

A Simple Practicable Prediction Tool for Sick Children: Surcu5 - A Conceptual Research Framework

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Abstract

Clinical risk scores are essential in clinical practice for disease stratification and prognostication. This is especially true for under five sick children. Sick children have narrow margin of safety between disease manifestation and clinical deterioration and its associated high mortality. Many available clinical scores are essential but complex to practice due to number of parameters and scoring system used. Hence, a simple and practicable risk tool comprising few parameters and easy scoring system is mandatory for daily paediatric practice especially during surge of endemic diseases. We conceptually framed a simple and practicable risk tool "SURCU5" for paediatric purpose.

Keywords: Tool; Sick Children; Surcu5

Abbreviations

AKI: Acute Kidney Injury; BTS: British Thoracic Society; CRT: Capillary Refill Time; ESR: Emergency Service Room; IP: Inpatient; OP: Outpatient; PICU: Paediatric Intensive Care Unit; RR: Respiratory Rate; UNICEF: United Nations International Children's Emergency Fund; U5MR: Under-Five Mortality Rate; WHO: World Health Organization

Introduction

A simple, practicable, easily memorable risk score with less clinical parameters is very much needed for clinical practice. The risk score should identify and grade the sick children, assist in deciding where to station them in delivering health care and to initiate appropriate risk-based management. Many available clinical risk scores are complex with number of parameters and not easy to practice without device or app assistance. This is so true in a busy paediatric out patient (OP) or during patient first contact at paediatric emergency department especially during seasonal surge of endemic diseases or epidemics in tropical countries like India.

Background and rationale

We faced challenges in clinical practice while deciding correctly which sick child needs hospitalisation, if yes - where to station

them at health care facility? and what type of medical intervention is needed?. It is hard to decide the allocation of clinical resources like beds, man and machine without a clinical tool especially when they are limited and bed occupancy and referrals from outside are high as seen during surge in endemic diseases like dengue fever, other viral fevers, respiratory tract infections, bronchial asthma, gastroenteritis, malaria etc. in tropical countries like India.

Methods-development of conceptual theory

The above clinical situation stimulated me to search online and offline for available simple clinical risk scores which can fit and solve above problem at our centre. "CURB-65" clinical risk score is a simple risk score tool intended for clinical use in elderly patients by British Thoracic Society (BTS) [1]. It is well evaluated and practiced widely in clinical medicine. I had modified the adult clinical scoring system "CURB 65" and framed with practicable simple clinical parameters for paediatric purpose based on my clinical experience and observations in the past.

Structure and components of framework

The proposed paediatric clinical risk score included risk parameters like altered sensorium, oliguria or anuria, respiratory rate (RR), delayed capillary refill time (CRT) >3seconds and one to

under-fives high risk group. This score is simple and can be used both by doctors and nurses at patient first contact or in outpatient department during busy paediatric consultation hours so that all at risk children quickly identified, triaged and managed properly.

Purpose

This concept helped us in allocating the available resources at our facility to identify, station (as OP at home care, hospitalization and admission in the paediatric ward and PICU/Paediatric Emergency Service Room admission) and manage the sick patients based on our framed risk tool. This had reduced the under fives mortality to almost zero figures at our health care facility, Manikrishna Hospital, Metpally, India. This clinical score abbreviated as "SURCU5". This score includes five simple, clinical parameters for risk scoring. A normal parameter was given score zero and scored one when parameter noticed abnormal. Total maximum score is 5 and the minimum is zero.

Surcu5 risk tool clinical parameters

- **S:** Sensorium, normal = score 0 and altered = score 1 (agitated, irritability, lethargic and comatose).
- **U:** Urine output in the past 12hrs, normal = score 0 (noticed by mother as usual urine output and not significantly altered) and Abnormal = score 1 (no urine passed or significantly decreased <50% of usual urine output).
- **R:** Respiratory rate upper limit for age, normal = score 0 (<40 for children more than 1 year and less than 5 years) and abnormally increased for the age (>40/minute and/or chest indrawing) = score 1 (apnoea and gasping not included).
- **CRT delayed:** Delayed capillary refill time of three or more than 3seconds at OP presentation, CRT <3 seconds normal = score 0 and CRT >3seconds = score 1.
- **U5:** Under 5 years of age (1 - < 5years), more than 5 years = score 0 and less than 5 years = score 1.

Sl. No.	Parameter	Score 0	Score 1
1.	Sensorium	Normal	Altered
2.	Urine output in the past 12 hours noticed by mother or caregiver	Normal	No/decreased
3.	Respiratory rate for the age (upper limit) 1-5yrs = 40/min.	Normal	Increased or chest indrawing
4.	Capillary refill time	Normal <3seconds	Delayed >3seconds
5.	Under five children	5 years	< than 5 years

Table 1: SURCU5 scoring system for sick children between 1 to 5 years of age.

Surcu5 score interpretation.

