SERIOUS IMPACT OF BICYCLE HANDLEBAR INJURIES

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BICYCLES AND CHILDREN

- In Alberta, bicycle trauma tops the list of sport and recreational activities injuries, especially in children who do not wear helmets:
  - three times more likely to suffer head injury in a crash
  - 20 times more likely to die

BICYCLES, THE LAW, AND INJURIES

- **May 2002: Alberta law**:
  - cyclists under 18 years are required to wear an approved bicycle helmet
- Helmet use has helped reduce the rate of head injuries by up to 54% in parts of Canada
- cycling injuries continue to rank amongst the highest in injury severity amongst children
- Assessment of fractures, lacerations and head injuries are common practice; however, handlebar induced injuries may be their internal nature and insidious presentation.

BACKGROUND

- Bicycle injuries are a leading cause of trauma in Canadian children.
- We seek to investigate the epidemiology of bicycle handlebar injuries.

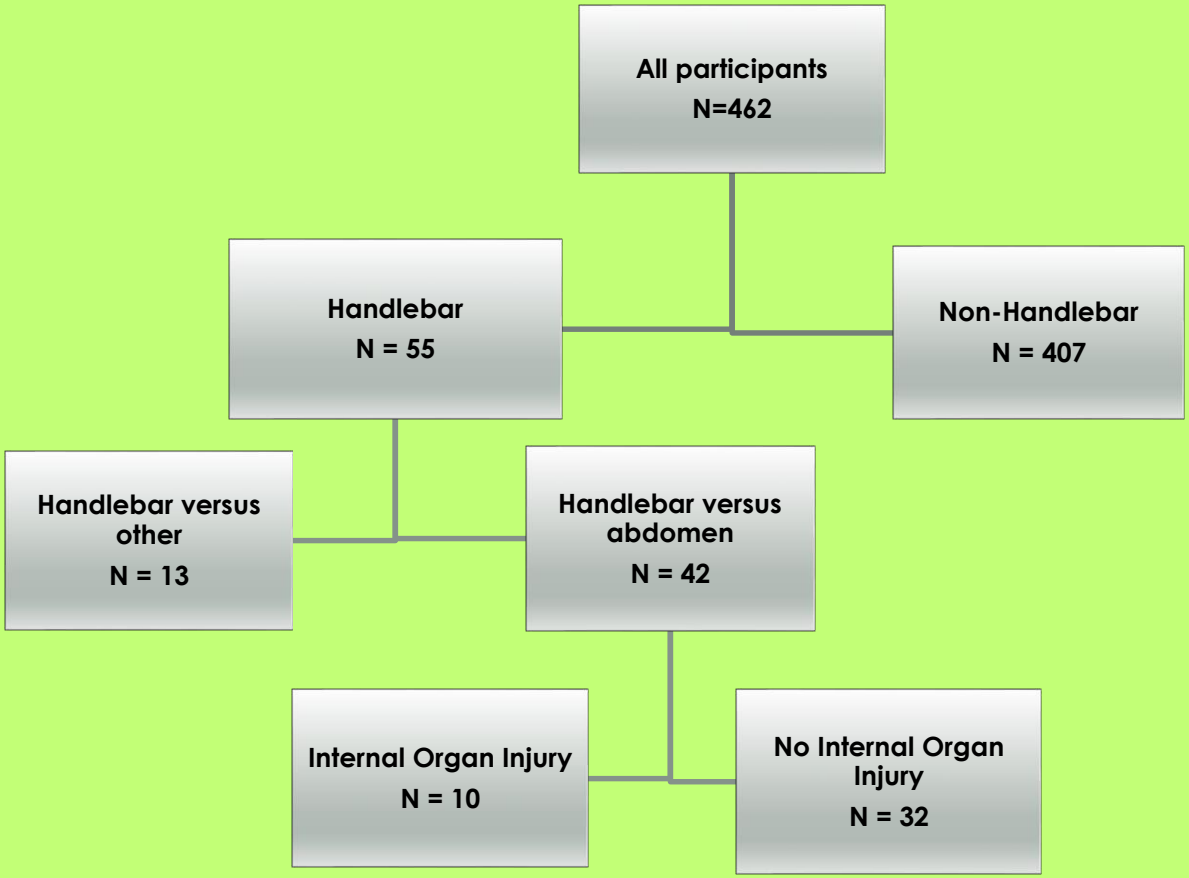
METHODS

- Retrospective analysis of pediatric (<17 years) patients with bicycle trauma treated at our institution was done using existing complementary databases:
  - Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) database
  - Alberta Trauma Registry (ATR) Database
  - Medical Chart review
- Comparing epidemiology, injury, and outcomes
- Spanning February 2012 through July 2013

RESULTS: OVERALL

- **Sample size:** 462 children presented with injuries while riding a bicycle
- **Gender:** 71% male
- **Age:** median age 11 years
- **Bicycle model:**
  - 76% of participants were using an unspecified bicycle
  - 9% using a dirt-bike, and
  - 11% using a BMX bike
- **Helmet use:** Only 55% of participants wore a helmet
- **Most common injuries:**
  - abrasions (n=135)
  - closed fractures of upper extremities (n=114) and
  - soft tissue injuries of extremities, head and neck (n=118).

