PREDICT Paediatric Research in Emergency Departments International Collaborative

Developing a National Head Injury Guideline for Children

Franz Babl, Royal Children's Hospital and PREDICT

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Outline

- Background
- Baseline studies
- Planning the guideline

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ED Assessment of Head Injuries

- CT current gold standard
  - Obvious for severe injury
  - Problematic in milder head injuries
- Increase in CT rates multiple regions
- Variation in care
- Concern radiation risk of ↑ fatal cancer
- Development of clinical decision rules for neuroimaging

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APHIRST Studies (Australiasian Paediatric Head Injury Rules Study)

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Accuracy of PECARN, CATCH, and CHALICE head injury decision rules in children: a prospective cohort study

Franz E Babl, Meredith L Borland, Natalie Phillips, Amit Kochar, Sarah Dalton, Mary McCaskill, John A Cheek, Yuri Gilhotra, Jeremy Furyk, Jocelyn Neutze, Mark D Lyttle, Silvia Bressan, Susan Donath, Charlotte Molesworth, Kim Jachno, Brenton Ward, Amanda Williams, Amy Baylis, Louise Crowe, Ed Oakley, Stuart R Dalziel, for the Paediatric Research in Emergency Departments International Collaborative (PREDICT)

www.thelancet.com **Published online April 11, 2017**

- 10 sites, n=20,137
- Assess accuracy of 3 highest quality CT decision rules
  - PECARN, CATCH and CHALICE rules
- Prospective observational study
- CT scan / follow up call

Accuracy of PECARN, CATCH, and CHALICE head injury decision rules in children: a prospective cohort study

Franz E Babl, Meredith L Borland, Natalie Phillips, Amit Kochar, Sarah Dalton, Mary McCaskill, John A Cheek, Yuri Gilhotra, Jeremy Furyk, Jocelyn Neutze, Mark D Lyttle, Silvia Bressan, Susan Donath, Charlotte Molesworth, Kim Jachno, Brenton Ward, Amanda Williams, Amy Baylis, Louise Crowe, Ed Oakley, Stuart R Dalziel, for the Paediatric Research in Emergency Departments International Collaborative (PREDICT)

www.thelancet.com **Published online April 11, 2017**

Rules in comparison cohort (GCS 13-15, using clinically important TBI as outcome)

	PECARN <2 years			
Clinically important traumatic brain in				
Positive on criteria				
With outcome (n)	42			
Without outcome (n)	2047			
Negative on criteria				
With outcome (n)	0			
Without outcome (n)	2957			
Sensitivity (95% CI)	100·0			
Specificity (95% CI)	59·1			
PPV (95% CI)	2·0			
NPV (95% CI)	100·0% (99·9–100·0)	100·0% (99·9–100·0)	99·9% (99·8–99·9)	99·9% (99·9–100·0)

Comparison Cohort

Point sensitivity/specificity	Missed
PECARN <2y 100%/59%	**0**
PECARN ≥2y 99%/52%	**1**
CATCH 92%/70%	**13**
CHALICE 93%/79%	**12**

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PEDIATRICS/ORIGINAL RESEARCH

Accuracy of Clinician Practice Compared With Three Head Injury Decision Rules in Children: A Prospective Cohort Study

Franz E. Babl, MD*; Ed Oakley, MBBS; Stuart R. Dalziel, PhD; Meredith L. Borland, MBBS; Natalie Phillips, MBBS; Amit Kochar, MD; Sarah Dalton, BMed; John A. Cheek, MBBS; Yuri Gilhotra, MBBS; Jeremy Furyk, MBBS; Jocelyn Neutze, MBChB; Susan Donath, MA; Stephen Hearps, PGDipPsych; Charlotte Molesworth, MBiostat; Louise Crowe, PhD; Silvia Bressan, MD, PhD; Mark D. Lyttle, MBChB

Ann Emerg Med. 2018 Jun;71(6):703-710.

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Accuracy of Physician Practice

GCS 13 - 15, <24 h

n=18,913

Accuracy measure: CT during initial ED visit

	Positive	Negative
Yes	158	2
No	1420	17332

Clinically important traumatic brain injury *

- Sens (95% CI): 158/160 98.8% (95.6– 99.8)
- Spec (95% CI): 17332/18753 92.4% (92.0 – 92.8)
- PPV (95% CI): 158/1578 10.0% (8.6 – 11.6)
- NPV (95% CI)

Traumatic brain injury or CT**

- Sens (95% CI)
- Spec (95% CI)
- PPV (95% CI)
- NPV (95% CI) 99.9% (99.9 – 100.0)

Clinician practice:

Sensitivity 99%

Specificity 92%

	Positive	Negative
Yes	24	0
No	1555	17334

Neurosurgery***

- Sens (95% CI): 24/24 100% (85.8 – 100)
- Spec (95% CI): 17334/18889

A Cost-Effectiveness Analysis Comparing Clinical Decision Rules PECARN, CATCH, and CHALICE With Usual Care for the Management of Pediatric Head Injury

Kim Dalziel, PhD; John A. Cheek, MBBS*; Laura Fanning, MPH; Meredith L. Borland, MBBS; Natalie Phillips, MBBS; Amit Kochar, MD; Sarah Dalton, BMed; Jeremy Furyk, MBBS; Jocelyn Neutze, MBChB; Stuart R. Dalziel, PhD; Mark D. Lyttle, MBChB; Silvia Bressan, PhD; Susan Donath, MA; Charlotte Molesworth, MBiostat; Stephen J. C. Hearps, PGD; Ed Oakley, MBBS; Franz E. Babl, MD; for the Pediatric Research in Emergency Departments International Collaborative (PREDICT)

[Ann Emerg Med. 2018;■:1-11.]

Editor's Capsule Summary

What this study adds to our knowledge

In this Australian and New Zealand decision analysis model based on 18,913 injured children, the cost-effectiveness was similar between the 3 clinical decision rules and unstructured clinical judgment.

How this is relevant to clinical practice

In Australia and New Zealand, pediatric head CT clinical decision rules are not more cost-effective than unstructured clinical judgment.

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Key Issues

- Vomiting
- Non accidental injuries
- Bleeding disorders
- VP shunts

Vomiting With Head Trauma and Risk of Traumatic Brain Injury

Meredith L. Borland, MBBS,[a,b] Stuart R. Dalziel, PhD,[c,d] Natalie Phillips, MBBS,[e,f] Sarah Dalton, BMed,[g] Mark D. Lyttle, MBChB,[h,i,j] Silvia Bressan, PhD,[h,k] Ed Oakley, MBBS,[h,l,m] Stephen J.C. Hearps, PGDipBiostat,[h] Amit Kochar, MD,[n] Jeremy Furyk, MBBS,[o] John A. Cheek, MBBS,[h,l] Jocelyn Neutze, MBChB,[p] Franz E. Babl, MD,[h,l,m] on behalf of the Paediatric Research in Emergency Department International Collaborative group

Pediatrics. 2018;141(4):e20173123

External Validation of the PediBIRN Clinical Prediction Rule for Abusive Head Trauma

Helena Pfeiffer,[a,b] Anne Smith, MBBS,[b,c] Alison Mary Kemp, MRCP,[d] Laura Elizabeth Cowley, MSc,[d] John A. Cheek, MBBS,[a,b,e] Stuart R. Dalziel, PhD,[f,g] Meredith L. Borland, MBBS,[h,i,j] Sharon O'Brien, BNurs,[h] Megan Bonisch, BNurs,[f] Jocelyn Neutze, MBChB,[k] Ed Oakley, MBBS,[a,b,l] Louise Crowe, PhD,[b] Stephen J.C. Hearps, PGDipBiostat,[b] Mark D. Lyttle, MBChB,[b,m,n] Silvia Bressan, MD, PhD,[b,o] Franz E. Babl, MD, MPH,[a,b,l] on behalf of the Paediatric Research in Emergency Department International Collaborative (PREDICT)

Pediatrics. 2018;141(5):e20173674

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APHIRST Gap Study

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APHIRST Gap - Background

- In the Australasian APHIRST study (audit of 10 PREDICT sites) the current CT rate across any severity head injury was 8.8% in tertiary hospitals.

