‘A state of flux’

Non-indicated acid-suppression prescribing in a tertiary paediatric hospital: an audit and costing study

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RACP Congress 2019, Auckland

Disclosure

- There are no conflicts of interest to declare in relation to this research

Background

Low-value health care

- Use of investigations or treatments that confer no actual benefit or benefit disproportionately low compared to attendant costs

Scott IA, Duckett SJ. *Medical Journal of Australia*, 2015

Over-diagnosis

- Identification of a true abnormality, but detection does not benefit the patient

Coon ER, et al. *Pediatrics*, 2014

Australian initiatives: CareTrack Kids and EVOLVE projects

- Gastro-oesophageal reflux disease and acid-suppressing therapies (AST) a focus

When
NEXIUM® (e

GORD and its complications are the only indications for acid-suppressing therapies

BABY!

*Use of NEXIUM in pediatric patients 1 month to 17 years of age is supported by extrapolation of results from adequate and well-controlled studies for adults as well as safety, pharmacokinetic, and pharmacodynamic studies performed in pediatric and adolescent patients. Please see label for specific dosing and Indications. The safety and effectiveness of NEXIUM have not been established in patients <1 month of age.

Not actual patients.

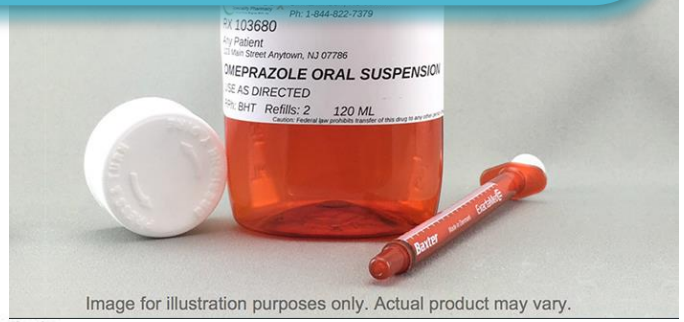

Image for illustration purposes only. Actual product may vary.

1. Barron JJ, *J Pediatr Gastro Nutr*, 2007
2. De Bruyne P, *J Pediatr Gastroenterol Nutr*, 2014

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Excellence in clinical care, research and education

The Royal Children's Hospital Melbourne
murdoch children's research institute
THE UNIVERSITY OF MELBOURNE

Reasons for concern

GORD Global Consensus Definition (2009):

- Persistent reflux of gastric contents → 'sufficiently troublesome' symptoms +/- complications

- Distinguishing physiological reflux from GOR*D* is challenging
  - Symptoms lack sensitivity and specificity
  - Critical, to avoid unnecessary tests and medications

Vandenplaus Y, *J Pediatr Gastrol Nutr*, 2009

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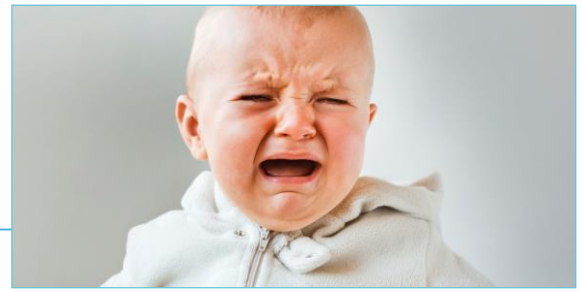


The problem of unsettled infant behaviour

- No causal relationship between crying, feeding difficulties or unsettled behavior and objective findings for reflux

Heine R., *Archives of disease in childhood, 1995*

ASTs are ineffective in reducing symptoms purported to be GORD in infants (RCTs)

Van der Pol, *Pediatrics,* 2011

Long-term safety

- Increased rates of gastroenteritis and pneumonia
- Increased rates of fractures, in infants exposed < 1 year of age

Canani RB, *Paediatrics,* 2006

Malchodi L, *Presented at PAS*, 2017

Aims

Part 1: Primary

- To determine prevalence and associated factors of non-indicated acid-suppression prescribing within a tertiary, paediatric hospital.

Part 2: Secondary

- To determine financial costs of non-indicated anti-reflux medication prescribing.

