospital is represented separately in the following tables.

**Liverpool Hospital** n=3,794

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	505	948	769	404	363	8	2,997	21.8
Face	1383	574	76	5	0	0	2,038	14.8
Neck	126	29	14	4	1	0	174	1.3
Thorax	565	370	511	187	85	5	1,723	12.6
Abdomen and Pelvic	388	391	208	95	63	3	1,148	8.4
Spine	40	447	186	9	15	6	703	5.1
Upper Extremity	678	759	216	0	0	0	1,653	12.0
Lower Extremity	765	1395	795	15	19	0	2,989	21.8
External, burns, other	227	16	34	7	18	1	303	2.2
Injuries Total	4677	4929	2809	726	564	23	13,728	100
%	34.1	35.9	20.5	5.3	4.1	0.2	100	

**Bankstown Hospital** n=920

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	103	158	65	22	16	3	367	16.6
Face	220	67	12	0	0	0	299	13.5
Neck	7	5	0	0	0	0	12	0.5
Thorax	74	87	61	20	4	0	246	11.1
Abdomen and Pelvic	38	26	7	1	0	0	72	3.3
Spine	7	110	12	0	0	0	129	5.8
Upper Extremity	114	148	54	0	0	0	316	14.3
Lower Extremity	93	361	235	1	0	0	690	31.2
External, burns, other	63	4	10	2	0	0	79	3.6
Injuries Total	719	966	456	46	20	3	2,210	100
%	32.5	43.7	20.6	2.1	0.9	0.1	100	

**Campbelltown Hospital** n=879

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	107	212	75	33	19	0	446	21.3
Face	170	55	9	0	0	0	234	11.2
Neck	11	2	1	0	0	0	14	0.7
Thorax	71	46	53	9	4	0	183	8.7
Abdomen and Pelvic	62	28	19	4	4	0	117	5.6
Spine	7	59	23	1	1	0	91	4.3
Upper Extremity	90	125	47	0	0	0	262	12.5
Lower Extremity	113	369	205	1	0	0	688	32.8
External, burns, other	52	7	2	0	0	0	61	2.9
Injuries Total	683	903	434	48	28	0	2,096	100

## INJURY SCORES FOR BODY REGIONS

### Fairfield Hospital n=472

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	62	81	29	9	10	0	191	18.3
Face	86	24	1	0	0	0	111	10.6
Neck	7	0	0	0	0	0	7	0.7
Thorax	56	54	34	9	1	0	154	14.8
Abdomen and Pelvic	31	22	8	5	1	0	67	6.4
Spine	1	39	3	1	1	0	45	4.3
Upper Extremity	54	62	31	0	0	0	147	14.1
Lower Extremity	50	150	81	1	1	0	283	27.1
External,burns,other	30	2	5	1	0	1	39	3.7
Injuries Total	377	434	192	26	14	1	1,044	100
%	36.1	41.6	18.4	2.5	1.3	0.1	100	

### Bowral Hospital n=433

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	72	110	55	23	9	0	269	21.0
Face	130	35	6	0	0	0	171	13.3
Neck	7	1	2	0	0	0	10	0.8
Thorax	59	28	46	14	2	0	149	11.6
Abdomen and Pelvic	25	19	1	1	1	0	47	3.7
Spine	2	48	14	0	0	0	64	5.0
Upper Extremity	82	78	26	0	0	0	186	14.5
Lower Extremity	87	167	87	0	0	0	341	26.6
External,burns,other	35	6	5	0	0	0	46	3.6
Injuries Total	499	492	242	38	12	0	1,283	100
%	38.9	38.3	18.9	3.0	0.9	0	100	