- Most paediatric patients are seen in mixed EDs (paediatric and adult).

- Evidence from USA shows that CT rates are highly variable - and higher in mixed EDs with lower paediatric patient volumes.[2]

1. Oakley E et al. Computed tomography for head injuries in children: change in Australian usage rates over time (submitted)
2. Marin JR et al. Variation in computed tomography imaging for pediatric injury-related emergency visits. The Journal of Pediatrics 2015; 167: 897-904

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APHIRST Gap

Aims of this study:

- Assess ED-level variation in the use of CT scanning of the brain (CTB) in the diagnosis of children with head injury in a range of hospital settings

- Identify potential hospital / clinician and/or patient level factors associated with variation in CTB use

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METHODS

Quantitative – Retrospective Observational design

- A stratified sample of 30 hospitals in Australia and New Zealand - tertiary, urban/suburban, regional/rural (using ACEM classification)

- Data extraction of 100 eligible head injury presentations per site in 2016 - total sample of 3000

- Inclusions: <16 years

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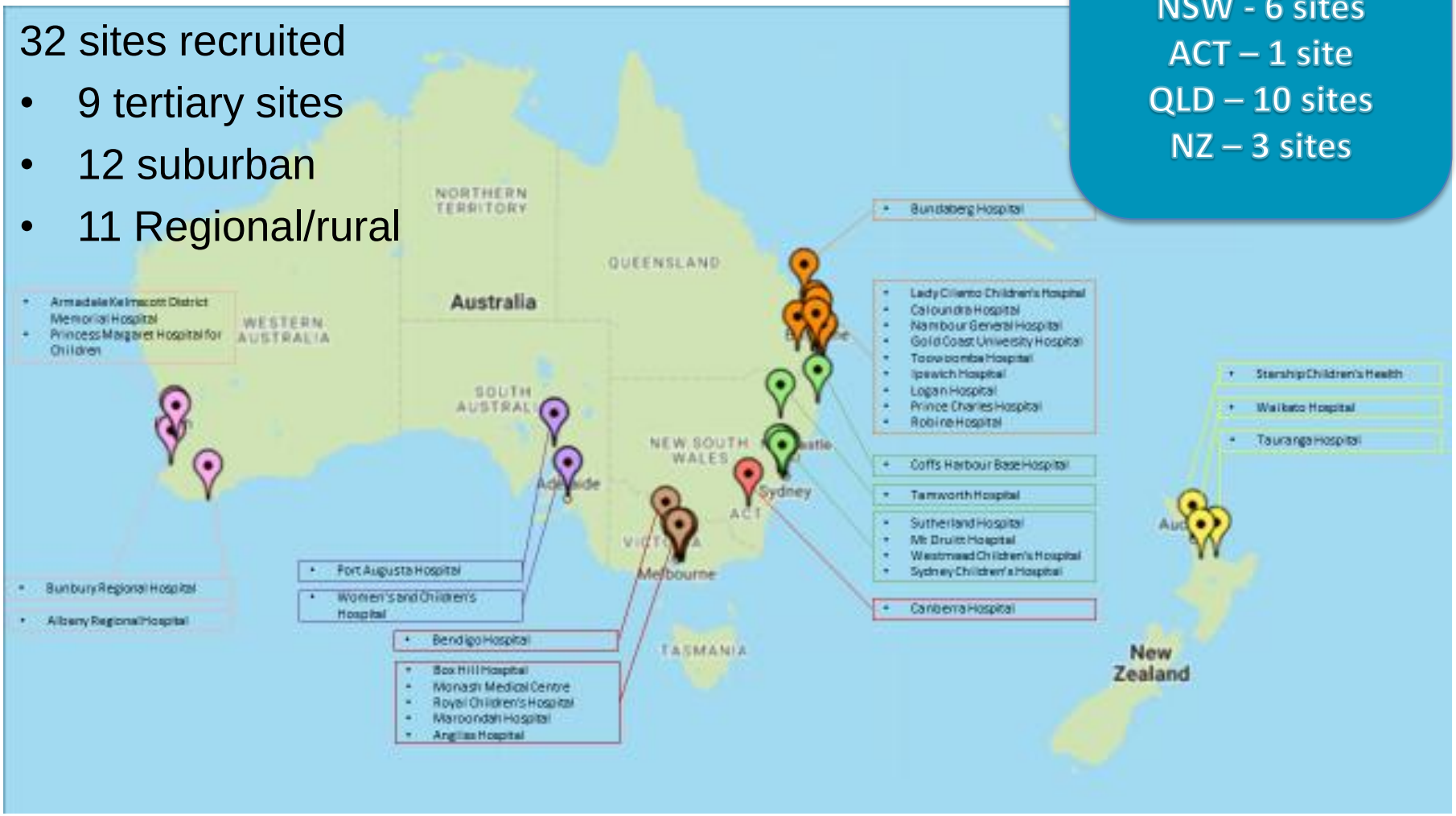
RECRUITMENT OF SITES

WA – 4 sites
SA – 2 sites
VIC – 6 sites
NSW - 6 sites
ACT – 1 site
QLD – 10 sites
NZ – 3 sites

32 sites recruited

- 9 tertiary sites
- 12 suburban
- 11 Regional/rural



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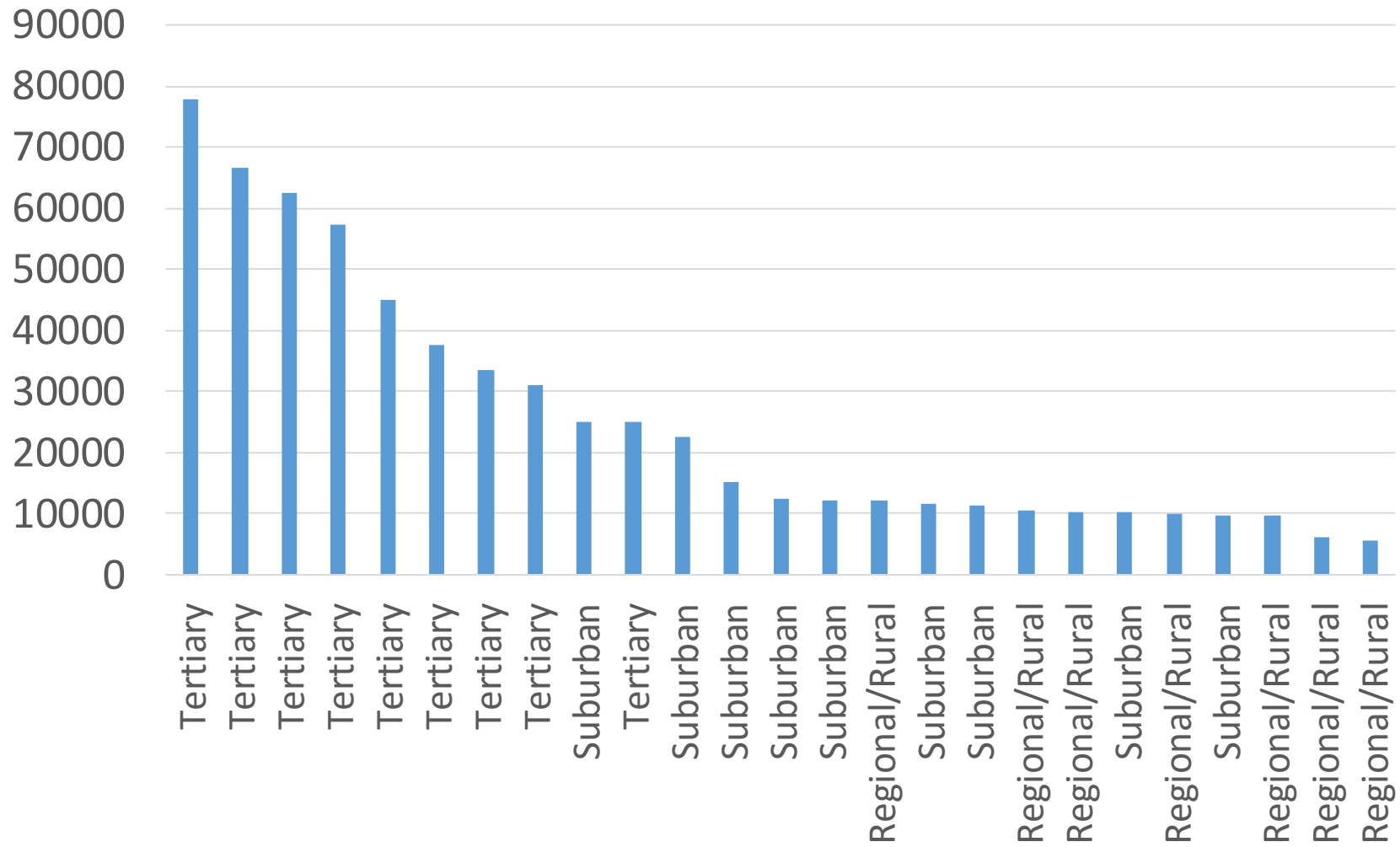
Paediatric ED presentations in 2016 (n=25 hosp.)



