Reducing Paediatric Prescribing Errors Using A Standardized Weight-Based Tool In Resource-Limited Primary Care: A Multi-Centre Quality Improvement Study In Sri Lanka

Dr. Mashooth

DOI: 10.29322/IJSRP.16.04.2026.p17213
https://dx.doi.org/10.29322/IJSRP.16.04.2026.p17213

Paper Received Date: 17th March 2026
Paper Acceptance Date: 18th April 2026
Paper Publication Date: 22nd April 2026

ABSTRACT

Background

Paediatric prescribing in resource-limited outpatient settings is highly susceptible to medication errors due to reliance on manual weight-based calculations, high patient volumes and limited decision-support systems. These risks are amplified in low- and middle-income countries, where system constraints affect prescribing safety.

Objective

To reduce paediatric prescribing errors and improve consultation efficiency through implementation of a standardised weight-based prescribing tool across primary care institutions.

Methods

We conducted a multicentre quality improvement study using iterative Plan–Do–Study–Act (PDSA) cycles across six primary care institutions in the Regional Director of Health Services (RDHS) Kalmunai region, Sri Lanka, between December 2025 and April 2026. Baseline and sequential cross-sectional samples of paediatric outpatient prescriptions were analysed. The intervention comprised a pre-printed weight-based dosing chart, a colour-coded alignment system and a “red flag” high-risk medication table. Primary outcome was proportion of prescriptions with correct weight-based dosing. Secondary outcomes included overdose and underdose rates, frequency errors, documentation of weight and consultation time. Data were analysed using descriptive statistics, χ^2 test for trend and run chart methods.

Results

A total of 863 prescriptions were analysed. Correct dosing improved from 70.7% at baseline to 98.7% following the final PDSA cycle (absolute improvement 28.0 percentage points, 95% CI 24.9 to 31.1; $p<0.001$). Overdose rates decreased from 10.8% to 0.3%, and underdosing from 7.0% to 0.9%. Frequency errors declined from 26.8% to 2.7%. Run chart analysis demonstrated non-random variation with sustained improvement following intervention introduction. Estimated consultation time reduced from approximately 3–10 minutes to 2–5 minutes.

Conclusion

A low-cost, standardised prescribing tool was associated with substantial improvements in paediatric prescribing accuracy and workflow efficiency in resource-limited primary care settings. This scalable intervention offers a practical approach to improving medication safety in similar contexts.

KEY MESSAGES

What is already known on this topic

Paediatric prescribing errors are common, particularly in outpatient settings in low- and middle-income countries, where weight-based dosing and high workload increase risk.

What this study adds

A simple, paper-based, standardised prescribing tool incorporating dosing charts, colour coding and risk flagging was associated with a large and sustained reduction in prescribing errors across multiple primary care settings.

How this study might affect research, practice or policy

Low-cost, context-appropriate prescribing support tools can improve patient safety and may be integrated into national prescribing practices in resource-limited health systems.

PROBLEM

Paediatric prescribing in outpatient departments within the RDHS Kalmunai region, Sri Lanka, is undertaken in high-volume, resource-constrained settings characterised by limited staffing and absence of standardised prescribing support tools. Prescriptions are typically written manually, requiring real-time weight-based dose calculations for each patient.

Baseline observations identified several system-level challenges, including frequent omission of patient weight, variability in dosing practices, prolonged consultation times and overcrowded clinics. Manual calculations introduce multiple steps in the prescribing process, increasing the likelihood of arithmetic and transcription errors, particularly under time pressure.[1–3]

Preliminary review of prescribing practices demonstrated that only 70.7% of prescriptions met correct weight-based dosing standards, with substantial proportions of overdosing, underdosing and incorrect dosing frequency. These findings indicated a need for a system-level intervention to improve prescribing safety and efficiency.[4]

The aim of this quality improvement project was to increase the proportion of correctly dosed paediatric prescriptions from 70% to at least 95% within four months, and to reduce prescribing errors in primary care outpatient settings through implementation of a standardised weight-based prescribing tool.

BACKGROUND

Medication errors in paediatric populations are well recognised as a major patient safety concern. Children are particularly vulnerable due to the need for weight-based dosing, age-related pharmacokinetic variability and limited availability of standardised formulations.[1–3] Errors can occur at multiple stages of the medication-use process, with prescribing identified as a key source of preventable harm.[1 2]

Evidence suggests that paediatric patients are significantly more likely to experience medication errors compared with adults, with dosing errors representing the most common type.[2 3] Reported rates of prescribing errors in paediatric settings vary widely, ranging from approximately 22% to 70%, depending on clinical context and methodology.[4]

In low- and middle-income countries, these risks are exacerbated by health system constraints, including high patient volumes, workforce shortages and lack of clinical decision-support tools.[6] In Sri Lanka, previous studies have identified gaps in prescribing practices, including incomplete documentation, omission of weight and inappropriate dosing, contributing to preventable patient harm.[5 6]