### Camden Hospital n=153

Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	AIS 6	Total	%
Head	16	32	10	5	0	0	63	16.4
Face	44	11	0	0	0	0	55	14.4
Neck	4	0	0	0	0	0	4	1.0
Thorax	18	15	20	3	0	0	56	14.6
Abdomen and Pelvic	10	8	3	1	1	0	23	6.0
Spine	2	22	10	0	0	0	34	8.9
Upper Extremity	27	20	8	0	0	0	55	14.4
Lower Extremity	25	41	13	0	0	0	79	20.6
External,burns,other	12	0	1	1	0	0	14	3.7
Injuries Total	158	149	65	10	1	0	383	100
%	41.3	38.9	17.0	2.6	0.3	0	100	

This data reflects all patients with Major Category injuries who are admitted to each hospital. If a patient is admitted to one hospital in SWSAHS and then transferred to Liverpool Hospital then that patient is represented at both hospitals in these pages in order to illustrate the type of injuries each hospital receives. 9.6% of the injuries admitted to Liverpool Hospital have individual injury scores of 4 or more (classified as serious). 3.1% of Bankstown's admissions 3.1% and 3.6% of Campbelltown's received patients have injuries that are serious.

## INJURY SEVERITY SCORES

### Annual Trends for Each Hospital for ISS ≥ 16

<b>Liverpool</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	72	7.9	90	9.9	96	11	99	11	105	12	462	50.8
25-49	68	7.5	92	10	94	10	93	10	101	11	448	49.2
50-74	12	1.3	14	1.5	16	1.7	12	1.3	12	1.3	0	0.0
<b>Total</b>	<b>152</b>	<b>17</b>	<b>196</b>	<b>21</b>	<b>206</b>	<b>23</b>	<b>204</b>	<b>22</b>	<b>218</b>	<b>24</b>	<b>910</b>	<b>100</b>

<b>Bankstown</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	7	9.9	5	7	9	13	13	18	15	21	49	69.0
25-49	0	0	4	5.6	6	8.5	3	4.2	9	13	22	31.0
50-74	0	0	3	4.2	1	1.4	0	0	0	0	0	0.0
<b>Total</b>	<b>7</b>	<b>9.9</b>	<b>12</b>	<b>17</b>	<b>16</b>	<b>23</b>	<b>16</b>	<b>23</b>	<b>24</b>	<b>34</b>	<b>71</b>	<b>100</b>

<b>Campbelltown</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	7	10	8	11	2	2.9	12	17	8	11	37	52.9
25-49	6	8.6	0	0	7	10	9	13	11	16	33	47.1
50-74	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	<b>13</b>	<b>19</b>	<b>8</b>	<b>11</b>	<b>9</b>	<b>13</b>	<b>21</b>	<b>30</b>	<b>19</b>	<b>27</b>	<b>70</b>	<b>100</b>

<b>Fairfield</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	2	7.1	2	7.1	4	14	4	14	5	18	17	60.7
25-49	3	11	5	18	1	3.6	1	3.6	1	3.6	11	39.3
50-74	1	3.6	0	0	0	0	1	3.6	0	0	0	0.0
<b>Total</b>	<b>6</b>	<b>22</b>	<b>7</b>	<b>25</b>	<b>5</b>	<b>18</b>	<b>6</b>	<b>22</b>	<b>6</b>	<b>22</b>	<b>28</b>	<b>100</b>

<b>Bowral</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	11	20	4	7.4	7	13	8	15	5	9.3	35	64.8
25-49	4	7.4	0	0	7	13	6	11	2	3.7	19	35.2
50-74	0	0	3	5.6	1	1.9	0	0	0	0	0	0.0
<b>Total</b>	<b>15</b>	<b>27</b>	<b>7</b>	<b>13</b>	<b>15</b>	<b>28</b>	<b>14</b>	<b>26</b>	<b>7</b>	<b>13</b>	<b>54</b>	<b>100</b>