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Age and mode of arrival

	Tertiary (9)		Suburban (9)		Regional /Rural (7)	
	n=900		n=872		n=700	
Age in years, M (SD)	**3.8**	4.1	**5.2**	4.7	**5.7**	4.7
Age ≤ 2 years, n (%)	491	**55%**	374	**43%**	252	**36%**
Sex (male), n (%)	528	**59%**	568	**65%**	468	**67%**
Arrival mode, n (%)						
By own means	698	**78%**	726	**83%**	622	**89%**
Ambulance	189	**21%**	144	**17%**	74	**11%**
Air ambulance	5	**0.6%**	0	**0.0%**	1	**0.1%**

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Mechanism of injury – top 8

	Tertiary (9)		Suburban (9)		Regional /Rural (7)	
Mechanism of injury n (%)	**n=900**		**n=872**		**n=700**	
Fall - low (< 1m)	473	**53%**	407	**47%**	288	**44%**
Impact Injury	160	**18%**	171	**20%**	148	**21%**
Fall – high (>1m)	118	**13%**	98	**11%**	80	**11%**
Sport	19	**2%**	86	**10%**	69	**10%**
Cyclist	15	**2%**	33	**4%**	29	**4%**
Other recreational	14	**2%**	22	**3%**	15	**2%**
Motor vehicle	11	**1%**	8	**1%**	5	**1%**

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Initial GCS on presentation to ED

	Tertiary (9)		Suburban (9)		Regional /Rural (7)	
Initial GCS, n (%)	**n=900**		**n=872**		**n=700**	
15	857	**95%**	817	**94%**	655	**94%**
14	22	**2%**	40	**5%**	18	**3%**
13	4	**<1%**	5	**<1%**	2	**<1%**
12-9	5	**1%**	7	**1%**	5	**1%**
3-8	2	**<1%**	1	**<1%**	1	**<1%**

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Comorbidities

	Tertiary (9)		Suburban (9)		Regional /Rural (7)	
Comorbidities, n (%)	**n=900**		**n=872**		**n=700**	
Total Comorbidities	42	**5%**	18	**2%**	14	**2%**
Possible NAI	0		2		4	
VP shunt	0		2		1	
Brain Tumor	2		1		1	
Neurological conds*	18		7		7	
Bleeding dis.	6		0		0	
Other*	22		9		4	

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Neuroimaging rates of head injuries in the ED

	Tertiary (9)		Suburban (9)		Regional /Rural (7)		*=p<.05
Neuroimaging in ED, n (%)	**n=900**		**n=872**		**n=700**		chi2
All Types Imaging	80	**8.9%**	72	**8.3%**	33	**4.7%**	0.004
CT	74	**8.2%**	63	**7.2%**	29	**4.1%**	0.004
- CT abnormal	32	**43%**	20	**32%**	9	**31%**	

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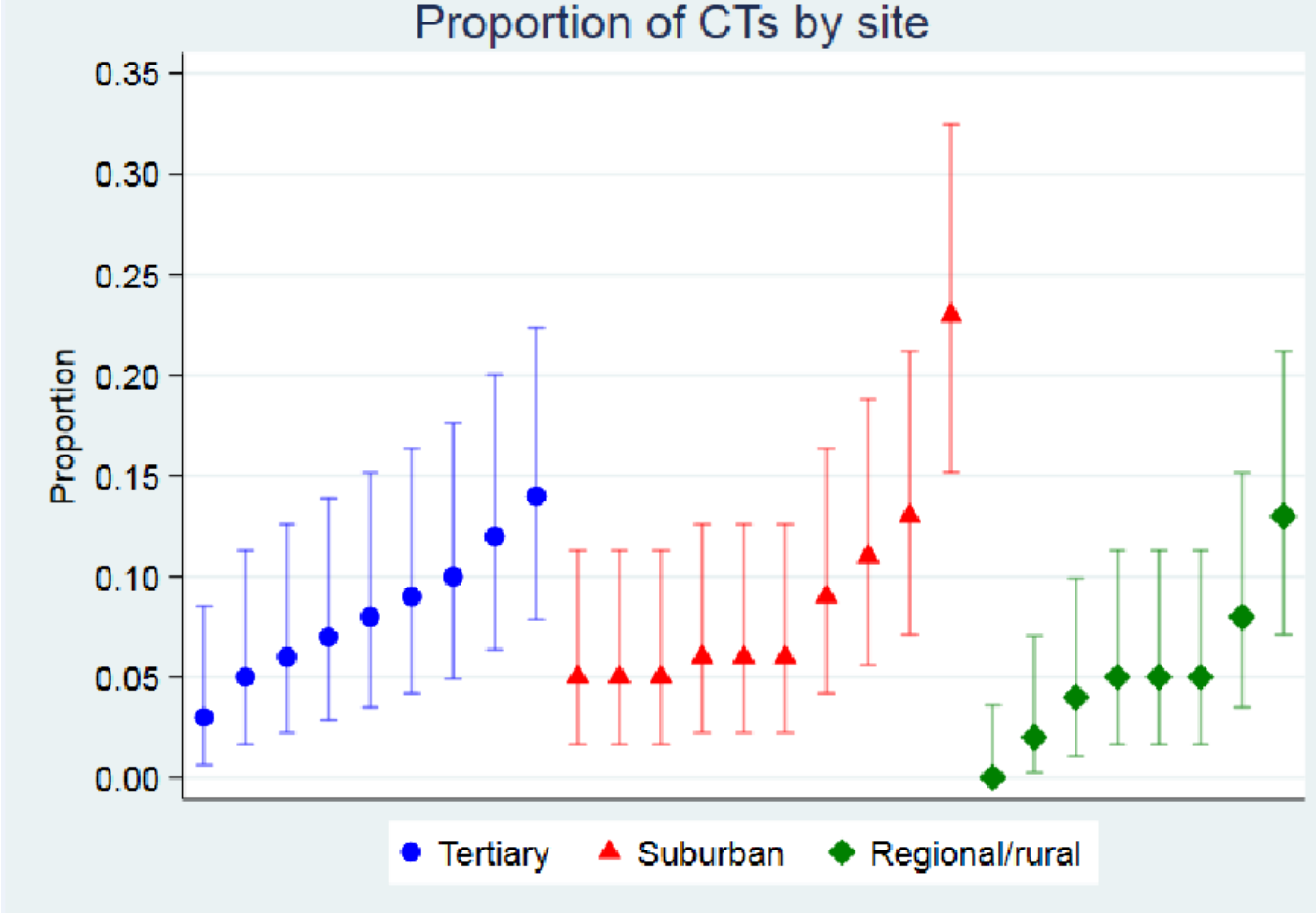
Neuroimaging rates of head injuries in the ED



