

*Why do we ship kids out?
Characteristics of children transferred
to a specialist children's hospital
following presentation to a tertiary
mixed Emergency Department*

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Background

- Specialist children's hospitals designed to provide superior outcomes for seriously ill and injured children
- Increasing argument by Paediatric specialists that children are better managed in specialized centres
- Increasing reluctance by specialists in general hospitals to manage sick children

Background

- Problem is largely anecdotal with little research
- The clinical conditions which require specialized services are not always well defined
- Often no clear cut guidelines to determine which children should be transferred
- The burden of managing these children largely rests with the ED staff
 - ☞ The decision to transfer
 - ☞ The logistics of arranging transfer
 - ☞ Communication with staff at specialist centres

Study Objectives

- To explore the characteristics of children transferred out compared with those admitted locally
- To identify subgroups of children with relatively high rates of transfer
- To establish any factors which may reduce unnecessary transfers and/or help identify those children who would benefit from early transfer

Methods 1

- Urban tertiary ED with 60,000 patients p.a., 25 % children (<16 years)
- Retrospective data extraction for all children presenting to ED who were either admitted locally or transferred to the specialist paediatric centres in 2007
- Variables extracted included age, sex, triage category, time of day of presentation, length of stay in ED and diagnosis at ED departure
- Ethics Committee approval

Methods 2

- Diagnostic subgroups with the highest rate of transfer identified
- Structured medical record review for each patient in these diagnostic subgroups:
 - ◆ Investigations undertaken in the ED prior to transfer or admission
 - ◆ Injury Severity Score (ISS) for trauma patients
 - ◆ Whether or not the child went to the operating theatre
 - ◆ Operative findings
 - ◆ Final diagnosis at hospital discharge
 - ◆ Length of hospital stay
- For children transferred to the specialist children's hospital, we also examined whether further additional diagnostic investigations were performed

Data Analysis

- Data analysis using SPSS version 15.0
- Comparative analysis:
 - ◆ Chi-square test for categorical data
 - ◆ T-test for normally distributed continuous variables
 - ◆ Continuous variables with a skewed distribution were either compared using Mann-Whitney test or categorized into logical categories and analyzed using chi-square test
- The significance level was set at 0.05

Results

- 2247 children met inclusion criteria
- 291 (12.9%) subsequently transferred
- Transferred children:
 - ◆ had higher triage codes
 - ◆ were younger (4.7 vs. 5.9)
 - ◆ had shorter lengths of stay in ED (4.23 vs. 5.52)
- No difference in the time of day of presentation between the two groups

	<i>Admitted</i> N=1956	<i>Transferred</i> N=291	<i>P value</i>
Triage category			<0.001 [^]
1	28 (1.4%)	22 (7.6%)	
2	458 (23.4%)	126 (43.3%)	
3	1177 (60.2%)	109 (37.5%)	
4	260 (13.3%)	32 (11.0%)	
5	33 (1.7%)	2 (0.7%)	
Age in years			<0.001*
Median (IQR)	5 (9)	3 (7)	
Mean	5.9	4.7	
ED LOS (hr:mm)			<0.001*
Median (IQR)	5:48 (3:05)	4:07 (3:25)	
Mean	5:52	4:23	
Time of presentation			0.07 [^]
00:00-07:59	278 (14.2%)	29 (10%)	
08:00-15:59	752 (38.4%)	128 (44%)	
16:00-23:59	926 (47.3%)	134 (46%)	

Results

- The diagnostic groups with the highest rate of transfer were:
 - ◆ urological (100%)
 - ◆ burns (94.7%)
 - ◆ abdominal pain (55.4%)
 - ◆ trauma patients (44.9%)
- Abdominal pain and Trauma accounted for 128 of the 291 (44%) children who were transferred

<i>Diagnostic group</i>	<i>Admitted Count (%)</i>	<i>Transferred Count (%)</i>
Urological	0 (0)	16 (100%)
Burns	1 (5.3%)	18 (94.7%)
Abdominal pain	54 (44.6%)	67 (55.4%)
Trauma	75 (55.1%)	61 (44.9%)
Allergies / poisonings	24 (88.9%)	3 (11.1%)
Other	124 (89.9%)	14 (10.1%)
Neurology	168 (90.3%)	18 (9.7%)
Respiratory	689 (93.1%)	51 (6.9%)
Neonatal	30 (93.8%)	2 (6.3%)
Renal	31 (93.9%)	2 (6.1%)
Infectious disease	236 (94.4%)	14 (5.6%)
Orthopaedic	222 (94.5%)	13 (5.5%)
Haematological	18 (94.7%)	1 (5.3%)
Non-surgical GIT	212 (95.5%)	10 (4.5%)
ENT	72 (98.6%)	1 (1.4%)

Abdominal Pain

- 104 medical records reviewed
 - ◆ 56 transferred, 48 admitted locally
- Children transferred out were on average younger, but the range of children operated on at both sites ranged from 0 to 15 years
- No significant difference in
 - ◆ distribution of triage categories
 - ◆ time of day of arrival
 - ◆ proportion who underwent surgery
 - ◆ length of hospital stay
- **Negative operative findings:**
 - ◆ 6 of 20 children operated on locally
 - ◆ 3 of 30 operated on at the specialist centre (P=NS)