ACCORDING TO MECHANISM OF BICYCLE TRAUMA, PARTICIPANTS WERE DIVIDED INTO 2 GROUPS: THOSE INJURED BY HANDLEBAR AND NON-HANDLEBAR. THE HANDLEBAR GROUP WAS FURTHER DIVIDED INTO HANDLEBAR VERSUS ABDOMEN AND HANDLEBAR VERSUS OTHER.



RESULTS: HANDLEBAR VERSUS ABDOMEN SUBGROUP

- Handlebar impact accounted for **12%** of all bike injuries
- with 75% of these being handlebar versus abdomen
  - 9% of the total sample

- **Mechanism of injury:**
  - 68% - general fall
  - 10% - stunting
  - 12% - excess speed
  - 5% - collisions with vehicles.

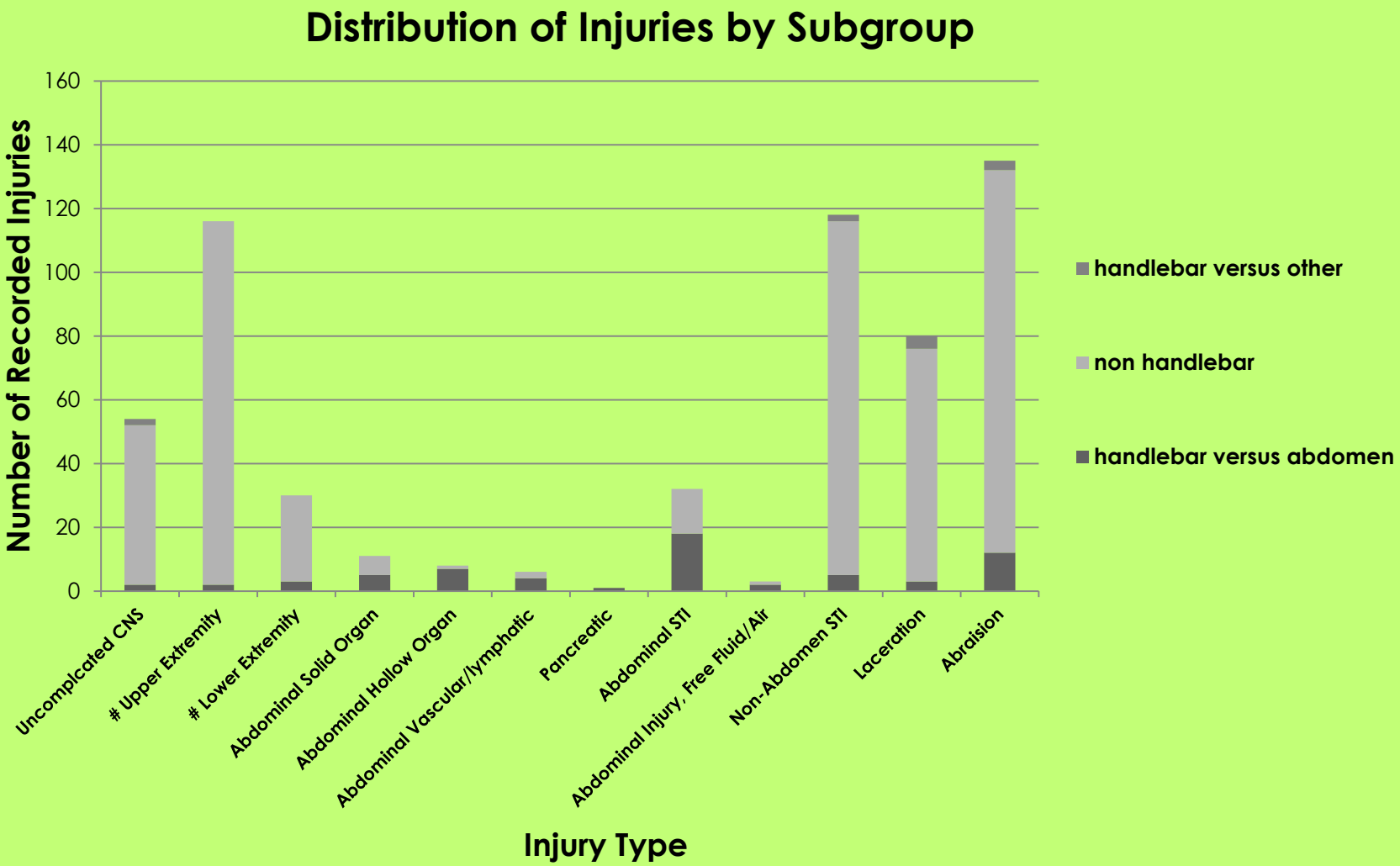
- **1 out of 4 patients** with handlebar injury to the abdomen presented with ***damage to internal organs*** compared to 1 in 100 of non-handlebar injuries