- **Score 0 and 1:** Outpatient management with or without explanation of warning signs of clinical deterioration to parents (for revisiting especially for those patients who are staying 6km or more away from health care facility with all seasonal road connectivity at district level).
- **Score 2 and 3:** In patient ward admission, physician supervision at intervals and management.
- **Score 4 and 5:** Paediatric emergency service room or intensive care unit admission, continuous monitoring, supervision and more intensive management or referral to teaching hospital if facility not available.

Significance of surcu5 score clinical parameters.

- **Sensorium:** Altered sensorium is induced by many factors that cause and or alter the normal glycaemic state, hydration state and electrolyte balance, hypoxaemia, hypotension, seizures, cerebral perfusion, intracranial pressure, focal or diffuse structural alteration of brain [2] etc. It is often seen in sick children. Hence, altered sensorium was included as clinical risk parameter in this score.

- **Urine output in the past 12hours prior to consultation:** Normal urine out put is (>1ml/kg/hour) a sign of adequate renal perfusion and simple, clinical marker of organ perfusion. Anuria or significantly decreased urine out put of less than 50% of usual in the immediate past 12hrs (noticed by mother or caretaker) will reflect the hydration statue, hypotension, shock, azotaemia and renal dysfunction [3] (KDIGO CPG KIS, 2012). Early detection and management of Acute kidney injury in children prevents end stage renal failure [4].
- **Respiratory rate:** Increased RR is a simple vital parameter with profound clinical significance. It may be a sign of hypoxaemia secondary to respiratory disease [5] (pneumonia, WHO ARI,1990) or cardiorespiratory dysfunction, respiratory or metabolic acidosis, hyperpyrexia, intracranial pathology, pneumothorax, pleural effusion etc. Respiratory rate also depends on rise in body temperature from baseline as seen in acute febrile illnesses like malaria and Dengue fever [6]. Respiratory rate was calculated either manually or Rrate Google app by soft Android mobiles by nurses [7,8].

- **Delayed capillary refill time:** Hypotension with decreased systolic or diastolic pressure or narrowed pulse pressure is a late sign of shock and difficult to measure in sick young children. Moreover, evidence showed its limited benefit in routine recording in emergency department in sick children [9]. Delayed CRT can be used as surrogate marker for tissue perfusion and prognostication in sick children. Delayed CRT in sick children is associated with four-fold increased mortality [10].
- **Under five children:** This is a vulnerable group of human population. Under 5 mortality is high in developing countries including India (<5MR 37, WHO-2020). Five million deaths are taking place every year among this group [11]. Both infectious and non-infectious diseases are responsible for high mortality in this age group. ARI and diarrhoeal disorders significantly contribute to these figures [12]. Fourteen percent of under five children [13], approximately 800,000 every year, UNICEF - are dying due to preventable acute illnesses (WHO Factsheet, 2021).

Results

This simple practical clinical risk tool taught and explained in local Telugu language to nursing staff. They were trained to calculate the scores of sick children and bypass the long awaiting out patient queue if children score 3 or more. These very sick children directly brought to physician consultation for examination, hospitalisation for inpatient care or prompt referral to a medical college hospital. This risk score based care model resulted in prompt attention and management of those under 5s with disease severity. This clinical practice resulted in almost zero mortality at our health care facility. We were practicing this tool for a decade and more.

Discussion

Predictive scores for estimating disease severity and ongoing clinical deterioration like PEWS scores [14] already in use. These scores had scoring of 0 to 3 with 4 parameters for calculating which is quite difficult for nurses and residents to remember. This needs documentation by scoring on offline or online charts. A prediction score with few parameters - five or less and scoring of 0 to 1 is easy to remember and practice by both medical and paramedical health personnel especially at resource limited settings. Our "SURCU5" prediction score probably answers this question in estimating disease severity at presentation, further clinical deterioration or improvement upon hospitalization by repeating the score and in decision taking whether to continue management or referral to higher care facility.

Conclusions

Simple Clinical risk score tools help healthcare professionals to

- Reduce time of first OP registration to consultation and prompt initiation of medical care in clinics and hospitals especially at district level.
- Better utilisation of limited resources for needy patients with disease severity.
- Favourable clinical outcomes – lesser complications, reduced hospital stay, reduced morbidity and mortality.
- Prompt recognition and stabilization of deranged hemodynamic status and prompt decision for referral.
- Improved patient satisfaction.
- More structured and organized work.

What is already known about this topic?

Various clinical risk scores are available for clinical practice. These scores are essential but complex and in use for diagnosing and grading the disease severity.

What this paper adds?

Simple and practical clinical risk score with less parameters and scoring for paediatric purpose is needed for daily practice (for busy clinics and hospitals in tropical countries during seasonal surge of endemic diseases). SURCU5 clinical score is a simple and practical, conceptualized research work intended for better utilisation of limited resources (at small scale healthcare facilities with men 10 -50) during surge of endemic diseases.

Limitations

This is a conceptualized research work in a single health care facility, and we were not published the data regarding the same. This needs to be practiced and evaluated in other health care centres for care optimization and before recommendation.

Conflict of Interest

There are no conflicts of interest for this work.

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