

# Apps for paediatric dosing – an evaluation

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## Objectives

Thousands of medical apps can be found in the apple app store and google play. This huge amount makes it difficult to find an appropriate app and to ensure quality and accuracy of an app.

Since we are interested to see whether the available apps are safe to use and to identify areas for possible improvement, we evaluated their quality and content. This evaluation was done in accordance with the European Statements of Hospital Pharmacy to be involved in eHealth/mHealth procedures and to decrease the risk of medication errors (statements 1.7, 5.5).<sup>1</sup>

Our website [www.kinderdosierungen.ch](http://www.kinderdosierungen.ch) provides paediatric dosages in two languages, German and French (the English version will be published soon). To increase usability, we aim to develop a mobile version whereby the results of our evaluation might be useful.

## Methods

### Search for paediatric dosing apps

- Keywords such as paediatric, medical, app, dosing (in English or German)
- Perform a google search and search the apple app store and google play
- Search between April and June 2015

### Inclusion criteria

- Part I: Selection of apps in either English or German containing structured paediatric dosages (preselection)
- Part II: Selection of apps with a dosage calculator and either more than 70 active ingredients or a calculator specific for preterm infants (in-depth evaluation)

## Conclusion

- Several high quality paediatric dosage apps are available.
- The apps Epocrates, Lexicomp and Safe Dose reached the highest scores in our evaluation, followed by AGN Emergency Booklet and EMRA Peds Meds.
- The calculator is the feature that could be improved in all five top apps.
- It is important to keep in mind that the appropriate medical app depends on the contents and features that are relevant for the individual user.
- We recommend that prior to using an app, a short evaluation is performed.

## Evaluation

- Six main categories containing a total of 73 criteria were chosen (Table 1)
- Category weights chosen according to importance for usage by healthcare professionals (Table 1)
- Criteria and weights defined by two experts

Table 1: In-depth evaluation of selected paediatric dosage apps

Category (weight)	Criteria (examples out of 73 criteria)
Quality/Content (35%)	Updates, maximum dose, different dosages for different indications, accuracy of dosage, references
Quantity (10%)	Number of active ingredients and preparations, different routes of administration
Calculator (20%)	Integration, plausibility check weight/age, pre-term calculations
Features (15%)	Add bookmarks, calculation of volumes (liquid forms) or tablets (solid forms), different therapeutic categories
Usability (15%)	Data presentation, efficiency
Additional professional information (5%)	Adverse events, drug-drug interactions, compatibility

## Results & Discussion



Figure 1: Paediatric dosing app selected for in-depth evaluation<sup>2</sup>

- Preselection: 43 paediatric dosage apps
- Eighteen apps fulfilled criteria for in-depth evaluation
- Top five apps: Epocrates, Lexicomp, Safe Dose, AGN Emergency Booklet, EMRA Peds Meds
- Table 2: Ranking of top five apps within the 18 included apps for each of the six categories
- Table 3: Summary of different details together with strengths and weaknesses of the top five apps

### Suggestions for improvements

- Calculators, especially regarding integration of preterm infant calculations
- Data presentation: Large amount of information to be presented

### Important to know

- No danger to use any of the 18 evaluated apps
- Quality of the dosages of seven randomly chosen active ingredients from different drug groups (e.g. amoxicillin, furosemide, paracetamol) were evaluated and displayed correct dosage ranges

### Limitation of the evaluation

- Evaluation is based on criteria/weights that two experts defined
- End result could be different depending on criteria/weights chosen

Table 2: Ranking within categories for the top five paediatric dosing apps

App	Quality/Content	Quantity	Calculator	Features	Usability	Additional professional information	Rank
Epocrates	3	3	15	3	3	3	1
Lexicomp	1	1	18	2	17	1	1
Safe Dose	2	5	9	1	5	2	1
AGN Emergency Booklet	6	6	8	4	7	13	4
EMRA Peds Meds	10	7	1	5	7	13	5

Table 3: Details of the top five paediatric dosing apps

	Languages	Operation system	Price (CHF)	Calculator	Strengths	Weaknesses
Epocrates	English	Android iOS	free	integrated manual calculation	differentiation* usability	calculator
Lexicomp	English German further languages	Android iOS	75	not integrated	quality quantity	calculator
Safe Dose	English German further languages	Android iOS	free (limited number of medications) 100 (all medications)	integrated automatic calculation	features usability	missing galenic forms
AGN Emergency Booklet	German	Android	24	integrated automatic calculation hard to find	administrative features (FAQ, informations)	additional professional information
EMRA Peds Meds	English	iOS	3	integrated automatic calculation	calculator	additional professional information differentiation*

\*Differentiation: several indications, different dosages for different age groups