Methods Part 1: Audit study

Prospective, single-center electronic medical audit study in a tertiary paediatric hospital

Scripts for PPIs or H_2RAs over a 2-month period

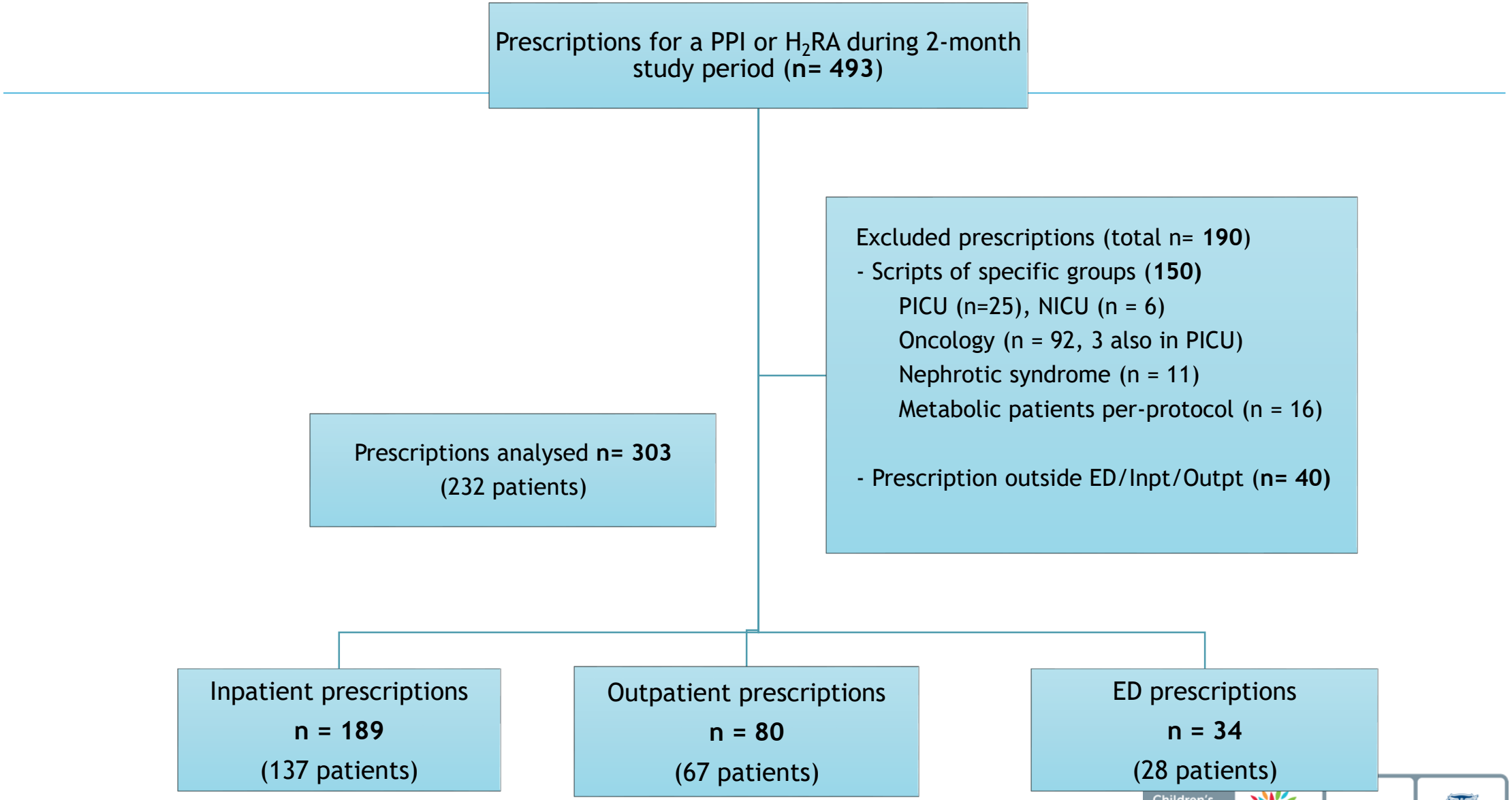
- Inpatients, Outpatients and Emergency Department
  - Patient, provider and hospital setting details
  - Clinical presentation (encounter diagnoses)
    - Evaluated against pre-determined indicator and predisposing diagnoses lists
    - To determine indicated vs. non-indicated scripts