Characteristics of children with abdominal pain

	<i>Admitted</i>	<i>Transferred</i>	<i>P value</i>
Triage category*			0.2 [#]
1	0%	0%	
2	6%	11%	
3	63%	72%	
4	31%	16%	
5	0%	2%	
Age in years*			<0.001 ^{\$}
Median (IQR)	13 (5)	9 (6)	
Mean	11.2	8.1	
Range	0-15	0-15	
Underwent surgery[^]	20/48 (42%)	30/56 (54%)	0.2 [#]
Negative operative findings[^]	6 (30%)	3 (10%)	0.07 [#]
Hospital length of stay (days)[^]			0.4 ^{\$}
Median (IQR)	2.5 (1)	2.0 (3)	
Mean	2.8	2.6	
Range	0-10	0-12	

Abdominal pain diagnoses

<i>Diagnosis</i>	<i>Admitted</i>	<i>Transferred</i>
Appendicitis	13	24
Non-specific abdominal pain	19	20
Gastroenteritis	7	4
Other (hernia, abscess, DKA)	2	3
Constipation	5	2
Intussusception	0	2
Urinary tract infection	2	1

Trauma

- 121 medical records reviewed
 - ◆ 54 transferred, 67 admitted locally
- Children transferred:
 - ◆ had more acute triage codes
 - ◆ were younger (6.5 vs. 8.4, $P < 0.01$)
 - ◆ were *less* likely to undergo surgery (20% vs. 64%, $P < 0.001$)
- No difference in ISS scores (5.8 vs. 5.3)
- No difference in hospital length of stay (2.6 vs. 2 days)

Characteristics of children with trauma

	<i>Admitted</i>	<i>Transferred</i>	<i>P value</i>
Triage category*			<0.001 [#]
1	8%	7%	
2	18%	54%	
3	37%	25%	
4	25%	14%	
5	12%	0%	
Age in years*			<0.01 ^s
Median (IQR)	8 (9)	6 (8)	
Mean	8.5	6.4	
Range	0-15	0-15	
Underwent surgery[^]	43/67 (64%)	11/54 (20%)	<0.001 [#]
Injury severity score[^]			1.0 ^s
Median (IQR)	4 (4)	4 (7)	
Mean	5.3	5.8	
Range	0-16	1-18	
Hospital length of stay (days)[^]			0.2 ^s
Median (IQR)	1 (1)	1 (2)	
Mean	2.0	2.6	
Range	0-31	0-21	

Trauma

- Children at both sites had short LoS
 - ◆ 60% of children discharged within 2 days and 90% within 4 days
- 11 children underwent surgery at the specialist centre (Out of 54)
 - ◆ 9 lacerations to the face, hands or genitals
 - ◆ 1 craniotomy
 - ◆ 1 laparotomy
- 43 children operated on locally (out of 67)
 - ◆ 42 soft tissue wound repair
 - ◆ 1 urgent laparotomy for ruptured diaphragm and transferred the following day.
- Of the 54 children transferred
 - ◆ 16 underwent further imaging investigations at the specialist hospital
 - ◆ 11 of these were follow-up tests for injuries already identified

Discussion

- In general, age and acuity of triage were strongly associated with transfer in most diagnostic subgroups i.e. younger, sicker children more likely to be transferred
- Patients with abdominal pain and trauma were transferred most frequently but there was no consistent age pattern which predicted which children were transferred out - children of all ages, including neonates, were managed at both sites
- Children with abdominal pain operated on locally had a non-significant trend towards negative operative findings
- The majority of trauma patients transferred had relatively minor injuries that did not require operative intervention or intensive care management

Discussion

- NSW Health guidelines suggest that many children over 5 years and 20kg can be satisfactorily managed in a general hospital but our results demonstrate that this process is not universally followed
- Sub-specialization of paediatric surgery has led to increasing reluctance by general surgeons to perform simple surgery in children. Our findings may reflect this shifting trend in management of paediatric surgical patients
- The patterns of transfer seemed to reflect the confidence and willingness of individual local surgeons to engage in the assessment and ongoing management of these children
- The reluctance of general anaesthetists to manage children is often cited as another barrier to managing children in general hospitals, but many children with ENT and plastics problems were operated on locally under GA

Discussion - Summary

- Ad hoc pattern of referral, with some surgeons willing to manage a wide range of children while others were transferred out with similar illness or injury
- This lack of consistency in the decision to transfer or admit locally places significant strain on ED staff, patients and their families

Limitations

- Retrospective study over 12 month period
- Some of the medical records were missing and could not be retrieved
- The study involves only one institution and may reflect the practice in just one section of Australia rather than a generalized pattern

Conclusions

- Children with abdominal pain and trauma underwent transfer far more frequently than other major diagnostic groups
- Age rather than severity of illness or injury was the main factor associated with the likelihood of transfer
- Clear and consistent guidelines need to be developed to determine which children can be managed in general hospitals