The requirement for manual dose calculation introduces cognitive burden, particularly in busy outpatient environments. Each prescription requires multiple steps, including weight measurement, dose calculation, unit conversion and transcription. These steps increase susceptibility to error, especially under conditions of time pressure and fatigue.[3 7]

Interventions to reduce paediatric prescribing errors have shown variable effectiveness. Electronic prescribing systems and clinical decision-support tools have demonstrated substantial reductions in error rates, but their implementation is often limited in resource-constrained settings.[8 9] Conversely, simpler interventions—such as standardised dosing charts, pre-printed order sets and visual aids—have been shown to improve prescribing accuracy and reduce errors, particularly when designed to simplify workflows and reduce reliance on mental calculations.[8–10]

Despite this evidence, there remains limited implementation of context-appropriate prescribing support tools in primary care settings in Sri Lanka. There is a need for scalable, low-cost interventions that can be integrated into routine clinical workflows without requiring substantial infrastructure investment.

RATIONALE

This intervention was informed by principles of human factors engineering and cognitive load theory, which emphasise the importance of simplifying complex tasks and reducing reliance on memory in high-pressure clinical environments.

Paediatric prescribing involves multiple cognitive steps, including calculation, interpretation and transcription, each of which introduces potential for error. Reducing these steps through standardisation and pre-calculation is expected to improve accuracy and consistency.[3 7]

The intervention was designed as a multi-component system targeting key sources of error:

- A **pre-calculated weight-based dosing chart** to eliminate arithmetic calculations
- A **colour-coded alignment system** to enhance visual discrimination and reduce selection errors
- A **"red flag" high-risk medication table** to increase awareness and promote cautious prescribing

These components were intended to function synergistically by simplifying decision-making, reducing cognitive load and embedding safety cues into routine workflow. Evidence suggests that such structured, multi-component interventions are more effective than single-component approaches in reducing prescribing errors.[8 9 11]

The underlying assumption was that improving system design—rather than relying solely on individual vigilance—would lead to more reliable and sustainable improvements in prescribing accuracy and efficiency.

METHODS

Study Design

This study was conducted as a multi-centre quality improvement initiative using iterative Plan–Do–Study–Act (PDSA) cycles, in accordance with the Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines.

The project aimed to improve paediatric prescribing safety and efficiency through implementation of a standardised weight-based prescribing tool in routine outpatient care.

Setting and Context

The study was carried out across six primary care institutions within the RDHS Kalmunai region, Sri Lanka, comprising two Base Hospitals, two Primary Medical Care Units and two District Hospitals.

These facilities operate in resource-limited, high-volume outpatient settings characterised by:

- High patient turnover
- Limited staffing
- Absence of electronic prescribing or clinical decision-support systems

Paediatric prescribing in these settings is predominantly manual and relies on individual clinicians performing weight-based dose calculations at the point of care, increasing susceptibility to prescribing errors.[3 7]

INTERVENTION

The intervention consisted of a **standardised weight-based paediatric prescribing tool** designed to reduce dosing errors and improve prescribing efficiency in high-volume outpatient settings.

Components of the intervention

The tool comprised three integrated components:

1. **Pre-calculated weight-based dosing chart**
    - Covered commonly prescribed paediatric medications in outpatient settings (eg, paracetamol, amoxicillin, salbutamol, domperidone)
    - Included predefined weight bands (kg-based) with corresponding dose, frequency and formulation guidance
    - Eliminated the need for real-time arithmetic dose calculations
2. **Colour-coded alignment system**
    - Each weight band was assigned a distinct colour
    - Corresponding drug doses were aligned using the same colour coding
    - Designed to facilitate rapid visual matching and reduce selection errors under time pressure
3. **"Red flag" high-risk medication table**
    - Included medications with higher risk of dosing-related harm (eg, antibiotics, narrow therapeutic index drugs)
    - Highlighted using a distinct red visual cue
    - Intended to prompt increased caution and verification during prescribing

Who used the intervention

- The tool was used by **medical officers prescribing in outpatient departments** across all participating institutions
- No restriction based on seniority; applicable to all prescribers involved in paediatric care

Where and how it was used

- Printed in **A4 format** and placed at prescribing desks in outpatient clinics
- Used at the **point of prescribing** during routine patient consultations
- No electronic systems were involved

Training and implementation

- A **brief orientation (approximately 10–15 minutes)** was provided to clinicians at each site
- Training included:
    - How to identify weight band
    - How to align colour coding
    - Use of red flag table

- No formal ongoing supervision or enforcement mechanism was implemented

Adaptation during implementation

The intervention was **iteratively refined** through PDSA cycles based on real-time feedback from clinicians:

- Initial usability challenges (visual similarity)
- Need for improved differentiation (colour coding)
- Need for risk prioritisation (red flag system)

Fidelity and uptake

- Uptake was monitored informally through observation and feedback
- High utilisation was reported across sites, although **formal adherence measurement was not performed** (acknowledged as a limitation)

STRATEGY - PDSA cycles

PDSA Cycle 1 — Introduction of Standardised Dosing Chart

Plan
To reduce prescribing errors by eliminating the need for manual dose calculations through introduction of a pre-calculated weight-based dosing chart.