Indicators < 1 year of age	Indicators ≥ 1 year of age
Non-indicated care measures	
Infant with reflux who is **healthy and thriving** with: • Irritability or unexplained crying * • Feeding refusal * • Frequent regurgitation *	
Indicated care measures	**Indicated care measures**
Reflux Oesophagitis	Reflux Oesophagitis
Haematemesis	Haematemesis
Weight loss or FTT	Weight loss or FTT
Apnoea spells	Heartburn
Anaemia	Dysphagia and Odynophagia
Oesophageal stricture	Anaemia
Chronic vomiting with respiratory complications	Oesophageal stricture
Sandifer syndrome (dystonic neck posturing)	Chronic vomiting with respiratory complications
	Barrett's Oesophagus
	Sandifer syndrome (dystonic neck posturing)

Indicators based on International guidelines and recent literature review

Predisposing conditions

- Neurological abnormality or deficit
- Congenital oesophageal defects
- Hiatus hernia
- Eosinophilic oesophagitis
- Cystic fibrosis
- Obesity
- Prematurity
- Family history of GORD or gastric cancer
- Oesophageal adenocarcinoma


Prescriptions for a PPI or H_2RA during 2-month study period (**n= 493**)
Excluded prescriptions (total n= **190**)
- Scripts of specific groups (**150**)
PICU (n=25), NICU (n = 6)
Oncology (n = 92, 3 also in PICU)
Nephrotic syndrome (n = 11)
Metabolic patients per-protocol (n = 16)
- Prescription outside ED/Inpt/Outpt (**n= 40**)
Prescriptions analysed **n= 303**
(232 patients)
Inpatient prescriptions
n = 189
(137 patients)
Outpatient prescriptions
n = 80
(67 patients)
ED prescriptions
n = 34
(28 patients)

Statistical analysis

Non-indicated scripts/total scripts

- Across settings and by age

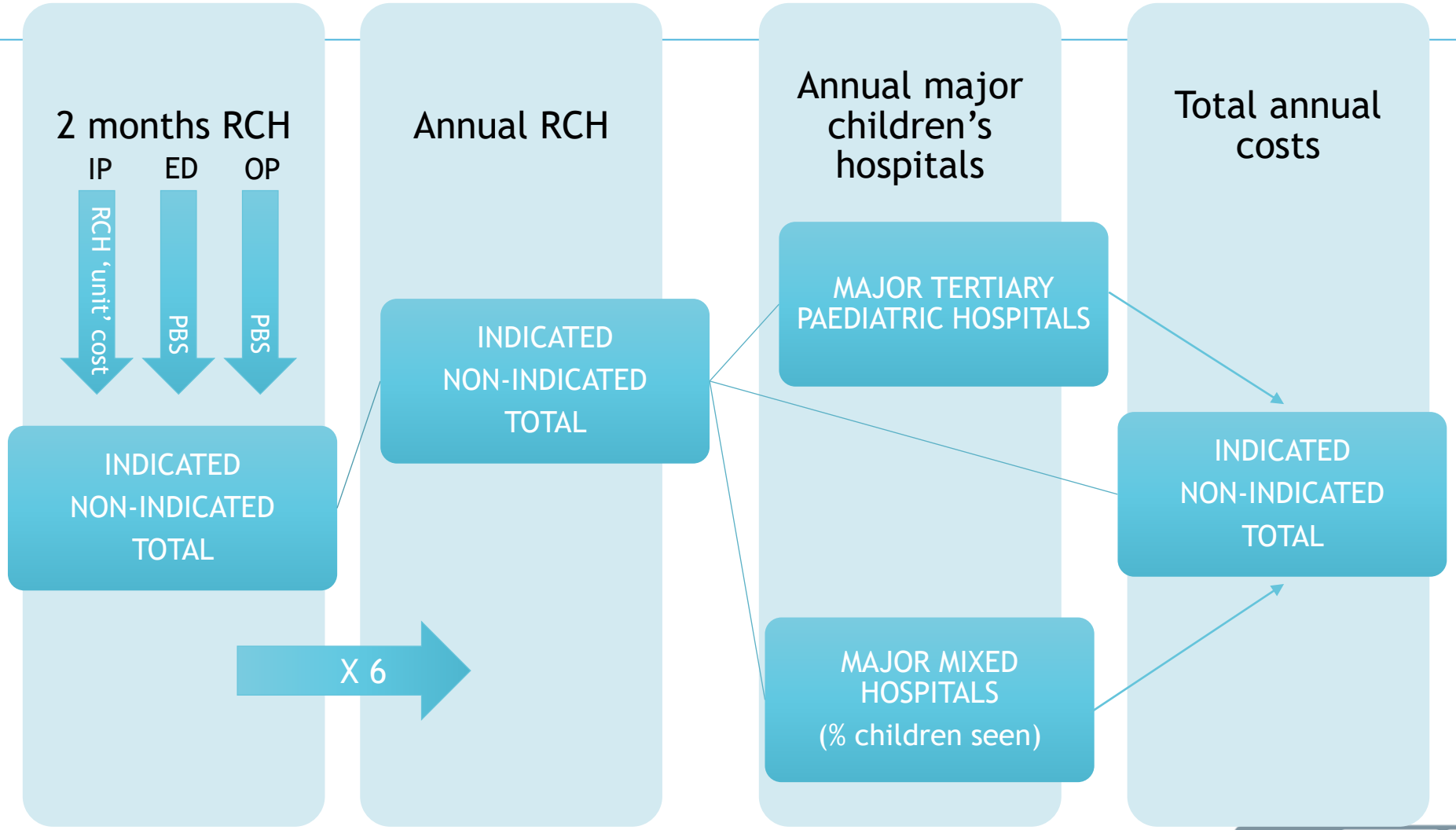
Bivariate analyses for patient, provider and clinical characteristics