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Clinical Course and Outcomes

	Tertiary		Suburban		Regional /Rural	
n (%)	**n=900**		**n=872**		**n=700**	
Neurosurgery	5	**0.6%**	1	**0.1%**	1	**0.1%**
Intubated/ventilat'd	8	**0.9%**	0	**0.0%**	3	**0.4%**
Transferred	1	**0.1%**	13	**1.5%**	5	**0.7%**
Deaths	2	**0.2%**	0	**0.0%**	0	**0.0%**
Admitted inpatient	253	**28%**	264	**30%**	64	**9%**
% LOS if >4 hrs	242	**27%**	215	**25%**	80	**11%**
Mdn LOS overall (hrs)	**2.6**	(1.5-4.2)	**2.7**	(1.6-3.9)	**1.8**	(1.0-2.8)

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Preliminary conclusions

- Neuroimaging rates for paediatric head injury are NOT higher in Suburban or Regional/Rural settings EDs– we differ from the USA
- Lower neuroimaging rates in Regional/Rural settings are not counteracted by increased observation
- Suburban and Regional/rural sites have similar GCS distributions, including GCS <14
- We need to consider NAI, VP shunts etc. in future guidelines as they occur in all contexts

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Qualitative interviews

- APHIRST Gap
  - Qualitative interviews (n=40):
    - Identify factors influencing variation in care
    - Assess barriers and enablers of care
    - Patient groups deemed difficult to manage
    - Potential interventions to support decision-making

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Qualitative Interviews

"It would be ***very useful to have an Australia-wide guideline*** that EDs agreed upon and was available on their system…something everybody could refer to with ***more consistency across opinions***"

"I use ***PECARN*** purely because it's got 3 clear indications for CTing and everything else is observations so ***you can tailor it to the individual***"

"***PECARN has grey areas***…how many vomits is serious? A perfectly healthy child but vomits 4 times?…what constitutes a vomiting episode? – vomiting continually is that 1 episode?"

"***Non-accidental injury***, and ***delayed presentations*** are situations that are ***difficult***"

"We currently have a mild head injury advice card but we ***don't have fact sheets on informed discussions or details on the risk of CT brain***…a lot use old radiation statistics"

"I think we are a bit ***lax on return to sport after head injuries advice***. If we could improve that by providing education to families or remembering to do it"

"Useful to have ***information sheets based on the severity of the child's injury***…practical advice about going back to school or what to worry about…its not well done because children at different ages have different needs"

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PREDICT Head Injury Guideline

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Background

AUSTRALASIAN BRONCHIOLITIS GUIDELINE

- Australasian Bronchiolitis Guideline
  - Evidence review
  - Wide consultation
  - Widely endorsed

Journal of Paediatrics and Child Health

doi:10.1111/jpc.14104

Journal of Paediatrics and Child Health (2018)

ORIGINAL ARTICLE

Australasian bronchiolitis guideline

Sharon O'Brien,[1,2] Meredith L Borland,[1,3] Elizabeth Cotterell,[4] David Armstrong,[5,6] Franz Babl,[7,8,9] Paul Bauert,[10] Christine Brabyn,[11] Lydia Garside,[12] Libby Haskell,[13] David Levitt,[14] Nicola McKay,[15] Jocelyn Neutze,[16] Andreas Schibler,[14,17,18] Kam Sinn,[19] Janine Spencer,[20] Helen Stevens,[21] David Thomas,[22] Michael Zhang,[23] Ed Oakley,[8,9,24,25] and Stuart R Dalziel;[13,26,27] on behalf of the Paediatric Research in Emergency Departments International Collaborative (PREDICT) Network, Australasia

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Scope

	Inclusion	Exclusion
Population	Children and infants (aged <18 years) Mild to moderate head injuries (including concussion) due to trauma/blunt head injuries (GCS 13-15)	Adults 18 years and over ABI, penetrating trauma Moderate to severe head injuries (GCS <13)
Time of presentation	Initial and repeat presentations (within 72 hours of injury)	Delayed and repeat presentation (injury occurs >72 hours)
Setting	Emergency Department and acute assessment areas of rural, regional and tertiary hospitals in Australia and New Zealand	Pre-hospital ICU Rehabilitation General Practice Sports Field Community
Recommendations	Initial diagnosis Neuroimaging Observation criteria and time Discharge Information including concussion return to school/play Discharge disposition Special consideration (suspected NAI, bleeding disorders, VP shunt)	Pre-hospital management ICU management Neurosurgical management Rehabilitation including post-concussion syndrome

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Guideline Methodology

JAMA Pediatrics | Special Communication

Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children

Angela Lumba-Brown, MD; Keith Owen Yeates, PhD; Kelly Sarmiento, MPH; Matthew J. Breiding, PhD; Tamara M. Haegerich, PhD; Gerard A. Gioia, PhD; Michael Turner, MD; Edward C. Benzel, MD; Stacy J. Suskauer, MD; Christopher C. Giza, MD; Madeline Joseph, MD; Catherine Broomand, PhD; Barbara Weissman, MD; Wayne Gordon, PhD; David W. Wright, MD; Rosemarie Scolaro Moser, PhD; Karen McAvoy, F Barbara Holshou Heather T. Keen P. B. Raksin, MD John DeWitt, PT Richard G. Ellenl Katrina Altenhol Robert E. O'Con

Da Dalt et al. Italian Journal of Pediatrics (2018) 44:7
DOI 10.1186/s13052-017-0442-0

Italian Journal of Pediatrics

REVIEW Open Access

Italian guidelines on the assessment and management of pediatric head injury in the emergency department

Liviana Da Dalt[1], Niccolo' Parri[2], Angela Amigoni[1], Agostino Nocerino[3], Francesca Selmin[1], Renzo Manara[4], Paola Perretta[5], Maria Paola Vardeu[6], Silvia Bressan[1*], on behalf of the Italian Society of Pediatric Emergency Medicine (SIMEUP) and the Italian Society of Pediatrics (SIP)

Consensus statement

Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

Paul McCrory,[1] Willem Meeuwisse,[2] Jiří Dvorak,[3,4] Mark Aubry,[5] Julian Bailes,[6] Steven Broglio,[7] Robert C Cantu,[8] David Cassidy,[9] Ruben J Echemendia,[10,11] Rudy J Castellani,[12] Gavin A Davis,[13,14] Richard Ellenbogen,[15] Carolyn Emery,[16] Lars Engebretsen,[17] Nina Feddermann-Demont,[18,19] Christopher C Giza,[20,21]

Astrand et al. BMC Medicine (2016) 14:33
DOI 10.1186/s12916-016-0574-x

BMC Medicine

GUIDELINE Open Access

Scandinavian guidelines for initial management of minor and moderate head trauma in children

Ramona Astrand[1], Christina Rosenlund[2] and Johan Undén[3*], for the Scandinavian Neurotrauma Committee (SNC)