Do
The dosing chart was introduced across all participating institutions and made available at prescribing points in outpatient departments.

Study
Initial observations and clinician feedback indicated improved prescribing speed and reduced reliance on mental calculations. However, usability issues were identified, particularly difficulty in visually distinguishing between adjacent weight bands due to similar formatting.

Act
The intervention was modified to improve visual clarity, leading to development of a colour-coded alignment system.

PDSA Cycle 2 — Introduction of Colour-Coded Alignment System

Plan
To improve usability and reduce selection errors by introducing colour coding to differentiate weight bands and corresponding doses.

Do
A colour-coded system was applied to the dosing chart, with consistent colour alignment across weight categories and medications.

Study

Clinicians reported improved ease of use and faster dose identification. Observations suggested further reductions in prescribing errors. However, feedback indicated that high-risk medications were not sufficiently distinguished from routine drugs.

Act

A targeted modification was planned to highlight high-risk medications using a distinct visual cue.

PDSA Cycle 3 — Introduction of Red Flag High-Risk Medication Table

Plan

To enhance prescribing safety by highlighting medications associated with higher risk of harm.

Do

A separate "red flag" table was introduced, visually distinguishing high-risk medications using a red background.

Study

Clinicians reported increased awareness and caution when prescribing high-risk medications. Further reductions in dosing errors were observed, particularly for medications requiring careful dosing.

Act

The final version of the prescribing tool incorporated all three components and was retained without further modification.

STUDY OF THE INTERVENTION

The study of the intervention aimed to determine whether observed improvements in prescribing outcomes were plausibly attributable to the implemented changes rather than external factors.

Temporal relationships between intervention phases and outcome measures were examined using run chart methodology. Sequential introduction of PDSA cycles allowed assessment of stepwise changes in prescribing accuracy following each modification.

The largest improvement was observed immediately following introduction of the pre-calculated dosing chart, suggesting that elimination of real-time arithmetic calculations was a key driver of change. Subsequent improvements following colour coding and red flag implementation were smaller but consistent, indicating additive effects of enhanced visual design and risk signalling.

The immediate and substantial improvement observed following PDSA cycle 1, compared with smaller incremental gains in subsequent cycles, reduces the likelihood that improvements were solely due to temporal trends or increased familiarity, supporting a specific effect of the intervention.

Potential confounding factors were considered, including increasing clinician familiarity over time, variation in patient case mix and observation effects. However, the magnitude, consistency and temporal alignment of improvements across multiple sites support a plausible association between the intervention and observed outcomes.

As this was a quasi-experimental quality improvement study without a control group, causality cannot be definitively established. Findings should therefore be interpreted as demonstrating strong association rather than proof of effect.

MEASURES

Primary Outcome

The primary outcome was the **proportion of prescriptions with correct weight-based dosing**.

A prescription was considered correct when:

- The **dose** and
- The **frequency of administration**

were both appropriate for the child's body weight, based on standard paediatric dosing references (eg, national guidelines and the BNF for Children).[1–3]

Secondary Outcomes

The following secondary outcomes were assessed:

- **Overdose rate**: proportion of prescriptions exceeding recommended weight-based dose
- **Underdose rate**: proportion of prescriptions below recommended dose
- **Frequency errors**: deviations from recommended dosing intervals
- **Documentation of patient weight**: proportion of prescriptions with recorded weight
- **Consultation time**: duration from patient encounter to completion of prescription

Process Measures

- Uptake of the prescribing tool (assessed informally through observation and clinician feedback)
- Progressive changes across PDSA cycles

Operational Definitions

- **Correct dosing**: dose within acceptable weight-based range AND correct frequency
- **Overdose/underdose**: deviation beyond recommended dosing range
- **Frequency error**: incorrect dosing interval (Ex: BD instead of TDS)

Data Collection

- Data were collected using a **standardised data collection form**
- Prescriptions were reviewed by **trained medical officers**
- Training included:
    - Use of dosing references
    - Standard interpretation of prescribing errors

To improve reliability:

- A **subset of prescriptions was independently reviewed by a second assessor**
- Discrepancies were resolved through **consensus discussion**

Sampling Strategy

- **Consecutive paediatric prescriptions** were included during routine outpatient clinic sessions

- Separate cross-sectional samples were collected at:
    - Baseline
    - Each PDSA cycle

This approach was used to minimise selection bias and reflect real-world prescribing practices.

