**Comparative evaluation of eight tools to prevent drug incompatibilities**

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**Background and Objective**

Intravenous drug administration in neonatal and paediatric intensive care units (PICU; NICU) is critical because of poor venous access, fluid restriction, small catheter diameter and low infusion rate.

Moreover scarce information on physical and chemical incompatibilities increases risks.

Eight tools for drug incompatibilities were evaluated in order to improve information delivered to NICU and PICU.

**Design**

Two experienced clinical pharmacists assessed consensually 8 tools (table 1) with 40 drug pairs usually used in NICU and PICU (table 2). Trissel’s Handbook 14th ed. served as reference.

**Table 2: The 40 pairs of drugs composed by 20 pairs compatibles (+=stable for at least 40) and 20 pairs incompatibles**

The scores were calculated for 3 criteria and corrected for the reference, which totalised 250 points for each criteria (see Appendix):

- **Accuracy**: summation of tools’ sensitivity, specificity, positive and negative predictive values
- **Completeness**: number of drug pairs documented
- **Comprehensiveness**: presence/absence of 16 items in the tool as temperature, solvent, recipient, concentration, etc.

Applicability was assessed by 7 pharmacists working in the drug information centre. The scoring combined the time needed to classify 5 drug pairs and their evaluation using visual analogical scales for design, usefulness, reliability and ergonomic.

The **global scores** for accuracy, completeness, comprehensiveness and applicability were finally calculated.

The percentage of non-conform answers (NCA) were calculated for pharmacists (n_{max}= 45: 5 pairs x 8 tools) and tools (n_{max}= 35: 5 pairs x 7 pharmacists).

**Results**

The highest scores for accuracy (224/250; table 3) and comprehensiveness (159/250; table 5) were determined for Thériaque, the one of completeness for KIK (219/250; table 5), the one of applicability for pH table (298/250; table 4).

- **The range of pharmacists’ NCA was between 9% (44/45 NCA) and 33% (15/45)**.

- **The range of tools’ NCA was between 6% (2/35) and 49% (18/35), being the lowest for pH table and the highest for Perfisy**. This last result may be explained by the construction of this tool, which pools information from different references. The absence of consensus may be related to the need for interpretation, with different possible conclusions.

- **The best global scores were obtained by Thériaque database and pH table** (781 and 780/1000 respectively; table 5).

**Conclusion**

Both Thériaque database and pH table excelled as drug incompatibility tools. However users should understand the limitations of all resources. Large ranges of pharmacists’ and tools’ NCA illustrate how results are influenced by different interpretations. A standardisation should be applied. Tools with low NCA percentage may be interesting for use by nurses in care units.

**Appendix - Evaluation parameters**

| Sensitivity= Sen= TP/(TP+FN) ; Specificity= Spe= TN/(TN+FP) ; PPV= TP/(TP+FP) ; NPV= TN/(TN+FN) ; Accuracy score= (Sen+Spe+NPV+PPV) x 0.25 ; Completeness score= Number of pairs x 0.25 ; Comprehensiveness score= Number of items x 2.08 ; Applicability score= 1/(time to classify 5 pairs) x 1000/3.33 + [EVA_{design} x 7.04] + [EVA_{usability} x 5.44] + [EVA_{ergonomic} x 5.32] + [EVA_{appearance} x 6.49] ; Global score= Accuracy score + Completeness score + Comprehensiveness score + Applicability score |

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