- Pearson's chi-squares and T-tests

Logistic regression

- Including factors associated in bivariate analyses at $p < 0.1$
- To identify factors associated with non-indicated prescribing of AST

Methods Part 2: Costing study



Using data from www.myhospitals.gov.au

Results

- 303 prescriptions analysed

	ED (n = 34)	Inpatient (n = 189)	Outpatient (n = 80)
Number of children, *n*	28	137	67
Indicated scripts, *n*	13	32	20
Non-indicated scripts, *n*	**21**	**157**	**60**
Proportion non-indicated scripts, %	**62 %**	**83 %**	**75%**
p - value	0.17	< 0.001	< 0.001

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Bivariate associations between number of indicated and non-indicated prescriptions, across hospital settings

Table 4 Bivariate associations between number of indicated and non-indicated acid-suppression therapy prescriptions across hospital settings

	Hospital setting								
	ED			Inpatient			Outpatient		
	Indicated	Non-indicated	*P* value	Indicated	Non-indicated	*P* value	Indicated	Non-indicated	*P* value
Number of scripts, *n*	13	21	0.17	32	157	<0.001	20	60	<0.001
Number of children, *n*	12	16	0.45	26	111	<0.001	18	49	<0.001
Child characteristics									
Male, *n* (%)	4 (30.8)	9 (42.9)	0.17	16 (50)	92 (58.6)	<0.001	12 (60)	27 (45)	0.02
Age, years, mean (SD)	11 (2.9)	11 (4.7)	0.98	8 (6.9)	6 (6.3)	0.18	9 (5.8)	9 (5.4)	0.53
Age < 1 year, *n* (%)	0	0	NA	7 (21.9)	32 (20.3)	<0.001	2 (10)	4 (6.7)	0.41
Possible steroids – Yes, *n* (%)	0	0	NA	0	12 (7.6)	<0.001	0	4 (6.7)	0.01
PEG/PEJ – Yes, *n* (%)	0	3 (14.3)	0.08	4 (12.5)	55 (35)	<0.001	1 (5)	9 (15)	0.01
Team, *n* (%)			1.00			0.09			0.34
Medical	NA	NA		7 (21.9)	40 (25.5)		0	4 (6.7)	
Surgical	NA	NA		2 (6.3)	27 (17.2)		1 (5)	1 (1.7)	
Specialty	NA	NA		22 (68.8)	90 (57.3)		9 (95)	55 (91.7)	
Emergency	13 (100)	21 (100)		NA	NA		NA	NA	
Medical imaging, *n* (%)	NA	NA		1 (3.1)	0		0	0	
Predisposing diagnosis, *n* (%)	0	1 (4.8)	0.31	12 (37.5)	40 (25.4)	<0.001	11 (55)	23 (38.3)	0.04
Family/Care giver characteristics									
SEIFA (IRSAD), mean (SD)†	6 (2)	5 (3)	0.73	6 (3)	6 (3)	0.68	6 (3)	6 (3)	0.97
Remoteness, *n* (%)			0.51			0.38			0.07
Regional	0	2 (9.5)		11 (34.4)	39 (24.8)		7 (35)	8 (13.3)	
Major city	13 (100)	18 (85.7)		21 (65.6)	117 (74.5)		13 (65)	52 (86.7)	
Prescriber characteristics, *n* (%)			1.00			0.76			0.01
Junior medical staff	12 (92.3)	19 (90.5)		28 (87.5)	140 (89.2)		9 (45)	8 (13.3)	
Consultant	1 (7.7)	2 (9.5)		4 (12.5)	17 (10.8)		11 (55)	52 (86.7)	
Diagnoses, *n* (%)			1.00			0.14			0.64
1	13 (100)	21 (100)		18 (56.3)	89 (56.7)		10 (50)	35 (58.3)	
2	NA	NA		5 (15.6)	39 (24.8)		6 (20)	12 (20)	
3 or more	NA	NA		9 (28.1)	22 (14)		6 (30)	12 (20)	

