

Signs and symptoms of serious illness in infants aged up to 6 months: rapid review of clinical guidelines

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ABSTRACT

Background There is a need to empower parents and carers of young infants to recognise signs of serious illness and to act on these appropriately. Compiling the signs and symptoms of serious illness in infants found in clinical guidelines will support the evidence-based update of the 30+-year-old content of the Baby Check App to empower parents and carers.

Objective To systematically review clinical guidelines for signs and symptoms related to serious illness in infants aged 6 months and below.

Methods A rapid review was carried out by searching PubMed, CINAHL, NICE, Cochrane and Embase for clinical guidelines reporting signs and symptoms of serious illness in young infants. The time period was restricted from 2018 to 2023. Only guidelines published in English were included.

Results Fourteen clinical guidelines from 2307 retrieved articles were reviewed. Sixty signs and symptoms indicative of serious illness in infants were identified from the clinical guidelines. The guidelines originated from the UK (n=9, 65%), Italy (n=1, 7%), South Africa (n=1, 7%), Switzerland (n=1, 7%), USA (n=1, 7%), UK and USA (n=1, 7%). The 10 most frequent signs and symptoms were decreased consciousness, tachypnoea, looks seriously unwell to a health professional, high fever, central cyanosis, apnoea, seizures, frequent vomiting, non-blanching rash and noisy breathing.

Conclusions Knowledge of the most frequently occurring signs and symptoms that were found in the reviewed guidelines will contribute to the update of the content of the Baby Check App. This will ensure that guidance for parents and carers is consistent with the current evidence base.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ There is a need to empower parents and carers in recognising signs and symptoms of serious illness in young infants.
- ⇒ The signs and symptoms of serious illness in young infants can be identified by reviewing current clinical guidelines.
- ⇒ At present, the Baby Check App is the only app mentioned in UK guidelines that helps parents and carers in recognising serious illness in young infants, but the content needs to be updated to conform with current clinical guidelines.

WHAT THIS STUDY ADDS

- ⇒ The review retrieved 14 clinical guidelines and identified 60 signs and symptoms of serious illness in young infants.
- ⇒ The identified signs and symptoms agree with previous reviews and studies.
- ⇒ Further work is needed to use the list of signs and symptoms found in guidelines for updating the Baby Check App.

backdrop of diminishing healthcare services, for example, the reduction of health visitors and Sure Start,^{1 4} parents or caregivers need additional resources to aid in the identification and interpretation of signs and symptoms of severe illness in young infants.

One such resource is a mobile app known as the Baby Check App, designed for parents to recognise different signs of illness and determine when to access medical help.⁵ The aim of this resource is to reduce morbidity and mortality, improve early identification of severe illnesses, and prevent unnecessary visits at A&E and general practitioner (GP) practices. The Baby Check App also enhances communication between families and healthcare professionals around recognition of critical illness of a young infant.

The Baby Check App is based on research undertaken in 1991.⁶⁻⁸ The research resulted in the Baby Check scoring system, originally released in a paper version that was trialled

INTRODUCTION

In England, young infants exhibit the highest rate of attendances to Accident and Emergency (A&E) departments relative to all other age demographics.¹⁻³ The prevalence of severe medical conditions among infants within the first 6 months of life reflects not only the substantial risk of serious illness in infancy, but also parental anxiety and insecurity about their child's well-being, especially when navigating parenthood for the first time. Moreover, juxtaposed against the



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in hospitals, in general practices and by parents at home. The Lullaby Trust initially distributed Baby Check as a booklet and then developed a mobile app version, the Baby Check App.⁹

With increased vaccines, better maternity care and societal hygiene, the current health situation has changed considerably in the past three decades. In addition, there is more evidence of the important indicators of severe illness in infants which has been translated into tools such as the PArEnts' Trigger Tool for Children with Medical Complexity (PAT-CMC)¹⁰ and the SIGNS-for-Kids illness recognition tool¹¹ to guide parents, carers and clinicians. Creating resources to empower parents and carers to detect serious illness in young infants therefore necessitates a review of current clinical guidelines.

Aim and objective of the review

The aim of the rapid review was to identify signs and symptoms of seriously ill infants aged 6 months and below from current clinical guidelines.

The objective was to compile evidence that will inform the update of the Baby Check App, based on current guidelines.

METHODS

Protocol and registration

A rapid evidence review approach¹² was employed to synthesise the existing literature on clinical guidelines about the management of seriously ill infants aged 6 months and below. The present review was restricted in several ways: (1) only evidence-based clinical guidelines were included; (2) only English-language publications were considered; (3) personal communication with experts was not used; and (4) no formal quality assessment of included studies was conducted.