<b>Camden</b>	<b>1995</b>	<b>%</b>	<b>1996</b>	<b>%</b>	<b>1997</b>	<b>%</b>	<b>1998</b>	<b>%</b>	<b>1999</b>	<b>%</b>	<b>Total</b>	<b>%</b>
16-24	1	8.3	3	25	1	8.3	4	33	2	17	11	91.7
25-49	0	0	0	0	0	0	0	0	1	8.3	1	8.3
50-74	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	<b>1</b>	<b>8.3</b>	<b>3</b>	<b>25</b>	<b>1</b>	<b>8.3</b>	<b>4</b>	<b>33</b>	<b>3</b>	<b>25</b>	<b>12</b>	<b>100</b>

## Survival Outcome of Patients

Admitted to Liverpool Hospital

### Less Serious Injuries (ISS ≤ 15)

#### Outcome for Patients with Less Serious Injuries (ISS #15)

Outcome	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Survived	498	97.3	539	99.3	525	98.9	607	98.4	600	97.6	2769	98.3
Died	14	2.7	4	0.7	6	1.1	10	1.6	15	2.4	49	1.7
Total	512	100	543	100	531	100	617	100	615	100	2818	100

#### Death Classification for Patients who Died with ISS #15

Classification	1995	1996	1997	1998	1999	Total
CNS	1	0	0	0	0	1
Non CNS	4	0	2	4	2	12
NOF	9	4	4	6	13	36
<b>Total</b>	<b>14</b>	<b>4</b>	<b>6</b>	<b>10</b>	<b>15</b>	<b>49</b>

### Serious Injuries (ISS ≥ 16)

#### Type of Trauma for Patients with Serious Injuries (ISS ≥ 16)

Type	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Blunt	146	96.1	173	88	184	89.3	193	94.6	205	94.0	901	92.3
Penetrating	6	3.9	23	12	22	10.7	11	5.4	13	6.0	75	7.7
Total	152	100	196	100	206	100	204	100	218	100	976	100

#### Outcome for Patients with Serious Injuries (ISS ≥ 16)

Survived												
Trauma Type	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Blunt	120	78.9	132	67.3	153	74.3	158	77.5	181	83.0	744	76.2
Penetrating	5	3.3	15	7.7	16	7.8	9	4.4	9	4.1	54	5.5
Total Survived	125	82.2	147	75.0	169	82.0	167	81.9	190	87.2	798	81.8
Died												
Blunt	26	17.1	41	20.9	31	15.0	35	17.2	24	11.0	157	16.1
Penetrating	1	0.7	8	4.1	6	2.9	2	1.0	4	1.8	21	2.2
Total Died	27	17.8	49	25.0	37	18.0	37	18.1	28	12.8	178	18.2
<b>Total Serious</b>	<b>152</b>	<b>100</b>	<b>196</b>	<b>100</b>	<b>206</b>	<b>100</b>	<b>204</b>	<b>100</b>	<b>218</b>	<b>100</b>	<b>976</b>	<b>100</b>

#### Outcome for Patients with Serious Injuries (ISS ≥ 16)

Type of Trauma	Survived	%	Died	%	Total	%
Blunt	744	82.4	157	17.6	901	100
Penetrating	54	74.5	21	25.5	75	100
<b>Total</b>	<b>798</b>	<b>81.8</b>	<b>178</b>	<b>18.2</b>	<b>976</b>	<b>100</b>

## Urban and Rural Hospitals

### ISS and Outcome for Major Category Injury Admissions to Urban and Rural Hospitals

Hospital	Patients	ISS	Deaths	ISS
Bankstown	920	7.9∇6.4 (1-75)	39	14.8∇16.6 (1-75)
Campbelltown	879	7.7∇5.4 (1-43)	13	14.7∇9.2 (9-35)
Fairfield	472	7.3∇6.1 (1-75)	17	18.2∇19.7 (4-75)
Bowral	434	8.6∇6.1 (1-43)	8	13.9∇7.8 (4-25)
Camden	155	7.3∇4.4 (1-25)	0	*
<b>Total</b>	<b>2860</b>	<b>7.8∇5.9 (1-75)</b>	<b>77</b>	<b>15.4∇15.5 (1-75)</b>