A total of **863 prescriptions** were analysed across all phases.

Measurement of Consultation Time

- Consultation time was assessed using:
    - **Direct observation in selected clinics**, where feasible
    - **Standardised estimation methods**, applied consistently across sites when direct measurement was not possible

This measure was included as an indicator of workflow efficiency.

STATISTICAL ANALYSIS

Descriptive Analysis

Descriptive statistics were used to summarise prescribing indicators across baseline and each PDSA cycle.

Categorical variables were presented as:

- Proportions (%)
- Absolute numbers

Comparative Analysis

Changes across study phases were assessed using the **χ^2 test for trend** for categorical variables.

Statistical significance was defined as:

- **$p < 0.05$**

Effect Size Reporting (IMPORTANT ADDITION)

Absolute changes in key outcomes were calculated and presented with **95% confidence intervals (CI)**:

- Absolute improvement in correct dosing
- Reduction in overdose and underdose rates
- Reduction in frequency errors

This approach was used to provide a more clinically meaningful interpretation of intervention impact.

Run Chart Analysis

Run chart analysis was performed to assess temporal patterns and detect **non-random variation** in prescribing performance over time.

Data were plotted sequentially across baseline and PDSA cycles. Standard run chart rules were applied to identify:

- **Shifts**: six or more consecutive points above or below the median
- **Trends**: five or more consecutive points increasing or decreasing
- **Runs**: sequences crossing the median

The presence of non-random patterns was interpreted as evidence of improvement associated with the intervention rather than random fluctuation.

Analytical Considerations

Given the quality improvement design:

- No adjustment was made for clustering at clinician or institutional level
- The study was not powered for hypothesis testing
- Findings were interpreted in the context of **practical significance and temporal association**, rather than strict causal inference

RESULTS

Overview of Data

A total of **863 paediatric outpatient prescriptions** were analysed across baseline and successive PDSA cycles, with separate cross-sectional samples collected at each phase.

Primary Outcome: Correct Weight-Based Dosing

The proportion of prescriptions with correct weight-based dosing improved substantially across the study period, increasing from **70.7% at baseline to 98.7% following the final PDSA cycle**.

This represents an **absolute improvement of 28.0 percentage points** (95% CI 24.9 to 31.1; $p<0.001$).

Improvement occurred progressively across PDSA cycles:

- Baseline: 70.7%
- PDSA Cycle 1: 89.2%
- PDSA Cycle 2: 95.5%
- PDSA Cycle 3: 98.7%

The largest increase was observed following **PDSA Cycle 1 (introduction of the dosing chart)**, with subsequent incremental improvements after introduction of colour coding and the red flag system.

As shown in Figure 1, there was a steady increase across successive PDSA cycles, indicating a sustained improvement over time

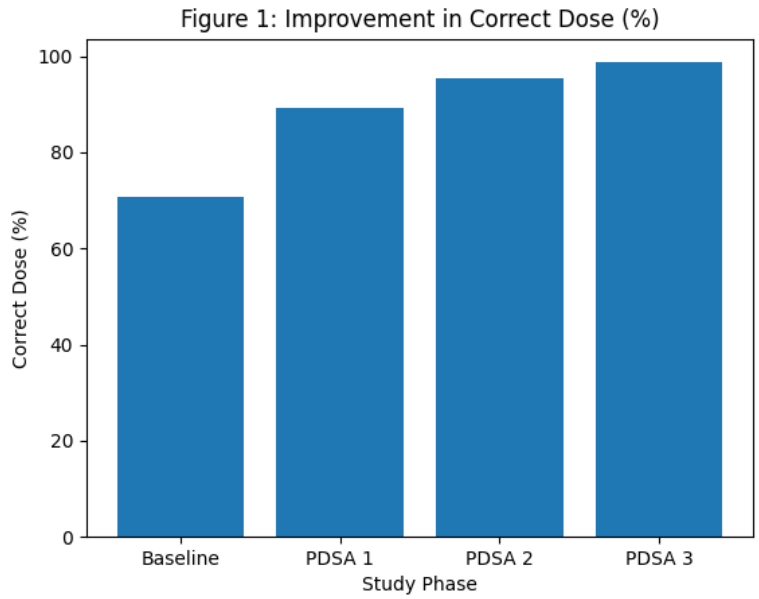

Figure 1: Improvement in correct dose (%) across baseline and successive PDSA cycles.

Run chart analysis demonstrated a **sustained upward shift in performance**, with consecutive data points above the baseline median following implementation, indicating **non-random improvement** associated with the intervention.