The rapid review protocol was prospectively registered on the Open Science Framework. To ensure methodological quality this rapid review used the updated reporting guidelines outlined in the international Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹³ (online supplemental file 1) and followed recommendations outlined by the Cochrane Rapid Reviews Methods Group.¹⁴

Information sources and search strategy

We conducted a systematic literature search using a strategy developed through consensus among the EASIER (Early recognition and Assessment of Severely Ill babies by paREnts) study team. We searched the following databases: PubMed (includes Medline) CINAHL, NICE, Cochrane and Embase. The search terms included: guidelines, infants, children, signs, symptoms, illness and their associated Medical Subject Headings. The full search strategy is available in online supplemental file 2. To ensure that the guidelines were up to date, the database search was limited to clinical guidelines published, reviewed or updated in the 5 years preceding the search

date, March 2023. Hand searching of reference lists was also performed to identify additional guidelines.

Deduplication and screening were performed using a web app for systematic reviews and followed the guidance of the Cochrane Rapid reviews methods group.¹⁴ Discrepancies were resolved through a discussion among all team members.

Inclusion/exclusion criteria

All guidelines published in English containing signs and symptoms of serious illness in infants aged 6 months or younger, and about any disease condition, were included.

Guidelines that were not in English, that contained only laboratory findings and biomarkers as illness indicators and were not authored by national or international societies or a panel of medical experts, were excluded. Table 1 shows the inclusion and exclusion criteria, following guidance on reviews of clinical guidelines.¹⁵

Data extraction

Data extraction of all included guidelines was completed using a standardised data extraction form (online supplemental file 3). Signs and symptoms were extracted from the included guidelines.

RESULTS

Guideline characteristics

From the 2307 retrieved records, 2278 were excluded during title and abstract screening. Full-text screening was performed of the remaining 29 records. Of these, 13 articles (11 guidelines and 2 associated quality standards articles) met the inclusion criteria. Three more guidelines were included from citation searching. A total of 14 clinical guidelines^{16–29} met the inclusion criteria and were included in our rapid review (figure 1: PRISMA diagram of study selection). Two quality standard articles^{30 31} that accompanied the guidelines for Postnatal Care,²⁹ and Fever in Under 5s²³ were also included in the final review as they met the inclusion criteria.

The characteristics of the included guidelines are presented in table 2.

Conditions addressed in the guidelines

Fever was the most frequent condition addressed by the included guidelines (n=3, 21.43 %), followed by brief resolved unexplained events (n=2, 14.29%), and sepsis (n=2, 14.29%). The other conditions covered by the guidelines are presented in table 3

Only the clinical guideline on Postnatal Care, issued by NICE²⁹ mentions an app for parents and carers to assess the severity of illness in young infants, and this is the Baby Check App.⁶

Signs and symptoms of serious illness identified

Sixty signs and symptoms were extracted from the 14 guidelines.

The list of signs and symptoms, and the frequency of their occurrence are presented in figure 2. Figure 2 is

Table 1 Inclusion and exclusion criteria

Criteria	Include	Exclude
Population, clinical indication(s) and condition(s)	Signs and symptoms of serious illness in infants aged 6 months or younger. Any condition.	Reports only laboratory results, biomarkers and other indicators of illness that are assessed using equipment not generally available to a parent or carer in the community. Not intended for infants aged 6 months or less.
Interventions	Any intervention.	
Content	All comparators.	
Attributes	English language. Guidelines must be detailed enough that data can be extracted about the signs and symptoms of illness in infants aged 6 months or less. Current version of guidelines. Published, reviewed or updated in 2018 or later. Only Clinical Practice Guidelines (CPGs) issued or endorsed by national or international scientific societies, government organisations or a review panel of medical experts were included.	Not in English. Not detailed enough to allow data extraction. Superseded version of guideline. Case studies. Not based on evidence. Commentaries, dissertations, conference proceedings and editorials. CPGs with fewer than three authors were excluded.
Recommendation characteristics	Not applicable.	

a series of radar plots which show the signs and symptoms found in the 14 included guidelines that are in Baby Check, as well as those that are not found in Baby Check, and the proportion of 14 guidelines each sign or symptom appears in.