Adjusted logistic regression of variables associated for non-indicated prescriptions *

Independent variable	Adjusted OR (95% C.I.)	p value
Consultant	2.69 (1.23 – 5.87)	0.01
Major city	1.56 (0.78 – 3.11)	0.20
Predisposing condition	0.41 (0.21 – 0.80)	0.009
Male	1.00 (0.55 – 1.82)	0.99
Age > 1 year	0.67 (0.27 – 1.63)	0.38
PEG/PEJ present	5.51 (1.96 – 15.46)	0.001
Inpatient setting	2.35 (1.16 – 4.77)	0.02

* Adjusted for all variables listed in the table

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Primary diagnoses for **non-indicated AST** prescriptions

ED		Inpatient		Outpatient	
Abdominal pain (non-specific)	9	Lower respiratory tract infection	13	Cerebral Palsy	10
Vomiting	3	Hypoglycaemia	11	Inflammatory bowel disease	6
Chronic constipation	1	Vomiting	9	PEG/feeding tube related	6
Back pain	1	PEG/feeding tube related	8	Abdominal pain (non-specific)	3
Dermatological diagnosis	1	Congenital heart disease	7	Behaviour issue	3
Fever	1	OSA	6	Congenital syndrome	3

Costing study

Calculated costs of indicated and non-indicated prescriptions

and projected annual and national expenditures

	Indicated (n = 65)	Non-indicated (n = 238)	Total (n = 303)
Royal Children's Hospital			
2 months (relative % of total)	$865 (25%)	$2,582 (75%)	$3,447(100%)
Annual	$5,188	$15,493	$20,681
Major children's hospitals			
Major tertiary paediatric	$19,955	$59, 588	$79,543
Major mixed	$8,979	$26,812	$35,791
Total annual (paediatric and mixed)	$28,934	$86,400	$115,334

Estimated costs extrapolated

Research context

Similar rates in adult populations

- 65 – 90% of acid suppressive therapy ‘unnecessarily prescribed’

Pham CQ, RB, *Anna pharmacoth*, 2006

Variation in paediatric clinical practice

- Disease severity increases variation in practice
  - Inpatient variation in care is often ‘over-management’

- Less variation in care amongst junior doctors
  - More likely to refer to clinical practice guidelines

Hiscock H, *SAX Institute*, 2014

New associations

PEG/PEJ

- No evidence to support *causation* between gastrostomy feeding tubes and increased GORD incidence

Razeghi S, *J Pediatr Gastroenterol Nutr, 2002*

Sulaeman E, *J Pediatr Gastroenterol Nutr, 1998*

Steroids and GORD

- Controversial, with no consistent evidence supporting direct causality and paediatric data lacking

Narum S, *BMJ Open*, 2014

- Gastroenterologists least likely to consider steroids ulcerogenic and co-administer gastro-protective medication