RESULTS: HANDLEBAR VERSUS ABDOMEN SUBGROUP

- The handlebar versus abdomen group accounted for **the majority of internal visceral injuries:**
  - 45.4% of solid organ
  - 87.5% of holloworgan
  - 66.6% of vascular or lymphatic and
  - 100% of pancreatic injuries.

- **10.9% of handlebar** and only 1.2% of non-handlebar injuries had ***severe injuries with ISS>12***.

THE MOST COMMON INJURIES ACROSS THE SAMPLE INCLUDE ABRASIONS, CLOSED UPPER EXTREMITY FRACTURES AND SOFT TISSUE INJURIES OF THE HEAD, NECK OR EXTREMITIES. THE HANDLEBAR VERSUS ABDOMEN SUBGROUP ACCOUNTS FOR 9% OF THE SAMPLE BUT ARE OVER REPRESENTED IN ALL ABDOMINAL INJURIES.



RESULTS: DIAGNOSIS DELAYED IN HANDLEBAR

- **Over half of children with handle bar injuries to the abdomen had delayed definitive diagnosis**
  - *were misdiagnosed or wrongfully discharged*
- **average time between initial and definitive visit for patient with internal organ injury**
  - Handlebar vs abdomen: 18.3 hours.
  - Non- handlebar:1.9 hours
- **average hospital stay for those admitted**
  - Handlebar vs abdomen: 6.75 days
  - Non- handlebar: 4.6 days

RESULTS: HANDLEBAR, PHYSICAL EXAM, LABS

- Of those with internal organ injuries from handle bar contact, there was a greater likelihood of presenting with **fever, emesis, signs of peritonitis, and high lipase**.

- Other laboratory results such as white blood cell count and neutrophil count, and liver enzyme levels were **initially non-specific for injury.**

- **Less than half of patients with handlebar versus abdomen mechanism of injury had diagnostic imaging at their initial visit** to investigate abdominal injuries.

TABLE 1 INITIAL LABORATORY, RADIOLOGIC AND CLINICAL INVESTIGATIONS OF CHILDREN WITH AND WITHOUT INTERNAL ORGAN INJURY BY SUBGROUP, WITH SIGNIFICANTLY DIFFERENT= *

	Handlebar vs abdomen WITH internal organ injury.	Handlebar vs abdomen with NO internal organ injury.	Non-handlebar bike trauma WITH internal organ injury.
Emesis	33.3%*	6.9%	20%
Peritonitis	44.4%*	0%	20%
Fever ≥37.8°C at any time	33.3%*	3.4%	20%
Radiologic test performed	55.5%	39.4%	100%
Blood work completed	77.8%	*18.75%	100%
Elevated Lipase	50%	0%	12.5%
Delayed Definitive visit noted	100%*	15.6%	60%

RESULTS: HANDLEBAR OUTCOMES

- Patients in the handlebar versus abdomen group with **solid organ injuries** such as liver/spleen/pancreatic injuries were all **managed conservatively with success**.
- The three patients with bowel injuries and one with vascular injuries were managed surgically.
- Three patients from the handlebar versus abdomen with internal organ damage subgroup were later seen for complications.
  - Two children were admitted for 5 and 7 days for postoperative bowel obstructions from adhesions.
  - One child was admitted for 14 days for a splenic abscess arising from their splenic injury.

CONCLUSION

- Handlebar to the abdomen cause the vast majority of internal organ injuries incurred while cycling.
- In our study, **1 out of 4** patients with a **HISTORY** of ***handle-bar trauma to the abdomen*** had internal organ damage to the spleen/liver/pancreas/bowel.
- The **mechanism of bicycle handlebar impact** to the abdomen should raise suspicion of a potentially significant internal organ injury.
- Though often **subtle at initial presentation** and delayed in definitive diagnosis, our findings indicate that a significant proportion of handlebar injuries to the abdomen have an elevated injury severity score when compared to non-handlebar bicycle injuries.

CONCLUSION

- As the mechanism of handlebar injury to the abdomen in a child presenting to the ER is by itself an indicator of potential severe injury:
  - Serial abdominal exams, laboratory investigations, and prompt CT abdomen should be used to rule out hollow, viscous or solid organ injuries.
  - Caregivers should seek health care if emesis, peritonitis, or fever appears following a handlebar injury.

QUESTIONS?