When we compared the list of 60 signs and symptoms that we extracted from the guidelines with the 26 signs and symptoms in the Baby Check, 23 (88%)/26 of the signs and symptoms in Baby Check App were present in list from the guidelines. Three (12%) signs,

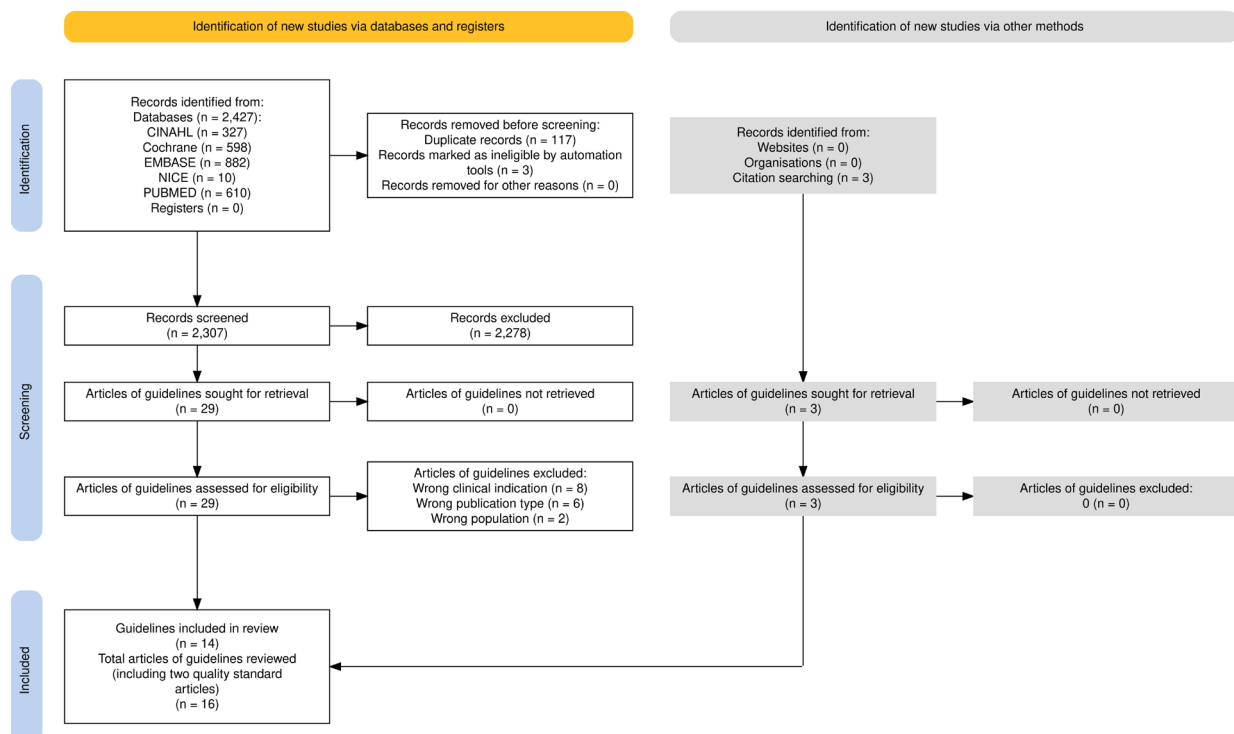

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram of study selection for inclusion into the review.

Table 2 Characteristics of included guidelines (n=14)

Country of origin	n (%)
UK	9 (65)
Italy	1 (7)
Switzerland	1 (7)
South Africa	1 (7)
USA	1 (7)
UK and USA	1 (7)
Settings	
Community, primary, secondary care	12 (85)
Emergency departments	2 (15)
Authoring bodies	
UK National Institute for Health and Care Excellence (NICE)	7 (50)
Panel of medical experts	5 (36)
American Academy of Pediatrics (AAP)	1 (7)
World Health Organization (WHO)	1 (7)

namely, raw weeping rash, blue nails and bulge in groin/scrotum, were not in the included guidelines but were in Baby Check. On reviewing the signs and symptoms from the guidelines, we found that there were 37 (62%)/60 that were not present in the Baby Check App.

DISCUSSION

Our review showed that clinical guidelines contain signs and symptoms that parents and carers could assess to detect serious illness in young infants. The most frequently occurring sign in the included guidelines was decreased consciousness. This manifests as a change of behaviour in the infant and is frequently noted by parents as an indicator that their child is ill.³² However, there were a few signs and symptoms which are not as useful to parents, for example, "Looks seriously unwell to

Table 3 Conditions covered by guidelines (n=14)

Condition addressed by guideline	Number of guidelines (%)
Fever	3 (21.43)
Brief resolved unexplained events	2 (14.29)
Sepsis	2 (14.29)
Bronchiolitis	1 (7.14)
Childhood illnesses	1 (7.14)
Decreased level of consciousness	1 (7.14)
Gastroenteritis	1 (7.14)
Gastro-oesophageal reflux	1 (7.14)
Meningitis	1 (7.14)
Postnatal care	1 (7.14)

a health professional'. This highlights that clinical guidelines are written with a health professional readership in mind. Reviews such as this are important to translate the evidence into a tool which can be used by parents/carers.