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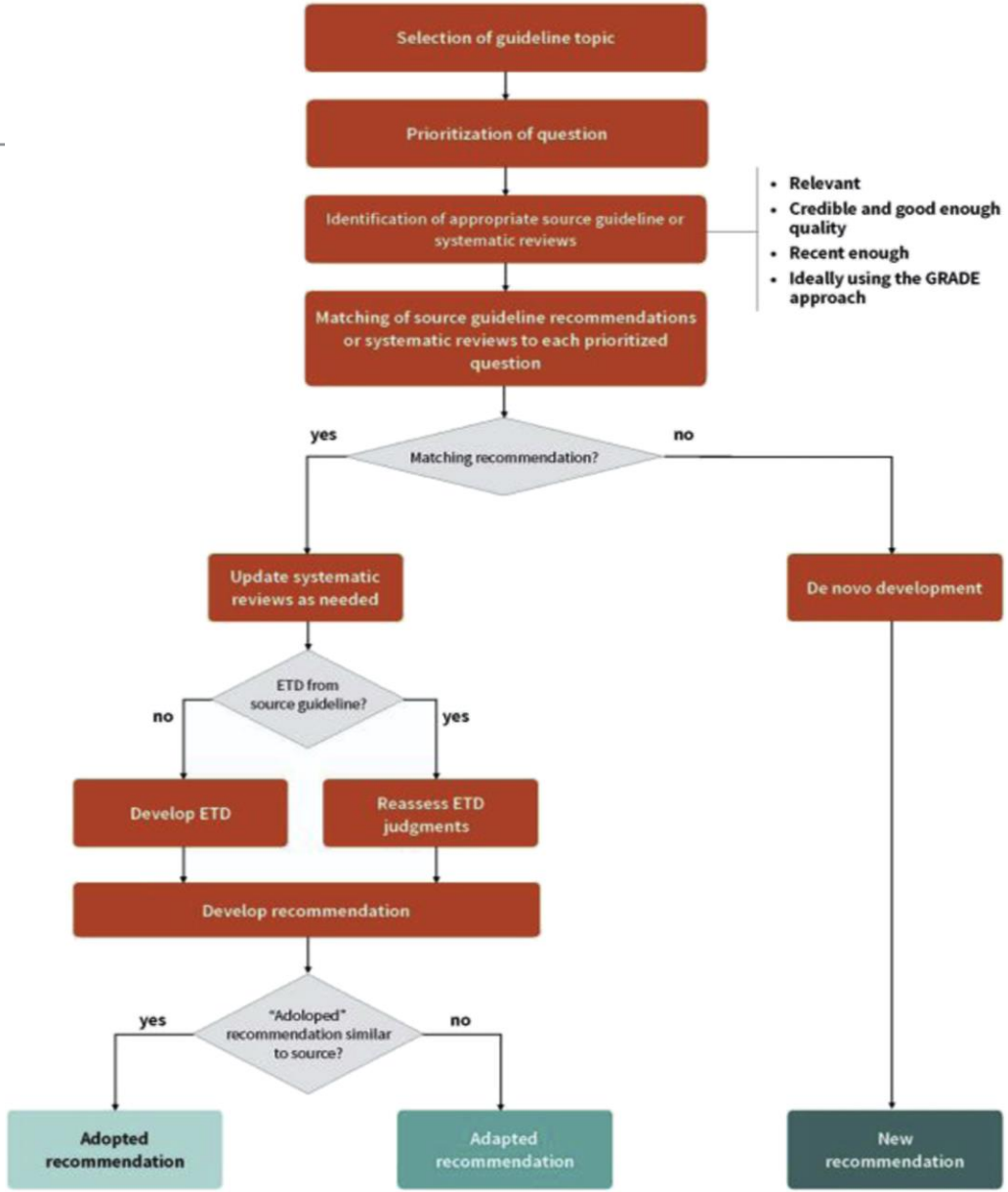
GRADE-ADOLOPMENT



ELSEVIER
CrossMark
Journal of Clinical Epidemiology 81 (2017) 101–110
Journal of Clinical Epidemiology

GRADE Evidence to Decision (EtD) frameworks for adoption, adaptation, and de novo development of trustworthy recommendations: GRADE-ADOLOPMENT

Holger J. Schünemann[a,b,*], Wojtek Wiercioch[a], Jan Brozek[a,b], Itziar Etxeandia-Ikobaltzeta[a], Reem A. Mustafa[a,c,d], Veena Manja[e,f], Romina Brignardello-Petersen[g,h], Ignacio Neumann[a,i], Maicon Falavigna[j,k], Waleed Alhazzani[a,b], Nancy Santesso[a], Yuan Zhang[a], Jörg J. Meerpohl[l,m], Rebecca L. Morgan[a], Bram Rochwerg[a], Andrea Darzi[d], Maria Ximenas Rojas[n], Alonso Carrasco-Labra[a,i], Yaser Adi[o], Zulfa AlRayees[p], John Riva[a,q], Claudia Bollig[l], Ainsley Moore[a,q], Juan José Yepes-Nuñez[a], Carlos Cuello[a,r], Reem Waziry[s,t], Elie A. Akl[a,s]

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Advisory Group

- Emergency Physician
- Paediatrician
- Paediatric Intensivist
- Neurosurgeon
- Sports Medicine/Concussion Physician
- Nurse Practitioner
- Nurse
- Radiologist
- Pre-hospital (retrieval and general ambulance)
- Neuro-cognitive Specialist
- Child Protection Consultant
- Paediatric Rehabilitation Physician
- General Practitioner

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Endorsement

- Paediatric Society of New Zealand
- Australian Paediatric Society
- Australasian College of Emergency Medicine
- Neurosurgical Society of Australasia
- Australasian College of Rural and Remote Medicine
- The Royal Australasian College of Physicians, Paediatric and Child Health Division
- College of Intensive Care Medicine of Australia and New Zealand
- The Royal Australian and New Zealand College of Radiologists
- Royal Australasian College of Surgeons
- Royal Australasian College of General Practitioners
- Children's Healthcare Australasia
- College of Emergency Nursing Australasia
- College of Emergency Nurses NZ
- NSW Office of Kids and Families