### Serious Injury (ISS ≥16) Admissions to Urban and Rural Hospitals Each Year

	1995	%	1996	%	1997	%	1998	%	1999	%	Total	%
Bankstown	7	16.7	12	35.3	16	35.6	15	25.0	22	39.3	72	30.4
Campbelltown	13	31.0	8	23.5	9	20.0	21	35.0	19	33.9	70	29.5
Fairfield	6	14.3	7	20.6	5	11.1	6	10.0	5	8.9	29	12.2
Bowral	15	35.7	4	11.8	14	31.1	14	23.3	7	12.5	54	22.8
Camden	1	2.4	3	8.8	1	2.2	4	6.7	3	5.4	12	5.1
<b>Total</b>	<b>42</b>	<b>100</b>	<b>34</b>	<b>100</b>	<b>45</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>56</b>	<b>100</b>	<b>237</b>	<b>100</b>

### Deaths: Body Region and Score for Patients Who Died in Urban and Rural Hospitals

Body Region	Score	1	2	3	4	5	6	Total
Head		7	1	7	3	11	2	31
Spine			3			2		5
Face		8	2					10
Thorax		4	1	4	3	2		14
Abdomen and Pelvic			3	2	4	1		10
Lower Extremity		6	5	50	2	1		64
Upper Extremity		7	4	2				13
External, burns		7					1	8
Total n= 77		39	19	65	12	17	3	155

For the 77 patients who died there were a total of 155 injuries.

### Age Distribution for Admissions to Urban Rural Hospitals

Age Group			Deaths		Patients	Patients
0-14	561	99.5	3	0.53	564	19.7
15-24	476	99.8	1	0.21	477	16.7
25-34	352	99.2	3	0.85	355	12.4
35-44	272	98.9	3	1.09	275	9.62
45-54	227	99.6	1	0.44	228	7.97
55-64	212	99.1	2	0.93	214	7.48
65+	683	91.4	64	8.57	747	26.1
<b>Total</b>	<b>2783</b>	<b>97.3</b>	<b>77</b>	<b>2.69</b>	<b>2860</b>	<b>100</b>

## Urban and Rural Hospitals

### Patients Who Died: Body Region and Score for All Injuries Sustained

There was a total of 155 injuries for the group of 77 patients that died. This table shows the injury severity score for each injury by Body region and sub-region.

*Value of score codes*

*1 minor      2 moderate      3 serious      4 severe      5 critical      6 =maximum*

<b>Body Region</b>	<b>Sub-Region</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>Total</b>
Head	Internal Organs			5	3	8		16
	Level of consciousness			1		3		4
	Skeletal		1	1				2
	Whole Area	7					2	9
<b>Total</b>		7	1	7	3	11	2	31
Face	Skeletal	1	2					3
	Whole Area	7						7
<b>Total</b>		8	2					10
Spine	Cervical spine					1		1
	Lumbar spine		3					3
	Thoracic spine					1		1
<b>Total</b>			3			2		5
Thorax	Internal Organs			4		1		5
	Skeletal	2	1		2	1		6
	Vessels				1			1
	Whole Area	2						2
<b>Total</b>		4	1	4	3	2		14
Abdomen and Pelvic contents	Internal Organs		3	1	2	1		7
	Vessels				2			2
	Whole Area			1				1
<b>Total</b>			3	2	4	1		10
Upper Extremity	Skeletal-bones		4	2				6
	Skeletal-joints	3						3
	Whole Area	4						4
<b>Total</b>		7	4	2				13
Lower Extremity	Skeletal-bones		5	49	1	1		56
	Skeletal-joints	1						1
	Vessels			1	1			2
	Whole Area	5						5
<b>Total</b>		6	5	50	2	1		64
External, burns	Burns	1						1
	Skin & subcutaneous tissue	6						6
	Other trauma							1
<b>Total</b>		7					1	8
<b>Grand Total</b>		39	19	65	12	17	3	155