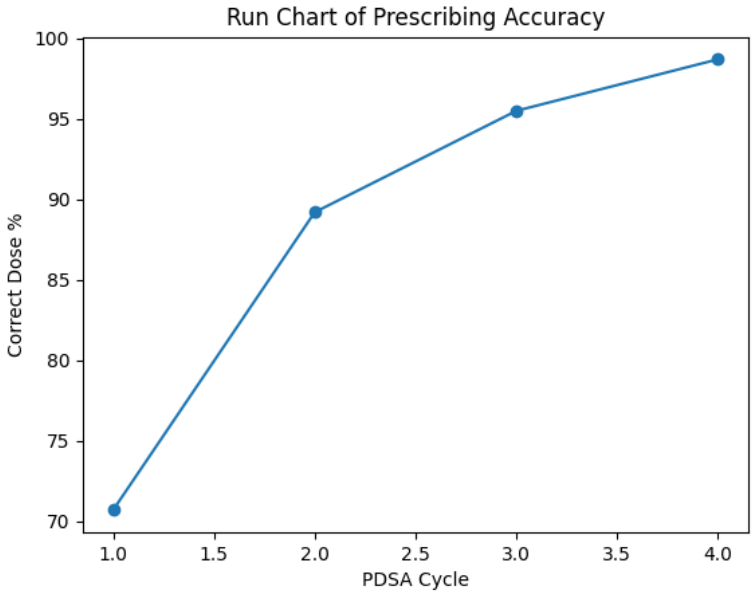

Figure 2: Run chart showing improvement across PDSA cycles with sustained upward trend.

Secondary Outcomes

Dosing Errors

There was a marked reduction in dosing errors across all categories.

- **Overdose rates** decreased from **10.8% to 0.3%**
    - Absolute reduction: 10.5 percentage points (95% CI 8.2 to 12.8)
- **Underdose rates** decreased from **7.0% to 0.9%**
    - Absolute reduction: 6.1 percentage points (95% CI 4.3 to 7.9)

These improvements occurred progressively across PDSA cycles, with the most substantial reductions observed following introduction of the standardised dosing chart.

Frequency Errors

Frequency errors declined significantly from **26.8% at baseline to 2.7% following the final intervention**.

- Absolute reduction: 24.1 percentage points (95% CI 20.5 to 27.7; $p<0.001$)

Run chart analysis demonstrated a **consistent downward trend**, with multiple consecutive points below the baseline median, indicating sustained improvement over time.

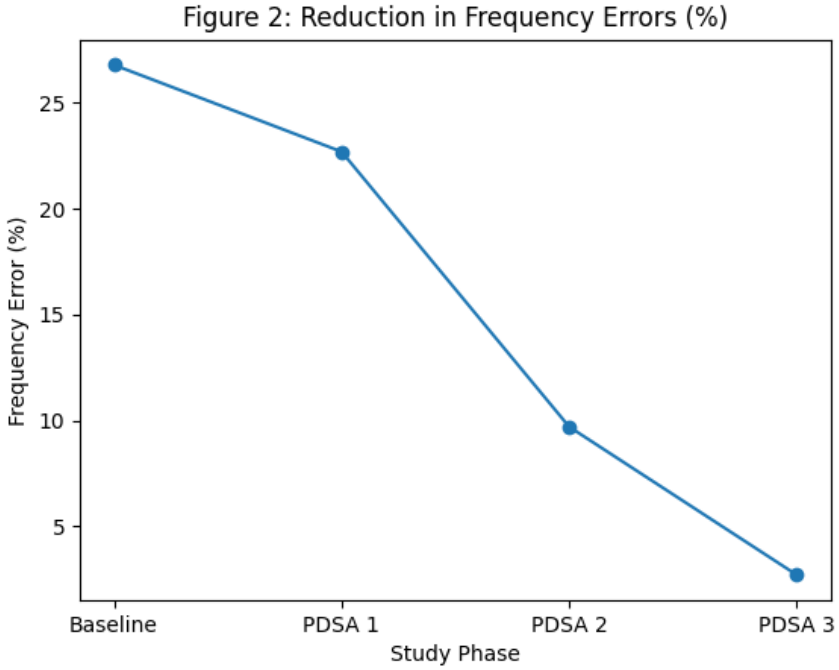

Figure 3: Reduction in frequency errors (%) across baseline and successive PDSA cycles

Figure 4 demonstrates improvements across all prescribing indicators, with substantial increases in correct dosing and marked reductions in dosing and frequency errors following the intervention