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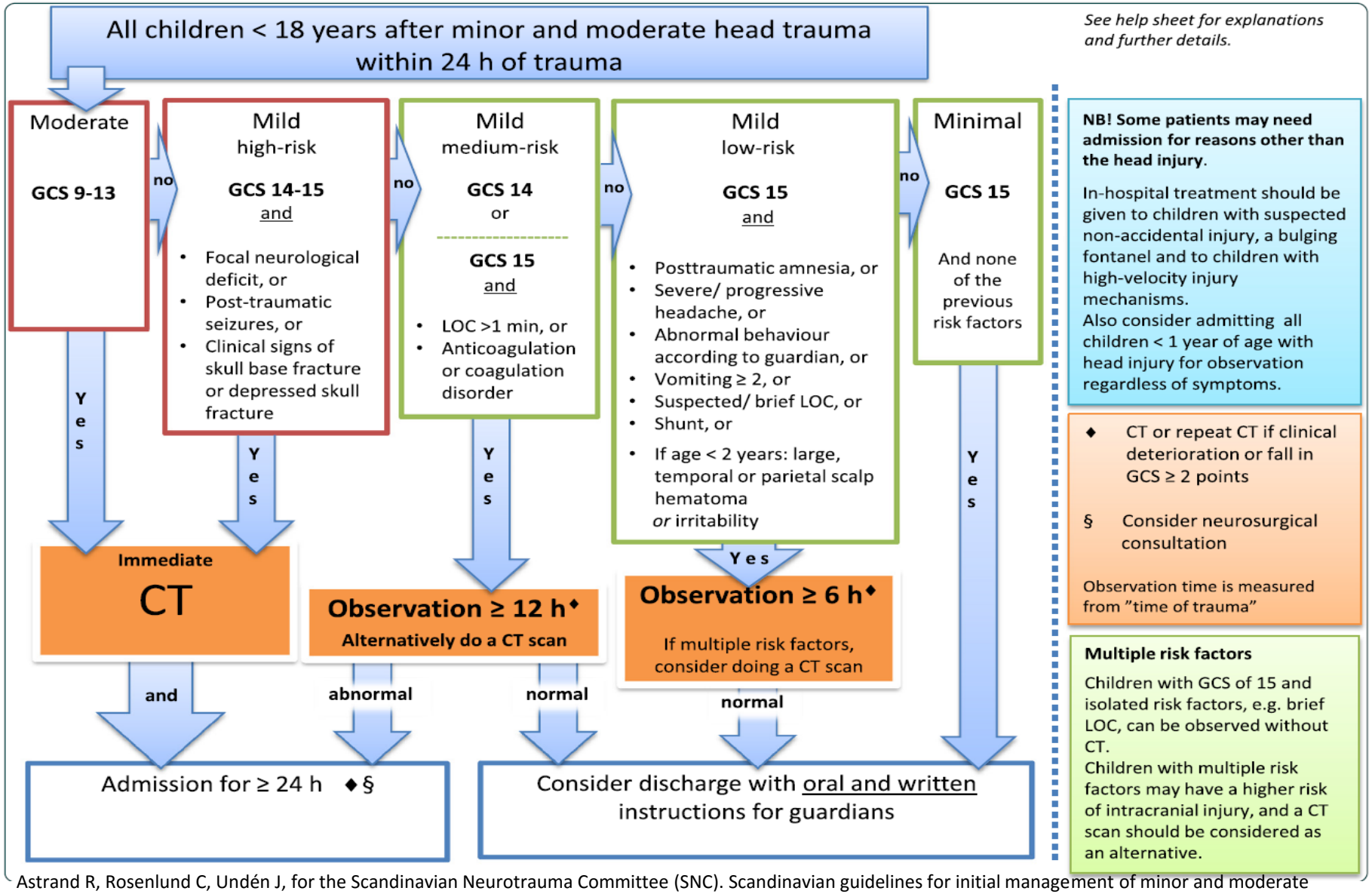
Guideline Steps and Progress

Step	Timeline
Identify scope/aim of the guideline	October 2018
Formulation of Guideline Advisory Group	November 2018
Develop PICOT questions (informed by Qualitative interviews)	November 2018
Identify recommendations from high quality guidelines and undertake literature searches to update	December 2018
Critical appraisal/evidence tables	February 2018
Face to face meeting to refine scope, PICOT, structure and methods	22 February 2019
Face to face meeting - consensus group technique Development of recommendations	7 June 2019
GAG consultation and agreement of draft guideline	July 2019
Stakeholder consultation and feedback	August-September 2019
Refine guideline and signoff	November-December 2019
Endorsement and signoff	December 2019

Format of guideline



Astrand R, Rosenlund C, Undén J, for the Scandinavian Neurotrauma Committee (SNC). Scandinavian guidelines for initial management of minor and moderate head trauma in children. *BMC Medicine*. 2016;14:33. doi:10.1186/s12916-016-0574-x.

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Head Injury Guideline for Children

- Focus on GCS 13-15 presenting to all hospitals
- Address
  - CT imaging and observation
  - Transfer, neurosurgical consultation
  - Special conditions: NAI, VP shunts, bleeding disorders
- Discharge information including concussion advice
- Link into electronic decision support

Acknowledgements

AUSTRALIA

Amit Kochar Women's and Children's Hospital, Adelaide

Ed Oakley, **Silvia Bressan, Mark Lyttle, Amanda Fry, Louise Crowe, Emma Tavender, Cate Wilson** Royal Children's Hospital, Melbourne

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Jeremy Furyk Townsville Hospital

Sarah Dalton, Mary McCaskill Children's Hospital at Westmead, Sydney

Meredith Borland, Sharon O'Brien Perth Children's Hospital, Perth

NEW ZEALAND

Jocelyn Neutze KidsFirst, Auckland, New Zealand

Stuart Dalziel Starship Children's Hospital, Auckland, New Zealand

Susan Donath Clinical Epdemiology & Biostatistics Unit, Murdoch Childrens Research Institute **Kim Dalziel** University of Melbourne **Stephen Hearps** CS Theme MCRI

All research assistants, Drs and RNs at PREDICT sites

Site	State	PI name	Research Assistants
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Sutherland Hospital	NSW	Gina Watkins	Elizabeth Walter
Mt Druitt ED	NSW	Stephen Teo	(no RA)
Tamworth Hospital	NSW	Aime Beattie	Blair Burke, Adrian Cheung, Kathryn Charlier, Emma Simmo
Westmead Children's Hospital	NSW	Mary McCaskill	Deepali Thosar
Sydney Childrens Hospital	NSW	Arjun Rao	Inas Hanna, Sophie Watkins
Coffs Harbour Base Hospital	NSW	Lorna McLeod	Michelle Fenton
Waikato Hospital	NZ	Christine Brabyn	Kirsty Greaves
Tauranga Hospital	NZ	Jo Cole	Karyne Coker
Starship Children's Health Hospital	NZ	Stuart Dalziel	Megan Bonisch
Bundaberg Hospital	QLD	Adam Michael	Nicholas Edwards, Matthew Vanderberg
Lady Cilento Children's Hospital	QLD	Natalie Phillips	Sally Gray, Kelly Foster
Caloundra Hospital	QLD	Stephen Priestly	Jessica Riordan
Nambour General Hospital	QLD	Stephen Priestly	Jessica Riordan
Gold Coast University Hospital	QLD	Shane George	Richele Tucker
Toowoomba Hospital	QLD	Alex King	Helena King
Ipswich Hospital	QLD	Corey Cassidy	Robert Hong, Justin Jin, Amy Richter, Bo Bi
Logan Hospital	QLD	Ben Lawton	Brooke Charters
Prince Charles Hospital	QLD	Fran Kinnear	Louise Spooner-Jackson, Ashlee Percival
Robina Hospital	QLD	Shane George	Richele Tucker
Women's and Children's Hospital	SA	Amit Kochar	Gaby Nieva
Port Augusta Hospital	SA	Lalith Gamage	Joshua Anderson
Box Hill Hospital	VIC	Peter Archer	Lisa Vermeulen
Monash Medical Centre	VIC	Simon Craig	Emma Ramage
Royal Children's Hospital	VIC	Franz Babl	Ali Crichton, Cate Wilson
Bendigo Hospital	VIC	Mark Putland	Daniel Bourne
Maroondah Hospital	VIC	Peter Archer	Lisa Vermeulen
Angliss Hospital	VIC	Peter Archer	Lisa Vermeulen
Armadale Kelmscott District Memorial Hospital	WA	Ashes Mukherjee	Jonathon Burcham, Samantha Berkelaar
Princess Margaret Hospital for Children	WA	Meredith Borland	Sharon O'Brien, Weikuei Ho,Madhuri Dama, Deidre Speldev
Albany Regional Hospital	WA	Russell Young	Tom Fox, Natalie Rudling
Bunbury Regional Hospital	WA	Hugh Mitenko	Marie Draper

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Any questions ?

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Thank you to all our site based teams and….