Martinek J, *Scand J Gastro*, 2010

Strengths

First study to assess factors associated with non-indicated prescribing of acid-suppression therapies in a tertiary paediatric hospital, across settings

- Linking scripts to diagnoses and other factors

Use of a sophisticated electronic medical record (EPIC)

‘A priori’ determination of clear and specific indicators

Completeness of our costing study

- State and Federal costs included

Limitations

Single-site design

- Limits generalisability

Data limitations associated with using electronic health records

- Missing data regarding diagnoses was minimised

Cross sectional nature

- No repeat prescriptions captured

Conclusions

Non-indicated prescribing of acid-suppression therapy appears common in a tertiary paediatric hospital

- Accounts for 75% total spending and represents a potential for cost savings

Several factors associated with non-indicated prescribing:

- Inpatient status
- Consultant provider
- PEG/PEJ
- ‘Possible steroids’

Future research

Qualitative methods to understand clinician perspectives on prescribing and barriers to best-practice

Placebo-controlled trials in children with gastrostomies or taking steroids

Trends of use post hospital initiation in infants and children

Multi-component intervention

- prescribing prompts, in-built protocols, auditing and feedback

Current projects at the RCH

- AST prescribing chosen at the current Choosing Wisely focus
- Gathering more data
  - Steroids and AST
  - PEGS and AST
- Collaboration with pharmacists
- Updating Clinical Practice Guidelines - eg. Nephrotic Syndrome
  - Routine use of acid suppressing therapies is not essential
  - Consider if there are upper gastrointestinal symptoms while on steroid therapy
  - If indicated, manage with Ranitidine 2-4mg/kg/dose 12 hourly (max 150mg per dose). Cease when steroid therapy is completed.

Journal of Paediatrics and Child Health

doi:10.1111/jpc.14287

ORIGINAL ARTICLE

Non-indicated acid-suppression prescribing in a tertiary paediatric hospital: An audit and costing study

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Aim: To quantify (i) indicated versus non-indicated prescribing of acid-suppression therapies (AST) in a tertiary paediatric hospital; (ii) patient, provider and hospital factors associated with non-indicated prescribing; and (iii) medication costs.

Methods: This was a prospective, electronic medical audit conducted at The Royal Children's Hospital (RCH) Melbourne in August–September 2016. Proton pump inhibitor (PPI) and histamine-2 receptor antagonist (H_2RA) prescriptions were extracted, with relevant patient, provider and hospital data. Logistic regression analysis of variables associated with indicated and non-indicated prescribing was undertaken. Costs of indicated and non-indicated prescriptions were estimated, with annual costs projected.

Results: There was more non-indicated than indicated prescribing across inpatient, outpatient and emergency department settings. Of the total 303 prescriptions analysed, 238 (78.5%) were non-indicated. Gastrostomy presence (odds ratio (OR) 5.51 (1.96–15.46), $P = 0.001$), consultant providers (OR 2.69 (1.23–5.87), $P = 0.01$) and inpatient setting (OR 2.35 (1.16–4.77), $P = 0.02$) were all associated with a higher likelihood of non-indicated prescribing. The child having a predisposing diagnosis was significantly associated with indicated prescribing (OR 0.41 (0.21–0.80), $P = 0.009$). A total of 75% of hospital and patient spending was for non-indicated prescriptions. Annual costs of non-indicated AST for Melbourne's RCH were projected to be $15 493.

Conclusions: Non-indicated acid-suppression prescribing is common in a tertiary paediatric hospital and associated with gastrostomy presence, consultant providers and inpatient status. Future research should use qualitative methods to understand clinician and patient drivers of prescribing and use this information to develop and test targeted solutions to reduce non-indicated AST prescribing.

Key words: gastro-oesophageal reflux; histamine H2 antagonist; low-value care/prescribing; paediatric hospital; proton pump inhibitor.

Acknowledgments

Prof Harriet Hiscock – supervisor

Shaoke Lei – MCRI statistician
Rachel Neely – MCRI researcher
Li Huang – health economist
Dr Kim Dalziel – health economist
Ahuva Segal – EMR researcher
Antun Bogovic – RCH pharmacist

Thank you

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