

Risky business: challenging perception of risk in paediatric antimicrobial prescribing.

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Introduction

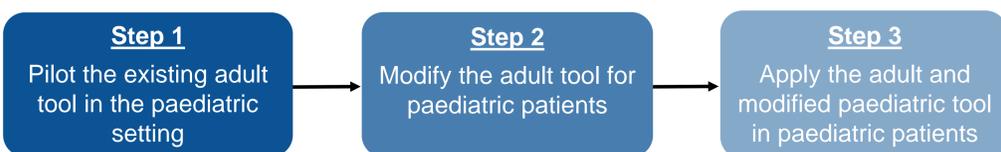
Antibiotics can be a lifesaving treatment for children with bacterial infections and is a commonly prescribed medication in this population. However, antibiotics can also result in adverse events, drug toxicity and detrimental effects on the gut microbiota and enteric immune system. Furthermore, at both the individual and population level, overuse drives the development and transmission of antimicrobial resistance. Judicious use is therefore paramount yet national surveys indicate that one third of antibiotic prescribing in hospitals is inappropriate¹.

Currently there is no framework to classify antibiotic misuse according to the risk posed to the patient². The National Antimicrobial Prescribing Survey (NAPS) offers a system to classify antibiotics as appropriate or inappropriate but may not capture the clinical significance of misuse^{1,2}. A risk rating system offers a novel way to communicate inappropriate antibiotic prescribing to the clinician and what impact this may have on their patient.

Aim/Objectives

1. To develop a risk rating tool to classify antibiotic misuse in paediatric patients by modifying an existing adult tool.
2. Apply both tools to recommendations regarding inappropriate antibiotics identified during paediatric antimicrobial stewardship (AMS) ward rounds to evaluate the difference in risk described.
3. Evaluate the relationship between risk rating and prescriber acceptance rates.

Method



Step 1 and 2

Our adult AMS service developed and validated a risk rating tool to quantify the risk of antibiotic misuse. The tool evaluates risk on a 1-5 scale, where 1 = minimal risk and 5 = catastrophic³. This tool was specifically designed based on priorities relevant to adult patients and had not been evaluated in the paediatric setting.

The adult risk rating tool was then applied retrospectively to 3 months' of antibiotic misuse data collected during paediatric AMS ward rounds in 2018. A multidisciplinary team including paediatric AMS clinicians and pharmacists identified clinical scenarios where risk was categorised differently from priorities identified by the adult AMS team. This formed the basis for changes to the modified paediatric tool (Figure 1).

Step 3

Both the adult and modified paediatric tool were then applied retrospectively to 12 months' of antibiotic misuse data in 2018. Acceptance rates by prescribers were also evaluated.

Risk rating	Examples
Low (1)	Topical and oral antimicrobial (unnecessary, duration too long, spectrum too broad)
Some (2)	Choice of dose too high (<25% of recommended dose) IV antimicrobial (unnecessary, duration too long, IV to oral switch required) <i>and</i> within 48 hours since initiation removed a bracket here IV antimicrobial (spectrum too broad)
Moderate (3)	Choice of dose too high (≥25% of recommended dose or higher than dose required in adult) IV antimicrobial (unnecessary, duration too long, IV to oral switch required) <i>and</i> greater than 48 hours since initiation
High (4)	Risk of treatment failure due to insufficient dose, duration, route or spectrum Potential harm due to age-related patient risk factors or contraindications
Catastrophic (5)	Significant risk of death or long term morbidity including severe allergy or under-treatment of life-threatening infections

Figure 1: Modified paediatric AMS tool.

Results and Discussion

Step 1 and 2

Modifications of risk rating 1-3

- Dosing errors: this may pose more risk to children due to increased susceptibility to adverse effects⁴. These were originally classified as risk rating 1 or 2, but increased to 2 or 3 in the modified version.
- Duration of IV antimicrobials: special consideration was given to how to categorise this risk in paediatric patients. Commencement of IV antibiotics empirically for suspected sepsis is common, due to the non-specific presentation in this age group. However, many children will have a viral illness and cessation is guided by microbiological findings available at 48 hours. Additionally, peripheral venous catheter complications are more likely with increasing IV antibiotic durations⁵. We therefore categorised IV antibiotic misuse less than 48 hours as risk rating 2, while the original tool classified all as risk rating 3.
- Oral antimicrobials: these were accordingly reduced from risk rating 2 to 1 as the risk posed to the patient was considered less than that by the IV route of administration.