Funders

- Angior Foundation
- Emergency Medicine Foundation
- NHMRC - CRE

Study Team

- MCRI (VIC, NSW, WA,SA, ACT, NZ)
  Franz Babl
  Ed Oakley
  Cate Wilson
  Emma Tavender
  Stephen Hearps

- PMH (WA sites)
  Sharon O'Brien

- LCCH (QLD sites)
  Natalie Phillips
  Sally McGuire
  Kelly Foster

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Preliminary Results – to date (25 sites)

TOTAL RECORDS REVIEWED AT 25 HOSPITALS = 2892

EXCLUDED: (N=420)
- ≥ 16 years (n=23)
- presented >24 hrs (n=142)
- neuroimaging done elsewhere (n=30)
- represented in 24 hrs (n=25)
- dental injury/ other (n=200)

TOTAL RECORDS INCLUDED IN THE ANALYSIS = 2472 (25 sites)

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METHODS

Quantitative – Retrospective Observational design

- A stratified sample of 30 hospitals in Australia and New Zealand
  - tertiary, urban/suburban, regional/rural (using ACEM classification)

- Data extraction of 100 eligible head injury presentations per site in 2016 - total sample of 3000
  - ICD 10 codes used to generate a list of potentially eligible presentations; reviewed in chronological order; entered into RedCAP

- Inclusions: <16 years who present to ED with a head injury
  Exclusions: presenting > 24hrs; representations in 24 hrs; imaging done elsewhere; those found not to be head injuries

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Undén et al. BMC Medicine (2018) 16:176
https://doi.org/10.1186/s12916-018-1166-8

BMC Medicine

RESEARCH ARTICLE Open Access

External validation of the Scandinavian guidelines for management of minimal, mild and moderate head injuries in children

Johan Undén[16,17], Stuart R. Dalziel[11,12], Meredith L. Borland[4,5], Natalie Phillips[6], Amit Kochar[7], Mark D. Lyttle[2,13,14], Silvia Bressan[2,15], John A. Cheek[1,2,9], Jocelyn Neutze[10], Susan Donath[2,3], Stephen Hearps[2], Ed Oakley[1,2,3], Sarah Dalton[8], Yuri Gilhotra[6], Franz E. Babl[1,2,3*] and on behalf of the Paediatric Research in Emergency Departments International Collaborative (PREDICT)

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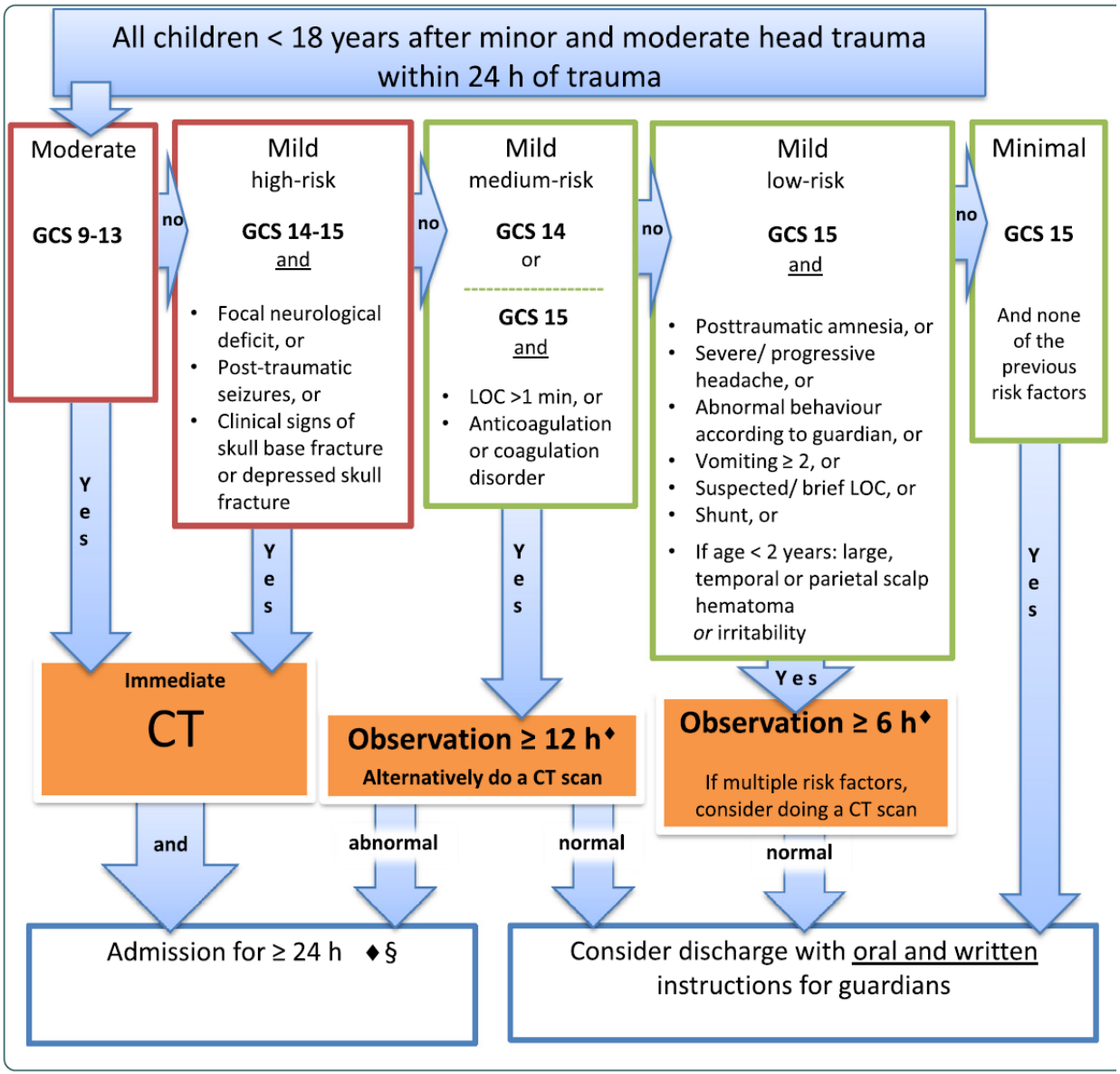
Scandinavian Head Injury Guidelines



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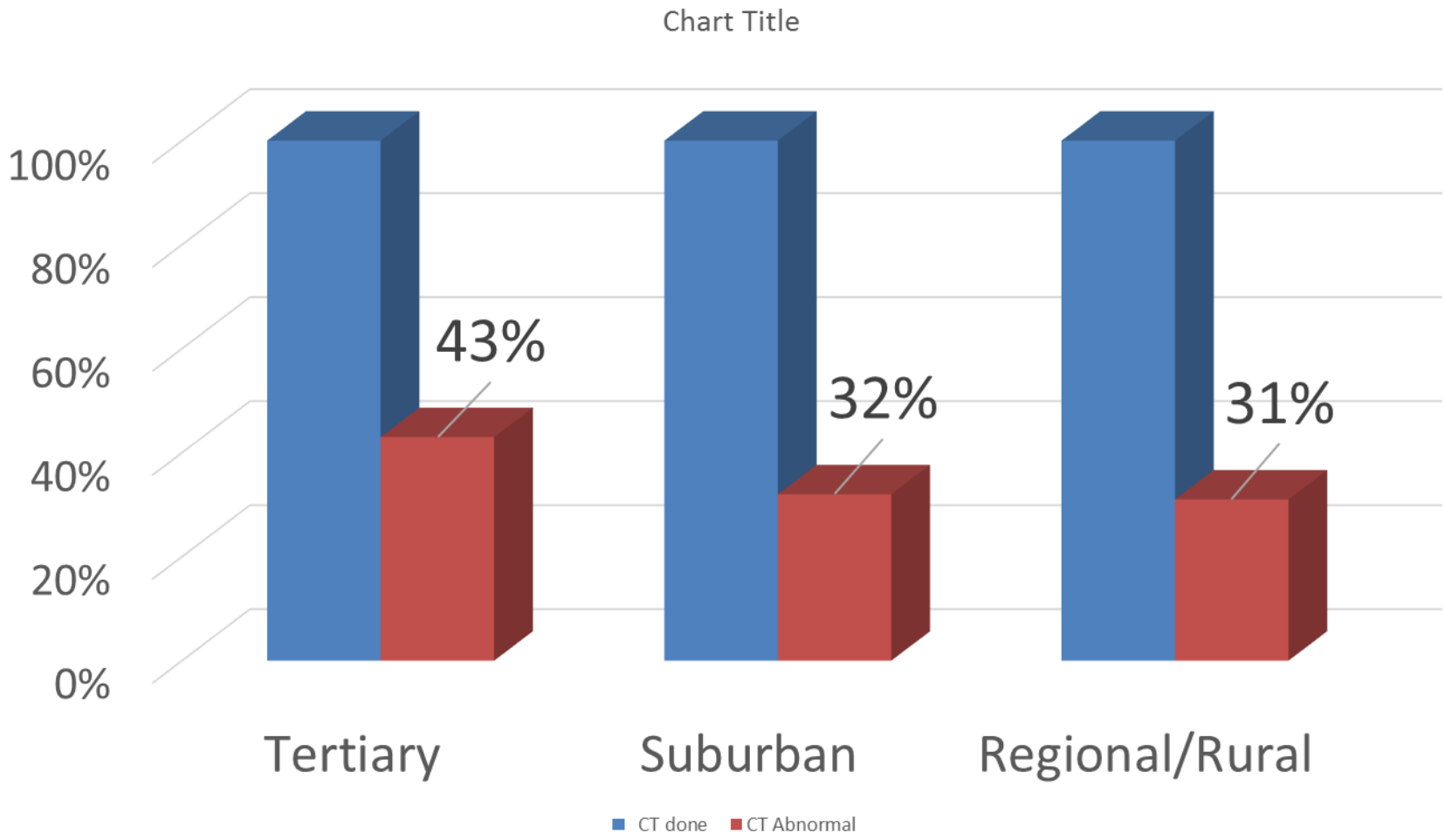
Total CT Scans done and proportion abnormal