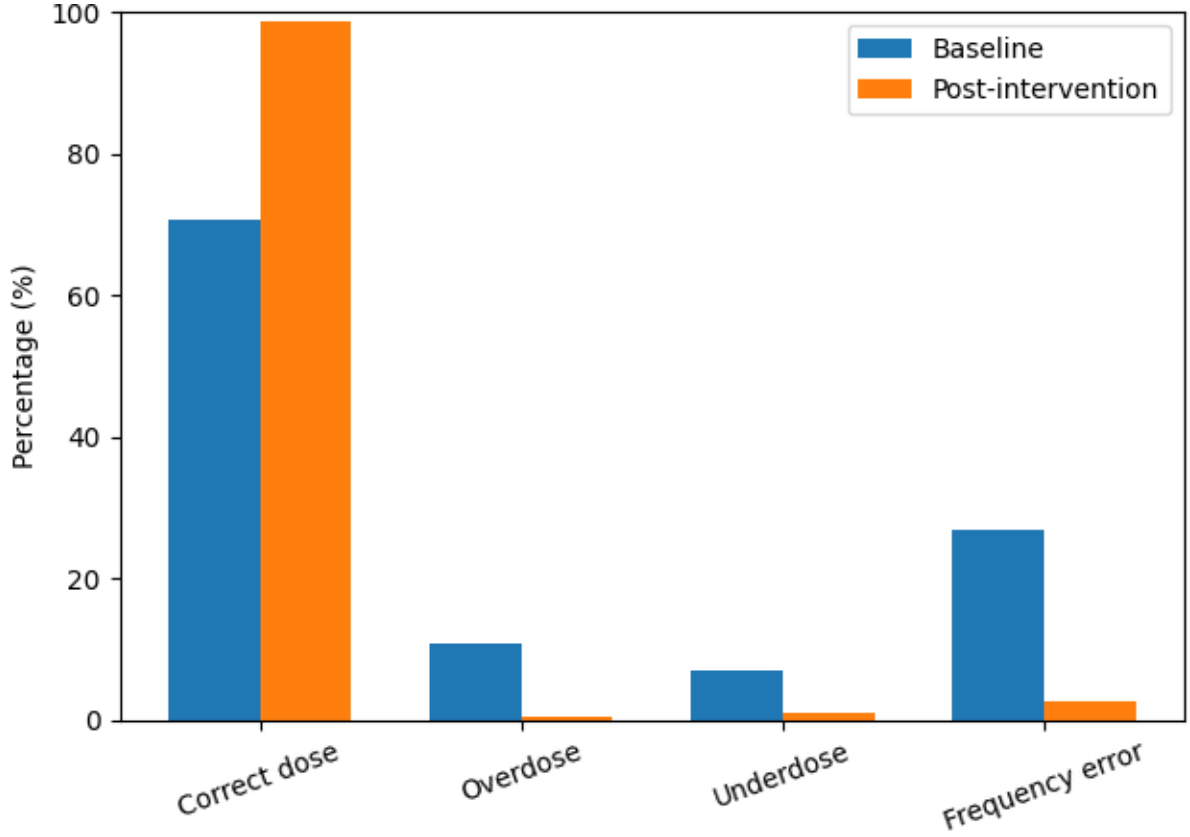

Figure 4: Changes in paediatric prescribing indicators before and after implementation of the standardised weight-based prescribing tool. Correct dosing increased substantially from 70.7% to 98.7%, while overdose, underdose and frequency errors decreased markedly, demonstrating overall improvement in prescribing quality

Documentation of Patient Weight

Documentation of patient weight improved from **28.5% at baseline to 45.9% post-intervention**.

Although this represents a moderate improvement, documentation remained suboptimal despite overall improvements in prescribing accuracy.

Consultation Time

Estimated consultation time decreased from approximately **3–10 minutes at baseline to 2–5 minutes post-intervention**.

This suggests improved workflow efficiency associated with reduced need for manual dose calculation and decision-making time. Although measurement methods varied across sites, consistent approaches were applied within each site to allow comparison across study phases.

Effect of Sequential PDSA Cycles

Improvements were observed in a **stepwise manner across successive PDSA cycles**, supporting a cumulative effect of the intervention components:

- **Cycle 1 (dosing chart)** produced the largest improvement in dosing accuracy
- **Cycle 2 (colour coding)** improved usability and reduced selection errors
- **Cycle 3 (red flag system)** enhanced safety for high-risk medications

The pattern of incremental gains across cycles supports the contribution of each modification to overall system improvement.

Unintended Effects

No unintended negative effects or adverse trends were identified during the study period.

Summary of Key Findings

Overall, the intervention was associated with:

- Near elimination of dosing errors
- Significant reduction in frequency errors
- Moderate improvement in documentation practices
- Improved consultation efficiency

These changes were **sustained across multiple sites** and aligned temporally with intervention implementation.

Table 1 summarises changes in prescribing indicators across baseline and successive PDSA cycles.

