

The eHISS algorithm: designing a mobile phone-based algorithm for symptom related health advice

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Background

The ubiquity of mobile phones in Africa offers great potential for mHealth applications to provide health advice to the population. The aims of this study in Ghana were to develop a clinical algorithm integrated to an Interactive Voice Response (IVR) System that:

- Correctly identifies symptoms of common childhood diseases and
- Provides corresponding advice

The study was part of the “electronic Health Information and Surveillance System” project (eHISS) (see ePoster EV0842 for further information).

Methods

- The automated algorithm was based on the WHO Guidelines for the Integrated Management of Childhood Illness (IMCI) to assess a child's condition using a 3-level classification system of disease severity (Figure 1).
- Symptoms to be identified were fever, cough, diarrhoea and vomiting.
- Disease severity was assessed and resulted in recommendations to either seek care immediately (A1), seek care within 24 hours (A2) or to remain home and treat and monitor symptoms (A3).
- The algorithm was evaluated in an outpatient department and resulting symptoms, diagnoses and advice was compared to consultation with a physician by calculating overall agreement (%) and Cohen's Kappa Value.

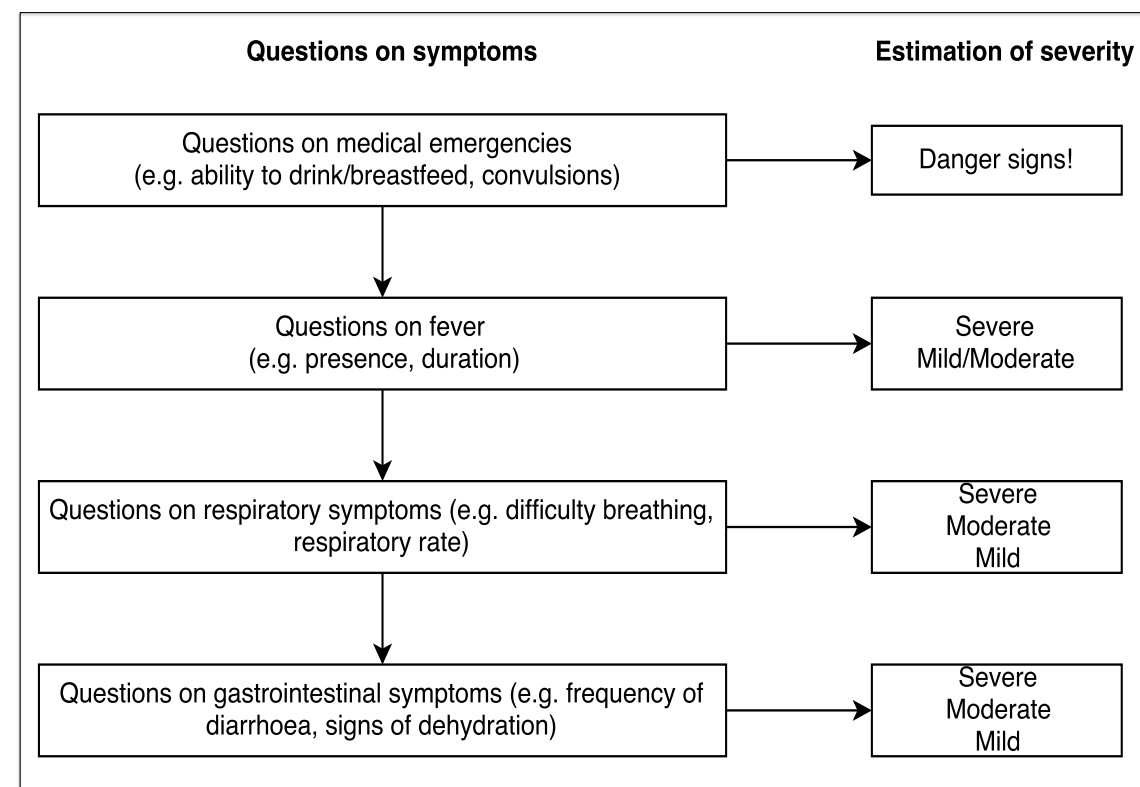


Figure 1. Schematic description of the algorithm

Table 1. Agreement between algorithm and physician

	Agreement (%)	Kappa*	p-value
Symptoms			
Fever	83.5	0.59	<0.001
Cough	82.3	0.61	<0.001
Diarrhoea	84.4	0.57	<0.001
Vomiting	76.4	0.42	<0.001
Grades of severity			
Danger signs	77.2	-0.08	0.71
Fever			
Severe	-	-	-
Mild-Moderate	78.9	0.51	<0.001
Respiratory			
Severe	84.0	0.3	<0.001
Moderate	63.7	0.05	0.21
Mild	63.7	-0.07	0.87
Gastrointestinal			
Severe	93.3	0.08	0.09
Moderate	81.9	0.25	<0.001
Mild	73.4	0.2	<0.001

*Cohen's Kappa

Results

In total 237 participants contributed data.

- Good agreement between the algorithm's and the physicians' findings was observed for identification of the symptoms cough, fever, and diarrhoea (>80% agreement and Kappa > 0.5) with slightly poorer agreement for vomiting.
- While overall agreement in the severity-assessment for most symptoms was still fairly good, the Kappa values were poorer (Table 1).
- Looking at the resulting recommendations, good agreement was seen in A1 (seek treatment immediately) with 42/48 (87.5%) cases assessed as A1 by the physician also assessed as A1 by the algorithm. The remaining 6 (12.5%) were assessed as A2.
- Fair agreement was seen for A2 with 168/175 cases assessed as A2 by the physician assessed as A1 (121 cases) or A2 (47 cases) by the algorithm.
- Among the 14 A3 cases, the algorithm diagnosed 4 correctly, 2 were declared as A2 and 8 as A1.

Conclusion

The automated IVR based algorithm performed well to identify symptoms correctly and sufficiently to assess disease severity and give according advice. Most importantly disease severity was not underestimated.

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