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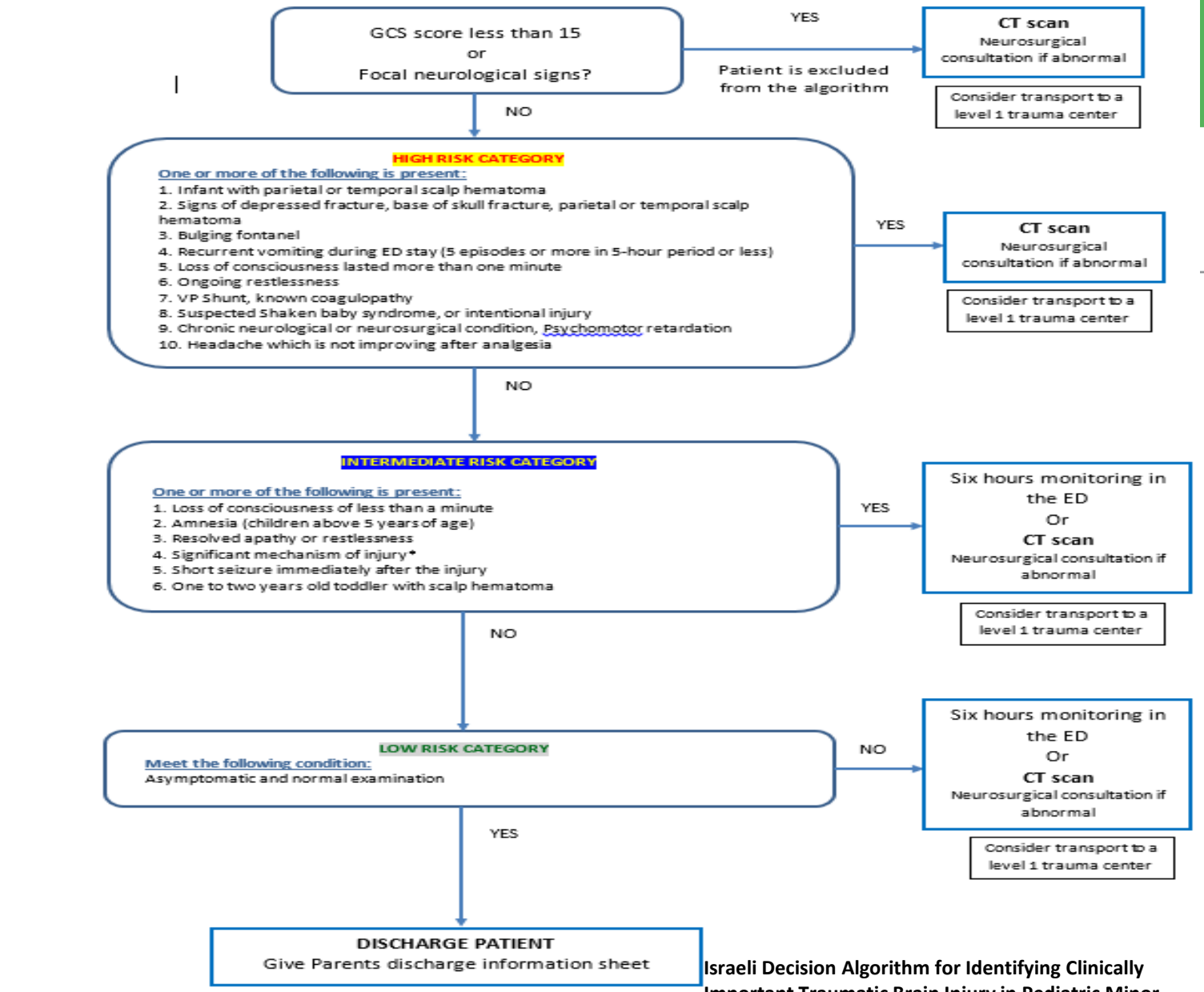
What next?

- Complete data entry at 4 remaining sites…
- Complete data cleaning – lots more…
  - sites review their own data and comment….
- EXPLORE the data further – look at variation within tertiary, suburban and regional/rural groups
- Submit quantitative paper to:
  - Academic Emergency Medicine
  - Emergency Medicine Australasia
- Complete the qualitative component
- Utilise findings in development of the HI guideline.



Israeli Decision Algorithm for Identifying Clinically Important Traumatic Brain Injury in Pediatric Minor Head Trauma (in press)

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Original article

Accuracy of NEXUS II head injury decision rule in children: a prospective PREDICT cohort study

Franz E Babl,[1,2,3] Ed Oakley,[1,2,3] Stuart R Dalziel,[4,5] Meredith L Borland,[6,7] Natalie Phillips,[8] Amit Kochar,[9] Sarah Dalton,[10] John Alexander Cheek,[1,2,11] Yuri Gilhotra,[8] Jeremy Furyk,[12] Jocelyn Neutze,[13] Susan Donath,[2,3] Stephen Hearps,[2] Louise M Crowe,[2] Marta Arpone,[2,3] Silvia Bressan,[2,14] Mark D Lyttle,[2,15,16] For the Paediatric Research in Emergency Department International Collaborative (PREDICT)

Emerg Med J 2018;**0**:1–8. doi:10.1136/emermed-2017-207435

NEXUS Head Injury Rule

Accuracy of NEXUS using APHIRST data

Table 3 Frequency and count of individual risk criteria for all children, aged <3 years and 3 to <18 years

	<3 years				3 to <18 years				Total			
	No ICI		ICI		No ICI		ICI		No ICI		ICI	
Criterion	n	%	n	%	n	%	n	%	n	%	n	%
N	7743		129		11 989		248		19 732		377	
Risk criteria count												
0	3503	45							9320	47.2	4	1.1
1	2899	37							6902	35.0	53	14.1
2	969	12							2435	12.3	99	26.3
3	283	3							783	4.0	117	31.0
4	73	0							240	1.2	74	19.6
5	15	0							49	0.2	26	6.9
6	1	0							3	0.0	4	1.1
7	0	0							0	0.0	0	0.0

At least one NEXUS risk criterion positive in 49.4% (n=8,909), even though no intracrancial injury