Table 1: Changes in paediatric prescribing indicators across baseline and successive PDSA cycles

Indicator	Baseline	PDSA 1	PDSA 2	PDSA 3
Correct dose (%)	70.7	89.2	95.5	98.7
Overdose (%)	10.8	3.8	1.5	0.3
Underdose (%)	7.0	6.9	3.0	0.9
Frequency error (%)	26.8	22.7	9.7	2.7
Weight documented (%)	28.5	34.1	40.1	45.9

DISCUSSION

Principal Findings

This multicentre quality improvement study demonstrated that implementation of a standardised weight-based prescribing tool was associated with substantial improvements in paediatric prescribing accuracy and workflow efficiency in resource-limited outpatient settings. The proportion of correctly dosed prescriptions increased from 70.7% to 98.7%, with near elimination of overdosing and marked reductions in underdosing and frequency errors.

Improvements occurred in a stepwise manner across successive PDSA cycles, with the largest effect observed following introduction of the pre-calculated dosing chart and additional gains following incorporation of colour coding and a high-risk medication alert system. Run chart analysis demonstrated sustained, non-random improvement over time, supporting a temporal association between the intervention and observed outcomes.

Interpretation of Findings

The observed improvements are likely explained by system-level changes that reduced reliance on individual cognitive processes during prescribing. Paediatric prescribing requires multiple sequential steps, including weight interpretation, dose calculation and transcription, each of which introduces potential for error.[3] [7]

The introduction of a pre-calculated dosing chart simplified this process by eliminating the need for real-time arithmetic calculations, which are a recognised source of prescribing error.[3] [7] The substantial improvement observed following the first PDSA cycle suggests that this component was the primary driver of change.

The addition of colour-coded alignment likely improved visual discrimination and reduced cognitive load, facilitating faster and more accurate selection of appropriate doses. Visual aids have been shown to improve performance in high-pressure clinical environments by reducing complexity and enhancing pattern recognition.[10]

The “red flag” high-risk medication table introduced an additional safety mechanism by prompting increased attention to medications associated with higher risk of harm. This aligns with human factors principles, whereby salient cues can influence clinician behaviour and improve decision-making in complex environments.

Taken together, these findings suggest that the intervention improved prescribing performance by **simplifying workflows, reducing cognitive burden and embedding safety cues into routine practice**, rather than relying solely on individual vigilance.

Comparison with Existing Literature

The findings of this study are consistent with existing literature demonstrating that structured interventions can reduce paediatric prescribing errors. Systematic reviews have reported that prescribing errors in paediatric populations are common, with dosing errors representing the predominant category.[1–3]

Previous studies evaluating prescribing support tools, including electronic decision-support systems and standardised order sets, have reported reductions in prescribing errors ranging from approximately 27% to over 80%.[8] [9] These interventions are most effective when they simplify clinical workflows and reduce reliance on manual calculations.

The magnitude of improvement observed in this study—particularly the near elimination of dosing errors—appears greater than that reported in many previous studies. This may be explained by the multi-component design of the intervention, which addressed multiple sources of error simultaneously. Evidence suggests that bundled interventions incorporating system redesign, standardisation and workflow integration are more effective than single-component approaches.[3] [11]

Importantly, most published studies have been conducted in tertiary or high-resource settings and have relied on electronic systems. In contrast, this study demonstrates that comparable improvements can be achieved using low-cost, paper-based tools in primary care settings within a low- and middle-income country context.

This highlights the importance of **context-appropriate, scalable interventions** that align with existing clinical workflows and resource constraints.

Implications for Practice and Policy

The findings of this study have important implications for healthcare systems in Sri Lanka and other low- and middle-income countries.

First, the intervention provides a **practical, low-cost solution** to a common patient safety problem, requiring minimal training and no additional infrastructure. Its simplicity and adaptability make it suitable for widespread implementation across primary care settings.

Second, integration of standardised paediatric prescribing tools into routine practice may contribute to reducing preventable medication errors at scale. This could be considered for incorporation into **regional or national prescribing guidelines**.

Third, the study highlights the value of applying **human factors principles** in healthcare system design. Interventions that reduce cognitive load and simplify decision-making may be particularly effective in high-volume, resource-constrained environments.

Strengths

This study has several strengths. It was conducted across multiple healthcare institutions, enhancing the generalisability of findings within the RDHS region. The relatively large sample size strengthens the reliability of observed improvements. The use of iterative PDSA cycles enabled progressive refinement of the intervention based on real-time feedback, improving usability and relevance.

In addition, the intervention was implemented within routine clinical practice, supporting its real-world applicability and scalability in similar resource-limited settings.

LIMITATIONS

Several limitations should be considered when interpreting these findings.

First, the absence of a control group limits the ability to establish causality. Although improvements were temporally associated with the intervention and demonstrated non-random patterns on run chart analysis, other factors such as increasing clinician familiarity or secular trends may have contributed.

Second, the potential for a **Hawthorne effect** cannot be excluded, as clinicians were aware of ongoing observation, which may have influenced prescribing behaviour independently of the intervention.

Third, outcome assessment was conducted by medical officers and was not blinded, introducing the possibility of **observer and measurement bias**.