The results of our review agree with other similar studies. Two previous reviews^{33 34} identified cyanosis, rapid breathing, poor peripheral perfusion, high fever and petechial rash were 'red flags' (ie, warning signs for serious infection). These 'red flags' are included in the list compiled by this review. Both reviews, as well as another review³⁵ also identified parental concern and clinician instinct as 'red flags'. This correlates with the finding of a recent qualitative study that parents described disease severity of their child mainly in terms of changes in their child's normal characteristics (behaviour and physical features).³² Healthcare professionals should therefore recognise that parents often 'know' that something is wrong with their child, even if they cannot articulate it completely.³⁶ This should be reflected within the updated Baby Check App. The Healthier Together programme also recommends numerous graded systems for use in community for early recognition of serious illness.³⁷

With the current pressure on healthcare services, resources should be made available that empower caregivers to recognise risk factors and when to seek healthcare professional input. There are differences between hospital settings and community settings which affect the way parents can detect if their child is seriously ill and this must be considered in creating guidance. The lack of scoring systems or grading of warning symptoms intended for parents and carers is also a factor. Most advice to parents gives equal weight to each sign or symptom, making it potentially difficult to stream parents to different healthcare providers based on risk factors. Parental resources that do have a grading system are the leaflet, 'How to Recognise if Your Child is Seriously Ill'³⁸ and the PArnts' Trigger Tool for Children with Medical Complexity (PAT-CMC).¹⁰ The signs and symptoms in these resources agree with the list compiled by this review.

Comparing the review findings with a previous study of signs and symptoms of serious illness in young infants (Baby Check App),⁶ most of the signs and symptoms identified in Baby Check App are in the list that we compiled from the included guidelines. It is worth noting that Baby Check App is the only serious illness scoring system for use by parents included in formal national guidance in the UK.³⁹

In another paper based on the same study, respiratory and pulse rates were found to be uninformative in identifying increased risk of serious illness, which is given as the reason for their exclusion from Baby Check App,⁸ which is intended for use by most parents, and not specifically for parents of children with medical complexities. It has been observed that parents of children with medical complexity do become experts in recognising signs of illness in their child, not only behavioural but also respiratory patterns and effort as well.^{10 40} However, it



Figure 2 Frequency of signs and symptoms in included guidelines (n=14). HCP, Health Care Professional.

should also be noted that parents/carers who are not healthcare professionals, or who do not have children with medical complexities may find it difficult to correctly check the respiratory and heart rates of their infants. This contrasts with current evidence and training for healthcare professionals on recognition of serious illness or deterioration, which places high importance on respiratory rate and pattern and heart rate, which is the cornerstone of the Paediatric Early Warning System.⁴¹ The current state of primary healthcare provision with reduction of health visitors,¹ and challenges to accessing GP appointments create a growing need for parents and carers to be more knowledgeable and competent in detecting signs of serious illness in their infants. Tools like Baby Check App may be helpful in this regard as studies have shown that use of Baby Check increases parental confidence and sense of competence.^{7 42}

Strengths of this review include adherence to published rapid review guidance,^{13 14} and of a multi-disciplinary team reviewing the compiled list of signs and symptoms extracted from the guidelines. The time frame of the included guidelines was limited to those that had been published or updated in the previous 5 years, to ensure that they are up to date with current practice. Since most clinical guidelines, such as those issued by NICE, are reviewed every 3 years, we are confident that we were able to include most of the relevant guidelines. We have used broad approach of reviewing

any guideline addressing any warning signs of serious illness, making it unique in its scope. In contrast, most reviews have a limited scope, looking at a single entity such as ‘fever’ or ‘bronchiolitis,’ and so on.

This rapid review has a few limitations consistent with this type of review^{12 43} such as the potential for missing literature, possible introduction of bias and limits to generalisability. To mitigate these, we have followed the most recent guidance on rapid reviews.

CONCLUSION

This review identified several signs and symptoms of acute illness in infants aged 6 months or younger as reported in 14 clinical guidelines. As clinical guidelines are written mostly for health professionals, the signs and symptoms are usually presented using medical terminology, which may be difficult for lay people to understand. Future work will refine this list, which will contribute to the update of the content of the Baby Check App.

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