Modifications of risk rating 4 and 5

- There was a minor change with the mention of age-related contraindications or risk factors for increased harm (e.g. Ceftriaxone).

Step 3

Both tools were applied to 121 AMS ward round recommendations (Figure 2). 36% of cases of antibiotic misuse were classified with the same risk rating. 45% of recommendations had a decreased risk rating with the modified paediatric tool and 20% were increased. Overall, there was an increased proportion of recommendations that were of lower risk (1 and 2) using the modified paediatric tool.

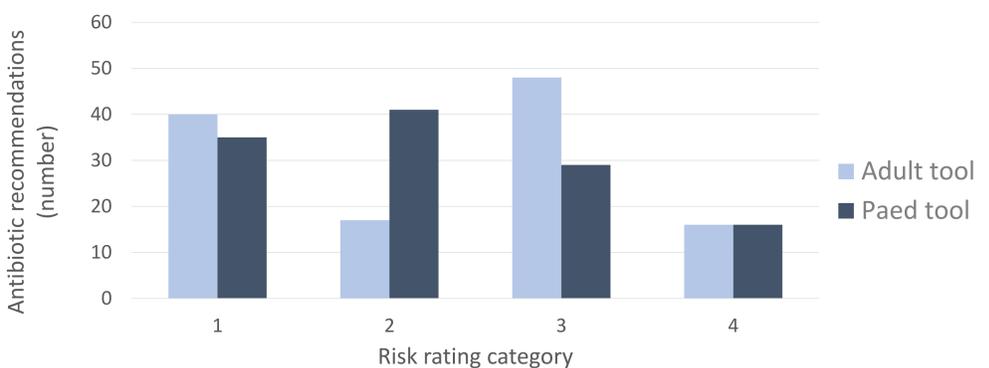


Figure 2: Risk category assessed from adult and paediatric risk rating tool.

Relationship between risk rating and prescriber acceptance rates

- When the modified tool was applied, acceptance rates increased with increasing severity in risk classification; 60% accepted in risk rating 1 and 79% in risk rating 4 (Figure 3). This trend was not observed when the adult tool was applied. This suggests that the modified tool better approximates paediatric prescriber perceptions of risk.

Risk rating	Adult tool	Paediatric tool
1	70%	60%
2	73%	68%
3	63%	79%
4	79%	79%

Figure 3: Acceptance rate from prescribers using the modified paediatric tool in comparison to the adult tool.

Conclusion

Risks associated with antibiotic misuse was perceived differently in adult and paediatric populations. In general, many AMS recommendations were considered to pose lower risk in paediatric patients, however there were specific cases where a higher rating was required. This demonstrated the importance of modifying a risk rating tool to incorporate unique paediatric factors. There were higher acceptance rates of recommendations as risk rating increased, which suggests that the modified tool also reflects prescriber perceptions of risk.

References

1. National Centre for Antimicrobial Stewardship and Australian Commission on Safety and Quality in Health Care. Antimicrobial Prescribing Practice in Australian Hospitals: Results of the 2017 National Antimicrobial Prescribing Survey. Sydney: Australian Commission on Safety and Quality in Health Care, 2018. [Google Scholar]
2. Liu, J. et al. It is time to define antimicrobial never events. *Infection Control & Hospital Epidemiology* 2019, 40(2), pp.206–207
3. A. Rattle, K. Horne, E. Roberts. (2019) 'Development and validation of a risk rating tool for Antimicrobial Stewardship (AMS) ward round recommendations', The Antimicrobials 2019 Annual Scientific Meeting, February 2019. Melbourne, Australia: Monash Health.
4. Stephenson T. How children's responses to drugs differ from adults. *Br J Clin Pharmacol.* 2005;59(6):670–673. doi:10.1111/j.1365-2125.2005.02445.
5. Ben Abdelaziz R, et al. Peripheral venous catheter complications in children: predisposing factors in a multicentre prospective cohort study. *BMC paediatrics.* 2017;17:208. https://doi.org/10.1186/s12887-017-0965-y.