Fourth, consultation time was not measured using formal time–motion methodology and, in some settings, was estimated rather than directly observed. This may have reduced the precision of this measure.

Fifth, the study did not account for **clustering effects** at the level of individual clinicians or institutions, which may influence prescribing patterns and outcomes.

Sixth, the study duration was relatively short, and **long-term sustainability** of the observed improvements was not assessed.

Finally, the study did not evaluate **downstream clinical outcomes**, such as adverse drug events, patient morbidity or cost-effectiveness, limiting assessment of the broader clinical and economic impact of the intervention.

CONCLUSION

Implementation of a standardised weight-based paediatric prescribing tool was associated with substantial improvements in prescribing accuracy and workflow efficiency in resource-limited primary care settings.

This low-cost, scalable intervention offers a practical approach to reducing medication errors and improving patient safety in similar contexts. Further research is warranted to evaluate long-term sustainability, clinical outcomes and potential for integration into national prescribing systems.

ETHICAL CONSIDERATIONS

This study was conducted as a quality improvement initiative embedded within routine clinical practice. No patient-identifiable data were collected, and all data were analysed in aggregate form.

Formal ethical approval was deemed not required in accordance with institutional policies governing quality improvement activities. Administrative approval for the project was obtained from the Regional Director of Health Services, Kalmunai region, and relevant institutional authorities.

The study adhered to principles of confidentiality, data protection and responsible conduct of research.

PATIENT AND PUBLIC INVOLVEMENT

Patients and the public were not involved in the design, conduct, reporting or dissemination of this quality improvement study.

FUNDING

This study received no external funding and was conducted as part of routine quality improvement activities within the RDHS Kalmunai region.

COMPETING INTERESTS

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author upon reasonable request. Data are not publicly available due to institutional and administrative restrictions.

REFERENCES

1. Miller MR, Robinson KA, Lubomski LH, Rinke ML, Pronovost PJ. Medication errors in paediatric care: a systematic review of epidemiology and an evaluation of evidence supporting reduction strategy recommendations. *Qual Saf Health Care* 2007;16:116–26. doi:10.1136/qshc.2006.019950
2. Alsabri M, Eapen D, Sabesan V, Hassan ZT, Amin M, Elshanbary AA, et al. Medication errors in pediatric emergency departments: a systematic review and recommendations for enhancing medication safety. *Pediatr Emerg Care* 2024;40:58–67. doi:10.1097/PEC.0000000000002870
3. Bannan DF, Tully MP. Bundle interventions used to reduce prescribing and administration errors in hospitalized children: a systematic review. *J Clin Pharm Ther*. 2016;41(3):246–255. doi:10.1111/jcpt.12398.
4. Hannibal GD, et al. Prescribing errors in paediatric care: a systematic review. *BMC Health Serv Res* 2025;25:967. doi:10.1186/s12913-025-13109-6
5. Rathish D, Bahini S, Sivakumar T, Thiranagama T, Abarajithan T, Wijerathne B, et al. Drug utilization, prescription errors and potential drug-drug interactions: an experience in rural Sri Lanka. *BMC Pharmacol Toxicol* 2016;17:27. doi:10.1186/s40360-016-0071-z
6. Ranasinghe P, Ranganathan SS. Commonly prescribed medicines and prescription errors in Sri Lanka: a descriptive cross-sectional study. *J Pharm Health Serv Res* 2024;15:rmae006. doi:10.1093/jphsr/rmae006

7. Hirata KM, Kang AH, Ramirez GV, Kimata C, Yamamoto LG. Pediatric weight errors and resultant medication dosing errors in the emergency department. *Pediatr Emerg Care* 2017;33:e1–e5. doi:10.1097/PEC.0000000000000701
8. Rinke ML, Bundy DG, Velasquez CA, Rao S, Zerhouni Y, Lobner K, et al. Interventions to reduce pediatric medication errors: a systematic review. *Pediatrics* 2014;134:338–60. doi:10.1542/peds.2013-3531
9. Feather C, Appelbaum N, Le Geyt J, Jheeta S, Maconochie I, Dean Franklin B. Evaluating the impact of an indication-based, patient-specific prescribing tool on prescribing errors in paediatrics: a non-randomised before-and-after study. *BMJ Paediatr Open* 2025;9:e003662. doi:10.1136/bmjpo-2025-003662
10. Frush KS, Luo X, Hutchinson P, Higgins JN. Evaluation of a method to reduce over-the-counter medication dosing error. *Arch Pediatr Adolesc Med* 2004;158:620–4. doi:10.1001/archpedi.158.7.620
11. Koeck JA, Young NJ, Kontny U, Orlikowsky T, Bassler D, Eisert A. Interventions to reduce pediatric prescribing errors in professional healthcare settings: a systematic review. *Pediatr Drugs* 2021;23:223–40. doi:10.1007/s40272-021-00450-6